



Work-Integrated Learning as an Outcome of Using Action Design Research in Practice

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Abstract. This paper highlights Work-Integrated Learning (WIL) as an outcome of using Action Design Research (ADR) in practice. We argue that ADR is a subtype of Design Science Research (DSR) and a prominent method for facilitating mutually beneficial collaboration between academia and practice. Subsequently, we tie our work around ADR and WIL to the Scandinavian school of IS-research and worker participation, by emphasizing reflective practice on both researcher and practitioner side. We demonstrate this through two empirical cases and four case episodes. Consequently, the cases highlight building, intervention, and evaluation in the areas of civic orientation and county administration. The narrative around each case focuses on ADR-activities that mediate reflection and learning through iterative cycles. Outcomes from the cases are reported as WIL-outcomes and finally, we conclude this paper by briefly suggesting two implications for future relevant research.

Keywords: Action Design Research · Work-Integrated learning · Reflective practice · Design Science Research

1 Introduction

Information Systems (IS) is an applied research discipline that has a history of believing in bridging scientific rigor with practical relevance. This generally concerns the adoption and improvement of methodologies and theories that help IS-researchers produce and bridge practical outcomes with theoretical contributions. A number of scientific and practitioner commentaries call for research approaches and methodologies that incorporate a dual mode of contribution through collaborative projects between practice and academia. Examples of this kind of work can be found in Action Research (AR) [1, 2], which aims for knowledge development through collaboration and intervention in real-world settings. Similarly, the paradigm of Design Science Research (DSR) in IS aims to produce efficient artifacts that support human activities [3–6]. Other examples include Practice Research (PR) [7], Collaborative Practice Research (CPR) [8], Engaged Scholarship (ES) [9, 10], Participatory Design (PD) [11, 12], and Action Design Research (ADR) [13].

The ADR-method in particular has gained increasing attention among IS researchers [14, 15]. In essence, the underlying philosophy of ADR advocates that the researchers shall start an ADR-project by emphasizing a specific problem or objective that is situated within a specific and real setting [e.g. 16]. From there on, the researchers engage with members of an ADR-team, which is constituted of stakeholders, such as, practitioners, and end-users [13]. A central aspect of the ADR-philosophy is thus sufficient collaboration between academia and practice. Such collaboration is organized and executed through iterative cycles of ADR-activities (e.g. building and evaluation of technologies, organizational intervention), which bridge a contribution of practical outcomes with theoretical outputs. In turn, a continuous process of reflection and learning is incorporated through mutual involvement between representatives of academia and practice [17]. An ADR-project is thus organized and performed through a collaboration between academia and practice, rather than being performed as an isolated research endeavor. The ADR-method provides a framework for participation that is organized into four stages (shown in Fig. 1).

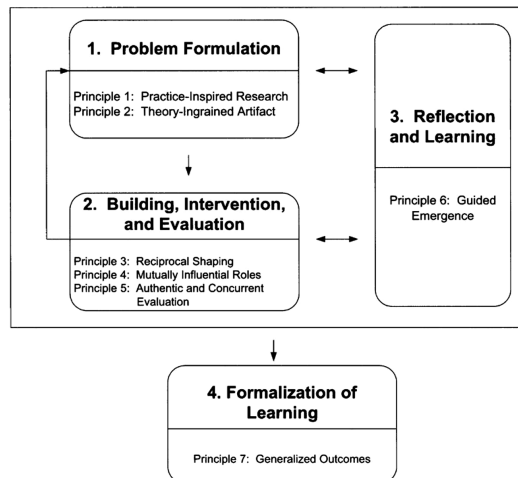


Fig. 1. ADR method: stages and principles [13]

Previous ADR-studies [16–23] motivate and verify the utility of ADR from perspectives of continuous process of building, intervention, and evaluation of sufficient artifacts that solve situated problems (e.g. organizational issues); iterative cycles of reflection and learning that are incorporated across various stages of ADR and producing generalizable learning outcomes and sharing those with representatives of both academia and practice. In this paper we argue that these perspectives of ADR implicitly incorporate a continuous learning process that enables a reciprocal knowledge transfer among scholars and practitioners. We frame this kind of learning outcome as Work-Integrated Learning (WIL) [24, 25], because it is organized and executed within the realms of (a) working environment through a process of being pro-active toward a reflective practice, intervention, and learning [26, 27] - rather than being formally detached from it.

The rationale and motivation behind discussing ADR from the perspective of WIL, can be summarized in the following arguments:

Collaboration and participation are essential components of a practice-driven IS-research approach [8, 12, 28–32]

Collaboration, participation, and organizational intervention, are discussed in WIL-related research [24, 25, 33, 34] as driving factors that engage practitioners in reflective learning processes at work

ADR facilitates collaboration and participation through cyclical iterations of producing practical outcomes (e.g. building and evaluating IT-artifacts) that are bridged with formalized research outputs (e.g. design principles). Consequently, ADR emphasizes *organizational intervention, reflection and learning*, as key components of an ADR-cycle.

