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Methodological "Learning-by-Doing" for Action Design Research

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ABSTRACT

This study shares the direct experiences of designing and implementing methodological "learning-by-doing" for Action Design Research (ADR) within a 5-credit module that condenses the realities of completing a full ADR project without compromising the rigour of the approach. The module is described in detail, along with the specifics of its implementation over two years and the key learnings from doing so. Adopting a confessional writing approach, documented experiences from those involved (both designers and students) provide a rich data source, analysed using autonomous and communicative reflexivity. The underlying contribution of this paper is that it provides insights into the learning of ADR, the doing of ADR, and the outcomes of a technique that simultaneously combines both. As a result, ADR educators and researchers can draw on these insights to further their teaching, learning, and research endeavours. Finally, key insights such as forced pragmatism and the challenge of problematisation add to our understanding of conducting ADR while avoiding issues such as methodological slurring.

Keywords: Methodological learning-by-doing, Action design research (ADR), Confessional writing, Curriculum design & development, Active learning

1. INTRODUCTION

Building on the methodological foundations of Design Science Research (DSR), Action Design Research (ADR) was developed with "organisational intervention at its very heart" (Sein et al., 2011, p. 39) and subsequently fits within the Iivari (2015) dichotomy of DSR strategy. In particular, ADR aligns with Iivari's (2015) "Strategy 2" which details an approach that tackles a specific problem instance within an organisation and generalises the learnings to a wider audience. As a result, it provides researchers with a framework to tackle problems, develop solutions in the form of artefacts, and generate academic contributions. Indeed, the fact that ADR focuses on real problems experienced by an actual client/organisation provides a level of research relevance that is lacking in business schools (Shapiro & Kirkman, 2018). However, tackling real problems requires a particular skill set and ability to deal with a level of unpredictability that doesn't exist in more mainstream research methodologies. As a result, a significant challenge exists to effectively teach a problem-led methodology within the limitations of a standard 5-credit module (as per the European Credit Transfer and Accumulation System). Translating the challenge into a research question: *How do you overcome the pedagogical challenge of facilitating a full ADR learning experience that provides a basis for rich feedback and guidance as students tackle real problems in a classroom environment?*

The challenge is further complicated by the level of inconsistency across published ADR papers and DSR papers in general. Labelled as "methodological slurring" (Nagle et al., 2022), the inconsistency of published ADR papers makes it difficult for students to appreciate the implementation of ADR from text alone. As a result, the option of taking a light-touch approach to teaching the methodology through published papers alone, may limit a student's ability rather than enhance it. Hence, there is a need to design a learning approach that provides a full exposure to the ADR methodology.

With the objective of answering the research question, this study describes the design of an ADR module that implements a methodological "learning-by-doing" pedagogical approach and analyses the results. Methodological "learning-by-doing" refers to the process of acquiring methodological skills and understanding while using the method and doing research (Pergert, 2009). While little research has been done on methodological "learning by doing," it has been examined in the context of grounded theory (Pergert, 2009). In that research,

two methods were highlighted for learning methodologies: (i) learning the methodology before undertaking research, and (ii) learning a methodology while using it. The benefits of the latter are an increased motivation and relevance of a topic that is often perceived as boring and irrelevant (Pergert, 2009).

This study systematically reflects on the design and implementation of a methodological "learning-by-doing" pedagogical approach, which we will refer to as the "pedagogical approach" hereafter. The outputs are (i) a detailed template for others to replicate and improve, (ii) insights into the teaching and learning of ADR, and (iii) guidance for implementing "learning-by-doing" across other IS topics. To provide context to these outputs, the paper begins by detailing standard module elements that are then modified to implement the pedagogical approach. Having described the approach, the paper then outlines the systematic reflection process implemented through confessional writing, autonomous reflexivity, and communicative reflexivity. From this the key learnings are outlined, followed by contributions.

2. MODULE DESIGN AND IMPLEMENTATION

The following section describes the module and its design and implementation. In particular, it outlines how standard module components were amended to facilitate the specific objectives of the pedagogical approach.

2.1 ADR Learning-by-Doing

The module in which the pedagogical approach is implemented is titled "Action Design Research – (BU7007)," which is part of the PhD taught offerings made available to the PhD students of Cork University Business School, University College Cork, Ireland. The implementation fully encompasses the entire module (of 5 ECTS credits), which has three module learning outcomes, which include:

1. Develop a theoretical stance towards action-oriented and design science research.
2. Demonstrate knowledge and understanding of action design research processes through a reflective learning approach.
3. Gain competence in planning, designing and evaluating, considering both the conceptual and structural requirements of action design research projects.

The module has been delivered twice, first during the academic year 2020/2021 and then in the following academic year. Ten students have completed the module, which is in line with expectations given the pool of PhD students across the business school. The students came from various backgrounds and research maturity. There were students starting their PhD journey after completing their undergraduate degree, students in their final PhD year, and students involved in research initiatives for several years. However, a significant proportion of the students had over five year's industry experience and had a strong interest in design or practice research. To embed the pedagogical approach, generic module components were customised in line with the approach. These generic components are listed below and further expanded:

(i) Lectures, which were normally delivered in 24 one-hour slots or 12 two-hour slots, were structured as 8 three-hour workshops over 14 weeks.
(ii) Going beyond feedback as a function of formal assessment. Continuous feedback was given throughout the module, which is in line with a real ADR project.
(iii) Text as a primary source of learning was enhanced by requiring the students to critique and evaluate academic articles as part of their ADR artefact.
(iv) The summative assessment was a final report that captured the ADR process performed (e.g., artefact development), with the aim of being publishable.

2.1.1 Workshop Format. Figure 1 outlines the module schedule for the 2021/2022 run of the module. As described, it includes 8 x 3-hour workshops over 14 weeks. The schedule also presents both the facilitator-led workshops (workshops 1, 3, 5, and 7) and the student-led workshops (workshops 2, 4, 6, and 8). Having these student-led "Assignment Show and Tell" workshops affords students the opportunity to present their progress to the group and learn from their peers. It also provides an opportunity for the facilitators to give regular feedback and another point of learning for the students. During workshop 1, students visualise the ADR approach outlined by Sein et al. (2011). Workshop 2 focuses on these visualisations to provide a base layer of understanding for the students by providing feedback on their initial understanding of ADR. Having presentations from each student also highlights different aspects of ADR understanding which, paired with feedback from the facilitator, provides a more rounded internalisation of the approach. It is worth noting that, while Sein et al. (2011) is prescribed, three other methodological papers are given to the students to help them make sense of ADR. It is also worth detailing that, in the last implementation of the module, some students went beyond Sein et al. (2011) and incorporated aspects of these papers (e.g., Mullarkey & Hevner, 2019) in their visualisations. This aspect of the module is designed to provide students with the essential elements to implement ADR while completing their first iteration.

