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The Concept of Creativity in the Information Systems Discipline: Past, Present, and Prospects

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Abstract:

In 1993 Couger et al. stated in an MIS Quarterly article on creativity in information systems (IS) organizations that the topic of creativity is under-researched in the IS discipline. Is the subject of creativity—despite its undisputable importance for individuals, organizations, and societies—still a neglected area in IS research? In what contexts, with what methods, and with what results have IS researchers studied the phenomenon of creativity? And what creativity-related themes warrant further investigation? In this article we analyze, based on six analytical dimensions, IS studies on creativity published in the eight top-ranked IS journals as recommended by the Association for Information Systems. The analysis provides a detailed picture of how the concept of creativity has been treated in our discipline's arguably most influential publication outlets. It becomes apparent that IS researchers have been predominantly employing a rather limited number of research designs aiming at a rather limited number of creativity-related topics. Grounded in our analysis, we discuss the prospects of creativity research in the IS discipline and provide a future research agenda. In doing so, we propose three main research themes that can meaningfully contribute to our discipline.

Keywords: creativity, literature analysis, IS research

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I. INTRODUCTION

Creativity has been defined as “the creation of a valuable, useful new product, service, idea, procedure, or process by individuals working together in a complex social system” [Woodman et al., 1993, p. 293]. Due to its undisputable relevance to individuals, organizations, and societies, the concept has been widely discussed over the last decades in a variety of disciplines [e.g., Wallas, 1926; Guilford, 1967; Csikszentmihalyi, 1988; Woodman et al., 1993; Amabile et al., 1996; Lubart, 2001]. While other disciplines have dedicated entire scientific journals to the subject and its study, it appears that the information systems (IS) discipline has paid relatively little attention to issues related to creativity. In 1993 Couger et al. asserted that the subject of creativity is a neglected area in IS research and that the field “needs to be developing more creative and innovative solutions to its problems” [Couger et al., 1993, p. 375]. Consequently, the question is how the IS discipline has dealt with this challenge. In this article, we investigate the role that creativity has played in IS research so far by analyzing the discipline’s journal publications as the “focal academic artifact” [Nevo et al., 2009, p. 224]. For this exercise we chose the eight premier journals of our discipline, the so-called *Senior Scholars’ Extended Basket of Journals* [Association for Information Systems, 2007]. As a lead of our inquiry, we propose seven research questions that aim at identifying the ways the phenomenon of creativity has been considered in IS research, what results have been produced, and what a prospect to future research may look like.

First, we are interested in the perspectives from which the IS discipline has investigated creativity. This is because it is commonly accepted that research on creativity typically focuses on four different perspectives, namely the creative process, the creative person, the creative product, and the creative press [Rhodes, 1961]. Correspondingly,

RQ1: *With regard to what perspectives has the IS discipline investigated creativity-related phenomena?*

Organizational and IS research takes place at various levels of analysis, that is, the individual, group, organizational, and market level [Woodman et al., 1993; Sidorova et al., 2008]. Correspondingly,

RQ2: *At what levels has the IS discipline investigated creativity-related phenomena?*

The third research question aims at identifying the role of the IT artifact in creativity-related IS research. As stated by Orlikowski and Iacono [2001], the “field of information systems is premised on the centrality of information technology in everyday life” [p. 121]. Correspondingly,

RQ3: *What are the prevalent roles of the IT artifact in creativity-related IS studies?*

We are also interested in how the above introduced aspects are considered in the research models underlying the different studies, that is, the dependent and independent constructs. Correspondingly,

RQ4: *What type of research frameworks do IS researchers primarily use in order to study creativity-related phenomena; that is, what are typically independent and dependent constructs?*

The fifth research question is concerned with the applied research methods. We deem this aspect relevant, as we not only want to uncover *what* IS researchers study, but also *how* they do it. Correspondingly,

RQ5: *What research methods do IS researchers use in order to study creativity-related phenomena?*

In this line of thought, the sixth research question relates to the results of research. Correspondingly,

RQ6: *What are the results of research produced by IS studies related to the phenomenon of creativity?*

Finally, based on our analysis, we aim to identify what a future research agenda for creativity-related research in the IS discipline could look like. Here, one point must be made: Our aim is to provide a future research agenda on creativity in the IS discipline, rather than *the* research agenda. Correspondingly,

RQ7: *What could a research agenda for further research on creativity in the IS discipline be?*

In order to seek answers to these research questions we use six analytical dimensions for analyzing creativity-related IS studies. Every dimension relates to one of the six research questions RQ1-RQ6. So as to answer the last

research question we pinpoint relevant, but underemphasized, fields of research, as revealed by our literature analysis, and provide a roadmap for future IS research in this important field. Consequently, this article makes three primary contributions. First, an analytical framework is proposed in order to analyze the IS literature on creativity that may also help IS researchers to position their own research. Second, an analysis of IS studies on creativity-related phenomena identifies the status quo of research in this field. Third, a research agenda is suggested; it is hoped that this will lead to future studies on creativity in the IS discipline.

The remainder of this article is structured as follows. In the next section, to further prepare the ground for the present study, we discuss the concept of creativity and existent research on this matter in disciplines different from ours. We then apply the aforementioned analytical dimensions to conduct a literature analysis on creativity-related research in the IS discipline. We also provide a discussion of the results, where the surveyed IS studies are systematized and patterns of IS research on creativity-related phenomena are derived. Based on this exercise, in the subsequent section, we propose a research agenda spotting potentially valuable fields of future inquiry. The article concludes with a discussion of contributions and limitations.

II. THE CONCEPT OF CREATIVITY

Conceptualizations of Creativity

The study of creativity has a long track record [e.g., Wallas, 1926; Csikszentmihalyi, 1988; Woodman et al., 1993; Amabile et al., 1996; Lubart, 2001]. Research on creativity has been subject to a variety of disciplines, including psychology, sociology, organizational behavior, IS, and the humanities [Styhre and Sundgren, 2005]. Most definitions of creativity concur, in that something new is at the core of creativity. May [1959], for example, defines creativity as “the process of bringing something new into birth” [p. 57]. Various authors have stated that the act of bringing something new into birth can also be seen as the imaginative recombination of known elements [e.g., Couger et al., 1993]. Later definitions require creativity to be purposeful or useful. For example, Sternberg and Lubart [1999] state that creativity “is the ability to produce work that is both novel ... and appropriate” [p. 3]. In accordance to this, Amabile [1998] claims that “in business, originality isn’t enough. To be creative, an idea must also be appropriate—useful and actionable” [p. 78].

The mere characterization of creativity as producing something novel and useful, however, does not sufficiently accommodate the complexity of the concept. The so-called 4-Ps model that was originally proposed by Rhodes [1961] provides a more detailed structure for understanding creativity [Couger et al., 1993]. The model posits four specific perspectives on creativity that have been subject to research, namely creative processes, creative persons, creative products, and creative press or environments. This model has been referred to by many researchers [e.g., Brown, 1989; Harrington, 1990; Woodman et al., 1993; Styhre and Sundgren, 2005], including those from the IS discipline [e.g., Couger et al., 1993; Satzinger et al., 1999; Santanen et al., 2004; Dean et al., 2006; Avital and Te’eni, 2009]. In the following section, we will provide a closer look on existent research concerned with the different aspects of creativity.

