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ENTERING AND ORGANIZING ENGAGED INFORMATION SYSTEMS RESEARCH

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Entering and Organizing Engaged Information Systems Research

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Abstract:
In Engaged Scholarship, researchers collaborate with practitioners to examine and address real-world problem situations while contributing to scientific knowledge. There are many methods for planning and carrying out specific forms of engaged inquiry in Information Systems (IS) research, such as Case studies (CS), Action Research (AR), Design Science Research (DSR), and Action Design Research (ADR). Yet, there is a lack of guidance on how to select the relevant form(s) of inquiry in research projects where the problem situation and the possibilities that lie in the researcher-practitioner collaboration are poorly understood at the outset of the project or evolve as the project progresses. In this paper, we develop a model for entering and organizing engaged IS research. In the model, initial inquiries are framed as CS to develop descriptive and explanatory knowledge about the real-world problem situation. The researcher may select other forms of inquiry, such as design and evaluation of artifacts (DSR), or organizational change (AR), if and when it is deemed relevant and feasible. We illustrate the relevance and use of our model with examples from an ongoing engaged IS research project. Along with the model, which is our main contribution, we provide an overview of four relevant forms of engaged inquiry for IS research (CS, AR, DSR, ADR) and critical aspects of concern when selecting between them, which is helpful to researchers when planning their research projects.

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1. Introduction

In Engaged Scholarship (Van de Ven, 2007), researchers collaborate with practitioners in addressing problems relevant to a real-world problem situation and scientific knowledge. The form of research is commonly practiced and argued of relevance to the field of Information Systems (IS) (Conboy et al., 2012; Mathiassen, 2017; Mathiassen & Nielsen, 2008). Van de Ven (2007, p. 9), who introduces the term "Engaged Scholarship", describes it as "a participative form of research for obtaining the different perspectives of key stakeholders (researchers, users, clients, sponsors, and practitioners) in studying complex problems." A defining characteristic of engaged scholarship is that it "draws on the perspectives of key stakeholders in a real-world problem situation and aims to develop knowledge that helps to address it" (Mathiassen, 2017, p. 19). Several widely discussed and used research methods can be employed in engaged IS research projects, including Case Studies (CS) (Myers, 2019; Walsham, 2006), Action Research (AR) (Davison et al., 2004), Action Design Research (ADR) (Sein et al., 2011), and Design Science Research (DSR) (Gregor & Hevner, 2013). The methods support planning and carrying out distinct forms of inquiry for developing knowledge from real-world problem situations while contributing findings to academic literature. For instance, DSR supports researchers in developing prescriptive knowledge through the design and evaluation of artifacts (Gregor & Hevner, 2013), while AR supports research through planning, introducing, and evaluating changes in organizations (Davison et al., 2004).

Researchers are expected to balance relevance and rigor in selecting, planning, carrying out, and describing their research approach (Davenport et al., 1999; Mathiassen, 2017). Methods should not merely serve as a descriptive theory to make sense of what has happened in a research project but should be used to plan and carry out the research process in a rigorous manner (Davison et al., 2021). In engaged IS research, form(s) of inquiry are selected based on two key concerns:

a) What form of inquiry that is ***relevant*** given the current understanding of the real-world problem situation and the related knowledge interests of the practitioners and researcher(s) (Mathiassen & Nielsen, 2008; Van de Ven, 2007).
b) The ***feasibility*** of carrying out such an inquiry given the practical concerns of the project. I.e., the possibilities that lie in the researcher-practitioner collaboration. Feasibility is an important concern as the different forms of inquiry differ significantly in terms of what they require from the researcher-practitioner collaboration. (Simonsen, 2009; Vidgen & Braa, 1997).

However, many engaged research projects do not start with a clear understanding of the problem to be investigated, what represents a relevant knowledge contribution, nor detailed insight of what will be feasible within the researcher-practitioner collaboration (Mathiassen, 2017; Nielsen & Persson, 2016; Van de Ven, 2007). Instead, these aspects are inherently unpredictable, and a key aim in the research process is in itself to develop an understanding of the problem (Mathiassen, 2017; Nielsen & Persson, 2016). As articulated by Abbott (2004, p 83):

> *"We often don't see ahead of time exactly what the problem is; much less do we have an idea of the solution. We often come at an issue with only a gut feeling that there is something interesting about it. We often don't know even what an answer ought to look like. Indeed, figuring out what the puzzle really is, and what the answer ought to look like often happen in parallel with finding the answer itself."*

Accordingly, it will often make little sense to commit to a specific form of inquiry, such as design and evaluation of artifacts (DSR) or organizational change (AR), before the problem is investigated in greater detail and the relevance and feasibility of the further form of inquiry are assessed. Yet, when selecting methods such as CS, AR, or DSR when initially planning a research project, the choice of inquiry is already made at the outset before acquiring any intimate knowledge about the problem and researcher-practitioner collaboration.

We experience this challenge in our own ongoing engaged research project. We see that the various existing methods (CS, AR, ADR, DSR), although well suited for guiding engaged inquiry in response to specific forms of knowledge interests, require the researcher to commit to the dominant form of inquiry at the outset of the research project. The selection of methods thus assumes a detailed understanding of the problem, and what is feasible within the project, and that the problem and organization are relatively static over time. As a result, we see that early researchers struggle with identifying the right choice of method when planning, carrying out, and describing their engaged research. Often, they commit to one form (e.g., AR) and later have to radically change the plan and course of their research as they discover that the selected method is of limited relevance to the problem or unfeasible given the practical concerns of the project. Further, in our project, which is centered around a defined, yet broad problem area of focus, we have leveraged several forms of engaged inquiry to learn about multiple aspects of the problem, and to explore potential solutions. We find that engaged research projects aimed at understanding and addressing large, complex, and socio-technical problems may struggle with fitting such efforts into the specific models for CS, AR, ADR, or DSR.

In this paper, we explore the following research question to address this challenge: *How can we enter and organize an engaged IS research project so that we can select the form(s) of inquiry as the understanding of the problem and project evolve?*

To address our question, we survey the existing literature on engaged IS research and, combined with our experiences from a three-year engaged research project, develop a model for entering and organizing engaged IS research. In our model, the researcher(s) and practitioners initially commit to an engaged project oriented around a defined (preliminary) problem area. Initial inquiries are framed as a CS to develop descriptive and explanatory knowledge before further appropriate inquiries are planned. This allows researchers and practitioners to familiarize themselves with the problem situation to make an informed choice of further forms of inquiry based on their relevance and feasibility. The model is not meant to replace or compete with existing models for CS, AR, ADR, DSR, but rather to complement these with an overarching model to support entering and organizing smaller and larger engaged IS research projects. The model helps select and combine inquiries and emphasizes problem formulation as a central and continuous activity throughout the research process, which binds together inquiries carried out in sequence or parallel.

