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The Generation of Qualitative Data in Information Systems Research: The Diversity of Empirical Research Methods

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Abstract:

This paper investigates the concept of data collection in information systems qualitative research. In this text, I replace the term "data collection" with "data generation" to emphasize that the researcher arranges situations that produce rich and meaningful data for further analysis. Data generation comprises activities such as searching for, focusing on, noting, selecting, extracting, and capturing data. This paper analyzes and compares a repertoire of empirical research methods for generating qualitative data. It describes and visualizes (through a common data-generation template) 12 research methods: interviewing, questionnaire study, document study, artifact study, observation study, participant observation, intervention study, practice-based design study, lab-based design study, focus group study, test study, and self-reporting. I compare these data-generation methods according to 1) the researcher's role in data generation, 2) data generation's influence on everyday life reality, 3) each data-generation method's relationship to everyday life reality, 4) what parts/mediators of everyday life reality each data-generation method addresses, 5) the expected value of generated data and 6) possible shortcomings in generated data. As a basis for investigating data generation, I ontologically clarify (based on a practice-theoretical perspective) the empirical landscape of information systems (the kinds of phenomena and sources of data that exist). A concluding discussion contains 1) analyses concerning relationships between data-generation methods and compound research methods/strategies such as case study research, action research, and design science research and 2) the role of interpretation in data generation versus data analysis.

Keywords: Research Method, Qualitative Research, Data Generation, Data Collection, Information Systems.

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1 Introduction

1.1 Background

The information systems (IS) discipline contains many diverse research methods, especially methods concerned with qualitative research. It contains methods for collecting data and methods for analyzing data. It also contains overall methods (or rather research strategies) that integrate different methods concerned with specific aspects of the research process. However, the literature lacks terminological clarity about what to call these different types of methods (Mingers, 2001). Researchers sometimes use the label "method", sometimes "methodology", and in some case "technique" as in "data-collection technique" (Myers, 1997, 2016, 2013). Etymologically, the word "method" comes from the Ancient Greek "methodos", which means "following a way". When talking about research methods, this should obviously involve meaning that relates to conducting research (i.e., a describable, recognizable, and practical way). One should be able to apply the research method notion to larger or smaller parts of the research process.

The AIS Web resource on qualitative research in IS that Myers (2016) authored based on a previous paper (Myers, 1997) serves as one entry point for authors who wish to conduct such research. Myers (2013) more thoroughly describes how to structure qualitative research in different methods (see also Myers & Avison, 2002). Myers (1997, 2016, 2013) distinguishes between (overall) research methods, data-collection techniques, and modes of analysis. Myers (2013) describes a research method as "a way of finding empirical data of the world" (p. 25) and notes action research, ethnography, case study research, and grounded theory as examples of qualitative research methods. The choice of such a research method in a qualitative study "influences the way in which the researcher collects data" (p. 25). Myers (2013) notes interviews, participant observation/fieldwork, and document use as examples of data-collection techniques. However, Myers (2013) does not seem to clearly state how a research *method* (as a way of *finding* data) and a data-collection *technique* (as a way of *collecting* data) differ. Indeed, in his standard textbook on social research methods, Bryman (2016) considers interviewing, participant observation, and document use as *research methods* for qualitative research.

Myers (1997, 2016, 2013) does not seem to provide a current list of overall research methods. Since the early 2000s, design science research has emerged as a viable and popular research approach in IS (Hevner et al., 2004) that one can see as comparable to action research (e.g., Cole, Purao, Rossi, & Sein, 2005; Järvinen, 2007). Myers (2016) only mentions design research in passing as an example of engineering research and does not address it further when investigating qualitative research methods. Avenier and Thomas (2015) present a list of qualitative research methods that include the four methods that Myers mentions but with two additions: design research and critical research. Avenier and Thomas (2015) note that these methods have some overlap:

> *It is difficult to classify these methods. Indeed, a case study can be conducted with methods close to ethnography…or to grounded theory…. There is also some overlap between action research and design research… as well as between action research and critical research.*

Obviously, some compound research methods (or strategies) such as action research and case study research can include multiple methods for collecting data. It seems that a need exists to identify overall methods for qualitative research and more distinct methods that focus on certain parts of the research process such as data collection and data analysis. However, positioning grounded theory as an overall research method as Myers (2013) does seems to be questionable. The procedures of the grounded theory approach have certainly a clear focus on data analysis and theory construction in the research process (Bryman, 2016).

Myers (2013) seems to equate the research method ethnography (as he describes in the following way: "the distinguishing feature of ethnography is fieldwork" (p. 93)) with data collection through "participant observation and fieldwork" (p. 136). Thus, Myers' (1997, 2016, 2013) framework for qualitative research seems to involve some conceptual and terminological flaws. Given this framework has become an influential framework and established as an AIS resource, there seems to be a need for conceptual clarifications and refinements.

Methods for qualitative research show a great diversity. Qualitative and quantitative studies fundamentally differ in how they analyze data (i.e., a difference between analyzing and interpreting rich and meaningful material vs. dealing with numeric entities in standardized ways). In order to work with data in a meaning-

sensitive qualitative analysis, one needs processes that can produce and establish such rich and meaningful data. Therefore, data generation has a crucial role in qualitative research. Accordingly, we can understand the great historical interest in qualitative research methods in IS against this backdrop (e.g., Mumford, Hirschheim, Fitzgerald, & Wood-Harper, 1985; Nissen, Klein, & Hirschheim, 1991; Lee, Libenau, & DeGross, 1997; Trauth, 2001; Myers & Avison, 2002).

1.2 Focus, Purpose, Procedure, and Structure

In this paper, I focus on *data collection* in qualitative IS research in order to examine the varied ways that one can create rich data that allow one to analyze and interpret everyday life reality and to construct theory. This research interest contains several issues, such as how to conceive the border (if any) between data collection and data analysis and how to differentiate between data--collection methods and overall methods/strategies for qualitative research (as I indicate in Section 1.1). One also needs to investigate the very notion of *data collection*. Is it actually the case that a researcher *collects* data ready at hand? Or is it not rather that the researcher creates situations that produce data? To single out only three ways (interviews, participant observation, and documents) seems to be too poor for qualitative IS research and, I would add, does not do justice to the extant varied landscape of IS research.

With this paper, I contribute conceptualizations about data collection/generation in qualitative IS research. I establish a template for generating qualitative data (see Section 2.2) and apply it to several empirical methods. I adopt an inclusive approach and do not simply describe "standard methods" such as the ones I mention above. In all, I identify and describe 12 empirical methods in a comparable way using the "data-generation template" (see Section 3). This template builds on an ontological reflection concerning the empirical field of IS (i.e., the kinds of phenomena and sources of data that exist as objects to inquire about) (see Section 2.1). I also analyze the relationships between data collection/generation and overall research methods/strategies. In particular, I investigate the research methods of case study research, action research, and design science research (see Section 4.1). I note the vital role of interpretation throughout the paper and summarize it in Section 4.2, especially concerning the relationships between data collection/generation and data analysis.

This paper constitutes an inquiry into empirical qualitative research methods in information systems. As an inquiry (Dewey, 1938), it builds on unclear or otherwise unsettled issues and concerns. I summarize such issues and concerns in Section 1 and provide more details about them throughout the paper when I further clarify research methods and strategies. I conclude the inquiry in Section 4 with some reflections and advice.

The paper contributes to the literature by examining the diversified landscape of empirical methods in qualitative IS research and, thus, bringing more conceptual clarity to this methodological landscape.

2 Data as Fundaments for Qualitative IS Research

Qualitative and quantitative research share many concerns but also differ in important aspects (Bryman, 2016). Their research logic differs in several ways. Qualitative research involves more intense and continual contact with the empirical field. In quantitative research (typically a survey investigation), scholars usually collect data only at one point in time. To prepare for collecting such data, scholars develop and adapt specific instruments and based on clear research questions and well-defined/addressed categories (variables). In a qualitative research endeavor, scholars can base their efforts on a general research interest. More specific research questions can evolve gradually during contact with the empirical field. We can contrast the well-prepared focus in quantitative research before scholars collect data with an emergent and seeking focus in qualitative research. Categories typically emerge from scholars' collecting and analyzing data rather than their preparing them in advance.

The quality of qualitative research studies fundamentally depends on the process of generating data from the empirical field. One reason for scholars to choose a qualitative research approach, instead of a quantitative approach, is to avoid questionable data collected through obtrusive methods.

2.1 The Empirical Landscape of IS: Data Sources

As a fundamental strength, qualitative research allows scholars to *access* many parts of the empirical field and collect *different types of data* in several ways (Gummesson, 1991). To do so, they need to clearly comprehend what kind of data they can reach and obtain. They need to ontologically reflect in general on

the empirical landscape of information systems (e.g., “what kind of data sources are out there?”). As a basis for further investigation on empirical research methods, I conduct an ontological clarification of the reality of information systems in this section.

To clarify the disciplinary identity of information systems, Benbasat and Zmud (2003) have developed a nomological net of basic categories in the empirical field. The IT artifact resides at the center of this net. This focus point has in their net implications and antecedents. The IT artifact gives rise to usage and impact on the consequential side. The authors identify different capabilities and practices as antecedents to the IT artifact. I use this nomological net as a starting point for ontologically clarifying the IS empirical landscape. However, this net does not give a proper account of the IS reality as a basis for discussing empirical methods. This is not the place to go into any detailed critique of this nomological net (see, e.g., Galliers, 2003), but I do make some remarks about it as a means to progress this ontological reflection.

It seems appropriate to put the IT artifact at the center. However, the nomological net lacks important “elements” as explicit parts. It lacks explicit humans as users and designers, although other elements (e.g., usage, impact, and practices) seem to implicitly include them. The nomological net is much too coarse to discuss different types of empirical elements. Benbasat and Zmud (2003) mention the concept of practice, which seems important. However, they place practice outside the IT artifact as an antecedent. It seems more appropriate to see practice as the context of the IT artifact. We can talk about a use practice context of IT artifacts and also of a design practice context.