These arguments support the idea that practice centered research methods, such as ADR, support WIL implicitly, but can be made explicit through ADR-method development where interaction, reflection and collaboration between researchers and practitioners is designed to support mutual work-integrated learning. We will attempt to do so in this paper to achieve the following two objectives:

1. To initiate a discussion about ADR that concern humans, knowledge, learning, and work, as well as building and evaluation of sufficient artifacts.
2. To introduce WIL as an outcome of ADR where activities for reflection and formalization of learning is designed to support organizational transformation as well as supporting the further development of ADR.

The paper is structured as follows: first we will provide a general introduction to WIL as a research domain that studies the relations between humans, knowledge, learning, and work. Then, we will frame and discuss aspects of WIL within the IS-literature. We will in particular emphasize the participatory component of WIL and tie it to the longer perspective of Scandinavian approach to IS and worker participation. After that, we will demonstrate WIL as a practical outcome of ADR through case specific scenarios. Finally, we will provide a concluding discussion.

2 Work-Integrated Learning

At its core, WIL emphasizes a range of approaches and strategies that integrate theory with practice within a designed education curriculum [35]. WIL as a research domain is not solely constrained to the objective of bridging practice with theory through formalized education. Rather, WIL emphasizes the relations between humans, knowledge, learning, and work, as study phenomena. WIL concepts highlight how approaches and methods can be used to integrate learning processes with work activities to bridge different professions. Early works of Lave and Wenger [36] and Wenger [37] discussed foundations of WIL from the perspectives of situated learning and communities of practice, where members of a community share a collective activity in which a common interest binds them together through mutual engagement and the sharing of collective resources such as routines, tools, and notions. Learning was consequently defined as a

social process of collaboration, engagement, and participation in everyday activities in and between communities of practice [36, 37]. Subsequently, learning derives from the socio-cultural theory of learning (see e.g. [38] for an early discussion), and has been utilized in different constellations of WIL-related research [24, 25, 34–37].

Billett [24, 25] in particular, elaborates WIL from the aspects of collaboration, engagement, and participation, by emphasizing how workplaces provide opportunities for learning, and how that is integrated with work activities through guidance of advanced members within a community of practice. Billett [24] problematizes how participation in a professional community can increase levels of expertise through gradual and continuous learning process at work, and highlights the importance of designing for pedagogically rich activities [39] where agentic participants (40) from different communities can maximize the potential for mutual learning in a joint endeavor (e.g. researchers and practitioners in an ADR-project). WIL has been outlined and profiled by [41] as follows:

- Development of ‘hard’ and ‘soft’ skills at work
- Developing multi-tasking skills at work
- Promoting knowledge at work through formal and informal learning processes
- Promoting new technologies at work that incorporate learning activities
- Engaging practitioners in processes of reflective learning at work
- Establishing a knowledge-sharing culture through participation and co-participation
- Intrapersonal and interpersonal learning.
- Transformative and reflective learning

We note that all eight points implicitly depend on structures for diffusion of WIL in research and that practice organizations are in place to support transformative learning where the outcome of ADR catalyzes persistent organizational development [42]. We will, in the next section, continue to elaborate on these characteristics from the perspective of the Scandinavian School of IS-research and worker participation.

3 Scandinavian School of IS-Research and Worker Participation

Early works within the Scandinavian school of IS-research [11, 28, 43–46] emphasized the design process (of sufficient systems) as intertwined with a subsequent participation of workers. Ehn [28] for instance, scrutinized the human activity of designing computer artifacts that are useful to people in their daily activity at work, by emphasizing opportunities and constraints for industrial democracy and quality of work. Others such as Greenbaum and Kyng [46], elaborated essentials of how users can be involved through participation and cooperation during the design process, in order to collectively design computer systems that support and sustain the working environment of users. This underlying philosophy of engaging and involving users as co-participants of the design process, is the foundational pillar of Participatory Design (PD), which has its roots in Scandinavia and which has been (and still is) frequently incorporated in IS-research.

PD aims at designing efficient and sufficient IT-artifacts, by involving prospective users (and other stakeholders) in the design process. According to Bratteteig and Wagner [12], [32] PD differs from other user or human-centered design approaches, because PD emphasizes users as co-designers or co-participants during all phases of the design process. Enabling collaboration and allowing different ‘voices’ (e.g. researchers, designers, users) to be heard, is inherently incorporated by the PD-philosophy. This is implicitly explicated by Robertson and Wagner [47, p. 65] as follows:

The Core Principle of PD is that people have a basic right to make decisions about how they do their work and indeed any other activities where they might use technology. This is also the most contested aspect of PD, its most directly stated ethical commitment and its main point of difference to more mainstream user- or human-centered design approaches.

Scandinavian projects that incorporated prior notions of PD [11, 28, 48, 49] for more information), also developed an *Action Research* (AR) approach, emphasizing active co-operation between researchers and workers of the organization to help improve the workers’ work situation. This approach is built on the workers’ own experiences, needs and requirements, incorporated through in situ collaboration between researchers and workers. However, in current times, IT-artifacts enable people to work at different places (e.g. home, office) and time, making the landscape of work a complex arena for designers and researchers to incorporate through traditional PD-approaches [50].

