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UNDERSTANDING THE PROBLEM – INNOVATION IN THE WELFARE SECTOR THROUGH ACTION DESIGN RESEARCH

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Abstract

Action design research (ADR) is a method to produce knowledge and solve real-world problems through the design of innovative IT/IS artifacts. The starting point for all design science research projects is the identification of a significant problem. However, ADR does not provide detailed guidance in the early stages of the problem formulation. This makes the initial problem formulation process challenging, especially when innovating new artifacts in complex settings. The paper contributes to this discussion by exploring how the Work Systems (WS) snapshot can be used as a tool for identifying and understanding a problem domain. The study leans on a project that focuses on the welfare sector and the transition from school to employment for persons with intellectual disability. We show that the WS snapshot can provide guidance and structure in conceptualizing the problem and that user journeys can assist in communicating the findings to practitioners. However, we encountered challenges relating to the scope and the granularity of the work system. In addition, the complexity of the welfare sector demands that significant time is spend on understanding not only the problem domain itself, but also the surrounding settings.

Keywords: Action Design Research, Innovation, Welfare Sector, Intellectual Disabilities.

1   Introduction

Action design research (ADR) gives researchers the opportunity to combine action research and design science research (DSR) (Sein et al., 2011) and is a flexible method for solving real-world problems and at the same time generating learning outcomes (Haj-Bolouri et al., 2017; Sein et al., 2011). This is achieved by combining the knowledge provided by multiple practitioners in their organizational environment and theory through the design of artifacts (Sein et al., 2011). While ADR has mostly been used to improve or replace existing artifacts in private organisations (e.g. Lindgren et al., 2004; Westin and Sein, 2015), less is known about how to proceed in more complex settings with no given or existing artifact to improve or replace (Mullarkey and Hevner, 2015, 2018). One example of such a setting is the welfare sector where the service delivery is characterised by heterogenous groups of users, the balancing of public and collective interests, and tensions of inclusion/exclusion of citizens in the service delivery (Lindgren and Jansson, 2013).

Despite a broad consensus in Norway for an inclusive working society, research confirms that in recent years there have been a decrease in number of people with intellectual disabilities (ID) in working life (England and Langballe, 2018; OECD, 2018; Wendelborg, Kittelsaa and Wik, 2017). Today, the majority of Norwegian individuals with ID either have placements at day-centres or in segregated

workplaces provided by social care services (Wendelborg ,Kittelsaa and Wik, 2017). Very few persons with ID are employed in ordinary positions (Meld. St. 45, 2012-2013). The latest report shows that 48% of those with ID take part in day-centre activities while 41% take part in work-related activities. Out of the 41%, 87% work in in segregated workplaces funded by the state (Reinertsen, 2012). Persons with ID experience more challenges than others, as working life is getting more specialized, and requires more competence (Santilli et al., 2014). Participation in the labour market, however, is important as it does not only provide an income and daily structure, but also influences a person's self-esteem, health, well-being (Beyer et al., 2010; Kober and Eggleton, 2005), and quality of life (Law, Steinwender and Leclair, 1998).

In this paper, we therefore focus on the early stages of an innovation project in the Norwegian welfare sector seeking to increase the numbers of people with ID in ordinary working life. The project will design and develop IT/IS artifacts easing the transition from secondary school to work for persons with ID.

The outset for all DSR projects is the identification of a significant problem (Morana et al., 2017), so also in ADR (Sein et al., 2011), and in our project. While ADR provides guidance on how to carry out the process through four different stages, Sein and Rossi (2018) state that the founding paper do not go into detail regarding the different stages, as the application of the method should emerge in use. Still, researchers highlight the need for guidance in describing the problem situation in DSR in general (Morana et al., 2017) and also in ADR (Sein and Rossi, 2018; Veling et al., 2016). Inspired by the case described by Mullarkey and Hevner (2015), we seek to contribute to the discussion on the problem formulation in ADR. In our case, we started the ADR process already at the pre-design phase where we sought to understand the problem situation and the needs for innovative artifact(s) in a welfare sector setting, involving multiple organisations and actors, and with no given IT/IS artifact to redesign. Giving the wide scope of the innovation project - the transition from secondary school to employment – the design process crosses traditional organisational boundaries and includes public as well as private actors and also actors that personally engage to ease the transition. When ADR is applied at such an early stage in a project there is a need for a deeper understanding of the studied situation to confirm the existing problem (Mullarkey and Hevner, 2015).