<table>
<tr><th>Workshop 1 (26th Jan)</th><th>Workshop 2 (2nd Feb)</th><th>Workshop 3 (16th Feb)</th><th>Workshop 4 (23rd Feb)</th></tr>
<tr><td rowspan="2">Introduction and Overview</td><td rowspan="2">Assignment Show & Tell (ADR Visual)</td><td>Problem Formulation</td><td rowspan="2">Assignment Show & Tell (Iteration 1)</td></tr>
<tr><td>Guest Speaker</td></tr>
<tr><th>Workshop 5 (9th Mar)</th><th>Workshop 6 (23rd Mar)</th><th>Workshop 7 (30th Mar)</th><th>Workshop 8 (6th Apr)</th></tr>
<tr><td>Build and Evaluation</td><td rowspan="2">Assignment Show & Tell (Iteration 2)</td><td>Reflection and Formalisation</td><td rowspan="2">Assignment Show & Tell (Iteration 3)</td></tr>
<tr><td>Guest Speaker</td><td>Guest Speaker</td></tr>
</table>

Figure 1. Module Schedule

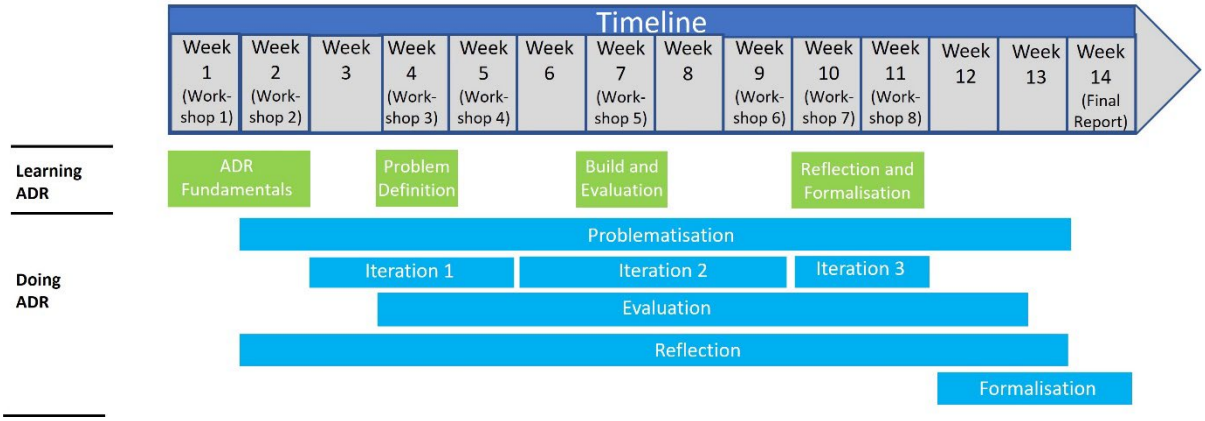

Figure 2. Visualising the Pedagogical Approach

2.1.2 Immediate Action and Continuous Feedback. Core to "learning-by-doing" is the need for immediate action and continuous feedback. The module is designed to mirror the reality of conducting ADR (idealised by Sein et al., 2011) in the wild and provides the opportunity to design, build, and evaluate three artefact iterations (workshops 4, 6, and 8). This is after the researcher has grasped the methodology fundamentals (workshops 1 to 3). Separating the learning elements from the doing elements (of ADR) in the module (see Figure 2), it is possible to see the close alignment of theory and practice within the module. While the iteration timeline is more condensed than normal, the sequencing of iterations is no different from any project following the ADR methodology. In essence, the students are able to go through the rigour of designing and building their artefact and evaluate the results, which provides feedback on their efforts. As a result, the students can mature their understanding of ADR and how to implement it successfully.

2.1.3 Critical Engagement of Text. As part of the module, three "Show and Tell" workshops are dedicated to presenting the artefact, which is designed to analyse a selection of ten empirical ADR papers to appreciate the operationalisation of ADR. The selection is not intended to be exhaustive and considers the time taken to reread text several times. The aim is to achieve a depth of understanding through a number of seminal papers rather than a multi-perspective understanding achieved by reading a broad number of texts on the topic. The selection also provides the basis for the development of the artefact (over three iterations) to appreciate ADR operationalisation. For the first and second iteration, five empirical ADR papers are available (on the course titled "Virtual Learning Environment") to aid the design, build, and evaluation of the initial artefact. For the third and final iteration, an additional five empirical ADR papers are given to the students to analyse (see Appendix B for the list of ADR empirical papers). Similar to the initial ADR visualisation, students present to the group and get feedback from the facilitator. Students are also invited to give feedback to their peers on their presentations.

2.1.4 Final Report. The final report, upon which the module is assessed, aims to capture the student's initial understanding of ADR as well as their use of ADR to build an artefact to appreciate the operationalisation of the method. This is achieved by analysing a selection of ADR empirical studies (see Appendix A for the 2021/2022 assignment brief). The aim of the report is to formalise the learning gained throughout the module. This is no different from formalising the learnings from any ADR project in a thesis or academic paper. Indeed, the students are asked to treat the report as a paper that could be published in a relevant conference or journal.

3. ANALYSIS OF ADR "LEARNING-BY-DOING"

Confessional writing is utilised by Mathiassen and Sandberg (2013) to explore how to bridge the practice-research gap within IS. They noted that "*confessional accounts serve to demystify fieldwork by revealing how research is practiced*" (p. 478). In the case of this study, we wish to extend that purpose by gaining insight into how ADR is practiced in the process of being taught. Therefore, four students were asked to participate in the study and co-author the paper with the two module facilitators. Since its inception, the module has completed two runs with confessional accounts included from the facilitator of each year and two students from each year (see Table 1).

Role/Perspective	Author (Course Year)
Student	1. Sharon Jones (2021) 2. John O'Sullivan (2021) 3. Gail Birkbeck (2022) 4. Niamh Daly (2022)
Facilitator	1. David Sammon (2021) 2. Tadhg Nagle (2022)

Table 1. Roles and Authors

The primary source of data for the confessional writing approach was a 2-hour (recorded) group discussion on the students' experience with the module. Before the discussion, seven questions were provided to each student (see Table 2). In line with Mathiassen and Sandberg (2013), this promoted autonomous reflexivity, which afforded each group member the opportunity to develop and strengthen their individual interpretations of the module based on their experiences as well as their personal notes, final report, and formal feedback (see Table 3). Furthermore, this was complemented by

communicative reflexivity, which occurred during the group discussion through an exploration and/or challenge of those individual interpretations. Both modes of reflexivity led to multiple unplanned discussions and outputs during the recorded session, which reduced the risk of incompleteness and bias that can occur using confessional accounts (Van Maanen, 1998). Once completed, the 2-hour group discussion was transcribed, and key themes were identified. These were shared between the group for validation and refinement.

