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DESIGN SCIENCE RESEARCH AND THE GROUNDED THEORY METHOD: CHARACTERISTICS, DIFFERENCES, AND COMPLEMENTARY USES

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Abstract

Two research strategies that have received increasing scholarly attention recently in IS are design science research (DSR) and the grounded theory method (GTM). In this paper, we conduct a systematic comparison of the most salient characteristics of both research strategies to identify the differences as well as possible complementary uses in a pluralistic research design. We find opportunities for future researchers to combine the two strategies to leverage the advantages of both. DSR focuses on the construction of an IT artifact and the solution of a local problem while GTM enables researchers to develop grounded substantive theory and make a contribution to the knowledge base. The goals of solving a real-world problem to achieve practical relevance and developing a theoretical contribution to achieve scientific rigor can be combined. To avoid possible pitfalls, researchers combining DSR and GTM into a pluralistic research design must take great care in combining the different research strategies in a way that is consistent with the characteristics of each single strategy which are presented in this paper.

Keywords: Design Science Research, Grounded Theory Method, Pluralistic Research Design.

1 INTRODUCTION

The IS research community is characterized by a large diversity of research approaches and topics. Although empirical quantitative research approaches dominate (Orlikowski et al. 1991), new research strategies are on the rise. Two research strategies that have received increasing scholarly attention recently are design science research (DSR) and the grounded theory method (GTM). For example, the European Journal of Information Systems (EJIS) recently published a special issue on design science research edited by Baskerville (2008). In addition, there is a call for papers by the same journal for a special issue on the grounded theory method which will appear in the near future. Leading scholars that are very familiar with either one of these research strategies are in the editorial board of some of the leading journals (e.g., Alan Hevner and Juhani Iivari are senior editors at MISQ and Richard Baskerville is editor-in-chief at EJIS) and new special interest groups are emerging (e.g., the AIS special interest group on grounded theory). Despite the fact that both research strategies are not new, they have something in common: They both have become popular in information systems research only recently while originating from related fields (grounded theory method from sociology and design science research from engineering and architecture). Hence, there is a need for IS scholars to deal with these research strategies to enhance our understanding how they can yield new findings in the study of IS phenomena.

Comparing different research strategies can help us to better understand and differentiate them and hence, might provide new ideas how they can be combined with each other in a complementary way within one single research project. IS researchers have called for a more pluralist research tradition in IS (Mingers 2001). There are some IS studies that critically compare design science research with other research approaches, for example with Action Research (AR). Some studies find similarities between the two strategies (e.g., Järvinen 2007), while others find differences (e.g., Baskerville et al. 2009, Iivari et al. 2009). Design science research has also been compared directly with the grounded theory method. For example, Goldkuhl (2004) offers an approach how to use techniques of the grounded theory method in a design science research project. He presents three different types of grounding, internal, empirical, and theoretical grounding, that can enhance a design science research project to generate grounded practical knowledge. However, the author does not link his ideas explicitly to the grounded theory method and bases his arguments upon myths such as the one that the grounded theory method involves purely inductive reasoning from empirical data and does not permit the inclusion of other knowledge sources (e.g., extant literature) in the theory building process (see Urquhart & Fernandez (2006) for a discussion of myths about the grounded theory method). Another study that compares these two research strategies finds that both research strategies complement each other well (Holmström et al. 2009). In particular, they develop a framework how design science research as an exploratory research approach can be complemented by a second research cycle including the development of substantive and formal theory (which is the focus of the grounded theory method) in order to make a contribution to the knowledge base besides focusing entirely on the problem solution and the IT artifact. While the paper must be acknowledged as the first major contribution towards a pluralistic research design that integrates design science with behavioral science, one limitation of this paper is that the grounded theory method is classified as an explanatory research method while in fact it is an exploratory theory-generating research method (Glaser 1978, Stebbins 2001).