With inspiration from a practice-theoretical turn in social research (Schatzki, 2001; Feldman & Orlikowski, 2011; Nicolini, 2012), it is possible to articulate the whole and parts of the empirical IS domain (Goldkuhl & Röstlinger, 2003). A practice-theoretical perspective acknowledges activities and symbolic and material objects besides humans as fundamental elements of a practice. A practice refers to “embodied, materially mediated arrays of human activity centrally organized around shared practical understanding” (Schatzki, 2001 p. 2). A practice is a purposeful whole that determines the meaning of its constituents. A practice perspective reconciles the antagonism between realism and constructivism (Tsoukas, 2000) by acknowledging both the realness of external elements and the constructive power of language and discourse. How should we conceive of the practice of IS and its parts? As I indicate above, we should not talk about one type of practice but several. Scholarly work in IS addresses at least two main types of practices: 1) design practices and 2) use practices. I employ a covering label for these two types of practices: *digitalization of practices*. It involves 1) how to digitalize a practice through *design* and 2) how a practice appears when it has become digitalized (i.e., the *use* practice).

Based on this practice-theoretical view, I use and further refine the ontology of socio-instrumental pragmatism (SIP) (Goldkuhl, 2002, 2005; Rittgen & Trejo, 2007; Sjöström & Goldkuhl, 2009) in order to clarify the foundational constituents of the IS discipline. This ontology has a disciplinary ground in IS and harmonizes well with a practice-theoretical view. Basically, I focus on clarifying fundamental elements (as data sources) in the digitalization of practices (as the empirical landscape of IS). Figure 1 depicts such a socio-instrumental practice ontology. It takes inspiration from the SIP sources above, but I have made several refinements and additions to it in relation to these sources.

Key elements include humans and their different types of actions (perceptions, interventions and reflections). Besides intentional actions, humans also give off bodily expressions, which other humans may interpret (Goffman, 1959). The ontology makes a division between personal (intra-subjective) knowledge and shared (inter-subjective) knowledge. The inter-subjective knowledge is, in the SIP model, considered as something socially established and may thus be parts of institutional patterns. Institutional knowledge can be of different kinds (Scott, 2014): cognitive-linguistic (constructs), normative (values, preferences), and regulative (rules). The view of knowledge is pragmatically oriented (as in practice theory), which implies a clear action relationship and means that knowledge also comprises pre-actional capabilities and intentions and post-actional experiences.

Of course, the ontology includes the IT artifact as one element, which I here label “digital artifact” following the concept of digitalization of practices. The original SIP ontology (Goldkuhl, 2002) has one artifact category. In my ontology, I make a division between digital artifacts, material artifacts, and monetary artifacts (i.e., money as artifacts for value exchange). The two last artifact types may not be substantial in IS research studies, but they can be of interest in some studies as current elements of many business practices. I have divided the concept of signs (symbolic objects) from the original SIP ontology into oral and written/recorded communication objects. Oral communication means (unrecorded) speech. Recorded speech is a part of written/recorded communication objects. This sign division is important when

discussing empirical methods since oral versus written forms of communication entail different empirical methods for access and capture. Of course, digital artifacts will contain digitally recorded communication (in databases, user interfaces, and message transferring).

Further, I have introduced the category of an institutional actor (i.e., an organization or an organizational unit) to the ontology, an important addition in relation to the original SIP ontology. Humans create organizations and give them an identity and a capacity to act. They cannot, as institutional constructions, act by themselves. Agents (humans or artifacts) that represent them perform their actions (Ahrne, 1994; Goldkuhl, 2005).

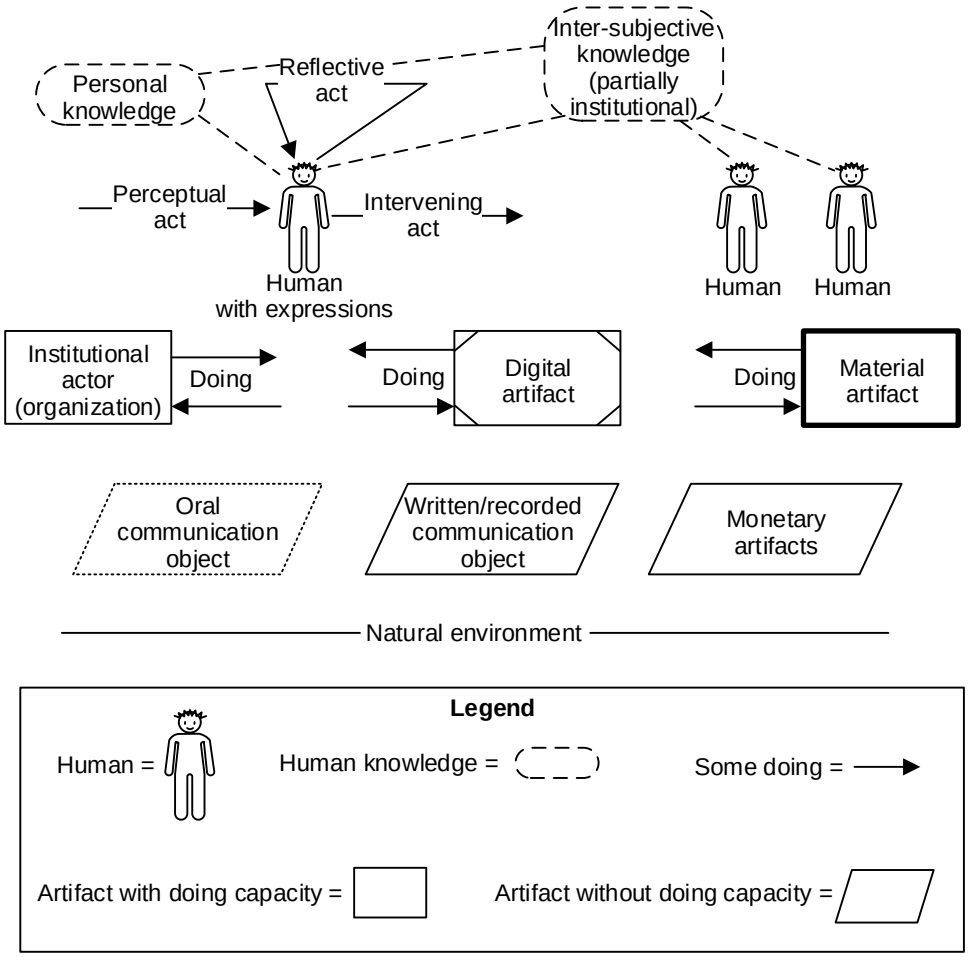

Figure 1. Digitalization of Practices: A Socio-instrumental Practice Ontology

Figure 1 presents these fundamental categories of IS practices: humans, their actions and expressions, their personal and inter-subjective knowledge, and different artifacts with capacities of doing and different objects without such capabilities. Thus, these fundamental SIP categories constitute basic building blocks for practices. A design practice will comprise humans interacting through perceptual, intervening, and reflective actions based on personal and shared knowledge. The design process can rely on some written assignment and plan. In the design process, the actors may use digital design tools, and the process takes place in some work setting that comprises monetary resources and material equipment. The participating actors can belong to different organizations as some kind of contractual arrangement; thus, different institutional actors can collaborate in the process.

The socio-instrumental practices of IS work (i.e., digitalization of practices as I define above) have other important traits. These social practices are *dynamic* and continually *changing* but also *stable* and *resilient to change* due to their *institutional* character (Berger & Luckmann, 1966; Scott, 2014) and a use of diverse *material artifacts*. As social practices, they already contain meanings. Silverman (1970) states that studying social practices fundamentally differs from studying nature. Social practices already involve *a meaningful internal logic* that researchers need to interpret and understand to produce theorized

knowledge. Meanings exist in social practices, but researchers need to detect them. Meanings exist through actions and different kinds of expressions such as communication objects (see Figure 1). Researchers cannot directly grasp meanings. They need to detect them via *interpreting* such *expressions of meanings*.

When preparing a qualitative empirical inquiry, one needs to: 1) reflect on possible data sources (as the fundamental categories in the revised SIP ontology above) and 2) based on this reflection, select and design suitable empirical methods to capture desirable data.

2.2 The Generation of Qualitative Data

How we label things and activities influences the way we think about them. "Data collection" is an established phrase for how researchers obtain data from the empirical field (Bryman, 2016). However, we can also frame this stage of the research process as "data generation" (e.g., Stenbacka, 2001). One can see the term "collection" as problematic since it may presuppose that researchers can access "ready-at-hand" data that they need only simply collect. While easily gatherable data may exist, consider interviewing, a central empirical method in qualitative research. Interviewing involves no data that researchers can easily grasp. To obtain interview data, the researcher/interviewer must pose intelligible questions and the informant must be willing and able to answer these questions. The answers (and their background in posed questions) constitute the generated data. The researcher has intentionally arranged an interview situation, which implies that the researcher has engaged informants to participate in this kind of conversation.

The issue at stake here involves how data emerge from the reality that researchers study. We can see data as "extracts" and "constructs" from the empirical field, which means that data must evolve from the study field as being an *indicative* part of it and *emerging* from it. Researchers must construct data in the sense that they have arranged a situation where data can be generated and captured. Researchers' actions in a data-generation situation are based on their inquiry interest and research questions. Researchers *look for* suitable sources and material while *focusing* and *noting* objects and events that seem *relevant* for the study and *select* and *record* what they consider *potentially valuable* for further study. Data generation in qualitative research is not a mechanical mapping process. Researchers' *interpretation* does not start in the data-analysis phase after data generation has been carried out. Rather, they begin to do so in the data-generation phase when they, based on some pre-understanding, try to *make sense* of what happens "out there" and selects and records what they interpret as relevant for their study. Acts such as searching for, focusing, interpreting, selecting, and recording are generic in qualitative data generation. They are all valid parts in empirical methods such as interviewing people, observing participants, and selecting documents even if these methods may involve differences in emphasis. Interpretation and selection occur in an interview when the interviewer assesses the answers and lets these assessments influence whether to ask follow-up questions or move on to new questions. Interpretation and selection occur in observations when researchers choose to put something in their field notes while disregarding other things they observe. Further, interpretation and selection occur in document collection when the researcher assesses if a document should be part of the empirical material or not.