Number	Question
1	The challenge of conducting ADR while still learning it.
2	The value of peer presentations and evaluation.
3	Appreciating your value as a "novice" ADR researcher.
4	Pitfalls you did and did not avoid.
5	The fit/relationship between you and the ADR method/project.
6	Parts of ADR you felt most difficult/easy.
7	Presentation of your work through presentations and the final submission.

Table 2. Reflective Questions Asked Between the Authorship Team

Data Source	Description
Direct Involvement	All six of the authorship team were directly involved in the module (two facilitators, four students). One facilitator and two students from each year the module was delivered.
Personal Notes	Notes taken by students throughout the module. Primarily including feedback from "show and tells" as well as insights from guest speakers over 14 weeks.
Formal Feedback	Formal feedback given by facilitators on each of the author's ADR project report.
Module Documentation	Module description and assignment briefs.
ADR Project Report	The final ADR project report submitted by each of the authors - over 50 pages in total.

Table 3. Sources of Data Used in the Autonomous and Communicative Reflexivity Processes

4. KEY LEARNINGS

This research is based on a module designed to facilitate an active learning approach for PhD researchers. The ambition was to create a tempo that afforded students the opportunity to experience an actual ADR project, particularly the twists and turns of designing, building, and evaluating an artefact as a solution to a problem (within a 5-credit module). The starting point of the ADR project gets the students to focus on building an artefact to help them appreciate how ADR is operationalised. To do this, the students have to find the correct depth of analysis to determine the strength of an empirical ADR paper. This is not a trivial task in terms of "how-to." It can often be the case that novice researchers are reading exemplars of ADR execution without taking inspiration as to how they should execute and present their own ADR studies. Furthermore, as the ADR starting point is not a problem, the students must define a relevant problem as they develop their artefact. In line with the overall objective of the paper, the following learnings provide insight into the implementation of the pedagogical approach as described in the previous sections.

4.1 Forced Action/Pragmatism

A significant challenge in designing the ADR learning-by-doing module was the condensed nature of the module and limited time to complete a full ADR project. As noted by Tadhg (Facilitator 2), the challenge for students is akin to building a parachute after being pushed from a plane. To help with this challenge, the module was scheduled in a way to inject momentum and keep the students progressing through the ADR approach and progressing their artefact. As Niamh (Student 4) commented, "*I was acutely aware that the project was going to move. So I knew at the beginning that I may not get an in-depth understanding of action design research… but there was a feeling for me that I would have to park it and keep it shallow just to keep up with the progression of what was required for the assignment*." However, that ability to progress came easier for some more than others. While none of the students had experience in ADR, John (Student 2) found strong parallels with ADR and his engineering background. He interpreted ADR as a series of steps that were executed sequentially. That pragmatism didn't come as easy to Sharon (Student 1), Gail (Student 3), and Niamh (Student 4). Sharon (Student 1) and Gail (Student 3) found it difficult at the start as they mapped ADR to existing concepts they would have previously experienced. Both found themselves "*in the weeds*" or "*underwater*" in those initial stages. Going into the weeds or underwater mainly occurred as a result of trying to get a comprehensive understanding of ADR before progressing. As Gail (Student 3) highlighted, "*I probably did my usual style, made it a lot of work for myself by going right down into the weeds. But that was just the process I had to go through to understand the different stages of it*." While understanding the necessity to move, Niamh (Student 4) had to manage her tendency to "*overthink*," primarily by identifying the tendency, and then progressing. However, given the challenges, there was an agreement on the effectiveness of the approach. Sharon (Student 1) highlighted that "*it was hard, but it was absolutely invaluable as the best way to get into it as a methodology and a set of concepts*." Yet, underpinning this effectiveness is the need to trust the process, which may challenge a student's mental model for doing research.

4.2 Convergent Learning - Divergent Action

A core part of the module is the standard nature of the task given to everybody. While the task given is a real challenge for each student (to appreciate how ADR is operationalised effectively), it does ring-fence the experiential nature of an ADR project in the wild. Yet, the trade-off of increased peer learning far outweighs the reduced experiential aspect of the design. All students go through the same process, are involved in the same discussions, and have the same assignment and dataset (set of 10 empirical ADR papers) to base their work on, which

provides a platform for building a rich shared understanding between the students. Furthermore, the feedback and discussion sessions provide a forum to openly discuss interpretations of the methodology. Indeed, this sensitivity to others' interpretations provides a wider base from which a student's own interpretations can be formed. Sharon (Student 1) found the experience with this peer learning aspect insightful in trying to understand ADR as others on the course were "*bringing their experiences into the ADR space and seeing it from different angles*" and lenses. It also helped the students to judge their own progress. Niamh (Student 4) highlighted that it gave her a "*centre point*" to aim towards and, through the feedback, she was able to centre her efforts the closer she got to completion. However, while the goal of the module is to build a shared understanding or convergent learning, it has resulted in divergent actions. Students focused on various problems, interpreted ADR in different ways, developed different artefacts (see Appendix C), and formalised different learnings and contributions. This demonstrates that the individual experiential nature of ADR is far from being lost within the module, which provides scope for personalised ADR implementations driven by an idiosyncratic relationship between the researcher (student) and the research methodology. Moreover, it demonstrates the need for facilitators to resist the temptation of enforcing convergent action that aligns with an idealised interpretation of ADR.

4.3 Doing ADR on ADR

A key challenge for the students was building an artefact using ADR to analyse ADR papers. As John (Student 2) described it: "*I just felt that because we were doing ADR on ADR that one clouded the ability to understand the other. It's like I'm trying to paint a painting of paint*." Niamh (Student 4) also commented on the challenge as she found it "*heavily interwoven*" which made it "*quite tricky*." Furthermore, John (Student 2) was an advocate of learning ADR by doing, but in a context of the students choosing their own projects. However, it was acknowledged that it would bring a wide variation of problem contexts that would dominate discussions and distract attention away from understanding the how-to of implementing ADR (the underlying objective of the module). Interestingly, to overcome the challenge of doing ADR on ADR, Gail (Student 3) highlighted a key realisation on the application of "*reflection-on-action*" and "*reflection-in-action*," concepts identified in Hustad and Olsen (2014, p. 448). Applying these concepts to the ADR process and the ADR papers (analysed in the module), highlights the layers of learning to be unpacked.

Figure 3 is a visual translation of the value of such reflection on and in-action as part of doing ADR. This visual emerged from the module designers' translation of the student conversation during the group discussion. It presents the centrality of reflection to the module but also highlights the depth of richness that can be achieved by conducting ADR in a short timeframe using a limited number of papers. Hence, tackling the challenge of teaching an "ADR lite" approach.