Participatory philosophy is incorporated by several current IS-research approaches (e.g. *Engaged Scholarship*, *Collaborative Practice Research*, *ADR*) inspired by the Scandinavian school of IS-research. Subsequently, early theories of action, organizational learning, and reflective practice [51, 52], are ideas that have been adopted and integrated into the designated stage of *reflection and learning* in the ADR-framework. Several recent extensions of ADR [53, 54] have attempted to elaborate the *participatory* aspect with an emphasis on cycles of reflective learning through practice.

We argue that ADR is highly inspired by the Scandinavian philosophy of IS-research with a particular interest for incorporating reflective practices and learning through action, design, and participation. Such characteristics (*participation, reflection, learning, practice*) are also central to WIL.

4 Two Empirical Cases of Producing WIL as an Outcome of ADR

This section outlines two cases where WIL was produced as an outcome of ADR. Both cases were conducted separately from each other and the principle researchers of the cases (author 1 and author 2) were not involved in each other’s case. We will thus, for each separate case, elaborate and highlight two specific episodes that concern how WIL was produced as an outcome of utilizing ADR. A summary of each case’s empirical setting is depicted in Table 1.

Table 1. The empirical setting of both cases

Case	Description
Case 1 – Designing e-learning solutions for the civic orientation program	The empirical setting of the first case was at a municipality in Sweden. The municipality was responsible for supporting the integration work of newly arrived immigrants in Sweden, also known as <i>newcomers</i> . The integration workers organize and perform civic orientation for a large and heterogeneous group of newcomers (e.g. newcomers from Somalia, Syria etc.). In turn, through participation in the civic orientation program, the newcomers learn fundamental knowledge about society such as: what is democracy, what are the laws in Sweden, what is the education like, etc. through classroom teachings
Case 2 – Designing a national work-integrated e-learning platform	The setting of the second case is the county administration in the Western part of Sweden. Essentially, the county administration is a government authority that ensures decisions made by the government and parliament are carried out locally in each of the 21 counties. Hereby the county administration serves as a link between the people and the municipal authorities on the one hand and the government, parliament and other central authorities on the other hand. Within the study, the county administration in the Western part of Sweden launched a project called the <i>Academy of County Administrations</i> aiming at creating a national platform for work integrated e-learning where the expertise from different counties would be made available

4.1 Case 1 – Designing an E-Learning Platform for the Civic Orientation Program

The primary reason for designing e-learning solutions for the civic orientation program was due to the need of distributing and making the program available nationwide. This had to do with the large influx of newcomers in Sweden as well as the need of performing the program through a flexible that combine different e-learning solutions – e.g. different pedagogies (e.g. e-learning, blended learning), different modes of performing civic orientation (e.g. online, classroom). More importantly, an essential part of this case concerned how to support the integration workers and extend their knowledge base (e.g. professional roles, areas of responsibility) through work-integrated learning. Different counties and municipalities in Sweden organize and provide civic orientation in non-standardized ways, meaning that they do not share a common base of knowledge domain (e.g. skills, competencies, education).

The integration workers had different professional roles with different areas of responsibilities. Some of them were employed on full time basis, whereas some of them were employed at part time basis. Additionally, they originate from different parts of the world and are thus heterogeneous with regards to their background, age, gender, culture, and worldviews in general. Therefore, a crucial challenge within the case concerned how to design e-learning solutions that are adaptable toward the integration workers’ different communities of practice. In order to address this challenge, and to incorporate their WIL continuously, certain WIL-activities were organized and conducted within the realm of the ADR-stages. These activities are summed up through two different episodes as follow.

Episode 1

The first episode took place during the ADR-stage of *building, intervention, and evaluation (BIE)* in 2014. This stage incorporated *reflection and learning* as an integrated part through a participatory workshop. The workshop was organized and conducted at the municipality together with a total of 10 integration workers. During the workshop, a framework (also referred to as a *platform*) of e-learning solutions was introduced, demonstrated, tested, and evaluated in situ with the integration workers. The integration workers were thus encouraged to (1) interact with the e-learning solutions, which consisted of different kind of technologies (e.g. cloud services, video conferencing, administrative tools etc.), (2) reflect on how well the solutions and their features were mapped with the integration workers’ daily tasks and responsibilities, and (3) ‘translating’ their experiences into future needs and refinements of the framework.

During the workshop, we combined an active process of reflection and learning with testing and evaluation of the framework, by (1) demonstrating the features and letting the integration workers test them; (2) observing their interaction with the framework; (3) collecting feedback through a roundtable discussion at the end of the workshop. The workshop was documented through notes and video recording. Excerpts from the roundtable discussion are depicted in Table 2.