The contribution is relevant in several situations. First, it is relevant for researchers to guide and make sense of larger long-term engaged research efforts including multiple forms of inquiry carried out in sequence or parallel (Nielsen & Persson, 2016). Second, it is relevant for researchers embarking on smaller engaged research efforts, where early commitment to a specific form of inquiry is difficult due to uncertainties regarding relevance and feasibility. Third, the paper provides an overview of the distinguishing aspects between four relevant forms of inquiry in engaged IS research. It is thus helpful for researchers to get an overview of various forms of engaged inquiry and when these are relevant and feasible. Accordingly,

the paper may also be used in discussion with practitioners when planning (further) relevant and feasible forms of inquiry in an engaged research project.

The rest of the paper is organized in the following manner: First, we provide an overview of four forms of engaged scholarship relevant to IS research. With a basis in existing approaches, we develop and present our model for entering and organizing engaged IS research. We then illustrate the relevance and use of our model through several empirical examples from an ongoing engaged research project where we study software design, development, and implementation practices in a global generic enterprise software project. Finally, we discuss some key traits of our model, its relevance for IS researchers, and its limitations before concluding our paper.

2. Forms of Engaged IS Research

We begin by providing an overview of relevant forms of engaged inquiry in IS research. In his book, Van de Ven (2007) describes four forms of engaged scholarship: Informed basic research, collaborative basic research, design and evaluation studies, and action research. Mathiassen & Nielsen (2008) argue that Van de Ven's four forms correspond to three widely used research methods or paradigms within IS research: 1) Practice studies – which we here equate with Case Studies (CS), 2) Design Science Research (DSR), and 3) Action Research (AR).

In the following sections, we will briefly introduce the origin and essential characteristics of these three approaches, and add a fourth method - Action Design Research (ADR) - that we see as a distinct and relevant form of engaged IS research.

2.1 Case Studies (CS)

CS in an engaged IS research project are carried out to describe and explain the practices and challenges of a group of practitioners (Goldkuhl, 2011; Mathiassen, 2002) to "understand current IS practice" (Nielsen & Persson, 2016, p. 723). Researchers may conduct engaged CS as "detached-outsiders" by "being a detached, impartial onlooker who gathers data on many units in different contexts" (Van de Ven, 2007, p. 27), for instance, through interviews, questionaries, and focus groups. The benefit is that the researcher gets a broad view of aspects and perspectives relevant to the defined problem area. "Detached" does not mean that the researcher is necessarily regarded as objective or unbiased in a positivist sense. From an interpretive point of view, data collection and analysis still involve the researchers' subjectivity. However, as a detached outsider, "the people in the field situation do not perceive the researcher as being aligned with a particular individual or group within the organization" (Walsham, 2006, p. 321). Alternatively, the researcher may be an "attached-insider" within the practice or "system" of study, as "a participant immersed in the actions and experiences within the system being studied" (Van de Ven, 2007, p. 27). Hence, "the researcher is personally involved in the activities in the research context" (Nandhakumar & Jones, 1997, p. 115), which provides the opportunity for the researcher(s) to gain insights and experiences of "actually 'being-in-the' IS situation" (Simonsen, 2009, p. 4). Here, the researcher may commit to undertake "responsibility for managing some or all activities during the project" (Simonsen, 2009, p. 4), including, for instance, software development activities. The benefit being that of extensive access and insights into the practices as they unfold.

The descriptive and explanatory knowledge developed through case studies help build an understanding of current practices and problems of the practitioners involved in the study and

may produce findings that can be developed as scientific contributions to related concerns in academic literature.

2.2 Design Science Research (DSR)

DSR supports the development of prescriptive and normative knowledge "to support IS practitioners" (Nielsen & Persson, 2016, p. 723). It originates from the field of engineering and has been subject to increased attention within IS in the last decade. The seminal article by Hevner et al. (2004, p. 76) describes DSR as a paradigm that aims to *"create innovations that define the ideas, practices, technical capabilities, and products through which the analysis, implementation, management and use of information systems can be effectively and efficiently accomplished."* From the process or the product of artifact design, prescriptive knowledge is defined and argued relevant to a broader 'class' of problems and solutions, and accordingly relevant to scientific knowledge (Lee et al., 2011). This prescriptive knowledge is often presented in the form of design principles (Jones & Gregor, 2007) to provide normative support for design and action (Mathiassen, 2002). For instance, Van Aken (2004) suggests the format of prescriptive theory within the field of management to be along the lines of "If you want to achieve Y in situation Z, then something like action X will help" (Aken, 2004, p. 227).

"Artifact" refers to "a thing that has, or can be transformed into, a material existence as an artificially made object (e.g., model, instantiation) or process (e.g., method, software)" (Gregor & Hevner, 2013, p. 340). Popular models for DSR include stages such as problem formulation, the definition of objectives, design and development, evaluation of the artifact, and communication of findings in scholarly articles and practitioner publications (Peffers et al., 2007). In the iterative process of artifact design and evaluation, *justification knowledge* is developed from existing theory and empirical data collection. It includes "any knowledge that informs design research, including informal knowledge from the field and the experience of practice" (Gregor & Hevner, 2013, p. 340). This knowledge both informs further design of the artifact and is used as the basis for developing prescriptive design theory for contributions to scientific knowledge (Jones & Gregor, 2007).

DSR is often carried out in a non-engaged mode, where the researcher selects and defines a problem for investigation without initial grounding in a specific organization of engagement (Iivari, 2015; Sein et al., 2011). However, DSR can be carried out in an engaged mode (Iivari, 2015; Otto & Osterle, 2012), where the researcher(s) **"**attempts to solve a client's specific problem by building a concrete […] artefact […] in that specific context and distills from it knowledge to be generalized into a general solution concept" (Iivari, 2015, p. 107)**.** For our model of engaged IS research, we refer to the engaged form of DSR.