In summary, while some IS scholars have made attempts to compare design science research with the grounded theory method and even explore complementary uses, there is a lack of understanding and consensus concerning the exact characteristics of both research strategies and how they are similar or different from one another. Developing a more precise understanding thereof provides us with the identification of complementary uses and serves as a guide for IS researchers pursuing a more pluralistic research approach. Hence, the focus of this paper is the comparison of design science

research with the grounded theory method to lay the foundation for a more intensive scholarly debate in IS about possible complementary uses in pluralist research projects and possible pitfalls or risks.

The remainder of this paper is structured as follows. The following two sections present the main characteristics of design science research and the grounded theory method. Thereby, it is important to notice that the characteristics are derived inductively from reviewing existing design science and grounded theory works and that they do not represent the author's view of the most appropriate characteristics that either research approach should have. We discuss the differences between the two approaches in the fourth section. Finally, we conclude with a discussion of the implications for IS research and possible complementary uses.

2 CHARACTERISTICS OF DESIGN SCIENCE RESEARCH (DSR)

The focal research attention in design science research is given to the 'design' of artificial artifacts (i.e., IT artifacts) and creating something new that does not yet exist. Hence, design is both a process (set of activities) of 'creating something new' and a product (i.e., the artifact that results out of this process) (Walls et al. 1992). In other words, design is both a verb and a noun. Hence, we must consider different types of design processes and design outcomes or artifacts. Besides distinguishing between build and evaluate in the design process, which we will discuss in the next section, different types of design outputs (i.e. artifacts) have been identified in the literature. The relevant artifacts are either constructs, models, methods, or instantiations, or a combination thereof (March et al. 1995). Concerning the evaluation of design artifacts, this categorization can serve as a guideline with the goal to assess the utility or overall quality of the designed artifact (i.e., construct, model, method, instantiation) to solve the problem that was formulated in the outset of the research process. The following table provides the reader with an overview over the four different types of design artifacts and their definitions (March, et al. 1995).

Design Artifact	Definition based on March & Smith (1995)
Constructs	…or concepts form the vocabulary of a domain. They constitute a conceptualization used to describe problems within the domain and to specify their solutions.
Model	…is a set of propositions or statements expressing relationships among constructs. In design activities, models represent situations as problem and solution statements.
Method	…is a set of steps (an algorithm or guideline) used to perform a task. Methods are based on a set of underlying constructs (language) and a representation (model) of the solution space.
Instantiation	…is the realization of an artifact in its environment. IT research instantiates both specific information systems and tools that address various aspect of designing information systems.

Table 1: Four different types of design artifacts

Elaborating on the above mentioned design 'process' more in detail, it may be distinguished between design research, which deals with the IT artifact creation, and design science, which is more about generating new scholarly insights. Prior design science research has been criticized for failing short regarding the latter (Hevner et al. 2004). In summary, we derive the following characteristic of design science research:

> DSR-1: The primary focus in a design science research project is mostly given to the design research part (i.e. the creation of an IT artifact), as opposed to the design science part (i.e. generating new knowledge).

The design science research activity itself can be described as "The proper study of those who are concerned with the artificial is the way in which that adaptation of means to environments is brought

about--and central to that is the process of design itself." (Simon 1996, p. 113). Simon himself labelled this the 'science of design' which is used interchangeably in the literature with the term 'design science'.

Mainly two different types of design processes have been distinguished that are deeply intertwined with each other. The first important design process is the sequence of activities to produce 'something new', an innovative product. In this process, the design artifact is built. The second important design process involves the evaluation of the created artifact to provide feedback and generate new knowledge about the problem at hand. The newly generated insights serve to improve both the quality of the artifact and the design process (Hevner, et al. 2004). The build and evaluate processes are deeply intertwined with each other. Moreover, they are not only conducted once in the overall design science research process. Rather, they are iterated multiple times until the design artifact is fully generated to the satisfaction of the researchers and practitioners that later make use of it (Markus et al. 2002).