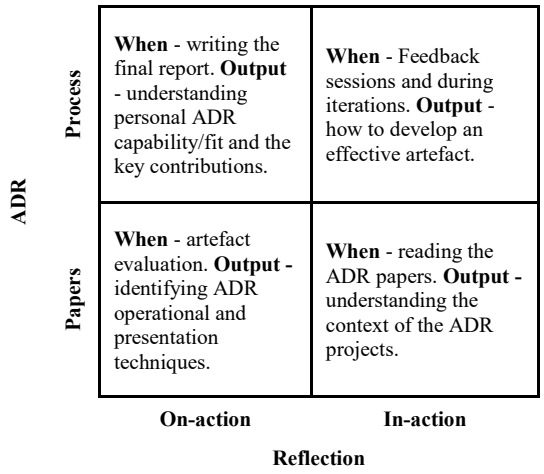

Figure 3. Types of Reflection Evident from the Technique

4.4 The Challenge of Problematisation

The importance of having a clear problem in ADR was recognised by all. As Gail (Student 3) stated "*the importance of having a clear problem area to address, with the stakeholders identified, helped in deciding on the [final] design as did the findings from the concurrent evaluation cycles.*" Moreover, the difficulty in defining a problem was also highlighted. Niamh (Student 4) articulated the challenge by stating "*ADR requires a level of pragmatism in terms of solving a practice-inspired problem. Academic researchers having experience or being exposed to other methodologies may interpret problems in a more theoretical context*." Interestingly, Sharon (Student 1), John (Student 2), and Gail (Student 3) interpreted the problem in the form of a question. For John (Student 2), the question was "*how to develop an assessment method for ADR projects?*" Both Sharon (Student 1) and Gail (Student 3) had similar questions but focused on the novice researcher. In contrast, Niamh's (Student 4) problem definition highlighted the lack of evaluation tools/mechanisms, which provided the motivation to develop one. While the difference between a question and a problem could be described as semantic in the case of ADR, a question can be answered without ever solving a problem. Hence, the practical value of the research is somewhat lessened. Nonetheless, there was strong evidence of "problem definition" refinement across the board. Yet, the prevalence of research objectives/questions being framed as problems highlights the ease of operationalising ADR with an objective orientated starting point. However, the challenge for students to make sense of problems should not be underestimated. In his feedback sessions (assignment "show and tells"), Tadhg (Facilitator 2) highlighted a number of clear problems that could be solved by the artefacts presented by the students. However, in most cases, they failed to make it into the final write up. This is in no way a slight on the students, given the challenge that seasoned researchers have on the exact same issue. It does, however, highlight the support needed for students in understanding "a problem" before they can tackle "the problem."

5. CONTRIBUTIONS

This study aims to share the direct experiences of designing and implementing a pedagogical approach to overcome the challenges of facilitating a full ADR learning experience that provides a basis for rich feedback and guidance as students tackle real problems in a classroom environment. By doing so, we have created a number of contributions to the teaching and learning of ADR. Firstly, as noted by Peffers et al. (2018), "*while there has been much research published about DSR [methods], there has not been as much research as we might hope that applies the DSR research paradigm to carry out IS research*" (pp. 129-130). In response, this article sheds some light on how ADR can be effectively taught to help increase the number of empirical ADR studies. Furthermore, our ADR "learning-by-doing" approach sets expectations of what can be achieved within a 5-credit module. Indeed, our analysis highlights that it is possible to condense the realities of completing an ADR project within a 5-credit module without compromising the rigour of the approach.

Secondly, we provide detailed insights into the intricacies of facilitating and participating in an ADR "learning-by-doing" module. We do this by calling out the key learnings from the confessional analysis of both students and facilitators. Indeed, to further refine our insights, we provide three key action points.

1. While facilitators will have extensive knowledge of ADR, they also need to consider the characteristics of the student and provide support in the stages they require it most. In our analysis, the need to push students into action and not overthink their positions was a critical factor in building momentum in their learning.
2. Aim for depth and richness in learning. The task required each student to read 14 papers, which is not a significant amount of reading. However, the depth of reading and re-reading given to those papers provided for building an ADR artefact and meaningful reflection and discussion. Nonetheless, facilitators should be conscious of conceptually separating reflection in-action from on-action against the ADR process and the analysed ADR papers.
3. Focusing on a standard task that is personally relevant to all students does not severely limit the experiential nature of ADR. Each student was given the same task within the module, which could be perceived as an artificial application of ADR. However, the fact that the task was personally relevant and was a problem experienced by each of the students provided scope for rich personal experimentation and group learning. In addition, the "Show and Tell" workshops gave each student the opportunity to give and receive micro-evaluations (Vaishnavi & Kuechler, 2004/2021), which over time provides a substantial portfolio of feedback.

Finally, our analysis highlights the challenges of facilitating strong problematisation. IS research has been called out for placing little value on empirically exploring and defining IS problems (Nielsen, 2020). Indeed, design research overlooks problem analysis compared to other problem-solving methods, such as action research and engaged scholarship, which prescribe empirical problem investigations (Nielsen, 2020). Nonetheless, the pedagogical approach described in this paper provides a basis that encourages divergent action. Furthermore, by doing ADR on ADR, researchers become keenly aware of the rigour and methodological specificity needed while avoiding common methodological slurring pitfalls (Nagle et al., 2022). While this study primarily focuses on the pedagogical (teaching centric) design of the approach, it provides an opportunity for future research that makes sense of the approach from a learner centric perspective (Sammon & Nagle, 2023)

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Gail Birkbeck is currently pursuing a PhD, and is also a part-

time lecturer at Business Information Systems, University College Cork (UCC). She is also an Adjunct Associate Professor with the School of Psychology (UCD). Her research focus is on Open Research Data and how to facilitate FAIR and Open Research practices. In her early career, she lectured in psychology, statistics, and supervised student research projects. Previously, Gail worked for Atlantic Philanthropies for 13 years where her role focused on measuring impact and capturing learning on funded projects.

Niamh Daly is currently a PhD candidate in Business

Information Systems at Cork University Business School, University College Cork, Ireland. Her research focuses on opportunities for information systems (IS) in Critical Infrastructure Organisations, and is currently investigating Digital Twins. Other research interests include Universal Design for Learning (UDL) practice and Action Design Research (ADR). Niamh Daly has extensive industry experience in User Interface design and development.

Sharon Jones is currently a PhD candidate at University

College Cork. She is also a Higher Education Consultant and experienced HE professional services director and project manager. She specialises in designing service innovation and transformation. She has expert knowledge of higher education policy, governance and board level relationship/stakeholder management, the law and regulation of higher education. She is known for her ability to lead beyond organisational boundaries and being an innovative problem solver.

John O'Sullivan is currently pursuing a PhD at University

College Cork, researching applications of innovation in the field of automation projects in the pharmaceutical sector. He is the Managing Director of Douglas Control and Automation. He lectures part-time at the Munster Technical University (MTU) in automation. He has published three books on European and Japanese missions to the International Space Station. He is a Chartered Engineer and Fellow of Engineers Ireland, a Project Management Professional with the Project Management Institute, and was awarded the Project Management Student of the Year award at MTU in 2016. He is a three times TÜV certified safety professional.