2.3 Action Research (AR)

Action Research has a long tradition within IS research, originates from the social sciences. It is used to develop knowledge through systematic introduction and evaluation of interventions in organizations to learn what it takes "to improve IS practice in organizations" (Nielsen & Persson, 2016, p. 723). AR aims to address the specific problem(s) of an organization through diagnosis, planning, introducing, and evaluating organizational interventions (Davison et al., 2004; Iivari & Venable, 2009; Susman & Evered, 1978). Findings from the process and result of organizational change are generalized to build knowledge that contributes to a relevant concern in academic literature (Davison et al., 2012). In contrast to DSR, AR is *always* engaged as problems necessarily are situated within a real-world problem situation. There are many AR methods conceptualized within IS (Avison et al., 2018; Davison et al., 2021). In this paper, we subscribe to the canonical AR model described by Davison et al., (2004). The

canonical model of AR is iterative and includes stages of diagnosis, action planning, action taking, evaluation, and reflection. For each cycle, "the resulting organizational system is rediagnosed, new plans are drawn up, and fresh interventions are performed in order to produce further changes" (Davison et al., 2004, p. 76). We base our understanding of AR on the canonical form of AR as it is the most widely discussed and used form of AR (Davison et al., 2021), and as it is clearly distinguishable from case studies carried out with researchers as attached insiders (in contrast to, e.g., the AR approach described by Simonsen (2009))

Theory and relevant academic literature should play a supportive role in the diagnosis of problems, action planning, or the evaluation and reflection stages of the project. In contrast to attached insider CS, where the researcher also may be involved in organizational change, in AR, change is systematically planned based on problem diagnosis and evaluated on how the intervention introduced addresses these problems (Baskerville, 1997). Thus, a "diagnosis of the organizational situation should produce a clear understanding of the problem and specification of its causes" (Davison et al., 2004, p. 75). Following, "the planned actions must be designed to address the observed problem and its specified causes. The action researcher should be able to explain each action and justify it as a remedy to part or all of the diagnosed problem" (R. Davison et al., 2004, p. 75).

AR inquiries are expected to contribute both to the concerns of practitioners by addressing the immediate problem experienced in practice and to a related concern in academic literature with descriptive, explanatory, or prescriptive knowledge on a similar phenomenon in similar contexts.

2.3.1 Design, Action, or Both: Similarities and Differences

Several articles have discussed the similarities and differences between DSR and AR. Some argue that they are close to similar although of different origin (e.g., Järvinen, 2007). Others argue that they are "deceivingly similar" and based on radically different ontological, epistemological, and ethical assumptions (e.g., Iivari & Venable, 2009; Maccani et al., 2015). We do not go into this debate in detail. Instead, for our model, we argue, in line with Mathiassen & Nielsen (2008), Mathiassen (2002; 2017), Goldkuhl (2013), and Goldkuhl & Sjöström (2018), that DSR and AR represent two viable forms of inquiries for exploring and addressing problems in engaged IS research. Their distinction lies in the underlying knowledge interest, particularly what is to be evaluated. Whereas DSR revolves around the design and evaluation of artifacts, AR revolves around planning, introducing, and evaluating organizational change (Goldkuhl, 2013; Iivari & Venable, 2009; Mathiassen, 2002). An engaged DSR inquiry may thus involve developing an artifact, e.g., a model describing existing practices and challenges, a method for addressing a particular challenge, or an IT solution as a response to an organizational problem. The focus of iterative design and evaluation will be on the artifact's utility for addressing the specified problem and on developing normative statements that may guide action in similar situations (Goldkuhl, 2013; Mathiassen, 2002). This may be done *without* introducing the artifact for use by the organization, where rather, evaluations could be in the form of focus groups and workshops with stakeholders to discuss its utility and implications for practice (Peffers et al., 2012; Pries-Heje et al., 2008). In contrast, an Action Research project requires a change in organizational practice to evaluate if and how this addresses the problem of focus.

It is also important to keep in mind that the design of artifacts and organizational changes may be part of all three forms of engaged inquiry presented. The essential criteria when selecting between them is the knowledge interest one has in the process: is it about developing

prescriptive knowledge, i.e., normative support through design and evaluation of artifacts (DSR), to develop descriptive and explanatory knowledge by exploring practices as they unfold (CS), or to develop knowledge from systematic introduction and evaluation of organizational change (AR).

2.4 Action Design Research (ADR)

In addition to Mathiassen et al.'s (2008) three forms of engaged IS research, we add Action Design Research (ADR) as a fourth relevant form. The ADR method (Sein et al., 2011; Sein & Rossi, 2019) integrates design and evaluation of artifacts with its introduction into a real-life problem situation. ADR thus promotes a process that *"simultaneously aims at building innovative IT artifacts in an organizational context and learning from the intervention while addressing a problematic situation"* (Sein et al., 2011, p. 38)**.** To support this, the ADR model features a single stage that integrates build, intervene, and evaluate (BIE), which "interweaves the building of the IT artifact, intervention in the organization, and evaluation" (Sein et al., 2011, p. 40). As with DSR, ADR uses learnings from the process and result of designing the artifact to develop prescriptive knowledge relevant to a broader class of problems and solutions (Sein et al., 2011), and thus to a pertinent concern in academic literature. In their words, ADR "should generate knowledge that can be applied to the class of problems that the specific problem identifies" (Sein et al., 2011, p. 40)**.** Since the artifact is iteratively designed *and* introduced into a real-world problem setting, ADR contrasts DSR in that the resulting artifact not only reflects theory and knowledge obtained through controlled evaluations with relevant stakeholders, "but also the influence of users and ongoing use in context." (Sein et al., 2011, p. 40)

ADR is as such distinct from both AR and DSR as it emphasizes iterative design and introduction of artifacts into organizational practice. The evaluated artifact accordingly reflects how it shapes and is shaped by use in a real-world context.

2.4.1 Combining Forms of Inquiry

Engaged Scholarship may be conducted by using one or several forms of inquiry within a research project. While Van de Ven (2007) argues that the different forms of inquiry can be combined in a research project, he does not elaborate on *how* to organize the process and combine forms of inquiry. There are, however, some arguments for and examples of combining several forms of inquiries in IS literature. Most notably, Mingers (2001) argues for combining methods as it a) helps shed light on multiple aspects of a phenomenon, and b) can be more or less apt for employment at various points in the research process. Here, two possibilities are presented. One where the research process involves different forms of inquiry carried out in sequence "with results from one feeding into the later one" (Mingers, 2001, p. 252). Alternatively, and maybe more common in more extensive research projects or programs, forms of inquiry may be carried out in parallel with "results feeding into each other" Mingers, 2001, p. 252).