Data generation represents a situation that researchers arrange in order to produce data that they should find useful for subsequent data analysis given the stated research interest. As I mention above, researchers can also use qualitative empirical data to revise and refine research questions. As such, I take *data generation* as the key concept in this study. I give preference to this concept and perspective (instead of collection) in this study since it emphasizes a researcher's intentional act to create situations that produce qualitative data. Researchers often cannot simply gather already existing data out of the everyday life reality. With that said, readers should not interpret my choice to use "data generation" as the key concept in this study as my totally rejecting "data collection" as a suitable term. Many scholars likely use "data collection" in a broad and inclusive way to mean how to arrange empirical situations that produce data rather than in a way that means to capture already existing empirical indications. My key message here is to convey an understanding that qualitative data result from scholars' actively creating data-generation situations. This *data-generation perspective* has then been applied to the different empirical methods. When talking about data generation, one should not interpret this as researchers are fabricating data. Researchers arrange situations that produce data that are as *authentic indications* as possible of the everyday life reality that they study.

Figure 2 depicts a simple model for data generation. It emphasizes that data have an origin from the empirical study field of IS practices. I use the label *everyday life reality (ELR)*, an established term in the

social sciences (Berger & Luckmann, 1966; Goffman, 1959), to denote this field. The researcher arranges the data-generation activity in order to create data to be useful in further data analysis. In other words, the generated data are what results from the data-generation process. The template shows a "data flow" from 1) everyday life reality via 2) the process of data generation to 3) the generated data that researchers can then analyze and use to develop theory. Note that researchers' research interest and research questions, considerations on suitable empirical methods (often a combination of different complementary methods), and considerations about how to analyze the generated data in order to reach their research purposes govern this process.

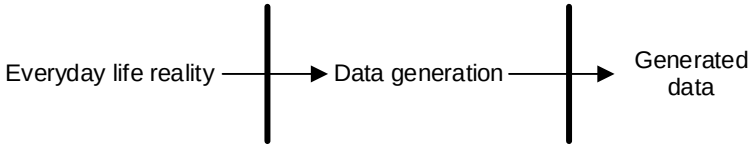

Figure 2. The Template for Data Generation

I study empirical research methods using this simple template. Researchers need to describe the data-generation situation in ways that make it clear how they create *a situation that has a capacity to produce data*. A researcher needs to ask several fundamental and generic questions when defining and describing empirical research methods for a qualitative research study:

- What kinds of actions should I conduct in order to obtain data?
- What is the relationship to everyday life reality in this data-generation process?
- How are data sources "working" in the data generation process in order to leave data?
- How should I behave in order to extract data from everyday life reality?
- How should I behave to capture such data in order to create a solid basis for further data analysis?

I use this template and these questions to obtain a comparable view of different methods for qualitative data generation that I present in Section 3.

3 Clarifying and Comparing Empirical Research Methods

Based on studying the standard literature on social research methods (e.g., Patton, 1990; Bryman, 2016) and literature on qualitative research in IS (e.g., Mumford et al., 1985; Nissen et al., 1991; Lee et al., 1997; Myers, 1997, 2016; Trauth, 2001; Myers & Avison, 2002; Davison, Martinsons, & Kock, 2004; Hevner, March, Park, & Ram, 2004; Iivari, 2015), I identified 12 data-generation methods:

1) Interviewing
2) Questionnaire study
3) Document study
4) Artifact study
5) Observation study
6) Participant observation
7) Intervention study
8) Practice-based design study
9) Lab-based design study
10) Focus group study
11) Test study
12) Self-reporting

I describe each method by using the simple data-generation template (see Figure 2).

3.1 Interviewing

Both general social studies (Bryman, 2016; Patton, 1990) and IS studies (Myers, 1997, 2016; Myers & Newman, 2007) consider interviewing a key qualitative method. Researchers can make the data generation close to everyday life reality (e.g., when they interview an informant at that informant's workplace). However, the interview situation is *separated* from everyday life reality in the sense that interviewees do not do it regularly in their everyday lives. The interview situation is arranged by the researcher. The interview is initiated by the researcher who has prepared themes to be addressed and questions to be posed. Figure 3 depicts data generation through interviewing following the template. The interviewee is "moved" from the interviewee's ordinary practice situation into the arranged interview situation. As a result, the interview generates data in the shape of answers, which researchers need to record in some way. They typically do so in notes and/or recordings. Researchers use these documented answers (as data) in subsequent qualitative data analyses.

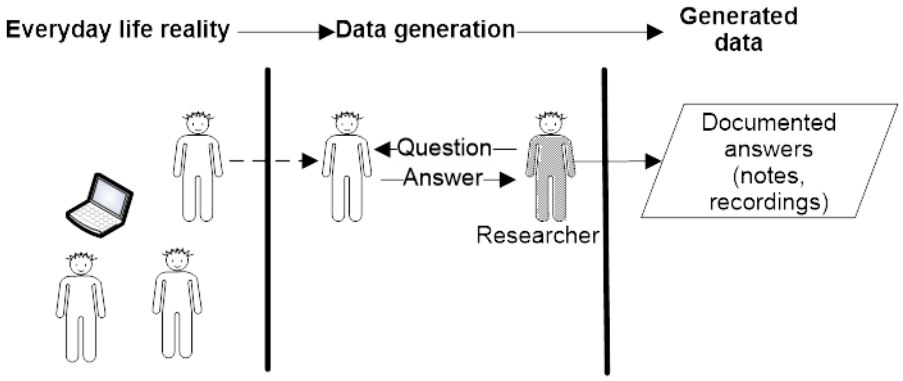

Figure 3. Data Generation through Interviewing

Researchers use the interviewees as a *mediator* to get access to their everyday life reality. The interviewer has an interest in some slice of the everyday life reality, which the interviewee has specific knowledge about. However, interviewing involves challenges in that researchers have to rely on interviewees to provide valid knowledge and to express it appropriately. This issue is one of source criticism just as in other data-generation methods (Hodder, 1998). Researchers do not get direct access to the investigated reality. Only through interviewees' capacity to know and speak about the slice of reality (Becker & Geer, 1957) can researchers obtain access to it. The situation differs if the researcher's interest relates to the interviewees' attitudes; in such a case, the source-critical challenge changes to another kind.

3.2 Questionnaire Study

Researchers often contrast interviews as a prime qualitative method with questionnaires, which quantitative surveys often use. As such, in doing so, they see questionnaires (as data generation) as a means in quantitative but not in qualitative research (Bryman, 2016). However, one can use written questions to generate open-ended qualitative data (Tengland, 2013). In some cases, it can be suitable to use written questions rather than oral communication as in an ordinary interview. I define here a questionnaire study in a classical and ideal-typical way with a questionnaire form given at one time. Rather, I see other written conversation such as email communication and chat as a mixture of these data-generation types ("interviews through writing"). Figure 4 depicts data generation through questionnaires.

Interviewing fundamentally differs from questionnaire study in some ways. Obviously, the former uses oral questions and the latter uses written questions. This difference has important consequences. Since questionnaires involve no social interaction (between researcher and informant), researchers cannot assess informants' reactions to questions and the answers they provide in real time. Further, researchers cannot adjust questions in real time when using a questionnaire, which means that researchers will not perform any interpretation in this kind of qualitative data generation. Informants directly record and deliver their answers. Therefore, researchers do not need any specific arrangements to capture the answers as in interviews. The delivered written answers constitute the generated data.

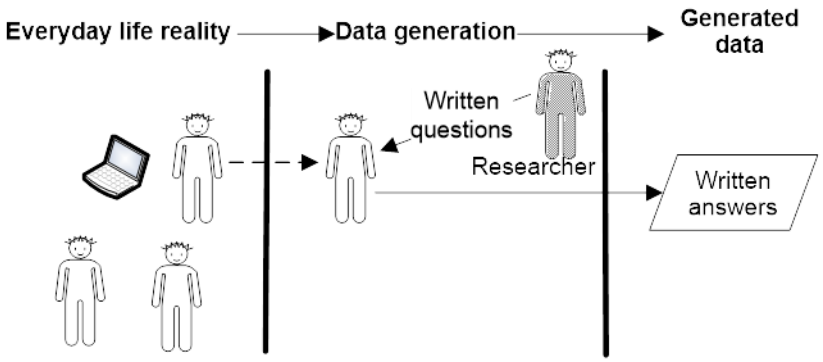

Figure 4. Data Generation through Questionnaire Study

3.3 Document Study

Documents represent important data sources in qualitative research (Hodder, 1998; Myers, 2013; Bryman, 2016). Many kinds of documents can pertain to IS research. Documentation plays important roles in developing and managing IS artifacts. The development of an information system usually produces a lot of specification and design documents, such as process models, goal models, information models, use-case models, interaction models, database models, and architecture sketches. An IS researcher may also find great interest in many other types of documents (e.g., legislative documents, policy documents, evaluation reports, meeting minutes, contracts, manuals, or e-mail correspondence). In data generation through documents, researchers will search for relevant documents. They can conduct such searches by making their own inquiries in physical archives or on the Internet. Searching can also be done through the assistance of knowledgeable persons who can retrieve potentially interesting documents. Researchers select documents that should be part of document data, which implies that they will likely need to initially screen and assess the documents for relevance and worth as data for further analysis. Figure 5 depicts data generation through documents.