Research on Creativity

This section provides an overview of research on creativity before, in the subsequent section, we provide an analysis of research on creativity-related phenomena in top-ranked IS journals. Consequently, the present section draws from reference disciplines, most notably management sciences, organization theory, and psychology, while the subsequent sections focus on pure IS studies. Due to the limited space of this article and the diversity of the field, we cannot claim to be exhaustive in our attempt to provide an overview of research on creativity; instead, we focus on the role of creativity in organizational settings. This emphasis on organizational settings resembles more recent developments of research on creativity which, historically, shifted from an early emphasis on isolated individuals [Barron, 1955; Guilford, 1956] to the interaction between individuals, that is, creativity at the group and organizational level [Drazin et al., 1999; Williams and Yang, 1999].

Williams and Yang [1999] state that “individual creativity and group creativity are two different beasts” [p. 377]. Individual views of creativity focus on creative persons and their personality [Barron and Harrington, 1981; Martindale, 1989], cognitive abilities such as thinking styles [Wallach and Kogan, 1965; Guilford, 1967; 1983; Plucker and Renzulli, 1999], motivation [Amabile, 1983], and knowledge [Amabile, 1988]. Prominent examples are tests of divergent thinking as proposed by Guilford [1956] or the study of the biographical and historical backgrounds of persons who showed outstanding creativity [Galton, 1869; Simonon, 1975]. Williams and Yang [1999] state that drawing conclusions from such psychometric studies for organizational creativity is problematic. The phenomenon they refer to has been labeled as *can* versus *will* distinction by Hunt [1995]. Put simply, the performance of an individual in a laboratory situation does not necessarily allow conclusions with regard to the same individual’s creative performance in the complex setting of an organization.

Consequently, individual views have then been further elaborated on in systems views, which focus on the individual in a context [Gruber, 1986; Csikszentmihalyi, 1988; Williams and Yang, 1999]. Such perspectives account for the problem that the individual perspectives tend to neglect the relationship between creative persons and their environment. That is, "the creative process is perceived as taking place within the context of a particular environment rather than in a vacuum" [Williams and Yang, 1999, p. 379]. Systems views thus posit that creative products are the result of a process that takes place in a complex setting. However, they still treat creativity as an "individualized phenomenon" [Williams and Yang, 1999, p. 379] rather than a complex interplay of various actors. Consequently, the scope of research on creativity was extended to the group and, later, to the organizational level.

At the group level, various characteristics of successful creative groups have been identified. Important characteristics are leadership, group composition, group structure, cohesiveness, and resource availability [King and Anderson, 1990; Payne, 1990]. Generally, creative groups should be heterogeneous and not too large [Amabile, 1998] and leadership should be democratic and collaborative, so as to allow for maximal creative performance [King and Anderson, 1990].

At the organizational level, creativity has been related to critical organizational influences [Amabile et al., 1996; Amabile, 1998; Ekvall and Ryhammer, 1999; Ryhammer and Smith, 1999; Williams and Yang, 1999; Runco, 2007]. Ryhammer and Smith [1999] identify organizational structure, culture, climate, resources, workload pressure, and leadership style as critical organizational influences on creativity. Amabile [1996] suggests a model comprised of five environmental components that impact organizational creativity, namely, encouragement of creativity, autonomy, resources, pressures, and organizational impediments to creativity. Yet, it has been asserted that relatively few variables at the organizational level have been considered in creativity models [Drazin et al., 1999; Styhre and Sundgren, 2005]. Some authors have discussed in more practical terms how organizational creativity can be managed. Perry [1995], for example, discusses the corporate culture of small organizations that fosters creativity and innovation. The issues discussed as conducive to creativity and innovation include the recruitment of people with appropriate personal and creative skills, the implementation of flat hierarchies, fostering of intrinsic motivation, rotating project leadership, cross-fertilization, and an innovation process comprised of these stages: understand, observe, visualize, implement, and evaluate.

Taking off from theories focusing on either the individual, group, or organizational level, so-called multilevel models [DiMaggio, 1991; Giddens, 1994] have emerged. It has been asserted that theoretical models of organizational creativity should consider multiple levels of analysis [Drazin et al., 1999; Borghini, 2005]. In one of the first multilevel models of organizational creativity Woodman et al. [1993] argue that at an organizational level creativity is "a function of the creative outputs of its [the organization's] component groups and contextual influences" [p. 296]. Thus, their multilevel, interactionist model describes organizational creativity as a complex interplay of individual creativity, group creativity, and organizational creativity that have an impact on the creative process and, therefore, on the creative product. Drazin et al. [1999] write that "Woodman et al. [1993] offer the most comprehensive theoretical model, linking culture, resources, technology, strategy, and rewards to organizational creativity" [p. 288]. Similarly, Borghini [2005] states that "at present only the model proposed by Woodman et al. [1993] offers a broad vision of the problem that approaches a systemic view" [p. 22].

Another way to look at research on creativity is with regard to the 4-Ps model introduced in the previous section. Research on the creative person focuses on the abilities of individuals as described above as well as personality factors and biographical backgrounds. Research on the creative process focuses on questions relating to creative problem solving. It can be roughly distinguished between two strands of research: the basic stage model and sub-process views of the creative process. Wallas [1926] states that the creative process is comprised of the basic stages of preparation, incubation, illumination, and evaluation. However, there has been a considerable debate on whether the model sufficiently describes the creative process. As a consequence, sub-process models of the creative process emerged, which focus on different processes involved in creativity, such as knowledge retrieval, ideas association, or synthesis [Finke et al., 1992]. Various studies suggest that deliberately nurturing the creative process can lead to a substantial improvement of creative performance [e.g., Massetti, 1996a]. Those who do research on the creative product explain the nature of the outcome of the creative process and discuss the measurement thereof. O'Quin and Besemer [1989], for example, identify common characteristics of creative products and propose a measurement scale, called the Creative Product Semantic Scale (CPSS), consisting of the dimensions novelty, resolution, and elaboration and synthesis. Research on the creative process investigates the relationship between humans and their environment. This type of research, thus, typically focuses on the organizational level as explained above.

Having briefly discussed different literatures on creativity and their development over the last decades, in the following we provide a detailed analysis of IS studies that have investigated the phenomenon of creativity from different angles.