David Sammon is a professor of information systems, a self-

confessed visual thinker (placing a great value in taxonomical thinking) and works to the adage that "*if you can't draw it, you don't understand it!*" David has 25 years of teaching experience in Business Information Systems (BIS), UCC, and is also an associate faculty at the Irish Management Institute (IMI). David has designed, developed, and directed several educational modules/programmes (NFQ Level 9), and in 2020, David secured funding valued at circa €1.44m over 3 years (2020-2023) for the *PGDip in Innovation through Design Thinking*.

APPENDICES

Appendix A. Assignment Outline

Part One – 10 marks

Requirements: (500 words)

- Identify the stages of the Sein et al. (2011) ADR method and briefly explain each stage. Visualise your interpretation of the ADR method they propose.

Part Two – 3 x 30 marks

Requirements: (2,500 words)

- Using the stages of the Sein et al. (2011) ADR method, analyse a selection of ADR empirical studies in order to appreciate the operationalisation of the ADR method.

Report Due Date: 22ndApril 2022 (3,000-word report)

"Show & Tell" Session Dates:

- Part One – 2nd February
- Part Two – Iteration 1 – 23rd February
- Part Two – Iteration 2 – 23rd March
- Part Two – Iteration 3 –6th April

Appendix B. Initial Reading List

Haj-Bolouri, A., Purao, S., Rossi, M., & Bernhardsson, L. (2017). *Action design research as a method-in-use: Problems and opportunities.* Paper presented at the Designing the Digital Transformation: DESRIST 2017 Research in Progress Proceedings of the 12th International Conference on Design Science Research in Information Systems and Technology. Karlsruhe, Germany. 30 May-1 June.

Maccani, G., McLoughlin, S., Prendergast, D., & Donnellan, B. (2017). *Positioning living labs within action design research: Preliminary findings from a systematic literature review*. Paper presented at the 12th International Conference on Design Science Research in Information Systems and Technology, Karlsruhe, Germany.

Mullarkey, M. T., & Hevner, A. R. (2019). An elaborated action design research process model. *European Journal of Information Systems*, *28*(1), 6-20.

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

ADR Papers for Iteration 1

Ebel, P., Bretschneider, U., & Leimeister, J. M. (2016). Leveraging virtual business model innovation: A framework for designing business model development tools. *Information Systems Journal*, 26(5), 519-550.

Giesbrecht, T., Schwabe, G., & Schenk, B. (2017). Service encounter thinklets: How to empower service agents to put value co-creation into practice. *Information Systems Journal*, *27*(2), 171-196.

Hustad, E., & Olsen, D. H. (2014). Educating reflective enterprise systems practitioners: A design research study of the iterative building of a teaching framework. *Information Systems Journal*, *24*(5), 445-473.

Mettler, T. (2018). Contextualizing a professional social network for health care: Experiences from an action design research study. *Information Systems Journal*, *28*(4), 684-707.

Spagnoletti, P., Resca, A., & Sæbø, Ø. (2015). Design for social media engagement: Insights from elderly care assistance. *Journal of Strategic Information Systems*, *24*(2), 128-145.

ADR Papers for Iteration 3

de Reuver, M., & Keijzer-Broers, W. J. (2016). *Action design research for social innovation: Lessons from designing a health and wellbeing platform.* Paper presented at the Proceedings of International Conference on Information Systems (ICIS).

Gill, A. Q., & Chew, E. (2019). Configuration information system architecture: Insights from applied action design research. *Information & Management*, *56*(4), 507-525.

Keijzer-Broers, W. J., & de Reuver, M. (2016). *Applying agile design sprint methods in action design research: Prototyping a health and wellbeing platform.* Paper presented at the International Conference on Design Science Research in Information System and Technology.

Maccani, G., Donnellan, B., & Helfert, M. (2014). *Action design research in practice: The case of smart cities.* Paper presented at the International Conference on Design Science Research in Information Systems.

Reibenspiess, V., Drechsler, K., Eckhardt, A., & Wagner, H.-T. (2020). Tapping into the wealth of employees' ideas: Design principles for a digital intrapreneurship platform. *Information & Management*, *59*(3), 103287.

Appendix C. Final Report Summaries

This appendix presents a summary of the final report submitted by each student that co-authored this paper. To highlight and support the learnings outlined in the papers, Table C-1 provides an analysis of the reports. From the analysis it is possible to see the divergent actions through entry points and artefacts. Furthermore, there is a similarity in observations from their key learnings. In particular, across the students there is an acknowledgment of the complexity and inconsistency of ADR studies.

	Niamh	**Gail**	**Sharon**	**John**
Entry Point	Problem Definition	Objective	Objective	Objective
Artefact	ADR Evaluation Tool for novice researchers	ADR Checklist (Quantitative)	Matrix of ADR Conditions	ADR Checklist (Qualitative)
Key Learnings	The pragmatism of ADR requires a researcher with an aligned ontological position.	It is possible to conduct ADR without fidelity to all the components and principles.	Complexity of ADR makes it hard to compare without a framework.	There is an inconsistency in how papers are labelled as ADR.

Table C-1. Problems Identified with Existing Evaluation of ADR Empirical Studies

NIAMH DALY – ADR PROJECT SUMMARY

1. Problem Description

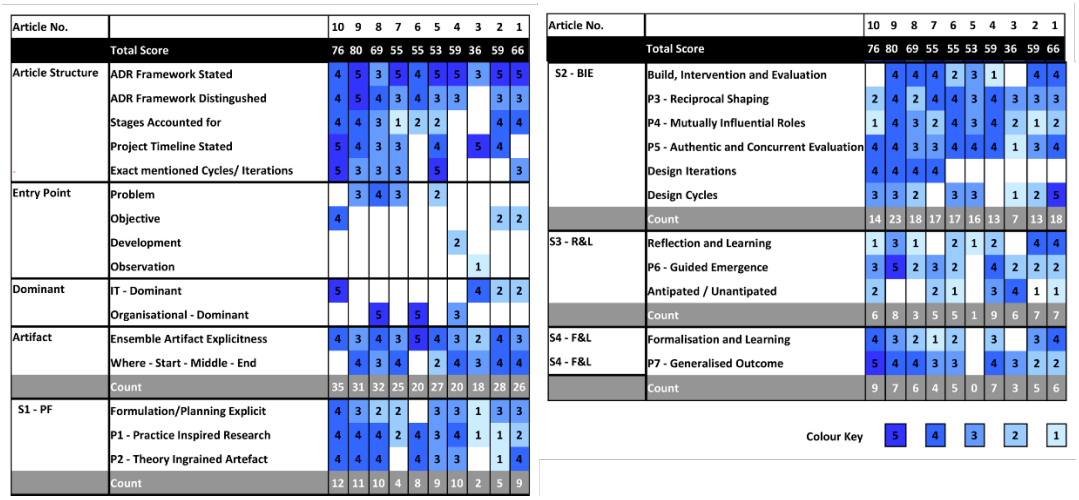
A problem that exists for both researchers and practitioners is gauging the success of projects that utilise ADR methodologies. This problem is two-fold. Firstly, successful ADR projects may not be documented or portrayed well as an academic contribution. Secondly, researchers find it difficult to ascertain what constitutes a good ADR article. A distinguishing feature of ADR from other methodologies is that, even in the event a project fails to produce an effective ensemble artefact, these failures, if communicated as knowledge outcomes, act to provide learning opportunities for researchers. Therefore, all ADR papers are learning opportunities for researchers if the project has been documented and communicated effectively. Through an investigation of existing literature, it was noted that no evaluation ADR tool currently exists. This created an opportunity to build an ADR evaluation tool that will aid novice researchers in measuring effective communication of outcomes in ADR empirical studies and is therefore considered a practice-inspired problem (Table C-2).