For engaged IS research more specifically, Davison et al. (2021) argue for the merit of carrying out CS and AR in sequence to "produce a case study as part of the familiarization or diagnosis phase of an AR project" (Davison et al., 2021, p. 857). Along the same lines, Nielsen & Persson (2016) argue for binding multiple forms of inquiry together through the activity of problem formulation. They argue that different forms can be leveraged in the same project by "explicitly linking the research approaches through the problem formulation" (Nielsen & Persson, 2016, p. 731). Further, approaches such as (Collaborative) Practice Research (Goldkuhl, 2011; Mathiassen, 2002) argues for combining AR, DSR, and CS where

AR is the "dominant" approach in the research process, accompanied by the design of artifacts and descriptive and explanatory studies of existing and ongoing practice.

3. A Model for Entering and Organizing Engaged IS Research

Having established an overview of four forms of engaged inquiry relevant in IS research, we now turn to the development of a model for entering and organizing engaged IS research projects. The model is presented in Figure 1. In addition to carrying out one or several forms of inquiry, the research process of our model centers around three activities: 1) researcher-practitioner negotiation, 2) problem formulation, and 3) selecting a form of inquiry. As the arrows indicate, the researcher revisits the three activities continuously throughout the research project. The practitioners involved in the study may more or less take an active part in the last two activities depending on the form of researcher-practitioner collaboration. Form(s) of inquiry are selected based on the evolving understanding of the real-world problem situation, what accordingly represent a relevant practical and theoretical knowledge interest, and what is feasible in the researcher-practitioner collaboration. We will discuss the three activities at the center of our model in the following sections before we illustrate the relevance and use of the model in the next chapter.

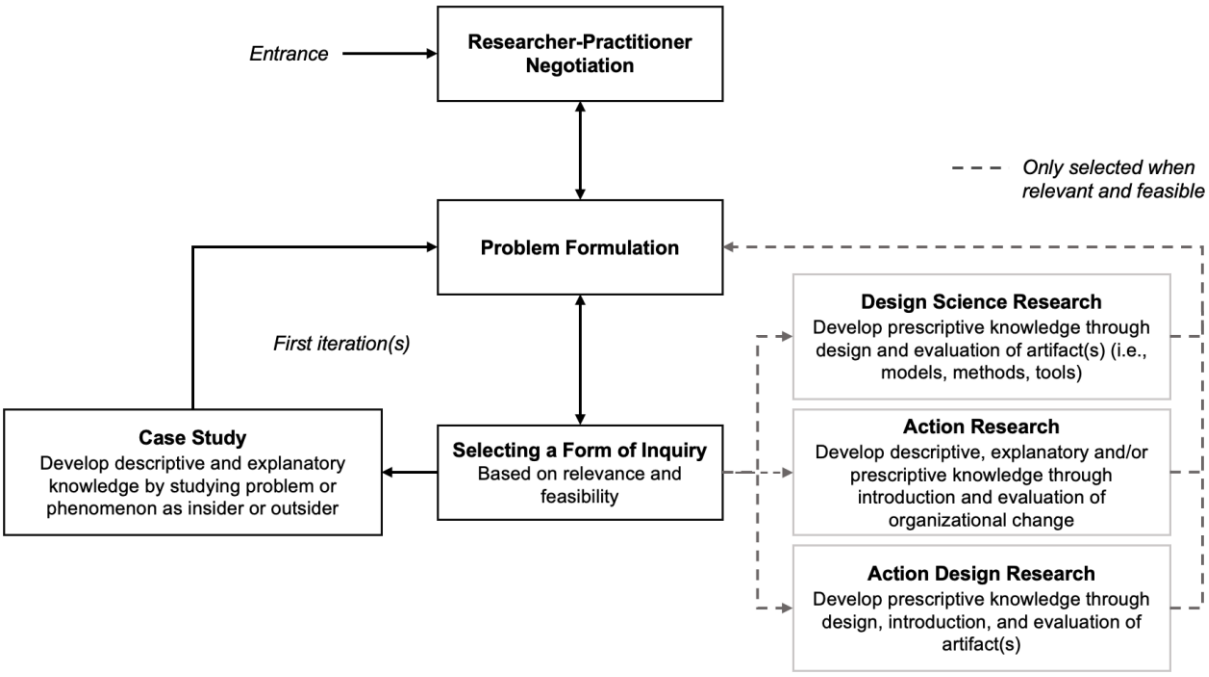

Figure 1: *A model for entering and organizing Engaged IS Research. The first form of inquiry is framed as a case study. Other forms of inquiry may be selected for later iterations if deemed feasible and relevant.*

3.1 Researcher-Practitioner Negotiation

Researcher-practitioner negotiation represents the entry point of our model, and the activity is continuously revisited throughout a research project. Any engaged research must be based on some form of agreed collaboration or partnership between researchers and a group of practitioners. A collaboration could be loosely arranged, for instance, through an agreement with practitioners on participating in a series of interviews, workshops, or researchers participating in concrete parts of an ongoing project within an organization (Van de Ven, 2007). It may also be based on more formalized long-term collaboration, for instance, within a 'university-industry collaboration' program (Schubert et al., 2015).

A vital aspect of the researcher-practitioner negotiation is to clarify the nature of the relationship between the two parties. Particularly, Van de Ven (2007, p. 288) points out the difference between research conducted *for* versus *with* a group of practitioners. Research conducted with practitioners is collaborative and aimed "to obtain the different but complementary perspectives of collaborators for understanding the problem domain." In contrast, research conducted *for* practitioners involves an exchange where the researchers work "in service of solving a problem of a client or user group." The choice of either affects the nature of the collaboration (e.g., expectations) and must be explicitly negotiated and agreed upon. If research is conducted *for* an organization, it is particularly important to agree on a balance between practical concerns (i.e., improving practice) and concerns of the researcher (developing scientific knowledge) that is acceptable to both parties. (Mathiassen & Sandberg, 2013)

Also, the practicalities of the collaboration must be discussed, such as researcher access, if the researcher should be engaged as a detached outsider or an attached insider, and concerns of timelines and resources. This includes "the boundaries of the research domain, and the entry and exit of the scientists" (Baskerville, 1997, p. 3). What will be feasible within the collaboration, which provides a basis for selecting the form of inquiry, should also be discussed.