III. LITERATURE ANALYSIS

Search Process

Research papers published in a discipline's top-tier journals constitute some of the most prominent and lasting academic artifacts and define the discipline they represent [Nevo et al., 2009]. In order to investigate the role of creativity in IS research, therefore, we included the six plus two top-ranked pure IS journals as proposed by the Association for Information Systems (*Senior Scholars' Extended Basket of Journals*) [Association for Information Systems, 2007; Lin and Gregor, 2009] into our literature analysis. The basket includes the *European Journal of Information Systems* (EJIS), the *Information Systems Journal* (ISJ), *Information Systems Research* (ISR), the *Journal of the Association of Information Systems* (JAIS), the *Journal of Information Technology* (JIT), the *Journal of Management Information Systems* (JMIS), the *Journal of Strategic Information Systems* (JSIS), and *Management Information Systems Quarterly* (MISQ). In order to obtain a longitudinal view of IS research on creativity-related phenomena, we considered all issues of the searched journals. In the case of MISQ, for example, these range from 1977 to 2009 (compare Table 1). The search strategy followed suggestions made by vom Brocke et al. [2009] and was based on a keyword search for "creativity" in the title, keyword, and abstract fields. Choosing this rather broad search approach is justified by our objective of obtaining a comprehensive overview of the discussion of creativity within the IS discipline. We collected the data using the electronic library databases *Business Source Premier* via *EBSCOhost*, *ABI/INFORM Global* via *ProQuest*, and *Science Direct*. Table 1 provides an overview of the results of this process. It has to be noted that the numbers of journal items listed in Table 1 refer to the number of delimited elements as hold ready by the searched databases. These include editorial comments, executive overviews, and opinions. A complete list of all retrieved elements can be found in the Appendix.

The literature search shows that, in average, less than 0.5 percent of the articles published in our top-tier journals focus on creativity-related topics. At the time of our search, the JIT, for instance, had never printed an article on this topic. Relatively low numbers of publications on a particular topic are not unusual for the IS discipline, which is generally "represented through a large number of research themes" [Sidorova et al., 2008, p. 473]. However, given the undisputable role of creativity for contemporary organizations [Florida, 2002; Amabile and Khair, 2008], we argue that relatively few papers investigate creativity-related topics from an IS perspective. This also becomes apparent in studies on the intellectual core of the IS discipline [Sidorova et al., 2008; Nevo et al., 2009]. Nevo et al. [2009], for example, identify the focal IT artifacts and IS themes addressed in ISR and MISQ until 2006. In addition to twelve explicitly named types of IT artifacts, the authors also cluster several types of IT systems "with only a limited representation within the dataset" [Nevo et al., 2009, p. 229]. Creativity support systems constitute one of these artifacts.

Table 1: Overview of Literature Analysis

Journal	Coverage (volume/issue)	Journal items	Hits	Relevant hits	Relevant hits (%)
EJIS	1991 (1/1)—2009 (18/4)	717	3	1	0.14%
ISJ	1991 (1/1)—2009 (19/6)	435	2	2	0.46%
ISR	1990 (1/1)—2009 (20/3)	463	3	2	0.43%
JAIS	2000 (1/1)—2009 (10/9)	203	3	2	0.99%
JIT	1986 (1/1)—2009 (24/4)	740	2	0	0.00%
JMIS	1984 (1/1)—2009 (26/2)	977	15	14	1.43%
JSIS	1991 (1/1)—2009 (18/4)	557	3	1	0.18%
MISQ	1977 (1/1)—2009 (33/4)	1367	11	5	0.37%
Total:		5459	42	27	0.49%

Process of Analysis

The literature analysis process was twofold. At the outset, the first two authors of the present study individually classified the retrieved papers with regard to the six analytical dimensions. In a second run, the individual results were consolidated in a collaborative effort. This process included the identification of papers irrelevant for this study, that is, papers where creativity is discussed only superficially. It became apparent that in some cases IS researchers just use the notion of creativity without actually discussing the concept. For example, Vandenbosch and Higgins [1996], in their study on information acquisition and mental models, write that executive support systems "may be able to challenge fundamental assumptions and help to build new mental models if executives scan through them to help formulate problems and foster creativity" [p. 198]. The role of creativity, however, is neither discussed in depth nor does it become part of the research model. Similarly, the seminal paper of Hevner et al. [2004] on design

research was also put forth by our search pattern, although it does not actually deal with creativity but constitutes a mere methodological paper. Consequently, both papers were not included in the in-depth analysis of the literature. Moreover, the set of elements retrieved by our search includes two executive overviews [Masseti, 1996b; Lee, 2000]. Since the related research articles also belong to the set of retrieved items, we classified both executive overviews as irrelevant to our analysis. The authors of the present study agreed on a total number of fifteen papers produced by the keyword search as not being relevant to the study. This left twenty-seven papers to be analyzed in depth.

In the following, we provide a more detailed description of the six dimensions that lead the literature analysis process. Figure 1 provides a graphical representation of this analytical framework.

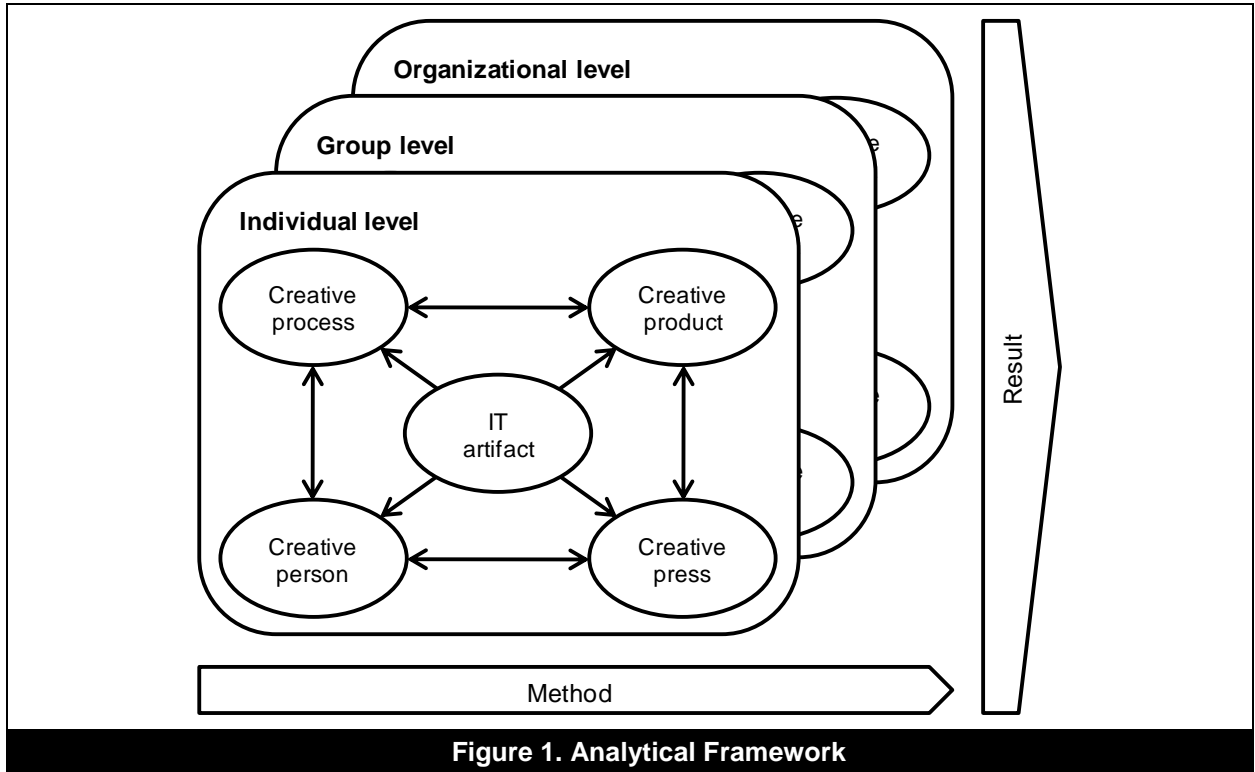


Figure 1. Analytical Framework

Analytical Dimensions

Dimension 1: 4-Ps Perspectives

Couger et al. [1993] state that the above discussed 4-Ps model provides a good structure for understanding creativity, as well as its application in the IS discipline. “The model’s simplicity allows for the individual measurement and assessment of each component as well as the evaluation of the interaction of the components” [Couger et al., 1993, p. 378]. In the present study, the 4-Ps model is applied in order to identify a study’s focus perspectives on creativity. Though all four components have to be considered when taking in a holistic view on the phenomenon of creativity, research often considers only a subset of the model’s elements. In order to determine this classification we characterize a paper’s main constructs/concepts in terms of their relation to the process, the product, the person, or the press component of creativity.