Whereas prior design science research has viewed the research process as episodic, recently it has been acknowledged that it is rather an iterative research process (Baskerville, et al. 2009). The following figure summarizes the design science research process.

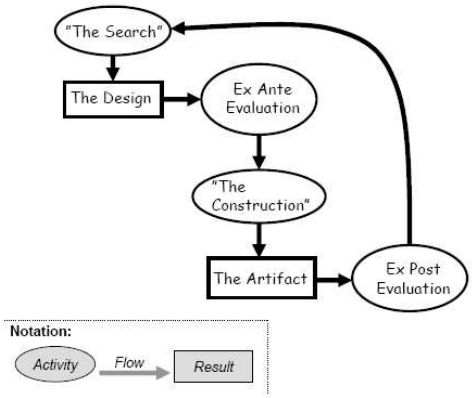

Figure 1: Iterative design science research process (Baskerville, et al. 2009)

Accordingly, the first step involves the search for a relevant problem to be solved. This leads the researcher to the design of a possible solution. Afterwards, the design (e.g., set of guidelines) has to be evaluated before moving to the next stage of construction or implementation. The final outcome is the design artifact which then has to be evaluated. The outcomes of this process trigger the redefinition of the problem or trigger the development of new problems to be solved in a separate study. The design science research process as presented by Baskerville et al. (2009) is one perspective, besides others, that we build upon in this paper. In summary, we derive the following characteristic of design science research:

> DSR-2: The design science research process involves the search for a relevant problem, the design and construction of an IT artifact, and its ex ante and ex post evaluation.

As mentioned in the description of the design science research process above, the first step is the identification and search for a relevant practical problem. The focus of design science research to solve a practical problem originates from its historical development. Design science research has its historical origins in architecture and engineering (Au 2001, McKay et al. 2005). In the engineering field, scientists are concerned with the design of a broad range of artifacts, including machines, devices, and systems. These artifacts are only designed and implemented if there is a practical need and a real-world problem to be solved. Similarly, architects design and construct something new, i.e., buildings and other physical structures. Again, the main purpose is to deliver a solution to a practical

need. Design science research originates from these two fields and is characterized by the same basic notion of building, constructing, or creating something new that solves a real-world problem. This is also the reason why many scholars in IS have come to believe that design science research conducted by researchers is not science but consulting. This is the reason why we distinguish between design science, which has its focus on the artifact construction and evaluation, and design science research, which lays additional emphasis on the study of design artifacts and the involving processes in order to generate new insights and make a contribution to knowledge (Winter 2008). However, even in design science research, an integral part of the research process is the search for a solution of a relevant problem (Hevner, et al. 2004, p. 78). In other words, "a design science research projects seeks a solution to a real-world problem of interest to practice" (Kuechler et al. 2008, p. 492). In summary, we derive the following characteristic of design science research:

> DSR-3: An important goal in design science research is to search and solve practically relevant real-world problems (or classes of problems).

Design science researchers have been debating for quite some time whether design science research is a method or methodology, a more general research approach, or even a research paradigm. A research method or methodology involves the collection of a set of pre-defined processes or steps that have to be carried out to do some kind of research. In other words, a research method provides the researcher with a kind or 'recipe' that shows him 'how' do find answers do a specific research question or problem. Hence, a research method or methodology is usually quite structured and proposes readily applicable techniques for the researcher. The researcher is then evaluated to what extent he 'followed' the defined method or methodology before his presented research results are accepted for publication. When Hevner et al. (2004) proposed a set of guidelines and evaluative criteria for design science research, many IS researchers interpreted them to form a recipe and hence thought of design science research as a method or methodology. However, recent scholarly debate over this topic shows that design science research has its own particular facets such as "the purpose-driven creation of artifacts and the introduction of these artifacts into otherwise natural settings" (Baskerville 2008, p. 442). Hence, some scholars argue that design science research is rather a paradigm than a method (e.g., Iivari 2007). We would not go so far to conclude that design science research is a paradigm (Hevner, et al. 2004) because then we would raise design science research to the same level as philosophy of science or epistemological perspectives which would not be justifiable. Rather, we suggest design science research to be a research approach, something in between a hands-on research method and a more general philosophy of science, or research paradigm. Hence, many different research methods can be used within a design science research project. Examples in the extant literature show that design science research can be combined with action research (e.g., Allen et al. 2000), ethnography (e.g., Baskerville et al. 2001), and other research methods. In summary, we derive the following characteristic of design science research:

> DSR-4: Design science research is a general research approach with a set of defining characteristics and can be used in combination with different research methods.

The majority of design science research publications have adopted a positivist epistemological perspective. For example, Baskerville et al. (2009) state that design science research tends to be positivistic which is also stated by McKay and Marshall (2005). The latter authors criticize this finding and call for more design science research that is carried out within an interpretive or social constructionist perspective. In a way, by combining design science research with anti-positivistic research methods such as action research or ethnography, IS scholars have already made attempts to bridge the gap between the two camps and work towards a pluralistic research tradition (Allen, et al. 2000, Baskerville, et al. 2001). However, the majority of design science research is purely positivistic. One possible explanation is that design science research focus on the IT artifact and the term artifact implies something real which exists in reality and which is not dependent upon subjective viewpoints. This is consistent with positivistic thinking which assumes that there exists an objective reality that can be readily depicted and described. The reality in this case consists of artifacts, e.g., a piece of

software that can be objectively identified in terms of its source code which is explicitly documented. In summary, we derive the following characteristic of design science research:

> DSR-5: Design science research is conducted most frequently within a positivistic epistemological perspective.

As mentioned above, the main goal of design science research is solving a real-world problem and creating an IT artifact. However, solving a particular problem of a particular entity in a particular context inhibits the challenge of generating generalizable solutions and findings. Design science researchers often solve a local and situation-specific problem and do not give uttermost attention to making a contribution to the knowledge base (Hevner, et al. 2004). Frequently, the problem solved by design science researchers is so specific to the situational and contextual conditions that the solution is not generalizable. Orlikowski and Iacono (2001) support this notion by stating that IT artifacts are always embedded in some time, place, discourse, and community. Hence, while the main goal of design science research is to solve a practical problem, this comes at a price, i.e., the generalizability of the solution and the findings. In summary, we derive the following characteristic of design science research:

> DSR-6: The outcome of design science research (i.e., the problem solution) is mostly an individual or local solution and the results cannot be readily generalized to other settings.

3 CHARACTERISTICS OF THE GROUNDED THEORY METHOD (GTM)

The grounded theory method originates from sociology back in the 1960s and has since been further developed and applied in a variety of disciplines, including information systems research. At the focus of scholarly attention in a grounded theory study is the 'discovery' or generation of 'grounded theory' (Glaser et al. 1967). Prior research in sociology and related fields had focused more on deductive reasoning, deriving hypotheses from a priori theory and testing these hypotheses in empirical settings. Out of this well established research tradition, the grounded theory method was invented in order to achieve a shift of scholarly focus from theory testing to theory generation and discovery. The assumption was that there is a lot of experience and data 'out there' in the empirical world to be discovered and explored and that researchers needed advice in forms of a research method in order to exploit the existing opportunities to generate new insights from real-world observations. With this motivation, the grounded theory method came into existence which gave exploratory researchers in the social sciences a tool to discover and generate grounded theory through a combination of inductive, deductive, and abductive reasoning (Glaser 1978). The main attention in a grounded theory study is given to the process of discovering concepts and categories, depicting the core categories and the relationships between them. The end result is usually a substantive theoretical contribution to the domain of study, i.e., the grounded theory. In summary, we derive the following characteristic of the grounded theory method:

> GTM-1: The focus of the grounded theory method is the discovery of grounded theory (i.e., categories and relationships between them).