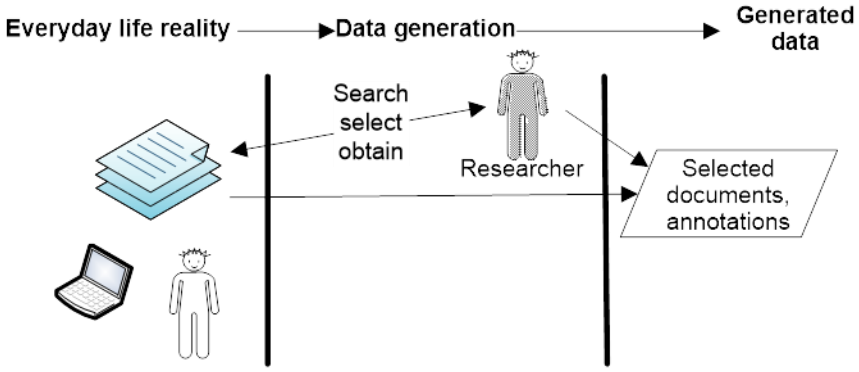

Figure 5. Data Generation through Document Study

Researchers may subsequently analyze documents via a content analysis (Krippendorff, 2004) or discourse analysis (Potter & Wetherell, 1987), which means that content analysis does not represent data collection/generation but rather an activity that follows data generation. Content analyses are typically an interpretive endeavor as with all kinds of qualitative data analyses. However, researchers need to perform some interpretation in generating data through documents. As I mention above, researchers may read and assess parts of a document in order to judge if it should be part of the generated data for the qualitative inquiry in question. In doing so, they may produce *annotations* in relation to selected documents. Annotations can contain motivations to include a specific document and immediate comments that highlight parts of a document for further analysis. Such annotations complement the selected documents such that, together, they form the generated document data (Figure 5). I see these annotations as data since researchers make them in direct connection to the data-generation process.

3.4 Artifact Study

A core object for qualitative studies in IS should be an IT artifact. However, when studying literature on qualitative research methods in IS, few researchers actually say anything about studying IT artifacts (e.g., Myers, 1997, 2016, 2013; Myers & Avison, 2002; Trauth, 2001). The interpretivist epistemology in IS that Walsham (1995), Butler (1998) and Klein and Myers (1999) have articulated has probably had a great impact on the emergence of a qualitative research tradition in IS. The clear orientation towards socially constructed beliefs and the social context of IS has probably drawn attention away from the IT artifact. In their seminal analysis, Orlikowski and Iacono (2001) state that IS research focuses too little on the IT artifact. The lack of proper research methods likely both causes and results from such a focus in a vicious circle: 1) the lack of proper methods for inquiring about IT artifacts does not help IS scholars to conduct research with a direct focus on IT artifacts and 2) the lack of research focus on the IT artifact has not stimulated researchers to develop and appropriate suitable research methods.

Research methods that focus on the IT artifact exist in human-computer interaction (HCI). We can see HCI as partially overlapping with the IS discipline. HCI has several *usability inspection methods* (Nielsen, 1993), which are adequate to relate to in this analysis. Usability inspection methods include, for example, heuristic evaluation (Nielsen, 1993) and cognitive walkthrough (Polson, Lewis, Rieman, & Wharton, 1992). Both these methods have a clear orientation towards usability issues. In an IS research study, such a usability focus is of course possible and adequate, but a broader or alternative focus on functionality/utility should also be desirable.

Several research domains, such as anthropology (Henare, Holbraad, & Wastell, 2007), archaeology (Binford, 1962), and design and engineering (Maier & Fadel, 2009) acknowledge the study of physical artifacts as a kind of enquiry. It should have a central place in qualitative IS research. Of course, while IS research would mainly study the IT artifact, it could also study other artifacts. One can follow a research approach to study such artifacts that takes inspiration from methods of usability inspection as I mention above. Such methods have, however, a narrower scope and primarily focus on formative evaluation as a basis for design. Figure 6 depicts data generation through artifact studies.

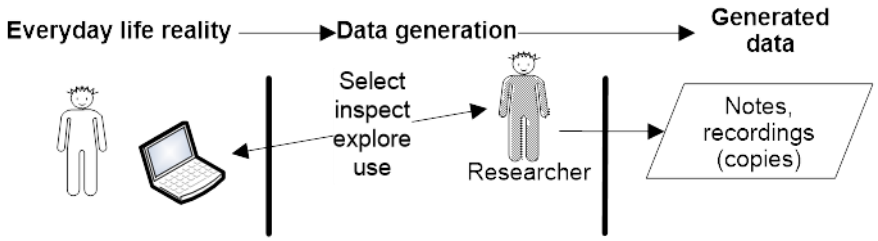

Figure 6. Data Generation through Artifact Study

Researchers need to select an (IT) artifact to study. They can perform data generation with different degrees of ambition and depth: from simply *inspecting* the artifact to *exploring it in depth* via *actively* using it. These investigations generate diverse kinds of data. Researchers should produce notes with observations and reflections. They should also visually record the IT artifact, such as by video recording the inquiry session, taking screenshots, or capturing and recording the whole interaction session with special software that has such a capability. If researchers obtain “copies” of studied artifacts (or parts thereof), such digital copies become parts of the generated data material.

In an artifact study, a researcher inspects and explores an IT artifact. This kind of study differs from a study on real users who interact with artifacts (see the method “observation study” in Section 3.5). It also differs from an arranged situation with recruited “users” who test an artifact (see the method “test study” in Section 3.11). The HCI discipline clearly separates expert inspections, studies of real users in the field, and test situations in the lab (Rogers, Sharp, & Preece, 2011). I follow these methodological distinctions here as I indicate above. An artifact study that I describe in this section equates to “expert inspection” in HCI.

3.5 Observation Study

Observation of what happens in a natural setting represents a key empirical method in qualitative research both in general social science (Patton, 1990; Gummesson, 1991) and in IS (Myers, 1997, 2016). However, we need to uphold a distinction between 1) "direct" observation made *without* any researcher *involvement* and 2) participant observation where the researcher engages with the setting (Yin, 2014). I make such a distinction in this paper, although one could also say that a spectator-participant continuum rather than a strict borderline between spectators and participants exists (Patton, 1990).

An observation study ("direct observation") means observing what happens in the field (see Figure 7). As an empirical method in qualitative social research, observation has a clear orientation towards a study of the interaction between humans. The natural setting usually involves artifacts of diverse kinds, and IS research should certainly study how humans use and interact with IT artifacts. As I indicate above, in HCI research there is a distinct interest on studying how real users interact with real systems in real settings (Rogers et al., 2011).

A (direct) observation study means that researchers perceive ongoing processes in a natural setting. They do not interfere with the humans that they observe. Usually the researchers have obtained some principal agreement that gives them the right to be present and observe. They might require such permission when they apply overt observation (Patton, 1990). Covert observation, where the study objects do not know they are being studied, represents another observational strategy (Patton, 1990) The presence of an overt observer may have some influence on the observed individuals (called an *observation effect*). I use a dotted line between ELR and data generation in Figure 7 to indicate this effect.

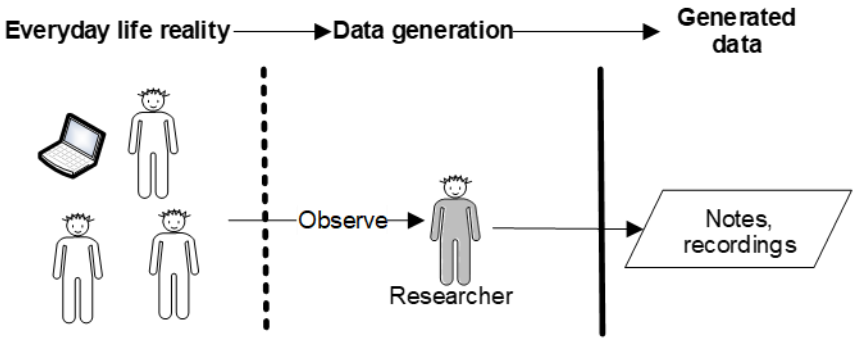

Figure 7. Data Generation through Observation Study

Researchers generate data through observation studies. Usually, they take field notes, which implies they continuously interpret and select what they find worthwhile to document as things occur. If appropriate, they might complement field notes with audio or video recordings.

3.6 Participant Observation

Participant observation means participating in social life as (close to being) an *ordinary member* of a social setting. Participant observation involves learning (and revealing) the tacit values, rules, and routines through a *firsthand involvement* in and *experience* of the studied social life. The aim of participant observation is to move from an outsider spectator to an *insider* (Gummesson, 1991; Myers, 2013) or, as Patton (1990, p. 207) notes, to "develop an insider's view of what is happening". Many scholars see participant observation as a key method in qualitative research (Becker & Geer, 1957; Silverman, 1985; Gummesson, 1991). Becker and Geer (1957, p. 28) even propose using participant observation as an exemplary yardstick for qualitative methods:

> *Participant observation can thus provide us with a yardstick against which to measure the completeness of data gathered in other ways, a model which can serve to let us know what orders of information escape us when we use other methods.*

However, as Trow (1957) notes, researchers cannot study everything through participant observation. Researchers need to address many issues with other methods as well, such as asking informants through interviews.

Researchers' direct involvement in a social setting implies that the sphere of studied reality and that of data generation coincide (see Figure 8). Researchers act and observe in the studied natural setting. Thus, they have *two roles:* one as an interacting member of the social setting and one as an observer of what occurs. Researchers can find it very demanding to combine these two roles. Thus, they sometimes resolve this issue by using several research participants who have a different emphasis in the roles of interacting versus observing. The observations and interpretations that researchers make have dual functions: to 1) generate authentic data and 2) adjust to the social interaction that occurs in the natural setting that the researcher participates in.