Dimension 2: Level of Analysis

As discussed before, it has been asserted that research on organizational creativity can consider different levels of analysis, namely, the individual, the group, and the organizational level [Borghini, 2005]. The distinction between different levels of analysis is not new to the IS discipline; in their efforts to uncovering the intellectual core of the IS discipline, Sidorova et al. [2008] identify that IS research has investigated IT artifacts at the level of individuals, groups, organizations, and markets. Accordingly, we apply this dimension to explain at what levels of analysis IS researchers have investigated creativity-related topics. However, it must be noted that the market view did not occur in our analysis and will thus not be further elaborated on.

Dimension 3: Role of the IT Artifact

Due to its central role in IS research [Benbasat and Zmud, 2003; Weber, 2003; Nevo et al., 2009], our analytical framework also considers the IT artifact and its treatment in the analyzed literature. For this purpose, we adopt a framework proposed by Orlikowski and Iacono [2001] (compare Akhlaghpour et al. [2009] for a recent follow-up on the original study). Orlikowski and Iacono [2001] identify fourteen different conceptualizations of information technology (IT) in the IS literature. These are further clustered into five broader views on the IT artifact, namely the tool view, the ensemble view, the nominal view, the computational view, and the proxy view. For our literature analysis only the former three views and a subset of related conceptualizations turned out to be relevant. In the following, therefore, we will only sketch these categories. For a detailed description of the remaining views and conceptualizations, compare Orlikowski and Iacono [2001] or Akhlaghpour et al. [2009].

The tool view suggests that technology is “the engineered artifact, expected to do what its designers intend it to do” [Orlikowski and Iacono, 2001, p. 123]. The IT artifact as the independent variable is conceptualized as a black box, and in the center of interest is the dependent variable, which is affected, altered, or transformed by the tool. The tool view manifests in two different ways within the analyzed literature: technology is conceptualized as either a means for enhancing the productivity of individuals, groups, or entire institutions (productivity) or as a medium that alters or enhances the way humans and organizations process information (information processing).

The ensemble view on technology emphasizes the dynamic interactions between people and IT artifacts in various contextual settings. Questions of how technologies emerged in their current form or how technologies come to be used are relevant to studies of this kind. The only conceptualization that surfaced in the analyzed studies is that of technology as an artifact in formation (development project). “The focus is on the social processes of designing, developing, and implementing technical artifacts, usually in specific organizational contexts” [Orlikowski and Iacono, 2001, p. 126].

The nominal view of technology constitutes a classification for studies that refer to IT either incidentally or in terms of providing background information to the aspect in focus. “The conceptual and analytical emphasis is elsewhere, typically focused on a range of topics of broad interest to the IS field” [Orlikowski and Iacono, 2001, p. 128].

It is hoped that explicating the different conceptualizations of the IT artifact can substantially help to explain the nature of IS research on creativity. Assessing the relationship between the IS discipline’s core concept [Benbasat and Zmud, 2003] and creativity-related phenomena is thought to mark off our discipline’s main contribution to research on creativity.

Dimension 4: Research Model/Framework

Having identified the perspectives on creativity that studies consider (process, product, person, press) as well as the conceptualization of the IT artifact, we also ask for the different roles of these components in a study’s research framework. The two dimensions are complementary and allow us to draw a rather detailed picture of the research models/frameworks underlying a study. First, variables can be process-related, person-related, product-related, or pertain to the creative press or environment. Garfield et al. [2001], for example, write: “There were four independent variables in this experiment: two measures of individual characteristics (personality type and creativity style), plus two process variables (creativity technique and stimuli from ‘other participants’) that were actively manipulated” [p. 327]. They further state: “The dependent measures in this experiment were the number of novel ideas and the number of PM [paradigm-modifying] ideas that were typed into the software by each subject” [p. 328]. Obviously, their study employs process-related and person-related constructs as independent variables and product-related constructs as dependent variables. Second, the IT artifact can be both an independent and a dependent variable. An example for the former case is a study that investigates the use of an IT system and focuses on how it impacts the creative performance of individuals or groups. Conceptualizing the IT artifact as a development project [Orlikowski and Iacono, 2001] and investigating the impact of work experience on the level of creativity in this process can be seen as an example of the latter.

In some cases, the roles of the different concepts are explicitly named; this is typically the case in laboratory experiments or other hypothesis testing research. In other cases, they can be inferred from the context of a study’s research objective. However, there are papers that are not amenable to this type of classification since they study the phenomenon of creativity independent of any form of impact analysis. For these studies we abstain from stating any form of artificial research framework but leave the corresponding dimension undefined.

Dimension 5: Research Method

It is further deemed relevant to identify the research methods that are typically used in order to investigate creativity-related phenomena in the IS discipline. It can be distinguished among qualitative, quantitative, and mixed method

studies [Creswell, 2003]. Typical methods in qualitative research are the grounded theory method [Glaser and Strauss, 1967], case study research [Benbasat et al., 1987], action research [Susman and Evered, 1978], or ethnographies [Myers, 1999]. Typical quantitative methods are laboratory experiments [Campbell and Stanley, 1963] or surveys [Babbie, 2001]. Quantitative studies usually make use of formal hypotheses, whereas qualitative methods are often used in rather exploratory research that aims at understanding and explaining complex social phenomena [Creswell, 2003]. Mixed methods combine qualitative and quantitative methods. Moreover, there has been a wide discussion on an emergent research field in the IS discipline called design research [Hevner et al., 2004; Vaishnavi and Kuechler, 2008]. Design research aims at developing new and purposeful artifacts that “extend the boundaries of human and organizational capabilities” [Hevner et al., 2004, p. 75].

Dimension 6: Results of Research

Research can have various results. While some studies generate theories, other studies test theories. Gregor [2006] proposes to distinguish five major types of theories in IS: theory for analysis, theory for explaining, theory for predicting, theory for explaining and predicting, and theory for design and action. Moreover, design research focuses on developing and evaluating system designs, or producing prescriptive design guidelines [Hevner et al., 2004]. The latter one may take the form of design theories [Gregor and Jones, 2007]. However, some studies do not fit into this schema since they do not generate or test any form of theory. These studies can be classified as generating merely descriptive statements.