The term grounded theory is given both to the end product (as described above) and to the process itself. Doing grounded theory involves a number of techniques that are prescribed by the grounded theory method (Glaser 1998, Glaser 1978, Glaser, et al. 1967). Two key techniques of doing grounded theory are theoretical sampling and the constant comparative method (Suddaby 2006). Theoretical sampling means that insights from initial data collection and analysis guides subsequent data collection and analysis. In other words, the grounded theory emerges over time through iterative cycles of data collection and analysis that are deeply intertwined with each other. Over time, the researchers reach 'theoretical saturation' which means that additional data collection and analysis efforts do not yield any new findings (Eisenhardt 1989) and hence, the researchers concentrate on

integrating their findings and working out the theoretical contribution to the domain of study. The other important technique in applying the grounded theory method is the constant comparative method which means constantly comparing indicators from their empirical data with each other as well with the concept that is given as label to a group of indicators. Concepts are grouped into categories and over time the core categories evolve from the analysis and form the basis for the development of substantive theory. To do is, grounded theory researchers make comparisons between different 'slices of data' (e.g., primary data such as qualitative interviews and secondary data such as documentations and the extant literature) in order to reach higher levels of abstraction and advance with the conceptualization. Relations are identified between the categories and through theoretical integration the substantive theory is formed. The following figure gives an overview over the process of grounded theory development.

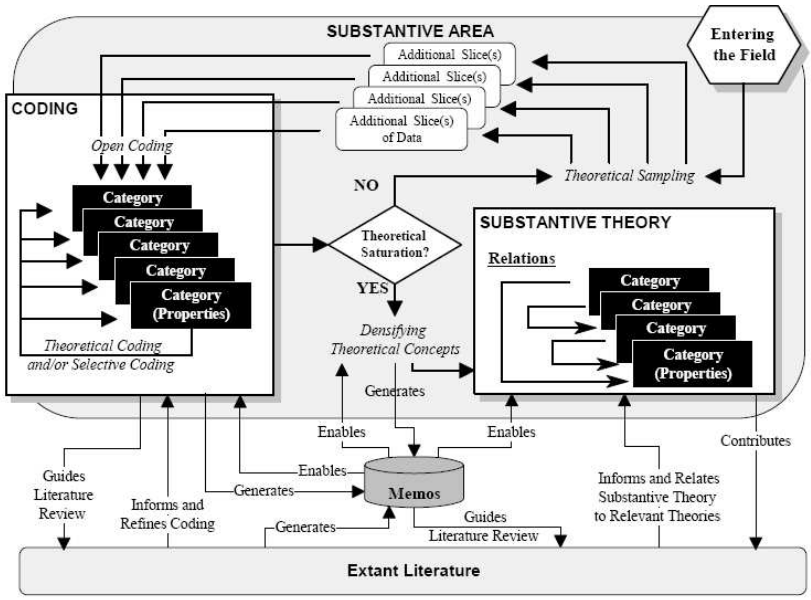

Figure 2: Grounded theory research model (Fernandez 2004)

In summary, we derive the following characteristic of the grounded theory method:

> GTM-2: The grounded theory research process involves theoretical sampling and constant comparisons to develop grounded theory and make a substantial theoretical contribution.