Table 2. Excerpts and analysis from the participatory workshop

Excerpts	Analysis
<p><i>I like the idea of combining different simple technologies to organize and prepare my sessions... it seems that this platform can be adapted and used at different levels of complexity... which is good, but requires more knowledge about the different features.</i> (Tutor)</p>	<p>Sense-making of the IT-tools and their relevance occur through early incremental testing and in situ evaluation</p>

(continued)

Table 2. (continued)

Excerpts	Analysis
<p><i>In the beginning I thought that the platform features were too trivial and not sufficient... especially from the perspective of coordinating content and sessions... but then after this workshop and the discussions... I feel that the features are easy to understand and adapt to... even for a person that is not an IT expert like me... this is important, especially because we at the integration center have different IT skills... and also because we need to teach future employees how the platform works... so I like the adaptable feeling of the features.</i> (Coordinator)</p>	<p>Sense-making of the IT-tools and their relevance occur through early incremental testing and in situ evaluation</p>
<p><i>The security features seem to be easy to administrate... I mean, because we need to administrate different users I guess... ranging from being tutors, to newcomers... from this perspective, the features need to be easy to understand and adapt to... and it seems that they are adaptable enough to different kind of users in the system.</i> (Coordinator)</p>	<p>Sense-making of the IT-tools and their relevance toward different users occur through early incremental testing and in situ evaluation</p>

Based on insights from analysis and experiences of the workshop, we share a summary of what we consider being the WIL outcome:

- WIL outcome – active learning and sense-making:** the workshop facilitated dialogues and a social process of sense-making, which enabled the integration workers to not only learn how to use the provided e-learning solutions, but also to learn the underlying meaning and relevance of the framework toward their roles and areas of responsibilities. Analysis of the excerpts indicate that early incremental testing and in situ evaluation, incorporates sense-making through a continuous and attached process of reflection and learning. This is an implication of encouraging active learning through participation and involvement of the integration workers, rather than treating them as passive recipients of implemented technologies. Here, we consider that WIL was produced through ADR due to active *participation* and *sense-making* during the stage of **building, intervention, and evaluation**. ADR did thus produce work-integrated learning as a practical outcome of the participatory workshop activities. In retrospect – we believe the workshops to be pedagogically rich activities [39], where the shared responsibility of the agenda contributed to making all participants agentic learners [40], and set the stage for transformative learning [42].

Episode 2

The second episode took place during the *building, intervention, and evaluation* stage in 2015. This stage was incorporated the stage of *reflection and learning* as an integrated part and was manifested through a set of workplace training sessions at the municipality. A total of 6 sessions were held with each session focusing on a particular training theme (depicted in Table 3).

Table 3. Workplace training sessions

Training session	Purpose	Participants
Training Sessions 1, 2, 3	To demonstrate, test, and learn collaborative features for distributing and publishing non-standardized online-learning content, together with underlying teaching pedagogies that support the features. The scope of these sessions was provided on a very fundamental level, with a simple structure and facts about the nature and purpose of the collaborative features. Participants were encouraged to test the features systematically within the frame of each session and ask questions sporadically when needed. These three sessions lasted for three hours per session	- 15 integration workers - 1 researcher
Training Sessions 4, 5	To demonstrate, test, and learn administrative features for producing, coordinating, sharing, and maintaining civic orientation content (both standardized and non-standardized). Participants were encouraged to test the features systematically within the frame of each session and ask questions sporadically when needed. These two sessions lasted for two hours per session	- 6 integration workers - 2 scholars - 1 researcher
Training Session 6	To elaborate extended roles of practitioners by introducing and explaining new areas of responsibilities. Here, the participants became familiar with new concepts and words, which help them understand their new responsibilities better. The new roles were introduced as system roles. The session lasted for three hours	- 12 integration workers - 2 scholars - 1 researcher

The first **three training sessions** focused on systematically training tutors and providing them fundamental knowledge about relevant system features that support their work with organizing and conducting civic orientation sessions in dual settings (e.g. classroom and digital setting). During the sessions, the researcher demonstrated all of the system features and encouraged the tutors to test and interact with the features continuously. The integration workers were basically provided with a tablet or laptop to interact with the artifact features. The approach of this session was inspired through informing literature [55–58] that promotes direct interaction between participants and technology, and which advocates an open philosophy for thinking about and discussing input from the participants as a reflective practice [26, 51, 52]. Thus, the participants were encouraged to reflect and provide input as they were interacting with the system.

The **fourth and fifth training sessions** focused on systematically training the content producers and coordinators and providing them advanced know-how about how to produce, coordinate, share, maintain, update, distribute, and publish civic orientation content. At this stage, a dichotomy was made between standardized content and non-standardized content, where standardized content was addressed as the formal course book or PowerPoint slides, whereas the non-standardized content was addressed as content that a unique tutor, in collaboration with content producers, can create and implement in their unique course sites. Essential artifact features of this purpose were presented and tested during the sessions. The integration workers were provided with a tablet or computer to interact with and test the features.