Table 2 recapitulates all six analytical dimensions and the corresponding items applied for paper classification.

Table 2: Analytical Dimensions		
Analytical dimension	Items	Description
4-Ps perspectives	Creative person, creative process, creative product, creative press	The 4-Ps are commonly accepted components of creativity and refer to different perspectives research may take in when analyzing creativity-related phenomena.
Level of analysis	Individual level, group level, organizational level	Research can focus on creativity at different levels of analysis.
Role of the IT artifact	Tool view (productivity/information processing), ensemble view (development project), nominal view (absent)	IS research is particularly characterized by the study of the IT artifact. There is a number of different views (and conceptualizations) researchers have taken onto the IT artifact [Orlikowski and Iacono, 2001].
Research model/framework	Dependent and independent variables (product-, process-, person-, or press-related)	This dimension aims to provide an overview of which constructs/ concepts are typically used as dependent/independent variables. There is a close relationship to the 4-Ps dimension as constructs may pertain to different components of creativity. Moreover, the IT artifact can refer to one of the components and thus also take in a dependent or independent role.
Research method	E.g., conceptual paper, case study, controlled laboratory experiment, field study, design research, action research	This dimension aims to provide an overview of the different types of research methods that are applied to study creativity-related phenomena in the IS discipline.
Result of research	Descriptive statements, explaining and predictive statements, prescriptive statements, methodological statements, designed artifact, tested hypotheses	The analyzed studies provide different contributions to the IS body of knowledge. These range from empirically tested, explanatory and predictive theory to design guidelines or prototypical IT systems.

IV. FINDINGS

In the following, we present the results of our literature analysis. Table 3 and Table 4 provide a detailed overview of the classifications of all twenty-seven papers that were examined in depth. We first describe the findings with regard

to the above introduced analytical dimensions individually before we then provide a more holistic picture by identifying dominant patterns of IS research that investigates creativity-related phenomena.

Findings Regarding the Analytical Dimensions

4-Ps Perspectives

Studies were classified as focusing on process, product, person, or press when related concepts and constructs are explicitly discussed and considered in the underlying research designs. That is, we aimed at identifying a study's *focus*. It becomes noticeable that often the relevance of all 4-Ps is discussed, but the actual research designs consider only a selection of these. Easton et al. [1990], for example, discuss a research model that is comprised of constructs pertaining to all 4-Ps, but their experimental design then considers only process- and product-related variables. Nagasundaram and Bostrom [1994] write: "While we have emphasized the importance of all four components of the creativity framework, we consider person, process, and product to constitute the core, and have chosen to focus on the interactions among these components in a given context, while controlling for press" [p. 99]. Satzinger et al. [1999] explicitly state that their study "focuses on the impact of creative processes on the product" [p. 145] even though they also acknowledge the relevance and interrelatedness of all 4-Ps.

With the exception of one study, all reviewed papers consider the creative process. The one exception [Dean et al., 2006] explicitly focuses on the measurement of creative products. The creative process is considered in a variety of ways. Nagasundaram and Bostrom [1994], for example, apply a research framework that reflects our notion of process-related concepts: "The creative process is represented via the metaphor of a lens that causes the person with a preferred creativity style to generate ideas" [p. 99]. Here, the process component also comprises creativity techniques as well as process-enabling or -supporting IT systems [Nagasundaram and Bostrom, 1994]. Accordingly, we classified the study of Couger et al. [1993] as process-related, since the authors discuss how different creativity techniques can be used in order to solve IS-related problems. However, the majority of studies classified as process-related focus on the enabling or supporting impact of IT systems on the creative process [e.g., Elam and Mead, 1990; Nagasundaram and Bostrom, 1994; Massetti, 1996a]. Elam and Mead [1990], for example, compare the use of no software with the use of two different types of software. The study of Weber [1986] dwells on both the impact of problem solving strategies and the use of IT systems (namely, decision support systems) on managers' creative capabilities.

The majority of studies (twenty) also considers the outcome (or creative product). Examples include studies that measure the impact of creativity support systems [e.g., Massetti, 1996a] or decision support systems [Elam and Mead, 1990] on individual creativity. Variables include creativity of response [Elam and Mead, 1990] or novelty and value [Massetti, 1996a]. As indicated, Dean et al. [2006] dedicate their paper to the investigation of how creativity has been measured in IS studies. They propose a method for the evaluation of ideas with regard to four dimensions, namely novelty, workability, relevance, and specificity.

Studies were classified as considering the creative person when there is evidence of concepts pertaining to the individual such as the creativity style (innovator vs. adaptor) in Garfield et al. [2001] or task motivation, knowledge, and cognitive factors in Cooper [2000]. This way thirteen studies could be identified that explicitly consider the creative person, that is, constructs pertaining to traits and abilities thereof. Elam and Mead [1990], for example, use an independent creativity measurement in order to yield a baseline creativity score for each of their subjects and the experiment of Schenk et al. [1998] distinguishes participants by their work experience (novices vs. experts).

Finally, we identified only three studies that explicitly address the creative press, or environment [Cooper, 2000; Lee and Choi, 2003; Aaen, 2008]. Cooper [2000], for example, considers organizational characteristics (culture, resources, rewards) that impact on individual and group creativity. Lee and Choi [2003] state that organizational culture, structure, people, and IT are incorporated into their research model; however, their focus is on knowledge management and knowledge management processes rather than on creativity.

Summarizing, our study suggests a clear tendency of creativity-related IS studies published in top-ranked journals to focus on process and product. Fewer studies also consider the individual traits and abilities of creative persons and even less studies consider the context in which the creative process is carried out. Only three studies were identified where the focus is on all four components of creativity [Cooper, 2000; Lee and Choi, 2003; Aaen, 2008].

Levels of Analysis

While in most cases (twenty-four) we were able to classify the studies regarding the chosen level of analysis, in some cases the lines turned out to be somewhat blurred; that is, constructs relating to different levels are employed in a single study. Santanen et al. [2004], for example, in their study of causal relationships in creative problem



solving, develop the cognitive network model, which rests on the individual level. However, they conduct an experiment in groups of four participants in order to test the model. The study was thus classified as pertaining to both individual and group levels. A single study applies a research design that addresses concepts on all three levels [Cooper, 2000], and one study does not refer to any level since it exclusively focuses on the measurement of creative products [Dean et al., 2006].

Among the studies we assessed, we identified a clear tendency toward aiming at the individual (eleven) and group (ten) levels. Hender et al. [2002], for example, empirically examine the effects of different creativity techniques implemented in a group support system. "Treatments were administered to groups, but the unit of analysis for this study was the individual" [Hender et al., 2002, p. 71]. At the same level of analysis, Lilley [1992] discusses the impact of executive IS on the creativity of senior managers. The paper of Tiwana and McLean [2005] provides an example for an IS study dealing with creativity at the group level. In their field study, they analyze how the integration of expertise held by individual team members aids the creativity of IS development teams.