One of the main goals of grounded theory is to produce theory that has 'grab' or 'works' (Glaser 1978). In other words, the resulting theory must 'fit' or must be grounded in the empirical data in order to have practical relevance. This is also the reason why grounded theory usually appeals to practitioners and seems to fit well with their own real-life experiences. The process of grounded theory development, as described above, involves techniques of theoretical sampling and constant comparisons that makes this kind of outcome possible. Accordingly, by following carefully the grounded theory method, research results may be produced that combine practical relevance with scientific rigor. Due to the fact that in a grounded theory study specific attention is given to the real-life empirical world to produce theoretical insights that have 'grab', the myth emerged that a prior knowledge on a given subject is not included in a grounded theory study and that the emerging theory grows entirely from the empirical data. In fact, as we explain above in describing the research process itself, extant literature and prior knowledge is included as additional 'slices of data' in a grounded theory study in order to work out the theoretical contribution and addition to the knowledge base and also in order to reach higher levels of theoretical abstraction. Hence, in a way the resulting grounded theory must fit and must be grounded in both the empirical data but also in the relevant literature upon which the conceptualization is based upon. However, it remains an important issue in a grounded

theory study to produce theory that 'works'. In summary, we derive the following characteristic of the grounded theory method:

> GTM-3: An important goal in grounded theory research is to produce theory that fits with the real world and is grounded in the empirical data.

Different viewpoints exist in the literature whether doing grounded theory is a general research approach or a research method. Many scholars state in their research articles that they do grounded theory but by stating this they do not refer to the method as originally proposed by Glaser and his co-authors (Suddaby 2006). Rather, they refer to grounded theory in a general sense as a way of inductively deriving insights from empirical data instead of deductively deriving hypotheses from a priori theory and testing them. Scholars doing grounded theory in a more narrow sense in the intellectual tradition of Glaser and his co-authors often criticize such works for not following the method. Hence, another group of scholars which forms a larger research community views grounded theory as a research method with a set of guiding principles and techniques. Guidelines include the ones mentioned before, theoretical sampling and constant comparisons, but there are more. For example, Cathy Urquhart, who has published grounded theory studies in the IS discipline, outlines five guidelines: Doing a literature review for orientation, coding for theory not superficial themes, use of theoretical memos, building the emerging theory and engaging with other theories, and clarity of procedures and chain of evidence (Urquhart 2007). Due to the limitations of space, we cannot provide the reader with a full overview over the techniques and guidelines offered by the grounded theory method. However, there is enough evidence for the fact that grounded theory has evolved to be become rather a research method than a more general research orientation or approach. One could also view grounded theory as a 'family of methods' due to the variety of ways in which grounded theory is carried out (Bryant et al. 2007). In fact, the flexibility and openness needed by scholars using the grounded theory method is something that is stated repeatedly in the methods books on grounded theory and the research techniques provided by the grounded theory should not be misinterpreted to be applied in a too narrow sense (Glaser 1998, Glaser 1978, Glaser, et al. 1967). In summary, we derive the following characteristic of the grounded theory method:

> GTM-4: Grounded theory is an evolving research method with sets of guidelines, principles, and techniques.

In principle, the grounded theory method can be used within any epistemological frame of reference. For example, Madill et al. (2000) state that the method can be used with an interpretive, naive realist, or critical realist lens. Furthermore, researchers have also used the research method within a positivist lens (e.g., Kirsch 2004). However, the overwhelming amount of research applied this method has adopted an interpretive or social constructivist lens. The reason for this lies both in the nature of the research method itself, which places a larger emphasis on developing deep understanding from the empirical data than other more traditional research methods, as well as the history and origins of the research method. As mentioned before, the research method emerged in the 1960s in sociology as a response to the dominating positivistic research tradition which focused continuously on applying statistical analysis in a rigorous manner instead of producing practically relevant research results. Hence, the motivation for the grounded theory method came from an anti-positivistic movement which stimulated the use and development of new research methods. The positivistic thinking was however still reflected in the first book on grounded theory (Glaser, et al. 1967), which stated that the objective was to 'discover' new theory as if it already existed in reality independently of subjective viewpoints. But due to the origins and its nature, the grounded theory method is most frequently used within an interpretive epistemological perspective (e.g., Orlikowski 1993). In summary, we derive the following characteristic of the grounded theory method:

> GTM-5: Grounded theory method is conducted most frequently within an interpretive epistemological perspective.