Regardless of the form of entrance and underlying agreement of the project, the researcher(s) enters the collaboration with his or her own research interests, prior experience, and competence. The researchers' interest and competence must somehow be matched to aspects seen as relevant to be explored and addressed by the practitioners in the real-world problem situation. During the initial client-researcher negotiation, a problem area seen as relevant for both parties is thus agreed upon. This problem area is often somewhat vague or formulated to concern a specific group of people or practice with some potentially interesting challenges (Nielsen & Persson, 2016; Van de Ven, 2007). Later the problem formulation is reformulated based on findings from consecutive cycles of inquiry.

3.2 Problem formulation

A research problem is defined by Van de Ven (2007, p. 73) as "any problematic situation, phenomenon, issue or topic that is chosen as the subject of an investigation." A defining characteristic of engaged scholarship is that problem formulation is an empirical process rather than being carried out exclusively through derivation from academic literature. A key and ongoing activity is thus to "situate, ground, diagnose, and infer the research problem by determining who, what, where, when, why and how the problem exists up close and from afar" (Van de Ven, 2007, p. 78). Problems are not objective phenomenon simply to be defined and then 'solved' through the research process but tied to the perspective of different observers. Hence, as argued by Schön, the researchers and practitioners "constructs the […] world within which he/she sets the dimensions of his/her problem space, and invents the moves by which he/she attempts to find solutions" (Schön, 1992, p. 11). The 'situating and grounding' of problems for specific actors at a time and place is thus a crucial part of determining from who's perspective and in who's service one is carrying out the research.

An engaged research project is as such as much a process of problem formulation or 'framing' (Schon, 1984) as a problem-solving activity (Nielsen & Persson, 2016; Van de Ven, 2007). Accordingly, we deliberately place the activity of problem formulation at the center of our model and emphasize its continuous revisit based on findings from empirical inquiry. The starting point may be an "anomality or breakdown that a scholar encounters in the literature or

in practice […] that are not consistent with the scholar's theory of the world" (Van de Ven, 2007, p. 72). In the first and early phases of a research project, the problem may thus be formulated general and accordingly often in the form of a somewhat vague problem area or phenomenon of mutual interest to the researchers and practitioners. Through iterations of inquiry, the problem is gradually modified and elaborated, 'reframed' (Schon, 1984), made more specific, or divided into several related problems of relevance to a broader problem area (Nielsen, 2020).

There is a dual knowledge interest that the formulated research problem must capture. First, the research must produce knowledge or other outcomes such as artifacts or organizational change that are relevant to better understand or address concerns in the real-world problem situation. The merit of the problem formulation should accordingly be judged based on how well it "brings the inquiry forward and whether it assists in making sense of the problem situation and possible solutions" (Nielsen & Persson, 2016, p. 730). Second, but as necessary, the research must produce knowledge of relevance to a related concern in academic literature (Mathiassen, 2017; Van de Ven, 2007). By making this 'link' between the real-world problem situation and a related concern in academic literature, the knowledge presented in a body of literature may inform the data collection and analysis (i.e., making sense of the real-world problem situation). In turn, the findings of the engaged research can (and must) contribute back to this body of scientific knowledge. The selected body of related academic literature must hence afford the researchers to "construct an opportunity to make a contribution" based on the findings from the project (Mathiassen, 2017, p. 19).

The formulated research problem is accordingly a function of both a problem relevant within the real-world problem situation and its relation to a pertinent concern in academic literature.
The process of identifying a relevant concern and theoretical concepts in academic literature can be seen as an abductive conversation between aspects of the real-world problem situation and a broad array of academic literature and theories (Van de Ven, 2007). It requires identification of the "generic representations of the critical characteristics of the phenomenon" observed in the real-world situation to develop a problem formulation with applicability "beyond the situation in which it is observed" (Van de Ven, 2007, p. 74). In CS inquiries, theory and concepts can guide data collection and analysis to describe and explain problems and phenomena. In inquiries of AR, theory and concepts are used during diagnosis, action planning, or evaluation (Davison et al., 2021). In DSR and ADR, it is used as *justification knowledge* (Gregor & Hevner, 2013), informing the design of the artifact and the development of prescriptive theory.

3.3 Selecting a Form of Inquiry

The four forms of engaged inquiry are all potential choices pending on their relevance and feasibility (Medaglia, 2012, p. 250). The first iteration(s) of inquiry are framed as CS to develop descriptive and explanatory knowledge to familiarize with the real-world problem situation. This knowledge helps guide further and more well-informed problem formulation, and in turn, the selection of further inquiries. The first iteration(s) of CS inquiry and problem formulation may warrant a continued CS framing if deemed the most relevant and feasible. Further, CS may be the only form of inquiry within a given research project if not the design of artifacts or organizational interventions is deemed relevant or feasible in any of the consecutive iterations of problem formulation and planning of further inquiry.

When selecting the relevant form of inquiry, the researcher(s) must balance two concerns: The first concern is what is relevant to the real-world problem situation of engagement given

the current understanding of the problem and the related knowledge interests of the practitioners and researcher(s). Thus, "pragmatically, the relevance of approaches […] should be judged in terms of how well they address the intended question about the problematic situation" (Van de Ven, 2007, p. 282). Second, what is feasible given the practicalities of the researcher-practitioner collaboration must be considered as the different forms of inquiry differ significantly in terms of what they require. For instance, forms of inquiry that involve systematic interventions into practice (AR and ADR) imply far more intensive collaboration between the researchers and the practitioners (Baskerville, 1997; Simonsen, 2009). Thus, in many cases, AR or ADR may not be feasible within the project regardless of their relevance. Here, CS or DSR may represent more viable options for understanding and exploring problems and potential solutions. Table 1 can be used to assess which form of inquiry is relevant and feasible based on what they require and what is produced.

When entering any form of inquiry, the relevant academic literature on CS, DSR, AR, or ADR should be used to guide the research, including available models and principles. For instance, if the nature of the problem and project warrant introduction and evaluation of organizational change, the model and principles of Canonical AR (Davison et al., 2004; Davison et al., 2021) may be used to guide the process. Similarly, if design, introduction, and evaluation of artifacts are relevant, Sein et al.'s. (2011) ADR model can be used to guide the research. Further, if selecting AR, DSR, or ADR, the knowledge developed through preceding iterations of CS feed into the diagnostic phase of AR or the justification knowledge of DSR or ADR.