Only three papers [Lee-Partridge et al., 2000; Lee and Choi, 2003; Datta, 2007] conduct research at a mere organizational level. However, none of these has its primary focus on creativity. Datta [2007] develops a model of organizational knowledge management processes. Organizational creativity is realized as an important prerequisite for transforming knowledge into innovation. Similarly, Lee and Choi [2003] develop a research model that interconnects knowledge management factors. "Organizational creativity was found to be critical for improving performance" [p. 179]. To the same extent, creativity plays an inferior role in the case study of Lee-Partridge et al. [2000]. Here, encouraging IT innovation and creativity is highlighted as one of four key management success factors.

Summarizing, the analyzed IS studies on creativity-related phenomena primarily conduct research at the individual and group level. For studies that choose the organization as their level of analysis, creativity is just one among many factors considered. We were able to identify only one study [Cooper, 2000] that considers all levels simultaneously.

Role of the IT Artifact

Our literature analysis reveals that only three out of Orlikowski and Iacono [2001]'s five views on the IT artifact are present within the analyzed IS studies on creativity and related phenomena. Moreover, as opposed to the findings of Orlikowski and Iacono [2001], the IT artifact is not primarily absent in these studies; in fact, the majority of studies (eighteen) employs a mere tool view of IT. Twelve of these examine how IT impacts on the creative capabilities of individuals or groups (productivity). Massetti [1996a], for instance, conducts a laboratory experiment with two creativity support systems to measure their influence on the number and novelty of ideas generated by individuals. Nagasundaram and Bostrom [1994] examine how factors such as individual creative style and the use or non-use of group support systems impact on the creative output of groups. Four studies from the tool view category do not focus on the impact of an IT artifact on productivity in terms of the creative output, but on the creative process as such (information processing). Nunamaker et al. [1987] examine how an electronic brainstorming tool facilitates or inhibits the idea generation process in a group planning session. Two of the tool view studies examine the IT artifact's impact on both productivity and on the process of information processing. One of these papers is the study of Elam and Mead [1990], where the authors empirically test two hypothesis that relate the use of a creativity-enhancing decision support system to the number of steps taken in a decision process (information processing) and the creativity level of the generated responses (productivity).

Four out of the twenty-seven analyzed papers employ a pure ensemble view by analyzing the role of creativity in the context of system development projects. A prototypical study of this kind is the paper of Schenk et al. [1998] who examine the differences in problem solving approaches of expert and novice system analysts to derive techniques for supporting the latter. Just two studies treat the IT artifact as nominal. Couger et al. [1993] present the findings of six case studies on the use of creativity techniques to solve various IS-related problems. The paper does not provide any reference to a concrete IT artifact. The same holds for Dean et al. [2006], who derive a framework from the literature on how to measure creativity.

Although the majority of the analyzed papers were amenable to a clear-cut categorization regarding the focal view on the IT artifact, three studies defy this attempt. These papers examine the impact of an IT system on the creative capabilities of a group in the context of a software development project. Thus, they equally take in a tool view and an ensemble view on the IT artifact. Ocker et al. [1995; 1998], for instance, assess the suitability of different modes of computer-mediated communication for the upstream portions of a software development project.

Summarizing, it becomes apparent that creativity-related IS studies tend to emphasize the role of the IT artifact. At this, there are two views of the IT artifact that account for the majority of the analyzed studies. Tool view

conceptualizations are the preeminent perspective on the IT artifact. The second largest group of studies takes in an ensemble view.

Research model/framework

Though we were able to derive a research framework from most of the analyzed studies, six papers [Weber, 1986; Nunamaker et al., 1987; Lilley, 1992; Couger et al., 1993; Lee-Partridge et al., 2000; Dean et al., 2006] turned out to be not amenable to this kind of categorization. Altogether, nineteen out of the remaining twenty-one categorized studies employ product-related constructs as the dependent variable. Typical variables include novelty, value, creative performance [e.g., Massetti, 1996a], or the number of ideas generated [e.g., Garfield et al., 2001]. One exemption can be found in Avital and Te'eni [2009] where generative capacity is introduced as the dependent variable that shifts the emphasis from the outcome of creative production to the human's capacity of acting creatively. Generative capacity is defined as "an attribute of a person, which refers to one's ability to reframe reality and subsequently to produce something ingenious or at least new in a particular context" [Avital and Te'eni, 2009, p. 346].

As often as dependent variables are related to the creative product our outcome, independent variables are related to the creative process. Typical constructs refer to the use of IT in order to support the creative process. Massetti [1996b], for example, uses alternative types of creativity support (generative creativity support systems, explorative creativity support systems, pen and paper, *Harvard Graphics* treatment) in order to support the creative process and impact on the creative production (product). Except for the aforementioned study by Avital and Te'eni [2009], all other studies that treat the process as an independent variable also employ product-related dependent variables. Thus, an input → process → output model is preeminent in the investigated studies. Moreover, the majority of studies (eighteen) that treat the process as the independent variable employ a tool-view (productivity or information processing) of the IT artifact.

Some studies (ten) also treat the process as a dependent variable. Cooper [2000], for example, assesses improving and constraining factors on the creative process of requirements development and logical design. Easton et al. [1990] apply a research model that aims at examining the effect of two different electronic meeting systems. "The model presents four classes of independent variables, each of which is hypothesized to affect group process and group outcomes directly" [Easton et al., 1990, p. 89].

In nine studies, person-related constructs appear in an independent role. These studies refer to personal traits in terms of "cognitive style" [Garfield et al., 2001, p. 325], "depth and breadth of knowledge, ... intrinsic motivation" [Cooper, 2000, p. 259], or "T-shaped skills" [Lee and Choi, 2003, p. 193]. Interestingly, there are only two cases where person-related constructs are treated as the dependent variable. The aforementioned paper of Avital and Te'eni [2009] analyzes the impact on a person's generative capacity and Aaen [2008] introduces a software development infrastructure and method that, inter alia, are meant to change persons' "mental models" [p. 546].

Press-related constructs play an even lesser role than person-related constructs within the analyzed research frameworks. Two studies exhibit a relation to an organization's environment within their independent constructs. Cooper [2000] formulates propositions that, inter alia, consider the impact of "organizational cultures ..., reward structures, [and] ... group norms" [p. 259]. Lee and Choi [2003] apply a research framework that considers the effects of cultural aspects such as collaboration, trust, and learning. On the dependent side, just Aaen [2008] analyzes the impact of two IT artifacts on project innovation, being "changes in the context, where products or services are produced" [p. 545].

Summarizing, there is the predominant pattern of process-related independent and product-related dependent variables among the analyzed research frameworks. These studies tend to employ a tool-view of IT; that is, IT is used in order to facilitate the creative process. To a less, but also noteworthy extent, process-related constructs appear as dependent and person-related constructs take in the role of independent factors. Person-related dependent variables and press-related variables play a rather negligible role in the analyzed studies.