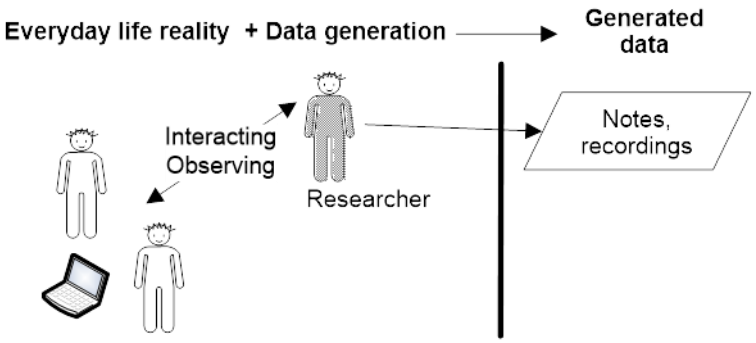

Figure 8. Data Generation through Participant Observation

This double-role challenge also places demands on documenting the observations (i.e., generating data). Researchers should take field notes, but it might be disturbing to take notes during ordinary social interaction. As such, they may need to postpone documentation until after each session. The use of recording equipment might also be obtrusive to the social interaction. Thus, a competent observer needs to memorize what occurs in the natural setting. As a result, the researcher may add notes (memories) to the data material sometime after the participation has occurred. This comment also pertains to other research methods in which researchers observe ELR.

3.7 Intervention Study

I consider action research (AR) in this paper as a compound research method/strategy and not a data-generation method following Myers (1997, 2016, 2013). In an AR study, researchers may use several different data-generation methods (which I discuss further in Section 4.1). However, we need to ask whether AR involves something specific data-generation activity such that one cannot cover it with a compilation of established data-generation methods (e.g., participant observation, interviewing). Participant observation actually comes close to the core idea of AR (i.e., a researcher participates actively in a social setting). However, AR goes one step further. To conduct AR, researchers cannot only participate in routine life; rather, they need to embark on a *collaborative change initiative* with practitioners. Braa and Vidgen (1999) characterize different research approaches in IS in an ideal-typical way. In doing so, they have differentiated between research that focuses on 1) prediction, 2) understanding, and 3) change. Research that focuses on understanding achieves it mainly through using interpretive case studies. Further, research that focuses on change achieves it through "a process of intervention as typified by action research" (Braa & Vidgen, 1999, p. 29). My conclusion here is that the core of AR should be seen as the application of "*interventionist observation*" as the kernel method. Without such an empirical method, a research study would not constitute action research. Susman and Evered (1978) have described action research as comprising five generic processes: diagnosis, action planning, action taking, evaluating, and specifying learning. To achieve change, a research study must involve an intervention through action planning and action taking. Interventionist observation (or, as I call it here, an "intervention study") resembles participant observation but with the important addition that this participation focuses on effecting change (see Figure 9).

The studied (and changed) social setting also contains data generation as in participant observation (compare Figures 8 and 9). Researchers must act as both observer and participant/change agent in the social setting. As such, they will experience demands to properly combine these different roles. Field notes and possibly recordings will constitute the data that results from this research method. However, not only process data are important. The achieved change result also needs to be described as part of the data set.

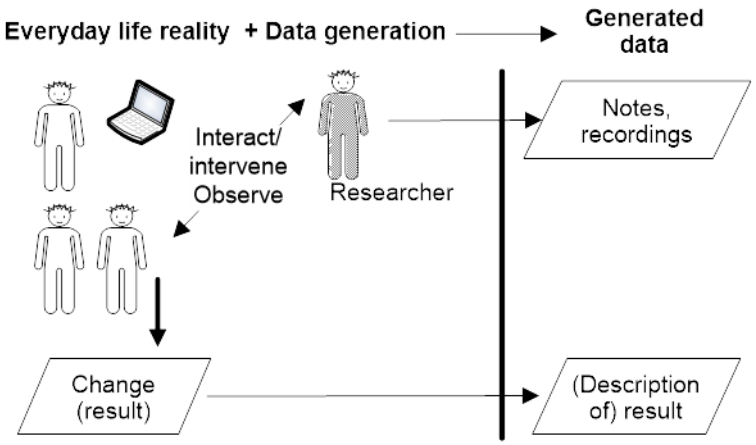

Figure 9. Data Generation through Intervention Study

3.8 Practice-based Design Study

A design science approach in IS has emerged as a viable and popular research method. Hevner et al. (2004)—based on forerunners such as Nunamaker, Chen, and Purdin (1991) and March and Smith (1995)—have stimulated a great interest in this kind of research. Researchers have compared a design science (DS) approach with action research and identified several similarities (Cole et al., 2005; Järvinen, 2007). Further, Sein et al. (2011) have even developed action design research (ADR) to fuse the two research approaches. If one sees DS as a compound research approach (in a similar way as AR), one could adopt the same type of reasoning as for AR above (see Section 3.7) where I classify intervention study as a data-generation method. Could we find a corresponding data-generation method in DS that would prove that it has a specific character in IS research? I note above that AR requires an interventionist observation that focuses on effecting change.

Design science is conceived of as consisting of building and evaluating activities (Hevner et al., 2004). We can see evaluation as a supportive activity to design/build in a similar way as evaluation supports intervention/change in AR. At its core, design science involves design. If it did not, then one could not claim a research endeavor to be design science. Figure 10 shows a way of illustrating "design as data generation", which corresponds well with intervention study as core to AR.

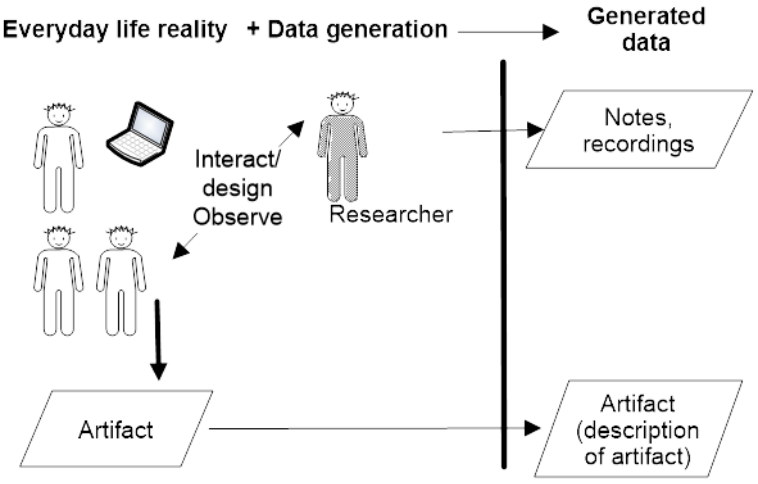

Figure 10. Data Generation through Practice-based Design Study

There are great similarities with intervention study. The studied reality (i.e., a design practice in some organized setting) coincides with data generation since the core task of designing forms part of the studied social setting. In AR, the intervention activities produce a change of some kind. In a design situation, a more specific result occurs: the designed artifact, which we can think of as an IT artifact.

I conceive of the way to conduct DS research in this paper as an endeavor close to an AR approach following the ideals described by Sein, Henfridsson, Purao, Rossi, and Lindgren (2011) in Action Design Research, Rohde, Brödner, Stevens, Betz, and Wulf (2017) in Grounded Design and McKay, Marshall, and Hirschheim (2012). This is, however, not the only way to perform DS research. Iivari (2015) has identified two different strategies to conduct DS. Iivari's first strategy works with general problems and general solutions that might be instantiated in IT artifacts as "proof-of-concepts". This strategy relates to the data-generation method described in Section 3.9 below. Iivari's second strategy works with real problems in real situations in which one develops artifacts as solutions to those identified problems. This is a DS study typically performed according to ADR. This approach contains the data-generation method considered in this section, and I label it "practice-based design study" here. The two strategies to perform DS research that Iivari (2015) presents correspond well to the strategies in HCI that Zimmerman and Forlizzi (2014) describe: 1) research through design in the lab and 2) research through design in the field. I discuss the lab-oriented design research approach (which corresponds with Iivari's (2015) first strategy) in Section 3.9.

Researchers conduct practice-based design research (like Iivari's (2015) second strategy and typically action design research) through several different data-generation methods. They will generate data about problems in a practice that form a basis for design. They will also generate data from evaluating the designed artifact. Practice-based design study is seen as a core activity in this research approach. It is important to conceive of this activity as data generation, which I explain further below.

Iivari (2015, p. 107) accuses "the scientific discourse on DSR [of being] in a state of conceptual confusion". Goldkuhl (2013) has identified one such confusion in Hevner and Chatterjee's (2010, p. 3) assertion that "research requires collection and interpretation of data or creation of artifacts". Specifically, Goldkuhl (2013) notes that:

> *The little word "or" is erroneous here. It is not the case that we either produce data or artefacts in design research. We produce artefacts since they are the key empirical data for our theorizing in design research.*

We need to consider this view of "artifact as data" when clarifying design as data generation. A design study produces artifacts as potential solutions to problems that individuals encounter in practice. These artifacts represent important elements in this practice but, at the same time, also constitute key empirical data from the design study. Besides artifact data, researchers will also produce field notes and possibly also recordings from the design process. As Figure 10 shows, researchers have a dual role of being 1) a practice-oriented designer and 2) an observer of the design process (as social interaction) in the studied setting.

3.9 Lab-based Design Study

Researchers can also perform design science research in the laboratory and not only in a practice setting ("the field") as I describe in Section 3.8. This kind of approach means that the researcher, based on some *design idea* and possibly also some conception of problems in practice, develops an artifact as a novel solution to the apprehended problems (Figure 11).