Problem	**Consequences**
No evaluation tool for ADR empirical studies currently exists	Evaluation requires foundation understanding of ADR methods
No mechanism to assess in terms of adherence to ADR method	Researchers may find it difficult to ascertain adherence to ADR method and to determine validity of knowledge contribution

Table C-2. Problems Identified with Existing Evaluation of ADR Empirical Studies

2. Artefact Description

The artefact is an ADR evaluation tool (Figure C-1) that is aimed towards a novice ADR researcher and serves to evaluate ADR empirical studies in how ADR methods are disseminated. It uses a grading system to indicate nuances of results and colour codes to indicate level of explicitness of ADR method and other characteristics important in aiding researchers to measure ADR contributions. The artefact is designed to evolve with use. As a researcher becomes more skilled at using it, the tool should be updated to match their increased level of expertise (Persky & Robinson, 2017).



Article No.		10	9	8	7	6	5	4	3	2	1
	Total Score	76	80	69	55	55	53	59	36	59	66
Article Structure	ADR Framework Stated	4	5	3	5	4	5	5	3	5	5
	ADR Framework Distingushed	4	5	4	3	4	3	3		3	3
	Stages Accounted for	4	4	3	1	2	2			4	4
	Project Timeline Stated	5	4	3	3		4		5	4	
	Exact mentioned Cycles/ Iterations	5	3	3	3		5				3
Entry Point	Problem		3	4	3		2				
	Objective	4								2	2
	Development							2			
	Observation								1		
Dominant	IT - Dominant	5							4	2	2
	Organisational - Dominant			5		5		3			
Artifact	Ensemble Artifact Explicitness	4	3	4	3	5	4	3	2	4	3
	Where - Start - Middle - End		4	3	4		2	4	3	4	4
	Count	35	31	32	25	20	27	20	18	28	26
S1 - PF	Formulation/Planning Explicit	4	3	2	2		3	3	1	3	3
	P1 - Practice Inspired Research	4	4	4	2	4	3	4	1	1	2
	P2 - Theory Ingrained Artefact	4	4	4		4	3	3		1	4
	Count	12	11	10	4	8	9	10	2	5	9

Article No.		10	9	8	7	6	5	4	3	2	1
	Total Score	76	80	69	55	55	53	59	36	59	66
S2 - BIE	Build, Intervention and Evaluation		4	4	4	2	3	1		4	4
	P3 - Reciprocal Shaping	2	4	2	4	4	3	4	3	3	3
	P4 - Mutually Influential Roles	1	4	3	2	4	3	4	2	1	2
	P5 - Authentic and Concurrent Evaluation	4	4	3	3	4	4	4	1	3	4
	Design Iterations	4	4	4	4						
	Design Cycles	3	3	2		3	3		1	2	5
	Count	14	23	18	17	17	16	13	7	13	18
S3 - R&L	Reflection and Learning	1	3	1		2	1	2		4	4
	P6 - Guided Emergence	3	5	2	3	2		4	2	2	2
	Antipated / Unantipated	2			2	1		3	4	1	1
	Count	6	8	3	5	5	1	9	6	7	7
S4 - F&L	Formalisation and Learning	4	3	2	1	2		3		3	4
S4 - F&L	P7 - Generalised Outcome	5	4	4	3	3		4	3	2	2
	Count	9	7	6	4	5	0	7	3	5	6

Colour Key: 5 4 3 2 1

Figure C-1. Iteration 3 of Evaluation Artefact: Evaluating Ten Empirical ADR Studies

3. Key Learnings

During problem formulation, the researcher's ontology posed an initial hurdle. ADR requires a level of pragmatism in terms of solving a practice-inspired problem. Academic researchers having experience or being exposed to other methodologies may interpret problems in a more theoretical context. Therefore, consideration to a researcher's ontology prior to undertaking an ADR investigation may aid problem formulation through adopting a pragmatic position or drawing attention to difficulties with problem formulation. When communicating iterations to ADR team members, effectiveness of communication can determine the level of feedback and input into the next evaluation. Therefore, it is worth investing time to communicate status. Through development of an evaluation ADR tool, the researchers transition through levels of expertise. In the context of this study, the researcher moved from novice to advanced beginner. This may have implications for perceived usefulness.

4. Key Contributions

Acknowledgement of research ontology should be made as this may directly impact evolution of tool and problem formulation. It has been observed that a natural progression of expertise is encountered, and the artefact may evolve depending on research investigation.

GAIL BIRKBECK – ADR PROJECT SUMMARY

1. Problem Description

A design principle identified after iteration 2 suggested the need to develop an aid to ensure researchers new to ADR don't forget an important component of ADR activities and stages and the principles underpinning the methodology. Based on this, the problem description for iteration 3 was as follows: ***How might we design*** [a tool to analyse ADR empirical studies] for [researchers new to ADR] in order to [appreciate the operationalisation of ADR] because [ADR is a useful methodology for dealing with real-life problems].

2. Artefact Description

Following three cycles, a checklist has been developed in this study to assist others to appreciate the operationalisation of ADR. Artefacts from the first two build cycles led to the design principles that informed the design of the checklist. The original activities as defined by Sein et al. (2011) were used to guide its development. A number of questions were developed to populate each activity area. The relevant ADR principle underpinning each question is also included to demonstrate the focus area. While Sein et al., (2011) identified the problem inspiring the development of ADR as IT-dominant or Organisation-dominant, a "Societal dominant" option was also included to capture in the use of ADR in such contexts. [Similarly], the entry point in an ADR study needs to be taken into consideration.