Results of Research

Regarding the results of research, we can broadly distinguish among rather descriptive studies, prescriptive studies that provide normative guidance, and studies that aim at providing and testing explaining and predictive statements. The majority (sixteen) of the analyzed studies belong to the latter kind. Thirteen out of these sixteen studies also test related hypotheses. Hender et al. [2002], for example, find significant differences between the creativity of ideas generated by applying different creativity techniques. Similarly, Massetti [1996a] tests the impact of two creativity support systems on individual creativity and finds "that responses generated with software support are significantly more novel and valuable than responses generated by pen and paper" [p. 83].



Four studies were identified that provide prescriptive statements. In one case, explicit design guidelines for the development of decision support systems are developed that provide the basis for the deviation of hypotheses and a subsequent testing of these [Elam and Mead, 1990]. In three cases [Weber, 1986; Lilley, 1992; Avital and Te'eni, 2009], the results of research were classified as mere prescriptive statements. Avital and Te'eni [2009], for example, derive a set of design directives that are meant to inform IT systems designs providing a high level of generative fit. Two studies work on a merely descriptive level. Lee-Partridge et al. [2000] discuss four key success factors in managing IT derived from a case study at the Port of Singapore Authority. Nunamaker et al. [1987] report the results of research on the use of a group decision support system gained from observations within a planning and decision laboratory. They classify their study as being "descriptive in nature" [p. 6]. Moreover, we classified the study of Couger et al. [1993] as contributing both descriptive and prescriptive statements. The authors' main contribution is the description of six case studies on the application of different creativity techniques in the context of IS-related problems. In addition, they conclude their study with a set of recommendations of how and where to use creativity techniques in an IS context.

There are four studies that deviate from the categorization scheme applied above. Initiated by the study of Massetti [1996a], Wierenga and Van Bruggen [1998] as well as Massetti [1998] take on a discussion on the role of idea fluency in the measurement of individual creativity. The results of their papers have thus to be regarded as methodological statements. Due to the chosen method of design research, the main contribution of Aaen's [2008] study is seen in the generation of novel artifacts. Finally, Dean et al. [2006] develop measures and scales for creativity.

Summarizing, there is a tendency that creativity-related IS studies work at the level of explaining and predictive statements; that is, theories are developed and tested that explain causality, but also make predictive statements, typically in the form of testable hypotheses.

Research Methods

While the analysis shows that a rather broad range of research methods is used in order to study creativity-related phenomena in IS research, the major part of the analyzed studies falls into one of three categories: controlled laboratory experiments (eleven), conceptual papers (seven), and case studies (four). A predominant issue examined within laboratory experiments is the impact of IT systems for group work (electronic meeting systems, group support systems, groupware) on the creative capabilities of groups and individuals [e.g., Easton et al., 1990; Ocker et al., 1995; Satzinger et al., 1999; Garfield et al., 2001]. In addition to the eleven studies applying a laboratory experiment, two conceptual papers discuss methodological issues related to this type of research [Massetti, 1998; Wierenga and Van Bruggen, 1998].

The remaining five conceptual papers discuss the impact of IT systems on productivity [Nagasundaram and Bostrom, 1994; Avital and Te'eni, 2009] and information processing [Weber, 1986; Lilley, 1992; Datta, 2007] at three levels of analysis (individual, group, and organization). Similarly, the four case studies operate on all levels of analysis and produce the whole range of research results ranging from rather descriptive or prescriptive statements [Couger et al., 1993; Dennis et al., 1993; Lee-Partridge et al., 2000] to explaining and predictive statements [Cooper, 2000].

Out of the remaining five papers, one paper can be labeled design research [Aaen, 2008], one paper uses a questionnaire for hypotheses testing [Lee and Choi, 2003], one paper employs action research [Dean et al., 2006], one paper is based on participant observation [Nunamaker et al., 1987], and Tiwana and McLean [2005] conduct a field study.

Summarizing, while IS researchers have employed different qualitative and quantitative methods to study creativity-related phenomena, there is a tendency toward using laboratory experiments to investigate the impact of IT systems on individual and group creativity.

Patterns of Creativity-Studies in the IS Discipline

While the previous section provided a rather detailed analysis with regard to the six analytical dimensions, the general nature of IS studies on creativity warrants further investigation. Therefore, we question whether there are certain patterns occurring in these studies. As the IS discipline is deemed to be "premised on the centrality of information technology in everyday socio-economic life" [Orlikowski and Iacono, 2001, p. 121], it will be particularly interesting to consider the role of the IT artifact in order to identify such patterns. Our analysis of twenty-seven papers helped us identify two major, and quite distinct, types of studies. In the following, we discuss each type and provide details on how studies that belong to that type can be further described and detailed.

First, the predominant type of IS studies on creativity can be framed as applying a tool view of the IT artifact and treating the creative process as the independent and the creative product as the dependent variable (Pattern 1). Thus, the use of IT is typically considered as the (process-related) independent variable; that is, the IT artifact is typically conceptualized as enabling the creative process. Types of IT that are investigated as enabling the creative process include individual creativity support systems [Masseti, 1996a; 1998; Wierenga and Van Bruggen, 1998], group support systems [Nagasundaram and Bostrom, 1994; Ocker et al., 1995; Shepherd et al., 1995; Ocker et al., 1998; Satzinger et al., 1999; Hender et al., 2002; Santanen et al., 2004], (group) decision support systems [Weber, 1986; Nunamaker et al., 1987; Elam and Mead, 1990], and electronic meeting systems [Easton et al., 1990; Dennis et al., 1993]. It also becomes apparent that these studies investigate creativity at the individual or group level. We identified a total of fifteen papers adhering to this pattern (compare Pattern 1 in Table 3 and Table 4). The analysis of the literature further revealed that the majority of these studies (ten) use laboratory experiments as the research method.

Second, we could identify a research pattern that can be framed as applying an ensemble view and treating the creative process as the dependent variable (Pattern 2). Thus, these studies investigate creativity in IS development processes. We identified the rather small number of five papers that adhere to this pattern. However, this figure has to be assessed in relation to the segmentation of all studies regarding the view on the IT artifact. Since the outweighing majority of papers apply a tool view, the studies taking in an ensemble view constitute the second largest group (seven). Moreover, we argue that studies of this type deserve to be treated as a different pattern, as they are fundamentally different to the aforementioned studies. While Pattern 1 studies investigate how IT can support creativity as an outcome, Pattern 2 studies investigate how creativity can be used within the process of IS development. Of course, there is not necessarily a contradiction, as IT support for creativity may be used in creative problem solving in IS development, too. This becomes apparent in the two studies that adhere to both patterns, namely Ocker et al. [1998] and Aaen [2008]. Ocker et al. [1998] discuss an experiment where IT is used in order to facilitate creativity in the upstream phases of software development. Similarly, Aaen [2008] discusses how an IT supported environment can facilitate software innovation through allowing changes and adaptations late in the development process. As such, the studies may be seen as supporting the awareness that there are at least two distinct perspectives to look at creativity from an IS point of view.

Of course, there are also studies that do not belong to any of the two patterns. For example, we identified two studies where the IT artifact is only treated superficially [Couger et al., 1993; Dean et al., 2006]. For six out of the nine studies that were not identified as belonging to any of the two patterns, we could not clearly determine what is treated as dependent and independent variables.

Table 3 and Table 4 provide an overview of our data analysis and also show which studies belong to what pattern.