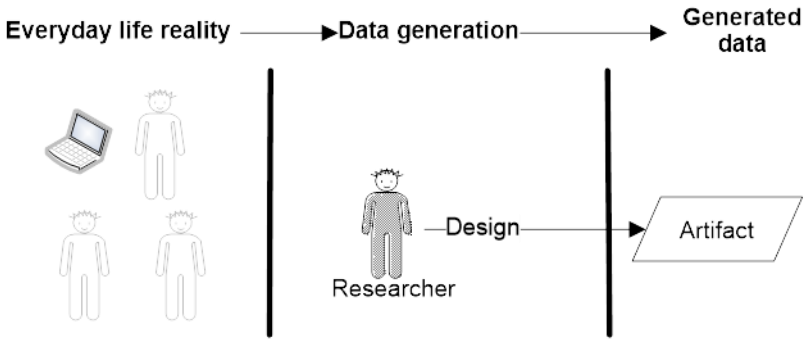

Figure 11. Data Generation through Lab-based Design Study

To generate data through a lab-based design study, researchers create an artifact (e.g., a prototype as a "proof-of-concept") (Nunamaker, Briggs, Derrick, & Schwabe, 2015). In other words, the designed artifacts

represent the generated data in this research method. In such a design/data-generation situation, researchers have no interaction with everyday life reality (practice settings), which I depict in the figure with faded grey figures in the everyday life reality column. This approach lets the researcher have greater control over the design process and, thus, the design product (Iivari, 2015; Zimmerman & Forlizzi, 2014). Note that a design science approach based on lab design strategy may involve other data-generation methods to support the design. Researchers could conduct qualitative studies on (problems in) practices to help them develop a design idea. They could also evaluate the developed artifacts using actors from the practice field (e.g. focus groups or test studies; see Sections 3.10 and 3.11 below).

Some researchers may object to incorporating lab-based design study as a qualitative data-generation method on the same footing as other described methods. In a lab-based design study, a researcher does not actually generate data from the practice field (the everyday life reality). The generated data comes from researchers due to their design efforts. Researchers create the meanings in the data, although they may base these creations on descriptions and evaluations of real practice settings and, thus, on other data-generation methods. Even if one could question whether this data-generation method of lab-based design study constitutes a "true" qualitative method since it does not capture data from an existing social setting, I describe it here as one possible option for generating qualitative data. There are reasons for including and describing this data-generation method here together with the other eleven methods, which all are based on data from the practice field of everyday life reality. Lab-based design science is proposed and described as a research approach and exists as such in research practices. The generated designed artifacts, which function as data for further analysis, comprise definitely qualitative meanings. I describe here this (partially deviant) data-generation method in a similar way to all the other qualitative data-generation methods in order to make a comparison possible. This data-generation method is here described together with the annotated shortcomings in order to make researchers vigilant concerning its limitations and possible objections against its use.

3.10 Focus Group Study

Researchers have increasingly used focus groups in IS research (Belanger, 2012; Nili, Tate, & Johnstone, 2017; Tremblay, Hevner, & Berndt, 2010). A focus group study refers to a group session where *knowledgeable people interact* and discuss some given themes (Morgan & Spanish, 1984; Bryman, 2016). One can see it as a special kind of group interview (Patton, 1990). Gathering several people for a joint session creates special opportunities for data generation. The social interaction encourages informants to express more and nuanced opinions based on other people's expressed views. The focus group session also has a moderator (often a researcher) who poses questions and takes responsibility for recording the discussion (see Figure 12). Besides recording (audio, and sometimes even video), researchers who act as the moderator will usually take notes from the discussion (e.g., document their own comments and reflections).

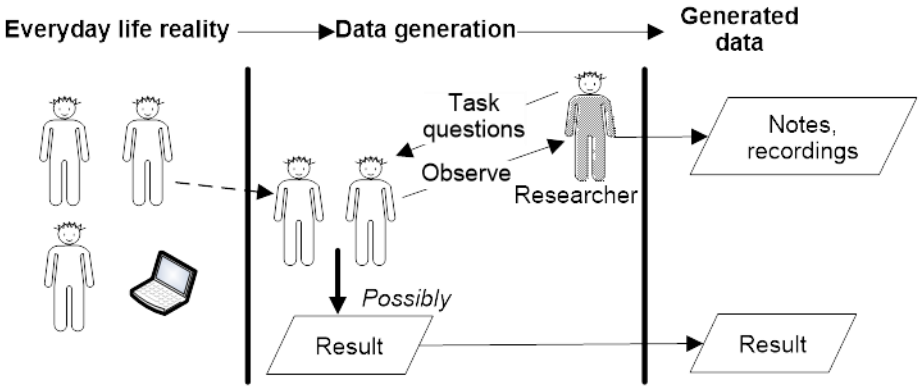

Figure 12. Data Generation through Focus Group Study

Researchers can use focus groups for generating different kinds of data. They can perform a focus group study as an interactive group interview based on posed questions/themes. They can also conduct a focus group study around some task assigned to the group. In this case, the group collaborates in some sense in completing the task. The task result becomes valuable generated data together with the group dialogue data, which express the group process. Researchers have suggested and used this more task-oriented

approach in a design science context (Tremblay et al., 2010). However, it is important to hold a distinction between a focus group study and the data-generation method of test study (described below in Section 3.11).

A focus group study has a relationship to everyday life reality in that sense that there are knowledgeable persons ("domain experts") who participate in the focus group, bringing their knowledge and views on some matter. This can be knowledge that is directly related to their own practices, but it can also be more general knowledge about some known affairs. The generated data are highly dependent on how this data capture situation is arranged. A focus group session is arranged by researchers but might bear some resemblance to social interaction in the field.

3.11 Test Study

Researchers often conduct test studies as part of laboratory experiments, which they usually perform following a quantitative approach (Bryman, 2016). However, they can also conduct a test study with a qualitative approach that focuses on obtaining rich qualitative data. In HCI, researchers use a well-established method in which they have potential users testing IT artifacts (Nielsen, 1993; Rogers et al., 2011). The standard approach seems to be quantitative, but as I state above, researchers can apply a test study while collecting qualitative data. Figure 13 depicts data generation through test study. In this approach, the basic logic involves bringing in knowledgeable persons to conduct some task related to a test object. A test object can be an IT artifact, but IS research should not always limit itself to IT artifacts. For example, other test objects include a proposed design method that test users may try according to an assigned task.

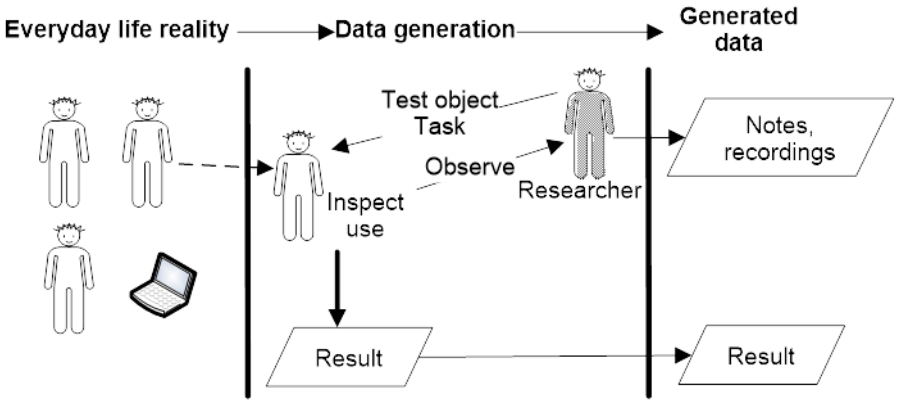

Figure 13. Data Generation through Test Study

The results from test use constitute key data in this data-generation method. Other important data in this data-generation method include process data, such as recordings in one form or the other and researchers' notes. In HCI, researchers also use another method that complements user testing: "thinking aloud" (Nielsen, Clemmensen, & Yssing, 2002). In this method, researchers urge the test persons to orally describe what they do, what obstacles they encounter, and their problem-solving deliberations. If researchers apply this method, the expressed thinking aloud forms part of the recorded process data.

As I indicate above, there might be some resemblance between a test study and a focus group study, especially if the focus group is task oriented. The test study, as an ideal-typical qualitative data-generation method, is conducted by test persons alone. In Figure 13, there is one single person depicted as a test person. When a group of people interact to perform some task, this is seen as a focus group study. In Figure 12, there are two persons (indicating a group) who interact.

3.12 Self-reporting

Self-reporting is a rare method in social research (Bryman, 2016), and also in IS research (e.g., Barrett et al., 2004; Rogers et al., 2011). In this method, researchers rely on "self-reporters" to provide self-reports that constitute the generated data. Self-reporting can be done continually as a diary study or a "life-history" description conducted on one occasion. Self-reporters need to be recruited and given instructions by the researcher (Figure 14). There is no interference besides instructions (and thus no interpretation) from the researcher in the data-generation process.

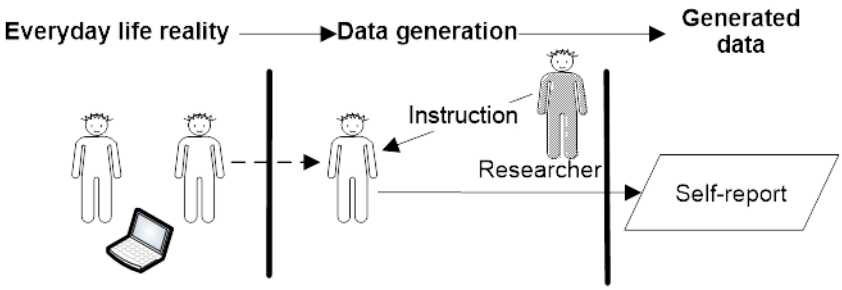

Figure 14. Data Generation through Self-reporting

3.13 Comparing the Twelve Methods

In Sections 3.1 to 3.12, I identify and describe 12 different data-generation methods using the same template for the sake of clarification. By looking at the different models (Figures 3-14), one can easily compare these methods. I provide further comparative characteristics in Tables 1-3 in this section.