The paper explores how the Work Systems (WS) snapshot can be used as a tool for identifying and understanding the problem domain. We therefore, aim to answer the following research question: *How can the Work Systems snapshot be used in the initial problem formulation phase of an ADR project?* Seeking to answer the research question we draw on data from the initial phase of a project focusing on innovation in the welfare sector for easing the dynamic and complex transition from school to employment for persons with intellectual disability. The project focuses on an area that has no IT/IS artifact that is serving this transition and is therefore seeking to inform theory and practice about problem understanding in more complex settings with no given or existing artifact to improve or replace (Mullarkey and Hevner, 2015, 2018).

In the following chapter we present related literature. In chapter 3 we present the research method we used followed by the results in chapter 4. Chapter 5 includes the discussion while chapter 6 concludes the paper.

2 Literature background

In the following sections we present action design research and the Work Systems snapshot.

2.1 Action design research

ADR provides a framework that combines design science research and action research to solve real-world problems in organizations. At the same time, it makes it possible to contribute to research by addressing a class of problems which are more general but exemplified by the real-world problem.

The ADR process consists of four main stages and seven guiding principles as described in Figure 1 (Sein et al., 2011).
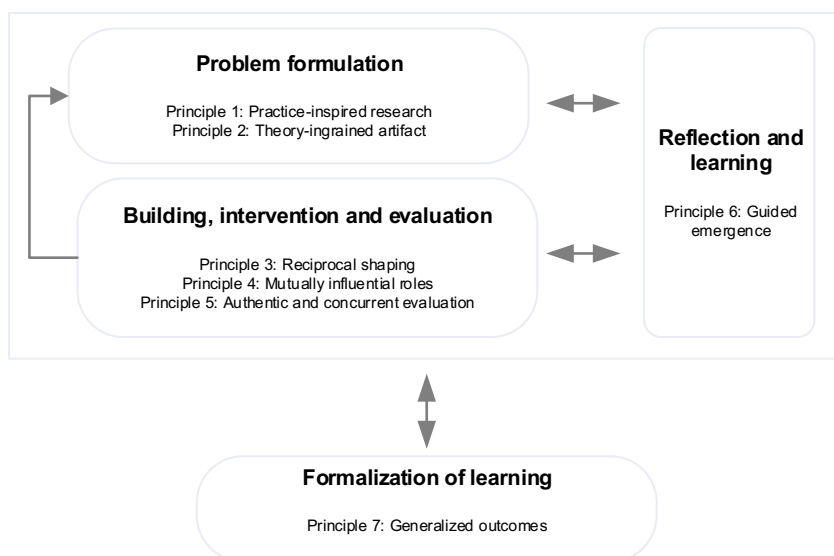

Figure 1.   Overview of the action design research process (adapted from Sein et al., 2011).

One of the important elements of ADR is the emergence of research problems through iterative problem formulations (Sein et al., 2011) as it is also the entry point for the research process (Sein and Rossi, 2018). The first stage of the ADR process is therefore the problem formulation stage which seeks to identify a class of problems, often inspired by an empirical investigation of a problem experienced in practice. The second stage – building, intervention and evaluation – is an iterative stage where the initial design of the artifact is developed and evaluated. To contribute to more generalizable knowledge, the stage also results in design principles. This stage (2) of the ADR process can be described on a continuum of organization-dominant or IT-dominant design, focusing mostly on organisational interventions or technological innovations. The third stage – reflection and learning – continues through the entire ADR process and seeks to contribute to existing knowledge by reflecting on and adjusting the research process. The final stage (4) – formalization and learning – focuses on generating knowledge by presenting solutions for a class of problems (Sein et al., 2011).