The **sixth and final training session** focused on introducing and explaining extended roles and areas of responsibility. This concerned extending and re-defining the integration workers' current roles with respect to new system roles, which concern new areas of responsibility for managing and administering the instantiated platform. The new areas of responsibility included adopting system roles that focus on various aspects of maintaining components of the platform's technical architecture, as well as its system layers. The session ended with an open discussion about the organizational implications of introducing new roles, and how such implications may affect the current organizational prerequisites.

In light of the workplace training activities and their outcomes, we highlight the WIL-outcome of the second episode as follows:

- **WIL outcome – workplace training and on-site learning:** the workplace training sessions are explicit examples of how WIL can be produced as a practical outcome of ADR. Here, the stage of *reflection and learning* was directly incorporated into the workplace training sessions by enabling learning to take place at the integration workers' workplace (on-site learning), mapped together with their different roles, responsibilities, and daily working routines.

The training sessions were thus not detached from their reality of work (as for instance formalized sessions of education may be). Instead, it was integrated with their work and each session highlighted and provided the integration workers with a relevant body of knowledge. Consequently, a reflective practice was facilitated through questions, dialogues, and a continuous process of interaction, which allowed the integration workers to reflect about their extended roles, responsibilities, and what bearing new concepts and words (e.g. e-learning, distance education) have toward their own practice of integration work.

We claim that this aspect of supporting a reflective practice through ADR, is a part of producing WIL as an outcome. The BIE-activities in an ADR-project are indeed candidates for what Billet [39] calls pedagogically rich activities. Subsequently, the experiences from the civic-orientation case, strengthened a view that the designed artifact can serve as a boundary object [37] that fosters intra- and inter-professional transformative learning [42].

4.2 Case 2 – Designing a Nationwide Work-Integrated E-Learning Platform

The primary reason for initiating this case was the negative experiences from a large competence development project that was launched because the Swedish Parliament decided that there should be a nationally unified environmental policy. As a consequence, adjacent counties were forced to collaborate to a greater extent than before and the policy change effected work practices throughout all areas of the county administrations. To address this, all 21 county administrations developed learning materials and arranged courses in various forms. The problem was that this was done in parallel with each other, with virtually no coordination or cooperation. The large shared costs for all these separate learning initiatives constituted a strong incentive to create a national platform for online education where experts from different counties could collaborate in developing digital courses. We will as follows highlight the WIL-outcomes of this case through two the subsequent case episodes (episode 3 and 4).

Episode 3

The initial ADR-team within the case consisted of two senior researchers, a PhD student, and three representatives from the County administration of Western part of Sweden (HR Manager, IT-manager, and an IT-expert). In addition, the project group reported to a reference group with representatives from the other participating county administrations. There was a need for increased skills in online searching expressed by employees through special interest groups and the project group decided that the first e-training initiative should be on the theme *Searching the WWW*. It was expressed by the representatives from the County administration that the e-training solution had to be flexible so that using it would not interfere with the employees' daily work.

During this first ADR-cycle, the goal was to develop a design concept for web-based lectures that could be used on other e-training courses. The initial problem phase exposed that there was a lack of research that acknowledges the complexity of the interplay that technology and pedagogy create when designing systems for learning and training in the workplace. A literature review [59–61] resulted in design-oriented theories and frameworks in a school setting, but eventually the authentic e-learning by Herrington et al. [60] was chosen to guide the design in stage of *building, intervention, and evaluation*.

Based on the pedagogical design framework of authentic e-learning [57] and the design frameworks for the interaction design and usability [62–64], a pilot system was built and tested in the IT environment at the county administration. After initial tests of different tools done by the researchers the choice fell on an XML based synchronization language called SMIL. SMIL gave a developer great freedom concerning layout and re-usability of the content. To run a SMIL application a standalone application such as the Ambulant Player had to be installed on the computer. A pilot system was built using SMIL and was evaluated throughout the *reflection and learning* stage, which was facilitated through a workshop with the representatives from the county administration. In light of this stage, we consider the WIL-outcome as follow

- **WIL outcome – reciprocal shaping of an e-training solution:** The workshop made it evident that the e-training system had to be re-designed so that it would run on one of the applications already available in the IT infrastructure of the county administration. This workshop resulted in the design principle - the limitations and opportunities of the organizational and infrastructural context must be carefully considered as a frame for the design of e-training. A new version using embedded HTML was then developed, implemented and evaluated in two more design cycles. Again, the episode demonstrates how the designed artefact can work as a catalyst for learning across the boundaries between researchers and practitioners and their respective contexts [42]. It is also a good illustration of how tentative design principles can be confirmed, rejected and/or developed [65] through pedagogically rich work-integrated learning interactions.

Episode 4

During the second ADR-cycle of designing the e-training system, the county administration approached the researchers of the ADR-team, since their IT department were about to start building the e-training system. The reason for this was that the county administration was migrating to one common IT milieu on a national level at the time of the study. This meant that e.g. using only one email client throughout the organization instead of the local counties choosing their own. For some counties this meant a big change in reference to system beings used in the everyday practice and for others already using a lot of the systems being implemented in the new common IT milieu it only meant minor changes.