Table 1 contains two feature columns: 1) researchers' role in data generation, and 2) data generation's influence on everyday life reality. The first column includes what researchers do in data generation but not in other activities. Thus, it does not include subsequent data-analysis activities, nor does it include activities associated with formulating/revising research questions, which researchers can perform prior to, concurrent with, or sometimes even subsequent to data generation. The role of the researchers is to arrange situations that are generative concerning qualitative data. Thus, they must arrange situations to trigger something to be *extracted* (as in interviewing recruiting informants and posing questions). They must also make arrangements so that they can *capture* data (e.g., in an interview, via taking notes and video/audio recording the events).

The second feature column in Table 1 describes, in a comparative way, how different data-generation methods may influence everyday life reality. In some cases, the method intentionally and innately influences everyday life reality as in intervention study and practice-based design study. When researchers observe ELR (as in observation study), their mere presence may influence it. In situations where researchers generate data through some arranged capture distinguished from ongoing ELR (as in interviewing, questionnaire study, focus group study, test study, and self-reporting), there will not be any direct influence on ELR. However, posed questions or assigned and conducted tasks may trigger informants' reflections and, thus, change their future behavior. Some data-generation methods, such as document study and artifact study, will probably have a limited influence on ELR. In lab-based design study, researchers have no interference at all with ELR.

Table 2 contains two feature columns: 1) relationship to everyday life reality and 2) addressed parts/mediators of everyday life reality. The data generation will be conducted more or less close to the everyday life reality. In some cases, the data generation and everyday life reality coincide (i.e., researchers fully conduct data generation in everyday life reality as in participant observation, intervention study, practice-based design study). In other cases, the researcher will observe elements in ELR and become only an outside spectator rather than an ordinary member in the field (as in observation study, artifact study). In some cases, researchers will bring knowledgeable actors from ELR to an arranged data-generation situation (e.g., in interviewing, focus group study, test study).

The data-generation methods differ in their capacities to address and access different parts and aspects of the everyday life reality that researchers study. The second feature column in Table 2 contains the parts of the ELR that each data-generation method addresses. In several cases, researchers have no direct access to the studied field, which they reach instead through some mediating capacity. The access occurs through informants who come from the field and provide their knowledge (e.g., in interviewing, focus group study) or through documents that provide information about states of reality.

Table 1. Comparing Methods for Generating Qualitative Data (1)

Data-generation method	Researcher role in data generation	Data generation's influence on ELR
Interviewing	Recruiting informants, asking questions, taking care of answers as data.	Interview may trigger informant's reflections and change their future behavior.
Questionnaire study	Recruiting informants, distributing written questions.	Questions may trigger informant's reflections and change their future behavior.
Document study	Searching for and selecting relevant documents.	Limited influence.
Artifact study	Inspecting and possibly trying out artifacts, documenting results from inspection/use.	Limited influence.
Observation study	Observing actors and environment of ELR, documenting observations.	Presence of observer may influence current behavior.
Participant observation	Engaging in daily life of ELR together with actors, becoming part of studied domain, interacting with actors and environment of ELR, observing interaction, documenting observations.	Observer will, through participation, continually influence ELR.
Intervention study	Agreeing with actors in ELR to participate in planned change, engaging/interacting with actors to change ELR, becoming part of studied domain, observing interaction/change; documenting observations and achieved changes.	Intentional change to ELR through intervention.
Practice-based design study	Agreeing with actors in ELR to participate in designing artifact, engaging in artifact design in ELR together with actors, becoming part of studied domain, interacting with actors and environment of ELR and designing artifact, observing interaction/design, documenting observations and designed artifacts.	Intentional change to ELR through design and implementation.
Lab-based design study	Designing an artifact.	No interference and, thus, no influence.
Focus group study	Recruiting informants, asking questions and/or providing tasks, observing and documenting interaction, taking care of results from focus group interaction.	Informants' experiences from focus group may be used to change future behavior.
Test study	Recruiting test persons, providing test objects and tasks, observing and documenting testing, taking care of results from testing.	Test persons' experiences from test may be used to change future behavior.
Self-reporting	Recruiting informants, providing instruction for self-reporting.	Instructions and self-reporting may trigger informants' reflections and change their future behavior.

Table 2. Comparing Methods for Generating Qualitative Data (2)

Data-generation method	Relationship to everyday life reality	Addressed parts/mediators of everyday life reality
Interviewing	Knowledgeable informants from ELR answer oral questions.	Informant's knowledge (about self and ELR).
Questionnaire study	Knowledgeable informants from ELR answer written questions.	Informant's knowledge (about self and ELR).
Document study	Researcher extracts documents from ELR.	Documents (providing information about parts of ELR).
Artifact study	Researcher investigates artifacts in ELR.	Artifacts.
Observation study	Researcher directly observes ongoing activities in ELR.	Observable parts of ELR.
Participant observation	Data-generation occurs in ELR, researcher directly observes ongoing activities in ELR.	Observable parts of ELR.
Intervention study	Data-generation occurs in ELR, researcher directly observes ongoing activities of change in ELR, research activities contribute to change to ELR.	Observable parts of ELR with focus on intervention and change.
Practice-based design study	Data-generation occurs in ELR, researcher directly observes ongoing activities of design in ELR, research activities contribute to design of artifacts as part of ELR.	Observable parts of ELR with focus on design of artifacts.
Lab-based design study	Researchers may conduct data generation (artifact design) based on some comprehension of ELR.	Designed artifacts with potential use in ELR.
Focus group study	Knowledgeable informants from ELR interact based on questions/tasks.	Exercised knowledge of informants.
Test study	Knowledgeable test persons from ELR test objects in arranged tasks.	Exercised knowledge of informant.
Self-reporting	Knowledgeable informants from ELR express and record experiences and views.	Informant's knowledge (about self and ELR).

Table 3 contains two feature columns: 1) expected value of generated data and 2) possible shortcomings in generated data. The table compares the 12 data-generation methods with a focus on generated data. Each method has specific advantages in bringing data with certain desired traits (see the first feature column). However, each method may also have shortcomings in the data it produces (see second feature column). For example, researchers may identify risks in producing data with bias from informants or that a method produces "thin data" (i.e., data that do not cover a broad spectrum of the everyday life reality). If the arranged situation is too artificial in relation to the everyday life reality, researchers may generate data with low ecological validity (Bryman, 2016) (i.e., data that are awkward and not relevant to the investigated domains of practice).

The character and quality of the generated data depend on how researchers arrange the data-generation situation. All kinds of data depend on the data-generation situation and, thus, how well the extraction and capture processes are established by the researchers. As an overall criterion, researchers should focus on obtaining *rich* and *authentic* data with *minimal distortion*. Data should be authentic in relation to the studied everyday life reality, and the data-generation process should not lead to distorted data.

Table 3. Comparing Methods for Generating Qualitative Data (3)

Data-generation method	Expected value of generated data	Possible shortcomings in generated data
Interviewing	The interviewer can, through dialog, guide informants to express their reflected knowledge about ELR well.	Informants may not have proper knowledge of what they report.
Questionnaire study	Much data can be generated due to a resource-efficient method. Articulate written answers if informants make use of time to reflect on answers.	Misunderstandings can occur (and, thus, influence the answers) since there is no dialog or direct meeting between informant and researcher. No chance to validate the informant's knowledge and willingness to produce truthful answers.
Document study	Documents can give in-depth accounts of processes and circumstances.	Documents can have different kinds of bias that one cannot easily reveal.
Artifact study	Detailed data concerning artifacts' functions and properties.	Researchers probably need other data to obtain knowledge about users' views and their use of artifacts.
Observation study	First-hand observations of processes and circumstances.	Resource-demanding for researcher to be present and to continually observe. Hard to get all observations documented. Risk that external observer will disturb informants.
Participant observation	First-hand observations (giving experiential data) of processes and circumstances guided by continual involvement in studied social setting.	Resource-demanding for researcher to be present and socially involved and to continually observe. Hard to document all observations.
Intervention study	Detailed knowledge (experiential data) about how change ideas emerge and how they can be manifested.	Resource-demanding for researcher to be engaged in the change situation and to continually observe. Hard to document all observations. Data might be thin (focused on change) and leave out required knowledge on preconditions and effects.
Practice-based design study	Detailed knowledge (experiential data) about how design ideas emerge and how they can be realized in artifacts.	Resource-demanding for researcher to be engaged in the design situation and to continually observe. Hard to document all observations. Data might be thin (focused on designed artifact) and leave out required knowledge on preconditions, use, and effects.
Lab-based design study	Researcher has total control over data (designed artifact).	Researcher can generate data/artifacts without any ecological validity.
Focus group study	Socially established views on some subject matter.	Artificial setting and time limits may restrict social interaction and the evolution of knowledge.
Test study	Detailed knowledge about some test object concerning properties and functions through informant's experiences.	Test situation might be too artificial to produce data with sufficient ecological validity.
Self-reporting	Possibly detailed descriptions of some historical process. The informants may have time to reflect and articulate written answers.	Hard to get informants to persevere sufficiently and articulate when producing self-reports and hard to know and assess if they fail to do so.

4 Discussions and Conclusions

4.1 Data Generation in Compound Research Strategies

In this paper, I build on a differentiation between data-generation methods and compound research methods/strategies. In doing so, I follow a division that Myers (1997, 2016, 2013) has made, although I apply different terminology. In a compound research strategy, researchers will usually use several different data-generation methods. I characterize well-known compound research strategies in IS in relation to data-generation methods: case study (CS), action research (AR) and design science research. I divide design science into the variants "design science in the field" (DS/F) and "design science in the lab"

(DS/L) following the division that Zimmerman and Forlizzi (2014) and Iivari (2015) make (see Sections 3.9 and 3.10). Myers (1997, 2016, 2013) describes case study and action research as overall qualitative research methods but does not include design science.