	Relevance – what is produced?	**Feasibility – what is required?**
CS	Descriptive and explanatory knowledge of relevance to the real-world problem situation and a concern in academic literature	Study phenomenon in a real-world problem situation as an attached insider (participant in the system of study) or as a detached outsider (e.g., interviews, questionaries, focus groups)
DSR	Artifact(s) relevant to the real-world problem situation, and prescriptive knowledge from the process and/or result of designing and evaluating the artifact(s) of relevance to a concern in academic literature	Design and evaluate artifact(s) (e.g., models, methods, tools) to address a problem within the real-world problem situation
AR	A change in practice relevant to the real-world problem situation, and descriptive, explanatory, and/or prescriptive knowledge from the process and/or result of an organizational change of relevance to a concern in academic literature	Plan, introduce, and evaluate organizational change to address a problem within the real-world problem situation
ADR	Artifact and change in practice from artifact introduction relevant to the real-world problem situation, and prescriptive knowledge from the process and/or result of designing and evaluating the artifact(s) of relevance to a concern in academic literature	Design, introduce, and evaluate artifact(s) that reflects "the influence of users and ongoing use in context." (Sein et al., 2012, p. 40) to address a problem within the real-world problem situation

Table 1: *Two key concerns when selecting a form of engaged inquiry – feasibility and relevance*

3.3.1 Multiple Forms of Inquiry: Sequential and Parallel

Our model supports and encourages multiple forms of inquiry to be employed in an engaged IS research project. As discussed in prior literature, the forms of inquiry could be combined in a sequential or parallel mode (Davison et al., 2021; Nielsen & Persson, 2016). The parallel mode is perhaps most relevant in more extensive research projects or research programs where several forms of inquiry can be enacted concurrently to address multiple problems within the overall problem area of focus. In smaller research projects, for instance, driven by an individual researcher, the process may only involve CS, or CS followed, for example, by

AR in sequence (Davison et al., 2021). When initiating new forms of inquiries carried out in *parallel*, the process illustrated in Figure 1 is not carried out in discrete steps. Instead, new parallel lines of inquiry are initiated, which continuously feeds learnings into the overall problem formulation. As such, the "… problem formulation brings knowledge from one form of scholarship to another" (Nielsen & Persson, 2016, p. 731). We will now turn to our case to illustrate the relevance and use of our model.

4. Case

Following the principles of engaged scholarship, the model presented in this paper is developed based on a real-world problem situation experienced in our own ongoing research project. The model is developed and evaluated through ongoing use in our research. In this section, we highlight some parts of our research process to illustrate the relevance and use of our model. We first describe how our research project is organized and then provide a brief story of how the project includes various forms of engaged inquiry guided by continuous problem formulation and negotiations of what is feasible and relevant in our collaboration with practitioners.

4.1 Background

We refer to our research project as the "design lab." Our design lab explores the software design, development, and implementation practices related to the generic enterprise software solution DHIS2. The DHIS2 software is an open-source software platform mainly used to support collecting, analyzing, and presenting health management information in the global south. The software is developed through an international research network called HISP. A central actor within this network is the University of Oslo (UiO), Norway, where the design lab is located. The development of DHIS2 as a generic solution is directed by a group of developers situated at UiO, referred to as the "core team." Meanwhile, several semi-independent groups comprising software implementers and developers are established in several countries such as India, Rwanda, South Africa, Mozambique, Tanzania, and Uganda. These groups specialize in implementing the software to serve the needs of specific user organizations. We refer to them as implementation specialist groups (ISGs). User organizations contract the ISGs to help configure and extend the generic DHIS2 solution according to their needs. Configuration is supported by an array of settings in the software supporting definition of what data to report, by whom, how often, and how the data is presented for use in decision-making. Further, the platform can be extended with "custom apps," enabling the development of functionality and user interfaces according to the specific needs of the individual user organizations.

Currently, the software is implemented within public and private organizations in more than 80 countries worldwide. Since UiO is a central actor within the HISP network and hosts the main developers of the generic DHIS2 solution, the design lab has extensive access to collaboration with the practitioners of the core team and the various ISGs. The project is led by two researchers, and has involved more than 30 master students who conduct a 1,5-year full-time research project as part of their master thesis work.

4.2 Entering Engaged IS Research

As the DHIS2 software is implemented by an increasing number of user organizations in more than 80 countries, it is difficult for the core team to design a generic solution that is usable and relevant to the increasingly diverse and dynamic audience of user organizations. Accordingly, the problem formulation that guided our initial work was: how can we ensure software usability and relevance in DHIS2 implementations?

At this point, an open question was still what the problem comprised of, and where, i.e., with what actors and at what "level" of design in the ecosystem, and how the problem best could be addressed. We defined three groups of practitioners as relevant stakeholders associated with the problem: 1) the core team, responsible for design, development, and maintenance of the generic DHIS2 software solution, 2) the ISGs in charge of implementing DHIS2 for user organizations in various countries by configuring, and sometimes, extending it according to their needs, and 3) user organizations that use DHIS2 to collect, analyze and present data within their organization. Initial researcher-practitioner negotiation with the core team revolved around when, where, and how the problem could be explored. An opportunity presented itself in an ongoing implementation project in India, where a local ISG was grappling with usability-related issues together with a user organization. Through discussions with the ISG team, we came up with the initial plan for a researcher and five master students to be part of the project to diagnose usability-related challenges, plan measures to address them, and evaluate the outcome. The assumption was that usability issues could be addressed by introducing the right methods into the software implementation process.

We planned to organize the research process as AR, where usability methods would be introduced and tested to develop knowledge relevant to the practitioners grappling with the usability issues and to develop knowledge relevant to the academic literature on usability design in ES implementation projects. As the project progressed, however, the dominantly challenging aspects of addressing the usability issues turned out to be more related to the conditions surrounding the implementation project. For instance, how the implementation process was organized and the possibilities to adapt the generic software features of the DHIS2 solution according to local circumstances. These aspects were beyond what we could systematically change. Our assumptions about the problem and how to address them thus turned out to be somewhat wrong. Our plan to systematically introduce and evaluate organizational change was accordingly deemed of little relevance and infeasible given the nature of the problem and our collaboration with the practitioners. The project did, however, offer the opportunity to explore challenges related to the software and project configuration – i.e., the "boundary conditions" of the usability design process.