Mullarkey and Hevner (2018) elaborate on the original ADR process by unpacking the building, intervention and evaluation stage (stage 2, cf. Figure 1) and suggest that this stage should be included in every ADR cycle, resulting in four ADR cycles (cf. Figure 2) that incorporate all the original stages. In addition, a specific problem diagnosis stage is added at the very beginning of the ADR process with the aim to understand and analyse the problem domain. An overview of the elaborated ADR process is described in Figure 2.
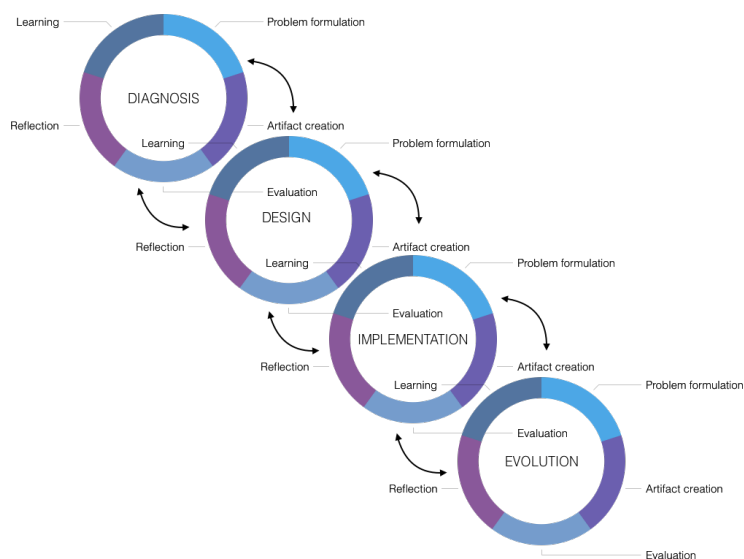
Figure 2. *Overview of the elaborated action design research process (adapted from Mullarkey and Hevner, 2018).*

The diagnosis stage is argued to be especially important when ADR is applied at an early phase of the design process where there is no given IT/IS artifact to redesign (referred to as an elaborated ADR process). The aim of the first stage is then not to *replace or improve an existing artifact* but to *confirm that a problem exists and that there is a need for innovative artifact(s)* (Mullarkey and Hevner, 2018). Instead, the problem diagnosis stage aims to *"analyse the importance of the problem domain and the relevance of the IT solution class to research and practice with mutual agreement among the re-searcher–practitioner team"* (Mullarkey and Hevner, 2015). This involves identifying the relevant kernel design theories, any existing socio-technical artefacts, and the goals of the ADR project. The learning during the problem diagnosis stage includes a thorough understanding of the domain of the ADR project but also about the existing knowledge and practices within the fields of study (Mullarkey and Hevner, 2018). Mullarkey and Hevner (2015) describe this stage as an iterative phase of problem formulation and design theory development which is followed by concept design. As a result, design principles emerge to address the studied problem and to evaluate existing artifacts (Mullarkey and Hevner, 2015). The design principles may then be used to further the innovative process.

To summarize, the problem diagnosis stage in a pre-design project seems to consist of i) a thorough understanding of the scope of the problem domain, ii) an agreement between researchers and practitioners, and iii) practice and research relevance of the problem domain and possible design solution.

2.2 Work System snapshot

The Work System framework by Alter takes the work system as a basis for studying systems in organizations. A work system is defined as "*a system in which human participants and/or machines perform work (processes and activities) using information, technology, and other resources to produce specific products/services for specific internal and/or external customers*" (Alter, 2013, p. 75). The framework has been used in various settings, for instance to analyse information exchange in healthcare (Johnsen, Fruhling and Fossum, 2016) and in agile development (Bolloju et al., 2017). The Work System framework is presented as a way to provide a representation of the work system during a relatively

stable period. Based on nine interrelated elements (Table 1), it outlines the form, function and environment of the work system (Alter, 2013) and can provide a basic understanding of a work system that might be supported by an information system (Bolloju et al., 2017).

Elements of the work system	Description
Processes and activities	Work-related activities that occur when products and services are offered.
Participants	People performing the work-related activities in the work system.
Information	Information entities in various forms that are *"used, created, captured, transmitted, stored, retrieved, manipulated, updated, displayed and/or deleted"* within the work system. Includes both standardized and non-codified information (for instance conversations).
Technologies	Tools that support the participants to carry out the work-related activities.
Products and Services	The combination of products and services that the work system offers to its customers.
Customers	Internal and external users who benefit from the offered products and services.
Environment	The organizational, cultural, technical, demographic, competitive, and regulatory environments in which the work system operates.
Infrastructure	Resources which are relevant to the work system, but that are shared with other work systems and managed outside of the work system. The resources can be human, information and technical.
Strategies	Different levels of guiding rationale and high-level choices which a work system operates within.

Table 1.   Description of the different elements in a work system (Alter, 2013).

The processes and activities in the work system are performed by participants who use and create information in different ways to carry out their work. The participants may be supported by technology, that is useful for the tasks that they perform and their role in the work system. The first four elements presented in Table 1 are the basis for the work system which results in product/services for both internal and external customers. In addition, the work system is built on an infrastructure that is shared with other work systems. The infrastructure includes resources that can be human actors, information, and technology that the work system relies on but that are managed outside of the work system. The environment, as well as the infrastructure and, the strategies, influence the work system but are not included as the most central elements of the system. The elements within the work system needs to be aligned for achieving successful work. For instance, the knowledge of the participants and the available information need to be aligned with the processes and activities that are performed within the work system (Alter, 2013).