There has been much debate in qualitative research in general over the issue of generalizability. Scholars with a positivistic background and that are trained heavily in quantitative research methods

and statistics often criticize qualitative case studies for producing only context-specific and situational knowledge that cannot be generalized or transferred to other settings. Qualitative researchers frequently respond to this critique that it is not the goal of qualitative research to produce (statistically) generalizable research results, but to provide a deep understanding of real-world phenomena in specific cases that may help to understand other cases in different settings. Yet other qualitative researchers respond to this critique by analyzing more cases and conducting multiple-case studies to increase the sample size. However, then the debate arises over the 'n', i.e., how many cases are sufficient to produce scientifically sound research results and make a generalized contribution to the knowledge base? The grounded theory method provides researchers with a very pragmatic way how to respond to this critique more efficiently by forcing researchers to reach high levels of theoretical saturation, abstraction, and integration. Theoretical saturation is reached by grounded theorists when additional data collection and analysis does not yield any additional findings to the prior steps in the research process. Finding this 'optimal' point where to stop collecting and analyzing data is not easy and requires high levels of 'theoretical sensitivity' (Glaser 1978). Ultimately, by evaluating the theory that is presented for publication, reviewers also take part in judging whether theoretical saturation has been reached. Researchers in a grounded theory study should also strive for conceptualizing and go beyond descriptive codes and analysis. Taking in the extant literature as additional slices of data may help researchers in this process. Finally, the theoretical insights must be integrated and prepared carefully for presentation. Grounded theorists must work out the theoretical contribution of their work. By following these and other guidelines of the grounded theory method, a substantive theoretical contribution in the domain of study becomes possible which is the main goal of grounded theory research. In addition, Glaser also provides guidelines how to develop formal theory based upon prior substantive theories (Glaser 1978). Both substantive theory and formal theory are considered 'middle-range' theories which fall between minor working hypotheses of everyday life and so-called grand theories (Merton 1968). In summary, we derive the following characteristic of the grounded theory method:

> GTM-6: The outcome of applying the grounded theory method is mostly a substantive theory in the domain of study and on its basis it is possible to further develop formal theory.

4 DIFFERENCES BETWEEN DSR AND GTM

The following table provides an overview and comparison of the characteristics of design science research and the grounded theory method. Thereby, six categories inductively emerged from the literature analysis when identifying the main characteristics.

Identified Category	**Design Science Research (DSR)**	**Grounded Theory Method (GTM)**
Theory focus	DSR-1: The primary focus in a design science research project is mostly given to the design research part (i.e. the creation of an IT artifact), as opposed to the design science part (i.e. generating new knowledge).	GTM-1: The focus of the grounded theory method is the discovery of grounded theory (i.e., categories and relationships between them).
Research process	DSR-2: The design science research process involves the search for a relevant problem, the design and construction of an IT artifact, and its ex ante and ex post evaluation.	GTM-2: The grounded theory research process involves theoretical sampling and constant comparisons to develop grounded theory and make a substantial theoretical contribution.
Research goal	DSR-3: An important goal in design science research is to search and solve practically relevant real-world problems	GTM-3: An important goal in grounded theory research is to produce theory that fits with the real world and is grounded

	(or classes of problems).	in the empirical data.
Nature of research	DSR-4: Design science research is a general research approach with a set of defining characteristics and can be used in combination with different research methods.	GTM-4: Grounded theory is an evolving research method with sets of guidelines, principles, and techniques.
Epistemology	DSR-5: Design science research is conducted most frequently within a positivistic epistemological perspective.	GTM-5: Grounded theory method is conducted most frequently within an interpretive epistemological perspective.
Research outcome	DSR-6: The outcome of design science research (i.e., the problem solution) is mostly an individual or local solution and the results cannot be readily generalized to other settings.	GTM-6: The outcome of applying the grounded theory method is mostly a substantive theory in the domain of study and on its basis it is possible to further develop formal theory.