CHECKLIST for ACTION DESIGN RESEARCH STUDIES (CARDS)	
1. Problem Formulation	
( ) Is there a practical problem inspiring the development of an artifact?	PIR
( ) IT-dominant ( ) Organisation-dominant ( ) Societal-dominant	
( ) Is the problem entry point clearly called out?	PIR
( ) Problem-centred ( ) Objective-centred ( ) Development-centred ( ) Observation	
( ) Are practitioners' *past* assessments considered (e.g., document scan)?	PIR
( ) Are practitioners' *current* assessments considered (e.g., exploratory surveys of need, solutions)?	ACE
( ) Is prior research in the subject area considered?	TIA
( ) Are there any design insights or components from the existing research identified? *a hunch on how to solve a problem	TIA
( ) Is there a theoretical basis informing the research?	TIA
( ) Is the class of problem identified?	TIA
( ) Is an ADR team identified?	RS
( ) Is there ethical approval to conduct the ADR study?	RS
2. Building, Intervention, Evaluation	
( ) Did the design insights lead to an artefact (alpha version)?	RS
( ) Were adjustments in the artefact design called out?	RS
( ) Did new design principles emerge in the development of the artefact?	RS
( ) Were different members of the design team (researchers and practitioners) engaged in the BIE stage?	MIR
( ) Are the evaluation criteria apparent?	ACE
( ) Are the evaluation methods apparent?	ACE
( ) Is the analysis discussed?	ACE
( ) Is there evidence of evaluation at each BIE cycle?	ACE
3. Reflection and Learning	
( ) Is there evidence of reflection and learning after each cycle?	GE
( ) Are the methods used to support reflection and learning activities apparent?	GE
( ) Does the study consider the application of the findings to a broader class of problems?	GE
4. Formalization of Learning	
( ) Use of findings from the artefact design to formalise design knowledge?	GO
( ) Can the problem area be generalised to a broader class of problems?	GO
( ) Can the solution area be generalised to a broader class of solutions?	GO
( ) Are design principles identified?	GO
Legend: PIR: practice-inspired research; TIG: theory-ingrained artifact; RS: reciprocal shaping; MIR: mutually influential roles; ACE: authentic and concurrent evaluation; (GE) guided emergence GO: generalized outcomes.	

Figure C-2. ADR Artefact

3. Key Learnings

The importance of having a clear problem area to address, with the stakeholders identified, helped in deciding on the design, as did the findings from the concurrent evaluation cycles. Before undertaking any further revisions on the checklist, personas of the end user would be helpful to inform the next iteration. Further refinement of the problem area would also inform the class of problem being addressed.

End-user testing of the checklist and expert review, by way of an evaluation, would help to assess the usability and validity of the checklist. Access to students with an interest in learning about ADR would have enhanced the evaluation and subsequent iterations of the artefact.

Like the studies reviewed to inform the development of an artefact in this study, ADR is operationalised in many different ways depending on the problem at hand, the maturity of the problem area, the entry point and, in the case of this study, resources in terms of time. Also, different artefacts can be produced at each iterative cycle.

I conducted this study as both a researcher and a practitioner (it was not possible to create a design team), where my own growing knowledge coloured the design process.

It's also clear that it's possible to conduct ADR without fidelity to all the components and principles. Having a checklist logging the absence of some aspects will ensure others are aware of the limitations of a study while also communicating to them how ADR is operationalised.

4. Key Contributions

In this study, I have described using the ADR methodology and how ADR is operationalised. Sein et al. (2011) did not prescribe exactly what ADR should look like instead setting out a series of activities underpinned by seven principles. The learning at this point suggests that the checklist could be a useful contribution to the field and a useful aid for both novice ADR researchers and ADR instructors. A brief search of the journal literature on this topic suggests there is a limited number of checklists regarding the operationalisation of ADR, so this artefact could be a welcome addition. However, further literature reviews are required.

SHARON JONES – ADR PROJECT SUMMARY

1. Problem Description

The assignment challenge was to use the stages of Sien et al. (2011) ADR method to analyse a selection of ADR empirical studies to appreciate the operationalisation of the ADR method. I reframed the challenge after undertaking two iterations of the assignment before moving to ask the question "*What is the minimal viable requirement to qualify as ADR research?*" This question arose from efforts to understand and characterise the diversity of the problems and methods used in the portfolio of ADR empirical studies provided by the course team for analysis and became the trigger for the artefact produced in the third iteration. The problem space developed at the third iteration to become "*How might a 'novice' ADR researcher rigorously conduct a rapid assessment of ADR empirical work to appreciate the operationalisation of the ADR method in empirical studies and the knowledge/theory contributions made by the research?*" This iteration and reframing of the problem/solution space reflects the learning reflexivity at the core of Sien's ADR method.

2. Artefact Description

The artefact produced in Iteration three sought to address the following questions:

- *Can we identify necessary and sufficient conditions to qualify as an ADR research study based on Sien's criteria?*
- *What evidence must an ADR study provide to demonstrate that the ADR Team has met necessary and sufficient conditions?*

Necessary and sufficient conditions in ADR may be summarised as: *If a necessary condition for ADR is absent, then ADR will not occur (or will be false); if a sufficient condition for ADR is present then ADR must occur (or be true).*

Four necessary conditions for ADR empirical studies emerge as having the potential to provide a holistic framework to evaluate the operationalisation of ADR in keeping with Sien methodology – Figure C-3.

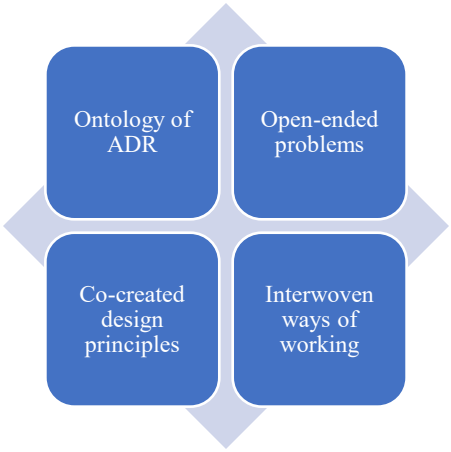


Figure C-3. Protype Matrix of Conditions to Operationalise Sien's ADR Method

A test of this approach applied to Ebel et al. (2016), Mettler (2018), and Reibenspiess et al. (2020). The method enabled a rapid assessment of the potential validity of the studies as representative of ADR operationalisation. The outcome is summarised in Table C-3.

Author	Ontology	Interwoven Ways of Working	Open-Ended Problem	Co-Created Design Principles
Ebel et al.	Y	Y	N	Y
Mettler	N	N	N	N
Reibenspiess et al.	y	Y	N	Y

Table C-3. Prototype: Sien ADR Matrix of Necessary Conditions Applied to ADR Studies

Refining the model one step further, it may be possible to pair open-ended problems and co-created design principles and interwoven ways of working and ADR ontology to provide further confidence in the ADR method.

3. Key Learnings

ADR a research methodology lends itself to reflective learning and flexible application in different contexts to address open ended problems which have more than one solution. This is a core ADR strength and enables its application. Consequently, ADR empirical research is complex because of its application in a diverse range of situations and contexts. This makes comparative analysis and theory building across studies challenging without an evaluative framework for application in practice.

4. Key Contributions

ADR is a flexible, open research method permeable to the infusion of learning from other knowledge domains. I drew upon legal training and design thinking to address questions of problem framing and case analysis to assist my research and learning while remaining within the ADR framework. The three iterations highlighted the complexity of the situations researched using ADR and offered an initial proposal to simplify the ADR outputs in practice to aid teaching and research analysis.