The main elements of the Work System framework can be applied to produce a formatted summary of a work system, called a Work System (WS) snapshot. It includes six of the above-mentioned elements: processes and activities, participants, information, technologies, products/services, and customers. The WS snapshot is a way to present the current situation, as-it-is, that could be supported by an information system (Alter, 2013) Still, the snapshot includes existing information systems and technologies that support the work system under study (Bolloju et al., 2017). The aim of a WS snapshot is to assist in a common understanding of the work system's scope and purpose (Alter, 2013).

Starting in the pre-design phase of an ADR process, we decided to apply the WS snapshot as it provided us with an opportunity to get an overview and a system view of the current situation, including processes and actors, their information exchange and current information systems (Alter, 2013). As there were no formal IT/IS artifacts as hardware-software instantiations in the problem domain, we follow ADR's suggestion to include the work practices of the context in which the IT/IS artifact is to be designed and implemented, its' actors and the surrounding environment (Purao et al., 2013).

3 Methods

ADR does not explicitly describe what research methods to use, but allows the researcher to choose and combine appropriate methods suitable to the situation under study (Sein et al., 2011). In the following sections we describe the methods used to elicit information and to diagnose the real-world problem studied. The data collection in the first stage of our ADR process was organized as a qualitative case study method, giving us the opportunity to study a real-life phenomenon in a complex setting (Yin, 2017). In addition, we could combine different data collection techniques (triangulation) to obtain rich data about the studied phenomenon.

3.1 Data collection to clarify the understanding of the problem

During the first stage of the ADR process we collected data through three main activities; workshops combined with focus group interviews (10 in total), workshops combined with individual interviews (4 in total) and participant observations (8 in total). The participants in the workshops were selected based on their role in the transition from secondary school to employment for person with ID. To understand the complex situation, the participants were recruited from potential future users of the designed artifact(s) and from organizations and persons that could be affected by a changed service delivery (Bilandzic and Venable, 2011) as persons employed in the Norwegian Labour and Welfare Administration (NAV), community-based housing, secondary school, day-care centres, work-training centres, private and public companies (employing staff with ID), private companies (not employing staff with ID) and next-of-kin. Data were collected in focus group interview including three to five participants. We also carried out four individual interviews. In total we collected data from 23 persons. The workshops started by asking and encouraging every participant to describe their actual experiences of a transition from secondary school to employment for persons with ID by identifying the following elements step by step:

- Activities affecting the transition from secondary school to employment

- Actors connected to those activities

- Means of information and communication between the involved actors

- Barriers and possible improvement areas connected to the activities

The participants documented, individually, the transition using A3 papers sheets, pens and post-it notes. This activity resulted in 23 different descriptions where the participants identified their own experience of how the transition from secondary school to employment unfolded. After finishing the individual descriptions, a focus group or an individual interview followed focusing on the roles of different actors, the use of technology and possible improvement areas related to the transition. The material from the workshops were recorded and later transcribed.

We furthered our data collection through a focus group interview with seven persons with ID that were either attending secondary school or working at a work training centre, a private company, or a public company. The participants in the focus group interview were asked questions regarding the activities performed in work training at school or at work. The focus group interview was complemented with a full day of participant observations of eight persons with ID. We, as researchers, observed the activities that were carried out during a specific day, focusing on the interaction with different actors, information sharing, and the use of technology. The focus group interview was recorded and later transcribed, and the observations were documented in field notes.

3.2 Data analysis to diagnose the problem

To start our search for an understanding of the problem situation under study and the potential need for innovative artifact(s), we combined the above-mentioned data into one general description. This

was done by categorizing the different activities and actors into groups and searching for similarities. To validate the findings and the description of the transition, the findings were presented and discussed with representatives of the organisations involved in the project. An additional interview was also performed with the Norwegian Labour and Welfare Administration to clarify the later steps of the transition. Details of the final description of the transition was validated by reading official documents, describing the transition. For each activity we added the reported information and/or technology used in connection to the activity.

The insights from the data analysis was summarized according to the six central elements of the WS snapshot, i.e. processes and activities, participants, information, technologies, products/services and customers.

4   Results

In the following section we describe our understanding of the problem domain inferred from the data analysis and the data in the elements of the WS snapshot (cf. Table 2).