The particular WIL outcome of this cycle is highlighted as follow:

- **WIL outcome – employee preparation:** In order to prepare the employees throughout the different counties for this change of IT milieu, an e-training system–technologies used to automate IT and business processes in general - would be developed and made available to them before the new IT milieu would be implemented. This was done throughout the building, intervention, and evaluation of the second ADR-cycle, where the authentic e-learning and interface framework were presented and discussed with the developing team during a workshop at the county administration. During this stage, reflection and learning, the team decided to develop and implement the e-training system guided by design-oriented theories of authentic e-learning and the lessons learned from the evaluations from the first cycle - e.g. by addressing the issues with collaboration and articulation by encouraging the employees to discuss any questions they would have with colleagues. The pedagogically rich activity is when developers meet with researchers to jointly make sense of how the guidelines could be translated to a new situation [39].

5 Concluding Remarks

In this paper, we have argued and demonstrated how and why work-integrated learning can be seen as an outcome of using ADR in practice. This is one critical element of engaging with practitioners and keeping them engaged and delivering knowledge

outcomes for them from an ADR project. Subsequently, we have (1) initiated a discussion about ADR from a dual perspective that concern humans, knowledge, learning, and work, as well as building and evaluation of sufficient artifacts; (2) introduced WIL as an outcome of ADR and a research domain that incorporate IS-research through relevant concepts and theories of work and learning, and (3) emphasizing that WIL in an ADR-project involves both the learning and transformative practices in the participating practices, as well as the researchers' learning in terms of method development of all four stages in the ADR-cycle.

We argue that ADR is a prominent method for bridging the gap between academia and practice, and that ADR incorporates typical characteristics (e.g. *participation, collaboration, organizational intervention, transformative learning*) of both WIL and the Scandinavian school of IS-research and worker participation. Consequently, we have demonstrated this through four case episodes, where ADR was retrospectively analyzed as a way to produce WIL outcomes. We do also suggest that, by fostering a participatory philosophy, ADR enables organizations and practitioners a continuous process of reflection and learning, which incorporates a reflective practice and challenges of transformative/expansive learning among practitioners. Additionally, we argue that our work is one of the few within the DSR-literature that highlights ADR from the perspective of WIL, and that this research may initiate further curiosity and interest within the DSR-community, about the relation between ADR and WIL-especially for future ADR-researchers.

Finally, our retrospective analysis of the cases has pointed out two implications for further research: (1) how ADR-cycles can be staged to better support diffusion and transformation of ideas and artifacts in participating organization, and (2) how an emphasis on learning feedback can be returned into the development of ADR-method. We believe that these implications can be problematized on a general basis for the utilization of ADR in practice, and that insights from such an endeavor would benefit overall discussions around the utilization of DSR-methods in general. The latter issue could advance through DSR-cases that explicitly highlight learning outcomes as an integrated element of building and evaluating IT-artifacts within organizations, because essential parts of any given DSR-project are (principally at least) to, solve real world problems and to produce academic body of knowledge that incorporates practical project outcomes. Our research is a step towards that direction and we hope that future method-focused research in DSR will derive inspiration from our work.

References

1. Baskerville, R., Myers, M.: Special issue on action research in information systems: making: IS research relevant to practice – foreword. *MIS Q.* **28**(3), 329–335 (2004)
2. Davison, R.M., Martinsons, M.G., Kock, N.: Principles of canonical action research. *Inf. Syst. J.* **14**, 65–86 (2004)
3. Walls, J., Widmeyer, G., El Sawy, O.: Building an information systems design theory for vigilant EIS. *Inf. Syst. Res.* **3**(1), 36–59 (1992)
4. Hevner, A.R., March, S.T., Park, K.: Design research in information systems research. *MIS Q.* **28**(1), 76–105 (2004)