Table 2: Comparison of Characteristics of Design Science Research and Grounded Theory Method

By comparing some of the most salient characteristics of design science research and the grounded theory method, we find some specific differences between these two research strategies. The first difference is the focus on the IT artifact (DSR-1) versus on grounded theory (GTM-1) as the main outcome and goal of the research strategy. A related difference concerns the research process where one strategy focuses in designing and constructing (DSR-2) while the other strategy focuses on discovery and theory development (GTM-2). Another difference results from the orientation towards practice. While both research strategies aim at producing practically relevant research results, the difference is that one strategy emphasizes the solution of a real-world problem (DSR-3) while the other research strategy focuses on producing theory that fits well with reality and generates an enhanced understanding of the problem at study (GTM-3). Hence, the difference is one of problem-solving versus problem understanding and explanation. The next difference is that one strategy can be characterized more as a research approach (DSR-4) while the other has grown to become a research method (GTM-4). Last but not least, one research strategy is conducted more frequently within a positivistic perspective (DSR-5) and the other within an interpretive perspective (GTM-5). Finally, one research strategy produces mostly results that solve an individual or local problem (DSR-6) while the other produces substantive theory in the domain of study (GTM-6).

5 SUMMARY AND OUTLOOK

By comparing design science research and the grounded theory method with each other in this paper, we stimulate a scholarly debate over the characteristics of each research strategy and possible complementary uses. Both research strategies are relatively new to information systems research and are gradually receiving more attention and being developed further. In our comparison, we identified six defining characteristics of both research strategies that show that there are precise differences between them. While prior research has made valid attempts to integrate both research strategies into one research framework (Goldkuhl 2004, Holmström, et al. 2009), this paper is the first to systematically compare the two strategies which provides a guidance for future researchers who wish to combine them into one single research design.

In fact, the results from our comparison suggest that there are opportunities for future researchers to combine the two research strategies as they may complement each other well. For example, design science research is a more general research approach that has been combined in the past with research methods such as action research (e.g., Allen, et al. 2000). We suggest that design science research may also be used in combination with the grounded theory method. For example, Hevner et al. (2004) call for more design science research that makes a scholarly contribution to the knowledge base. And Peffers et al. (2007) identify the missing link to theory as one of the main problems of design science

research as an IS research approach. The grounded theory method has the goal to develop a substantive grounded theory and thereby contribute to scientific knowledge. A substantive theory in a design science research project could deal with the relationships between the IT artifact, human behaviour (i.e., people), and the organization (i.e., tasks). For example, 'how is user behaviour influenced by the IT artifact and vice versa?'. Developing grounded substantive theory about IT artifact use and its relationships with human behaviour and the organizational environment may provide the means for IT artifact evaluation (an inherent part of the design science research cycle) and leverage a design science research project to make a theoretical contribution to the knowledge base to go beyond the local solution of a problem and the implementation of an IT artifact.

Another opportunity is to use the grounded theory method in the 'search' phase of a design science research project, where a problem is defined for which an IT artifact shall be developed in subsequent steps. So-called 'participatory' design science research approaches have made attempts in the past to use methods such as ethnography to develop a deep understanding of the problem area prior to developing an IT artifact. Using the grounded theory method may enable design science researchers to develop a more systematic understanding of the problem area and identify the requirements for the construction of an IT artifact.

However, researchers combining design science research with the grounded theory method have to be aware of the possible pitfalls. There is the risk of not following the guidelines offered by each research strategy rigorously, thus leading to flawed research designs. Editors have criticized past qualitative research of claiming to have done grounded theory while in fact the guidelines offered by the method have not been followed (Suddaby 2006). If the ultimate goal of our research is to get it published in top scholarly outlets, researchers pursuing a pluralistic research design must take great care in combining the different research strategies in a way that is consistent with the principles of each single strategy.

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