Every research endeavor has its own unique combination of data-generation methods. However, we can identify main candidates among the mentioned data-generation methods for the compound research strategies. Table 4 identifies typical uses of data-generation methods in these different research strategies. The table divides data-generation methods into four different classes in relation to possible uses in a compound research strategy: 1) primary method (i.e., necessary or almost necessary to use) (p), 2) possible/often useful method (u), 3) possible/occasionally used method (o), and 4) inappropriate method to use (i). The table links each data-generation method to the four compound research strategies. Note that researchers should see the table as a bold characterization that might be modified in the future based on further knowledge development.

Table 4. Compound Research Strategies and Data-generation Methods

Data-generation method	CS	AR	DS/F	DS/L
Interviewing	u	u	u	o
Questionnaire study	o	u	o	o
Document study	u	u	u	i
Artifact study	u	u	u	o
Observation study	u	u	u	u
Participant observation	u	o	o	i
Intervention study	i	p	o	i
Practice-based design study	i	o	p	i
Lab-based design study	i	i	o	p
Focus group study	o	o	u	u
Test study	i	o	u	u
Self-reporting	o	o	o	o

I define case study research as closely investigating one or more social settings. In such research, a researcher studies a contemporary real-world situation in-depth. Yin (2014) motivates the use of the case study method as when “the boundaries between phenomenon and context may not be clearly evident” (p. 16). Researchers have applied case study research widely in the IS discipline (Benbasat, Goldstein, & Mead, 1987; Lee, 1989; Walsham, 1995; Keutel, Michalik, & Richter, 2014). This is often based on a research interest to thoroughly investigate the use of IT artifacts in their organizational settings. In a case study, researchers study different dimensions and aspects of a case. In doing so, researchers often need different data-generation methods. Yin (2014) presents six ways to collect data in case study research: documentation, archival records, interviews, direct observation, participant observation, and physical artifacts. In this paper, I do not separate between documentation and archival records. Rather, I group them together in document study. Otherwise, these mentioned methods correspond directly to the methods I identify in this paper.

As I describe above, action research is a research strategy that aims at knowledge creation through intervention in some social setting where the researchers collaborate with practitioners from that setting (Susman & Evered, 1978; Braa & Vidgen, 1999). IS researchers have actively used AR, and its recognition as a valid research approach has continually grown (Baskerville & Wood-Harper, 1996; Baskerville & Myers, 2004; Davison et al., 2004; Kock, 2007). I define intervention study as a key data-generation method in action research. However, researchers need other empirical methods in action research as well. Intervention study is typically associated with action planning and action taking in the AR research cycle (Susman & Evered, 1978; Davison et al., 2004). Diagnosis precedes these phases, which focuses on studying the current situation. After implementation, researchers conduct an evaluation phase in which they study the changed situation. Researchers need to generate data to conduct these two evaluative endeavors. The two evaluative phases closely resemble case study research. Researchers conduct AR at a selected site and often need in-depth knowledge of broadly demarcated issues. Thus, those data-generation methods that I mention for case study research also apply to these parts of AR.

Practice-based DS shares many characteristics with AR (Cole et al., 2005; Järvinen, 2007; Sein et al., 2011; Rohde et al., 2017). I define the key data-generation method as practice-based design study in this paper. However, researchers need other empirical methods in practice-based DS as well. Several IS researchers have described DS (e.g., Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007; Sein et al., 2011) as involving phases of introductory problem identification and conclusive evaluation of designed artifacts. These phases correspond well with the evaluative phases of AR that I mention above and, thus, with those possible data-generation methods. The artifact-centric character of DS requires methods with a more distinct focus on the IT artifact. For this purpose, researchers can conduct focus group studies (Tremblay et al., 2010) and test studies (Nielsen, 1993; Rogers et al., 2011) about a designed artifact. This might especially be the case if lab-based DS is conducted. In such a research approach, the key data-generation method, lab-based design study, is conducted without the necessity of an introductory problem analysis performed in practice settings. In order to evaluate the outcome (a lab-designed artifact), researchers will need appropriate data-generation methods such as focus group study, test study, and observation study.

4.2 Interpretations in Data Generation vs. Data Analysis

A separation is often made in the literature between collection/generation of data and analysis/interpretation of data (Bryman, 2016). However, in qualitative research, one cannot draw such a sharp line. Interpretation will already occur during the generation of data. The study of social practices needs to be done with an interpretive mood in order to create meaningful data (Butler, 1998). As I indicate in several sections above, researchers need to interpret what they perceive in everyday life reality in order to select and capture such extracts as plausible data. When selecting and capturing data, they will probably make some real-time reflections, and such reflections also need to be recorded as parts of the data for further analysis. For several of the data-generation methods I examine in this paper, the data that researchers generate include notes and annotations. All such notes depend on a researcher's interpretive skills, and these data come as interpretations that researchers make through their empirical contact with parts of the everyday life reality. During data analysis, researchers make further interpretations through reflecting on the generated data.

Even if one cannot draw a sharp line concerning the use of interpretation in data generation and data analysis, they involve some distinctions that researchers should uphold. In data generation, researchers mainly use interpretation to *search for* and *extract meanings* that *exist* or *emerge* from the socio-instrumental world of IS practices. When subsequently analyzing data and developing theory, researchers use interpretation more to *bestow* the data material with *new meanings in terms of abstractions* and *new categories*. In generating qualitative data, researchers will often focus on extracting and capturing meanings that already exist in the everyday life reality of IS practices. However, it would be a simplification to state that the focus of data generation, in qualitative IS, is limited to such already existing meanings. There exist research situations, supported by appropriate data-generation methods, which are generative beyond existing meanings in ELR. New meanings can emerge through the use of appropriate data-generation methods. Table 5 shows four different data-generation strategies. These strategies imply differences in interpretations and the generation of new meanings through data.

Table 5. Different Strategies for Generating Meanings in Data

Type of meaning in generated data	Typical data-generation methods	Temporality of ELR
1. Established articulate meanings (reported/found in ELR)	Interviewing, document study	What is
2. New meanings that informants articulate through researcher stimulus	Interviewing, focus group study, self-reporting	What is, what might be
3. New meanings of observed occurrences and traits in ELR that the researcher has bestowed (possibly not previously articulated)	Observation study, participant observation, artifact study	What is
4. Created new situations (with new meanings) through researcher-practitioner interaction	Intervention study, practice-based design study	What might be, what has become

The first row describes the apparent strategy of capturing *meanings already there* in the ELR (established articulate meanings). However, as the second row describes, with the support of suitable data-generation methods (such as interviewing and focus group study), researchers can, through generative questions, stimulate and encourage informants to reflect on their practices and, thereby, *articulate* new insights (i.e.

new meanings about these practices). Such insights can comprise reflections on existing practices ("what is") or possible future practices ("what might be").Through adequate data-generation methods (e.g. observation study, artifact study), researchers could also detect *meanings* in processes and objects that *no one has previously articulated* in those ways (third row). Important research strategies in IS research involve working with change and improvement of practices (i.e., as in action research and design science). In such cases, researcher-practitioner interaction creates new situations, which means the *creation of new meanings* (fourth row).

4.3 Concluding Remarks and Advice

When discussing research inquiries, researchers sometimes differentiate between *naturalistic* versus *artificial* settings (e.g., Venable, Pries-Heje, & Baskerville, 2016). I do not exactly follow such a dichotomization here. Rather, I differentiate between *everyday life reality* (as natural settings) and *arranged settings* for data generation. To generate data always implies some kind of arrangement. Researchers often generate data separate from everyday life reality (e.g., when researchers recruit informants from everyday life reality to participate in interviews or focus groups). Sometimes, researchers can observe the natural setting as in observation studies and artifact studies. In other situations, researchers and practitioners agree to let the former become a temporary member of the empirical domain as a participant observer or an interventionist observer (in action research) or as a designer/observer (in design science research). In these latter cases, researchers more or less change everyday life reality to include data generation (i.e., they make arrangements to extract and capture data).

What implications do this conducted inquiry have for planning and performance of qualitative IS research? What has been presented here can be transformed into some general *guidelines* for the design of qualitative research. The design of research methods in a research study is of course dependent on the *purpose* of the study. However, other aspects beyond research interests and research questions influence what methods researchers should choose. The *characters of the study domain* decisively influence how researchers should design a study. They need clarify the possible *data sources*. Researchers may find the revised SIP ontology (see Section 2.1) as a useful aid in an ontological reflection on the study domain. Based on such a reflection, researchers need to consider how to extract and capture data (i.e., select/design appropriate data-generation methods for the inquiry). It is important for researchers to understand that it is not only a matter of collecting ready-at-hand data but rather a matter of arranging data-generation situations. Researchers should design data-generation situations based on what they know about available data-generation methods and their respective capacities. In this paper, I present 12 methods in a comparable way. Triangulation (Denzin, 1978; Yin, 2014) should be a general principle in generating qualitative data since one method alone rarely has a capacity to produce sufficiently rich data from a study domain. Instead, I would advise researchers to use *complementary methods* that provide an adequate set of *authentic*, *rich,* and *meaningful* data.

In qualitative research, researchers should conduct sampling of data based on insights from their data analysis and theory development, which can lead to their expanding the study domain and a search for new kinds of data. Researchers may need to revise their research design considerations concerning data sources and procedures for data generation while conducting a qualitative research study.

Besides applying and using these guidelines, some other possible routes for future knowledge development exist. Certain methods probably complement each other more than other methods. Thus, future work could more closely study the triangulation of different methods (i.e., how to combine different methods and how such methods complement each other in contributing rich data). Finally, future research could more deeply analyze the strengths and weaknesses of these different data-generation methods in qualitative IS research.

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