JOHN O'SULLIVAN – ADR PROJECT SUMMARY

1. Problem Description

The research opportunity was presented to the class of (BU7007) Action Design Research on 27 January 2021. The initial research question was "*After reading Sein et al. (2011), how can the ADR method be visualised?*" This was presented in the form of an assignment, requiring 500 words and a visualisation. It was made clear that this was one step on a multiple-step research project where ultimately a checklist, the artefact, would be produced to assess a set of empirical ADR papers for compliance with Sein et

al. (2011). The problem was cast as an instance of a class of problems. The primary problem was *how to develop an assessment method for ADR project*. The class of problem was *how to use ADR to develop an artefact*.

2. Artefact Description

Sein et al. (2011) and Mullarkey and Hevner (2019) were offered as theoretical bases for the work. The latter was not used in this project. As the artefact would be a checklist and a method, prior technological advances did not apply.

The initial design of the theory-ingrained artefact (Principle 2), in the form of a checklist was presented to the class during the "show and tell" of 03 January 2021. This single checklist only checked for the stage tasks and not the principles of ADR. This can be considered the first build. The class review and discussion can be considered the first intervention and evaluation. This artefact failed to meet the principle of practice-inspired research (Principle 1) as it was conducted entirely in the academic arena. After the "show and tell," after reviewing the artefacts of the other students and receiving feedback (evaluation), it was decided to include a second checklist to assess compliance with the principles of ADR. This is an example of reciprocal sharing (Principle 3). All members (Principle 4) of the team contributed to the discussion resulting in authentic and concurrent evaluation (Principle 5).

#	Step	Examples of compliance
1	**Problem Formulation**	
1.1	Identify and conceptualize the research opportunity	
1.2	Formulate initial research questions	
1.3	Cast the problem as an instance of a class of problems	
1.4	Identify contributing theoretical bases and prior technology advances	
1.5	Secure long-term organizational commitment	
1.6	Set up roles and responsibilities	
1.7	Initial design of the theory-ingrained artefact complete	
2	**Building, Intervention and Evaluation**	
2.1	Discover initial knowledge-creation target	
2.2	Select or customize BIE form	
2.3	Execute IT Dominant BIE cycle OR Execute Organisation Dominant BIE cycle	
2.4	Final Artefact complete	
3	**Reflection and Learning**	
3.1	Reflect on the design and redesign during the project	
3.2	Evaluate adherence to principles	
3.3	Analyze intervention results according to stated goals	
4	**Formalization of Learning**	
4.1	Abstract the learning into concepts for a class of field problems	
4.2	Share outcomes and assessment with practitioners	
4.3	Articulate outcomes as design principles	
4.4	Articulate learning in light of theories selected	
4.5	Formalize results for dissemination	
4.6	Class of problems defined	
4.7	Class of solutions defined	
4.8	Design principles defined	

#	Principle	Examples of compliance
1	**Problem Formulation**	
1.1	Principle 1: Practice-Inspired Research	
1.2	Principle 2: Theory-Ingrained Practice Artefact	
2	**Building, Intervention and Evaluation**	
2.1	Principle 3: Reciprocal Shaping	
2.2	**Principle 4: Mutually Influential Roles**	
2.3	Principle 5: Authentic and Concurrent Evaluation	
3	**Reflection and Learning**	
3.1	Principle 6: Guided Emergence	
4	**Formalization of Learning**	
4.1	Principle 7: Generalized Outcomes	
	Total number of compliant principles out of 7	

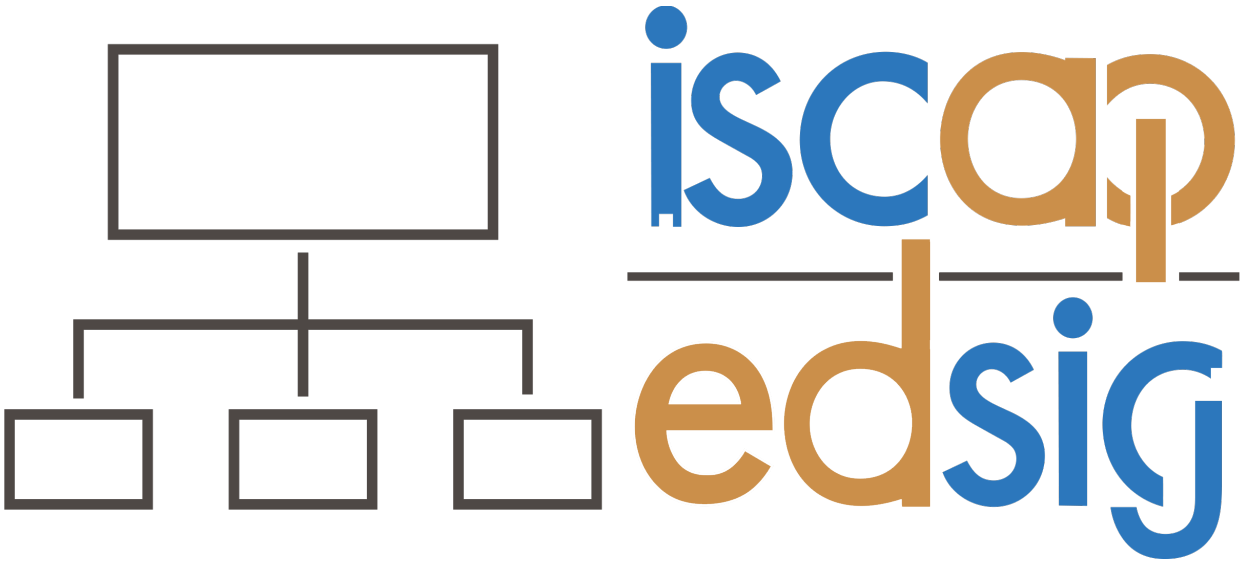
Figure C-4. Artefact Presentation

3. Key Learnings

Nine papers show evidence of substantial compliance with Sein et al. (2011). Keijzer-Broers and de Reuver (2016) cannot be considered an ADR paper in the same manner as the others. It describes a subset of an ADR project. It is an opportunistic attempt to publish an extra paper from the same dataset. A weakness of this artefact is that it does not allow for a richness of the level or degree of compliance, i.e., a barely-compliant paper can, theoretically, get the same score as an exemplar ADR paper.

4. Key Contributions

The artefact has been proven in use with the assessment of ten ADR papers, as well as the project paper. As a possible avenue of future research, the artefact could be modified to review and assess the papers critically to evaluate levels of compliance and more importantly empirical evidence of compliance, as opposed to statements of compliance. Also, future research could be to compare the results, e.g., the ranking of the papers, with the results of the other students in the group. While the artefact was developed in an artificial classroom environment, the lessons learned can and will be applied to future ADR projects, if only as a sanity check to assure the fundamentals of ADR are not forgotten.



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