5. Gregor, S., Jones, D.: The anatomy of a design theory. *J. Assoc. Inf. Syst. (JAIS)* **8**(5), 312–335 (2007)
6. Peffers, K., Tuunanen, T., Rothenberger, M., Chatterjee, S.: A design science research methodology for information systems research. *J. Manag. Inf. Syst.* **24**(3), 45–77 (2008)
7. Goldkuhl, G.: The research practice of practice research: theorizing and situational inquiry. *Syst. Signs Actions* **5**(1), 7–29 (2011)
8. Mathiassen, L.: Collaborative practice research. *Inf. Technol. People* **15**(4), 321–345 (2002)
9. Van de Ven, A.: *Engaged Scholarship: A Guide for Organizational and Social Research*. Oxford University Press, New York (2007)
10. Mathiassen, L., Nielsen, P.A.: Engaged scholarship in IS research. *Scand. J. Inf. Syst.* **20**(2), 1 (2008)
11. Ehn, P., Kyng, M.: The collective resource approach to systems design. In: *Computers and Democracy*, pp. 17–57 (1987)
12. Bratteteig, T., Wagner, I.: Spaces for participatory creativity. *CoDesign* **8**(2-3), 105–126 (2012)
13. Sein, M., Henfridsson, O., Purao, S., Rossi, M., Lindgren, R.: Action design research. *MIS Q.* **35**(1), 35–56 (2011)
14. Haj-Bolouri, A., Purao, S., Rossi, M., Bernhardsson, L.: Action design research as a method-in-use: problems and opportunities. In: *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*. Karlsruhe Institut für Technologie (KIT) (2017)
15. Haj-Bolouri, A., Purao, S., Rossi, M., Bernhardsson, L.: Action design research in practice: lessons and concerns. In: *European Conference on Information Systems, ECIS 2018, Portsmouth, UK, 23rd June–28th 2018* (2018)
16. Mullarkey, M.T., Hevner, A.R.: Entering action design research. In: Donnellan, B., Helfert, M., Kenneally, J., VanderMeer, D., Rothenberger, M., Winter, R. (eds.) *DESRIST 2015*. LNCS, vol. 9073, pp. 121–134. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-18714-3_8
17. Keijzer-Broers, W.J.W., de Reuver, M.: Applying agile design sprint methods in action design research: prototyping a health and wellbeing platform. In: Parsons, J., Tuunanen, T., Venable, J., Donnellan, B., Helfert, M., Kenneally, J. (eds.) *DESRIST 2016*. LNCS, vol. 9661, pp. 68–80. Springer, Cham (2016). https://doi.org/10.1007/978-3-319-39294-3_5
18. Lempinen, H., Rossi, M., Tuunainen, V.K.: Design principles for inter-organizational systems development – case hansel. In: Peffers, K., Rothenberger, M., Kuechler, B. (eds.) *DESRIST 2012*. LNCS, vol. 7286, pp. 52–65. Springer, Heidelberg (2012). https://doi.org/10.1007/978-3-642-29863-9_5
19. Mustafa, M.I., Sjöström, J.: Design principles for research data export: lessons learned in e-health design research. In: vom Brocke, J., Hekkala, R., Ram, S., Rossi, M. (eds.) *DESRIST 2013*. LNCS, vol. 7939, pp. 34–49. Springer, Heidelberg (2013). https://doi.org/10.1007/978-3-642-38827-9_3
20. Maccani, G., Donnellan, B., Helfert, M.: Action design research in practice: the case of smart cities. In: Tremblay, M.C., VanderMeer, D., Rothenberger, M., Gupta, A., Yoon, V. (eds.) *DESRIST 2014*. LNCS, vol. 8463, pp. 132–147. Springer, Cham (2014). https://doi.org/10.1007/978-3-319-06701-8_9
21. Miah, S., Gammack, J.: Ensemble artifact design for context sensitive decision support. *Aust. J. Inf. Syst.* **18**(2) (2014)
22. McCurdy, N., Dykes, J., Meyer, M.: Action design research and visualization design. In: *Proceedings of the Sixth Workshop on Beyond Time and Errors on Novel Evaluation Methods for Visualization, BELIV 2016*, pp. 10–18 (2016)