Following, we reframed our inquiry as insider-CS, where we, together with the practitioners, attempted to develop descriptive and explanatory knowledge of key challenges associated with addressing usability in implementations. We participated in activities involving project planning, design activities, and app development activities. We also conducted several interviews and focus groups with the ISG team to understand how this project related to their broader implementation practices. The descriptive and explanatory knowledge gained through these inquiries fed into further problem formulation. Through iterations of empirical inquiry, data analysis, and engagement with the relevant academic literature on challenges related to the design, development, and implementation of enterprise software, we developed concepts that helped frame further inquiries and problem formulation. In turn, our findings provided a basis for several master theses and research papers.

The initial part of our project illustrates the relevance of our model. Our experience was that it makes more sense to frame initial inquiries as a CS to familiarize with the problem situation. Committing to AR up-front made us try to "force" interventions and evaluations of organizational change into the project – our choice of AR *before* developing a proper understanding of the problem represented a hurdle rather than supporting us. Moving further in the project, we instead approached the initial phases of problem formulations and researcher-practitioner negotiations with "Engaged IS Research" as an umbrella, where CS,

AR, DRS, or ADR represented a menu of potential forms of inquiry to be employed when relevant and feasible.

4.3 From insider to outsider CS

A major insight gained through our first iterations of inquiry and problem formulation was that making DHIS2 usable and relevant largely hinges on the work done during implementation – which, in turn, is enabled, constrained, or "shaped" by the software flexibility and other resources provided by the core team. Accordingly, a relevant question that emerged through problem formulation: what are the conditions for usability-oriented design in DHIS2 implementation projects? We knew that there were significant differences between the ISGs in terms of design and innovation practices in implementation projects. To extend our understanding of how the process of implementing DHIS2 could play a role in ensuring software usability and relevance, it would be highly relevant to gain an understanding of how the practices and challenges experienced in the project in India compared to other ISGs. We negotiated with several ISGs to explore their practices and challenges related to implementing DHIS2. We identified common interest in mapping out their practices and challenges and how these compared to the other ISGs. We agreed that we would present our findings through presentations and a report.

We visited four ISGs for a one-week visit to their offices to engage in interviews, contextual inquiries, and focus groups. Also, we interacted with a few groups through online interviews. These inquiries were framed as outsider CS, where we - the researchers - as "outsiders" studied the practices of several ISGs. We examined differences and similarities to identify underlying conditions and factors that help explain convergence and divergence in how usability was addressed and the challenges experienced. The outsider-CS inquiries helped us develop a broader and more detailed appreciation of the implementation process and to study variance between ISGs and projects to identify conditions that have an enabling or constraining influence on usability-oriented design. Again, these findings culminated in several master theses and research papers.

4.4 Initiating and organizing parallel inquiries

The outsider-CS inquiries fed into our problem formulation, and culminated in three specific problem areas related to the implementation practices of the ISGs, how implementation projects are organized, and the design flexibility of the DHIS2 software solution. Each warranted further investigation, and we decided to initiate several parallel inquiries organized as sub-projects with a set of master students and researchers. Each sub-project thus represented an engaged IS project in its own right, including activities of researcher-practitioner negotiation, problem formulation, and the selection and carrying out one or several forms of inquiry. In turn, each sub-project feeds findings "up" to the larger problem formulation of the overarching project. For instance, one sub-project employed outsider-CS inquiries to understand better the app development practices of a set of ISGs. A second employed DSR to design and evaluate the initial idea and prototype of a shared component library that would allow developers to share pieces of software across ISGs. In another, we engage in insider-CS with the ISG in Rwanda to develop a web-based application, studying challenges and opportunities for strengthening software design and development practices.

4.5 From CS to ADR to DSR

While visiting Mozambique for our outsider-CS inquiries, we also discussed the potential for further collaboration with the ISG. We found the ISG interesting as it had many ongoing projects that would allow us to study usability-oriented design and innovation in greater detail.

More so, the ISG managers and employees shared our interest in strengthening usability-oriented design. Together, we identified an implementation project that seemed suited for exploring challenges and opportunities related to introducing usability-oriented methods into the implementation process. Framed as insider-CS, a master student was part of a two-week project initiation, including requirements gathering and project meetings. During these inquiries, an idea for developing some sort of resource that could support and promote the use of usability-oriented methods emerged. The idea was to design and develop a resource (e.g., document or website) that could provide guidance and support in implementation projects, both for the Mozambique ISG and, potentially, throughout the larger DHIS2 ecosystem. The Mozambique ISG found the idea of such a resource relevant. Through discussions, we agreed upon an initial problem area to guide our inquiries of *how we can support and promote the use of methods for usability-oriented design during implementation*. Thus, based on the problem understanding gained from our past insider-CS in India, ongoing outsider-CS with the Mozambique ISG and other ISGs, and learnings from insider-CS in the project in Mozambique, we planned the inquiry as ADR – to iteratively design, introduce, and evaluate the method resource as an artifact using the specific implementation-project as a testing ground.

However, as an unexpected hurdle, the COVID-19 pandemic halted all travels from Norway to other countries. This meant that we had to rethink the feasibility of ADR as the decided form of inquiry, and if and how we could keep our focus on the decided problem area, yet in a way that was possible within the constraints imposed by the pandemic. One possibility we discussed with the practitioners in Mozambique was that they would continue the project "on the ground" in Mozambique. At the same time, we would participate in frequent meetings online to plan and evaluate the use of usability-oriented methods and how a method resource best could support them in the project work. This would still make ADR feasible. However, the pandemic also affected the possibility of travel activities within Mozambique, and the project was put on a halt. Further, the project would lose much of its «manpower» if the researchers could not participate in the actual activities of the project and be less able to study the use of the resource and methods up close. To explore the problem and develop relevant prescriptive knowledge, we decided to frame the inquiry as DSR. In contrast to ADR, DSR supported us in designing and evaluating an artifact "detached" from an ongoing implementation project. Artifact design was based on insights from the earlier studies of the ISG practices and iterative evaluations of the evolving artifact design through interviews and focus groups with practitioners across several ISGs, conducted online. While losing some of the benefits of conducting ADR, i.e., the evaluation of the artifact that reflects "the influence of users and ongoing use in context." (Sein et al., 2012, p. 40), we were still able to develop relevant knowledge and an artifact and prescriptive knowledge that could serve as a basis for further inquiries.