4.1   Insights into the problem domain – innovating in the welfare sector

The transition from secondary school to work takes place in a unique work system, involving several organisations and individuals at different political and societal level. They all work for providing persons with ID the required competences and support to manage his/her daily life and future work. The information obtained and communication taking place during the process is documented in different information systems but also via phone calls and in face-to-face meetings. The transition can be described in four main phases: the end of elementary school, beginning of secondary school, end of secondary school, and the transition into work. A summary is given in the following paragraphs starting with transition from elementary school to secondary school.

When a person with ID approaches the end of elementary school, a transition meeting is held, to ease the transition to a new school. The participants in the meeting are the student, the parents, representatives from elementary school, representatives from secondary school, and the educational and psychological counselling service (PPT). Information which is considered important for the transition is documented in the individual subject curriculum. Based on the information discussed during the meeting and previous documents, PPT makes an expert assessment regarding the right to special education in secondary school. Data and analysis of the data reveals that the transition from secondary school to employment take an important start already in elementary school when the person with ID applies to enter secondary school.

At the beginning of secondary school, another meeting is held with the same participants and PPT makes a new assessment serving as a guide for adjusting the education progress according to the needs and abilities of the student. Apart from education in different subjects, the student receives work training at the school and possibly also in other organisations. These activities are organised and followed up by teachers in the actual secondary school and are documented in the individual subject curriculum. The secondary school, normally three years, can be extended with either one or two years depending on the needs of the student. As with other adjustments, the right for extension is assessed by PPT.

When the person with ID turns 18 years old, he/she can register at the Norwegian Labour and Welfare Administration (NAV). NAV can assist in work searching activities and grants the right to disability benefits. If the case is seen as "obvious", meaning that the person with ID has some specific diagnosis, the person is given disability benefit based on previous documentation. If the case is not seen as "obvious", NAV will assess the monetary earning capacity of the person based on for instance trainee periods in different kinds of organisations. During this time, it is possible to attend courses or take part in other initiatives. When the assessment of work capacity is completed, the person with ID is most likely to get a placement at a day-centre, in a segregated workplace within the state labour market initiative, or no placement at all.

Work System snapshot – Transition from secondary school to employment for persons with ID	
Customers	**Products and Services**
Persons with ID Parent(s) of persons with ID Employers	Competence and training for persons with ID Employment for persons with ID Work labour for employers
Work Practices (Major Activities or Processes)	

Final year in elementary school
Person with ID/parent sends application to high school
Elementary school holds a transition meeting with secondary school
PPT maps the student needs and abilities
First year(s) in secondary school
Person with ID starts in a specific school program
Secondary school holds a clarification meeting
PPT maps the student needs and abilities
The education is adjusted according to the decision by PPT
The student conducts work training at school
Final year(s) in secondary school
The teachers plan the trainee period
The student conducts trainee activities in organisation(s)
The teacher follow-up on work training and trainee activities
The student/parent sends an application regarding extension of education
PPT maps the student needs and abilities
The education is adjusted according to the decision by PPT
Different actors try to plan the future working life of the student
Transition to work
The person with ID/parent registers at NAV
NAV maps and evaluates the work abilities
The person with ID/parent applies for disability benefits
Different actors try to find an employment
The person receives a placement at a day-centre or an adjusted work position

Participants	Information	Technologies
Persons with ID Parents and/or next-of-kin Coordinator (assigned by municipality) Elementary school Secondary school Educational and psychological counsel-ling service (PPT) Habilitation services Norwegian Labour and Welfare Admin-istration (NAV) Day-centre Employer (private or public) General practitioner Community-based housing	Individual subject curriculum Individual plan Expert assessments (PPT) Expert assessments (NAV) Coordination meetings	E-mail applications Daily communication support (for instance facetime) Daily information sharing (school and community-based housing) Electronic patient record Communication with citizens (NAV) Electronic coordination system (NAV) Electronic coordination system (municipality) Electronic identification

Table 2.   The work system of the transition from secondary school to work for persons with ID.

5 Discussion

In this section we discuss how the Work Systems snapshot has been used in the initial problem formulation phase of an ADR project. We also discuss challenges connected to a project in the welfare sector, where there is no given IT/IS artifact to improve or replace.

5.1 Insights on problem formulation in the welfare sector

Despite the complex environment, the elements of the WS snapshot guided us with a structure to organize and visualize the scope of the problem. The goal of the initial stages of an elaborated ADR process can be conceptualisations of the problem (Mullarkey and Hevner, 2018), something that the WS snapshot supported with the identification and structure of processes and activities, participants, information, technologies, products/services, and customers. It gave us the ability to identify additional participants to include in the study and existing artifacts to evaluate as the ADR process evolves.