23. Haj-Bolouri, A.: Designing for adaptable learning. Doctoral Dissertation, University West (2018)
24. Billett, S.: Learning through work: workplace affordances and individual engagement. *J. Work. Learn.* **13**(5), 209–214 (2001)
25. Billett, S.: Workplace participatory practices: conceptualizing workplaces as learning environments. *J. Work. Learn.* **16**(6), 312–324 (2004)
26. Schön, D.: *Educating the Reflective Practitioner*. Jossey-Bass, San Francisco (1987)
27. Cole, R., Purao, S., Rossi, M., Sein, M.: Being proactive: where action research meets design research. In: *International Conference on Information Systems (ICIS)*, Las Vegas, Nevada, USA (2005)
28. Ehn, P.: Work-oriented design of computer artifacts. Doctoral Dissertation, Arbetslivscentrum (1988)
29. Bjerknes, G., Bratteteig, T.: User participation and democracy: a discussion of Scandinavian research on system development. *Scand. J. Inf. Syst.* **7**(1), 1 (1995)
30. Schuler, D., Namioka, A. (eds.): *Participatory Design: Principles and Practices*. CRC Press, Boca Raton (1993)
31. Kensing, F.: *Methods and Practices in Participatory Design*. ITU Press, Copenhagen (2003)
32. Brockbank, A., McGill, I., Beech, N.: *Reflective Learning in Practice*. Gower Publishing, Burlington (2002)
33. Engeström, Y., Kerosuo, H.: From workplace learning to inter-organizational learning and back: the contribution of activity theory. *J. Work. Learn.* **19**(6), 336–342 (2007)
34. Fuller, A., Unwin, L., Felstead, A., Jewson, N., Kakavelakis, K.: Creating and using knowledge: an analysis of the differentiated nature of workplace learning environments. *Br. Educ. Res. J.* **33**(5), 743–759 (2007)
35. Patrick, C.-J., Peach, D., Pocknee, C., Webb, F., Fletcher, M., Pretto, G.: *The WIL (Work-Integrated Learning) Report: A National Scoping Study*. Australian Learning and Teaching Council (ALTC), Queensland University of Technology, Brisbane (2008)
36. Lave, J., Wenger, E.: *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press, Cambridge (1991)
37. Wenger, E.: *Communities of Practice: Learning, Meaning, and Identity*. Cambridge University Press, Cambridge (1998)
38. Vygotsky, L.S.: *Socio-cultural theory*. In: *Mind in society* (1978)
39. Billett, S.: Implications for practice. In: *Mimetic Learning at Work*, pp. 83–103. Springer, Cham (2014)
40. Engeström, Y.: Expansive learning at work: toward an activity theoretical reconceptualization. *J. Educ. Work.* **14**(1), 133–156 (2001)
41. Malloch, M., Cairns, L., Evans, K., O'Connor, B.N.: *The SAGE Handbook of Workplace Learning*. Sage Publications, Thousand Oaks (2010)
42. Akkerman, S.F., Bakker, A.: Boundary crossing and boundary objects. *Rev. Educ. Res.* **81**(2), 132–169 (2011)
43. Nygaard, K.: Tasks, roles, and interests of information systems specialists in the 1980s. Lecture at CREST Course (1979)
44. Flensburg, P.: *Personlig Databehandling: Introduktion, Konsekvenser, Möjligheter*. Lund Universitet (1986)
45. Bjerknes, G., Ehn, P., Kyng, M.: *Computers and Democracy: A Scandinavian Challenge*. Avebury, Aldershot (1987)
46. Greenbaum, J., Kyng, M.: *Design at Work: Cooperative Design of Computer Systems*. Erlbaum Assoc, Hillsdale (1991)
47. Robertson, T., Wagner, I.: Engagement, representation and politics-in-action. In: Simonsen, J., Robertson, T. (eds.) *The Handbook of Participatory Design*, pp. 64–85 (2012)

48. Bodker, K., Kensing, F., Simonsen, J.: *Participatory IT Design: Designing for Business and Workplace Realities*. MIT Press, Cambridge (2004)
49. Bødker, S.: Creating conditions for participation: conflicts and resources in systems development. *Hum. Comput. Interact.* **11**(3), 215–236 (1996)
50. Beck, E.: P for political - participation is not enough. *SJIS* **14** (2002)
51. Argyris, C., Schön, D.A.: *Organizational Learning: A Theory of Action Perspective*. Addison-Wesley, Reading (1978)
52. Schön, D.A.: *The Reflective Practitioner: How Professionals Think in Action*. Basic Books, New York (1983)
53. Bilandzic, M., Venable, J.: Towards a participatory action design research: adapting action research and design science research methods for urban informatics. *J. Community Inform.* (2011)
54. Haj-Bolouri, A., Bernhardsson, L., Rossi, M.: PADRE: a method for participatory action design research. In: Parsons, J., Tuunanen, T., Venable, J., Donnellan, B., Helfert, M., Kenneally, J. (eds.) *DESIRIST 2016*. LNCS, vol. 9661, pp. 19–36. Springer, Cham (2016). https://doi.org/10.1007/978-3-319-39294-3_2
55. Berge, Z.L.: Obstacles to distance training and education in corporate organizations. *J. Work. Learn.* **14**(5), 182–189 (2002)
56. Lee, M.C.: Explaining and predicting users' continuance intention toward e-learning: an extension of the expectation–confirmation model. *Comput. Educ.* **54**(2), 506–516 (2010)
57. Kraiger, K., Ford, J.K.: The expanding role of workplace training: themes and trends influencing training research and practice. In: Koppes, L.L. (ed.) *Historical Perspectives in Industrial and Organizational Psychology*, pp. 281–309 (2006)
58. Tynjälä, P., Häkkinen, P., Hämäläinen, R.: TEL@ work: toward integration of theory and practice. *Br. J. Educ. Technol.* **45**(6), 990–1000 (2014)
59. Hung, D.W.L., Chen, D.: Situated cognition, vygotskian thought and learning from the communities of practice perspective: implications for the design of web-based e-learning. *Educ. Media Int.* **38**(1), 3–12 (2001)
60. Herrington, J., Reeves, T.C., Oliver, R.: *A Guide to Authentic E-Learning*. Routledge, New York (2010)
61. Hardless, C.: *Designing Competence Development Systems*. Department of Informatics, Göteborg University, Göteborg (2005)
62. Norman, D.A.: *The Design of Everyday Things*. Doubleday, New York (1988)
63. Nielsen, J.: *Designing Web Usability: The Practice of Simplicity*. New Riders, Indianapolis (2000)
64. Rogers, Y., Sharp, H., Preece, J.: *Interaction Design: Beyond Human Computer Interaction*, 3rd edn. Wiley, Hoboken (2011)
65. Östlund, C.: *Design for e-training*. Copenhagen Business School (2017)