4.6 Recursive inquiries and problem formulation

As evident in the previous sections, organizing our engaged IS research project using our model allows us to engage in multiple forms of inquiry and select forms of inquiry as our understanding of the problem evolves, and opportunities for practitioner collaboration emerge. Knowledge developed through iterations of problem formulation and inquiry serves as a basis for initiating new forms of inquiry, carried out in sequence or in parallel. The parallel inquiries also feed into one another through the overarching collective problem formulations, which continuously are modified and elaborated through insights from empirical findings and related concerns in academic literature. To integrate findings from the parallel inquiries into shared problem formulations, we engage in a variety of articulation work between the

researchers and master students within the design lab. Examples include activities such as workshops, presentations between the sub-projects, and the sharing of summary documents and figures. Further, some researchers and master students are involved in multiple sub-projects and accordingly act as "boundary spanners" (Titlestad et al., 2009), bringing knowledge from one "line" of inquiry to another.

5. Discussion and Conclusion

We have presented a model for entering and organizing engaged IS research that supports selecting form(s) of inquiry as the understanding of the problem and project evolve.

Our effort is motivated by the experience that it is difficult to select the best-suited form of inquiry without intimate knowledge of the real-world problem situation. Existing methods support different forms of engaged inquiry. Yet, they require researchers to commit and plan for specific forms of inquiry before knowing what is relevant to the real-world problem situation and feasible within the researcher-practitioner collaboration. The presented model addresses this problem by centering around the three key activities of researcher-practitioner negotiation, problem formulation, and selecting a form of inquiry. Further, it promotes case study as the initial form of inquiry to help researchers (and practitioners) familiarize with the problem. This allows the researcher(s) to develop a sufficient understanding of the real-world problem situation to select further forms of inquiry based on their relevance and feasibility.

Our model promotes combining several forms of engaged inquiry (Davison et al., 2021), either sequentially or in parallel (Mingers, 2001). As suggested by prior literature, the inquiries are bound together through the problem formulation (Nielsen & Persson, 2016). In our case, we have illustrated how the forms of inquiry can be carried out in sequence, e.g., using CS to diagnose existing practices and challenges followed by new lines of inquiry through CS focusing on particular aspects illuminated by former inquiries, or AR, DSR or ADR if relevant and feasible. Our case also shows how lines of inquiry may be initiated in parallel to explore multiple aspects of the problem concurrently, all feeding into a common problem formulation. Each sub-project within our lab operates with its own instantiation of our model, and hence including stages of researcher-practitioner negotiation, problem formulation, and selecting and carrying out inquires.

A strength of our model is that it 'scales' well, and is apt for entering and organizing both smaller and larger engaged research projects, as shown in our empirical case. It guides researchers in planning and carrying out a smaller project in structuring the process and making choices regarding further forms of inquiry as the process evolves. Meanwhile, large projects including several researchers and ongoing inquiries can describe the process as one where several inquiries are carried out in parallel, all feeding back to the formulation of the overall problem area that unites them.

We argue such an overarching model to be important as the tools and perspectives one enters a research project with to address a certain problem situation is important for how one frames the problem (Daudelin, 1996; Dorst, 2011). When entering with a predefined choice of approach, the problem will inevitably be framed as something that can be addressed through such means. Meanwhile, it might be more relevant and feasible to develop different forms of knowledge. Entering with a broader 'set of tools,' the collaborating researchers and practitioners have more options when framing problems and planning how to develop valuable knowledge about them and how they may be addressed. Our model allows researchers to enter a project with a broader set of forms of inquiry, which are selected when

identified as relevant and feasible. Further, by allowing for selection of inquiry as the researchers' are getting more familiar with the problem situation, researchers may avoid the feeling of 'defeat' (Simonsen, 2009) when the conditions for what is relevant or feasible change and thus the basis for the choice of the research approach. Our model explicitly considers such uncertainties as part of the process. In our project, the researchers within each of the sub-projects carrying out lines of inquiry in parallel are spending considerable time familiarizing themselves with the real-world problem situation through CS and potentially relevant concerns in academic literature before any other form of inquiry is decided upon. If and when other forms are chosen, the findings from the case studies provide a diagnostic basis for the problem being addressed through AR, ADR, or DSR (as argued for by, e.g., Davison et al., 2021).

Often, several forms of inquiry may be relevant to the problem and related knowledge interests within a project. In these cases, the choice is based on feasibility and what the researcher and practitioners deem most relevant and interesting. Interestingly, none of the sub-project in our design lab has offered an opportunity for AR as a form of inquiry thus far. This is because AR is particularly demanding for the researcher-practitioner collaboration as organizations must commit to carrying out organizational change, which is then subject to systematic evaluation (Davison et al., 2004; Simonsen, 2009). We have found that DSR and ADR are easier to conduct in collaboration with practitioners with busy schedules and critical practical obligations that often triumph over time spent with researchers in careful planning, introduction, and evaluation of organizational change.

We have deliberately not addressed questions of ontology and epistemology in detail in our paper. As a general note, in line with other works related to engaged IS research, we argue for pluralism (Goldkuhl, 2013; Mingers, 2001; Van de Ven, 2007). As argued by Mingers (2001, p. 241), "different research methods (especially from different paradigms) focus on different aspects of reality and therefore a richer understanding of a research topic will be gained by combining several methods together in a single piece of research or research program." As such, researchers may base all inquiries within an engaged IS research project on a singular assumption of the ontological and epistemological nature of the problem situation of focus. However, several paradigms may be relevant within the same project. For instance, inquiries aimed at developing descriptive and explanatory knowledge may favor positivist, interpretivist, or critical realist assumptions. Meanwhile, inquiries aimed at developing prescriptive knowledge may be better guided by a pragmatist epistemology favoring *utility* above truth when assessing the merit of scientific knowledge (Goldkuhl, 2012).

Further research aiming to challenge, extend, and elaborate the model by examining specific aspects of the process in more detail and through use in other research projects will be valuable. Concretely, we see two particularly fruitful avenues for further research. First, our model primarily focuses on the organizing activities related to selecting and combining forms of inquiry in engaged IS research projects. Exploring and elaborating on how to integrate these activities with other essential elements of the engaged research process such as data analysis (e.g., abductive analysis) and academic writing and publishing is relevant. Second, an interesting and challenging aspect of carrying out long-term projects with multiple researchers engaged in different forms of inquiry is to build a coherent overall problem formulation that is shared between the involved parties. We briefly touched upon this in our case and that we employ several measures such as workshops and "boundary spanning" activities to address it. A valuable avenue for further research is to explore how such collaborative problem formulation best can be organized.

6. References

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