Nevertheless, we did experience challenges during the problem formulation process when applying the WS snapshot in an early stage of the ADR process. Firstly, it was challenging to decide on the *scope* of the actual work system due to the highly complex environment of the welfare sector. According to Alter (2013), work systems can be viewed as existing both within and across organisations. Taking the user (person with ID) as the focal point we decided to view the entire transition process as a work system, as it offers services to the user. Viewing the different organisations as separate work systems would not have provided us with a deeper understanding of the complexity in the situation and would probably hinder a clarification. We also had to take into account that innovations within the welfare sector might need to cross traditional organisational boundaries and interact with both publicly and privately employed actors. We discovered, furthermore, that several persons contribute to the transition beyond what is expected of their professional role. At the start of the project, the aim was to frame the work system as consisting of the transition from secondary school to employment, but the WS snapshot helped us to understand that the transition process started already in elementary school.

A second challenge was the *granularity* and the level of detail in the description of both the activities and the actors. As described in the method chapter, the process of describing the activities and involved actors was iterative and we struggled to find an appropriate level of granularity. The data provided us with rich information, incorporating several actors in different organisations, and on different political levels. Thus, it was sometimes challenging, but also necessary, to restrict the description of the work system in order to make it manageable to understand and to overview. Following the iterative nature of the ADR process (Sein et al., 2011), we argue that it can be useful to combine a general description of the work system with more detail descriptions of certain parts as the problem formulation emerges and changes. This would also stress the importance of contributing both a class of problems and a problem perceived in practice (Sein et al., 2011).

Even if the WS snapshot did provide a structure to organize and visualize the scope of the problem, it did not provide enough guidance to analyse the practitioner and research relevance of the problem domain (Sein et al., 2011; Mullarkey and Hevner, 2018). The deeper understanding of the problem domain was achieved through an inductive data analysis of the material from the focus group interviews, the individual interviews and the observations. Thus, there is a need for further guidance regarding how to analyse the relevance of the problem domain and possible design solutions, both from a practitioner perspective and from a research perspective.

As it is of utmost importance to involve the practitioners in an ADR process (Sein et al, 2011) and to reach an agreement among researcher and practitioners, one needs to constantly reflect on how the research findings should be presented and visualized to the salient stakeholders. To communicate the problem understanding between researchers and practitioners in our project, the initial findings were presented visually as a user journey to ease the understanding of the transition from secondary school to employment. In addition, we attended several practitioner-oriented conferences to present and discuss the findings and their relevance. While we aimed to focus on the users, persons with ID, alternative ways of visualising initial findings to practitioners could be for instance the Value proposition

canvas which is a more business-oriented visualisation tool. The canvas can provide business and organisations with and understanding of the customer or citizen want and how value is intended to be created (Osterwalder et al., 2004).

6 Conclusion

Returning to our research question: *How can the Work Systems snapshot be used in the initial problem formulation phase of an ADR project?* The study shows that the WS snapshot did provide some basic guidance to structure and conceptualize the scope and the description of the problem. The main challenges relate to the scope and the granularity of the description of the work system. The user journeys contributed to communicate the problem understanding between researchers and practitioners. Still, there is a need for guidance regarding how to analyse if the problem domain and possible design solution are of relevance to practitioners and to research. It was also shown that the complexity of the welfare sector demands that significant time is spend on understanding the problem itself and that it is important to also understand the surrounding settings and contexts.

Based on these insights, we see a need for further studying and developing a coherent tool set for clarifying the initial stage of an elaborated ADR process. In complex settings, such as the welfare sector, and with no given IT/IS artifact to improve or replace, it is important to open up for different guiding methods and techniques that can support both a systemic understanding of the problem domain, communication and visualization of the problem to practitioners, and problem analysis.

The findings in this study are reported from an ongoing ADR project. The diagnosis of the problem will therefore continue as the ADR process unfolds and the solutions emerges. In the next stage of the ADR process, we aim to evaluate existing artifacts and to conduct ideation workshops to get user-driven ideas regarding the problem insights that have been identified during the first stage. These will serve as a basis for developing concept designs of innovative services later in the project. Thus, the problem understanding will continue to emerge along with design of artifacts. The WS snapshot might therefore be returned to and elaborated upon as the problem framing emerges.

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