Table 3: Results of Literature Analysis—Dimensions 1–3

Study	4-P perspectives				Level of analysis			View of IT artifact	Conceptualization of IT artifact	Pattern
	Product	Process	Person	Press	Individual	Group	Organization			
Aaen [2008]	X	X	X	X		X		Tool/ensemble	Productivity/development project	1/2
Avital and Te'eni [2009]		X	X		X			Tool	Productivity	N/A
Cooper [2000]	X	X	X	X	X	X	X	Ensemble	Development project	2
Couger et al. [1993]		X				X		Nominal	Absent	N/A
Datta [2007]	X	X	X				X	Tool	Information processing	N/A
Dean et al. [2006]	X						N/A	Nominal	Absent	N/A
Dennis et al. [1993]	X	X				X		Tool	Productivity	1
Easton et al. [1990]	X	X				X		Tool	Productivity/information processing	1
Elam and Mead [1990]	X	X	X		X			Tool	Productivity/information processing	1
Garfield et al. [2001]	X	X	X		X			Tool	Productivity	1
Hender et al. [2002]	X	X			X			Tool	Productivity	1
Lee and Choi [2003]	X	X	X	X			X	Tool	Productivity	N/A
Lee-Patridge et al. [2000]		X					X	Ensemble	Development project	N/A
Lilley [1992]		X			X			Tool	Information processing	N/A
Masseti [1996]	X	X	X		X			Tool	Productivity	1
Masseti [1998]	X	X	X		X			Tool	Productivity	1
Nagasundaram and Bostrom [1994]	X	X	X			X		Tool	Productivity	1
Nunamaker et al. [1987]		X				X		Tool	Information processing	N/A
Ocker et al. [1995]	X	X				X		Tool/ensemble	Productivity/development project	1
Ocker et al. [1998]	X	X				X		Tool/ensemble	Productivity/development project	1/2
Santanen et al. [2004]	X	X			X	X		Tool	Productivity	1
Satzinger et al. [1999]	X	X			X			Tool	Productivity	1
Schenk et al. [1998]	X	X	X		X			Ensemble	Development project	2
Shepherd et al. [1995]	X	X				X		Tool	Productivity	1
Tiwana and McLean [2005]		X	X			X		Ensemble	Development project	2
Weber [1986]		X			X			Tool	Information processing	N/A
Wierenga & Van Bruggen [1998]	X	X	X		X			Tool	Productivity	1



Table 4: Results of Literature Analysis—Dimensions 4–6

Study	Research model/framework								Results of research	Research method	Pattern
	Independent				Dependent						
	Product	Process	Person	Press	Product	Process	Person	Press			
Aaen [2008]		X			X	X	X	X	Designed artifacts	Design research	1/2
Avital and Te'eni [2009]		X					X		Prescriptive statements (design guidelines)	Conceptual paper	N/A
Cooper [2000]		X	X	X	X	X			Explaining and predictive statements	Case study	2
Couger et al. [1993]	N/A				N/A				Descriptive statements, prescriptive statements (to some extent)	Case study (descriptive)	N/A
Datta [2007]		X	X		X				Explaining and predictive statements	Conceptual paper	N/A
Dean et al. [2006]	N/A				N/A				Measures and scales (for creativity)	Literature review, action research, confirmatory factor analysis	N/A
Dennis et al. [1993]		X			X	X			Prescriptive statements	Case study	1
Easton et al. [1990]		X			X	X			Explaining and predictive statements, tested hypotheses	Controlled laboratory experiment	1
Elam and Mead [1990]		X			X	X			Prescriptive statements (design guidelines), explaining and predictive statements, tested hypotheses	Controlled laboratory experiment	1
Garfield et al. [2001]		X	X		X				Explaining and predictive statements, tested hypotheses	Controlled laboratory experiment	1
Hender et al. [2002]		X			X	X			Explaining and predictive statements, tested hypotheses	Controlled laboratory experiment	1
Lee and Choi [2003]		X	X	X	X	X			Explaining and predictive statements, tested hypotheses	Questionnaire-based testing of hypotheses	N/A
Lee-Patridge et al. [2000]	N/A				N/A				Descriptive statements	Case study	N/A
Lilley [1992]	N/A				N/A				Prescriptive statements (too some extent)	Conceptual paper	N/A
Massetti [1996]		X	X		X				Explaining and predictive statements, tested hypotheses	Controlled laboratory experiment	1
Massetti [1998]		X	X		X				Methodological discussion on constructs	Conceptual paper	1
Nagasundaram and Bostrom [1994]		X			X				Explaining and predictive statements	Conceptual paper	1
Nunamaker et al. [1987]	N/A				N/A				Descriptive statements	Participant observation, structured observation, questionnaires	N/A
Ocker et al. [1995]		X			X				Explaining and predictive statements, tested hypotheses	Controlled laboratory experiment	1
Ocker et al. [1998]		X			X	X			Explaining and predictive statements, tested hypotheses	Controlled laboratory experiment	1/2

Table 4: Results of Literature Analysis—Dimensions 4–6

Study	Research model/framework								Results of research	Research method	Pattern
	Independent				Dependent						
	Product	Process	Person	Press	Product	Process	Person	Press			
Santanen et al. [2004]		X			X				Explaining and predictive statements, tested hypotheses	Controlled laboratory experiment	1
Satzinger et al. [1999]		X			X				Explaining and predictive statements, tested hypotheses	Controlled laboratory experiment	1
Schenk et al. [1998]			X		X	X			Explaining and predictive statements, tested hypotheses	Controlled laboratory experiment	2
Shepherd et al. [1995]		X			X				Explaining and predictive statements, tested hypotheses	Controlled laboratory experiment	1
Tiwana and McLean [2005]			X			X			Explaining and predictive statements, tested hypotheses	Field study	2
Weber [1986]	N/A				N/A				Prescriptive statements (too some extent)	Conceptual paper	N/A
Wierenga & Van Bruggen [1998]		X	X		X				Methodological discussion on constructs	Conceptual paper	1

V. A FUTURE RESEARCH AGENDA FOR CREATIVITY IN THE IS DISCIPLINE

Having visited the past of IS research on creativity-related phenomena, we now discuss its future prospects. But let us first revisit the statement made by Couger et al. in 1993: “The subject of creativity is a neglected area in the literature of the Information Systems field” [p. 375]. Is this still true after seventeen years of further research? We argue that the mere number of studies published suggests that creativity has not yet received the attention it deserves. But in order to remedy this deficiency, we need to provide a more detailed picture. In this section, we derive a research agenda for IS research on creativity based on the above discussion of how creativity has been treated in top-ranked IS journals until now, as well as on contemplation of the nature of creativity and its appreciation in our discipline. The six analytical dimensions that were applied for the literature analysis also provide initial guidance for the identification of further research avenues. While we do not claim exhaustiveness in our attempt to identify future research topics, we argue that conspicuous white spots revealed by our analysis can be considered to pinpoint areas that deserve further inquiry. Revisiting the findings in relation to the individual dimensions, the following issues appeared to us to be most interesting:

- Regarding the 4-Ps focus, our study reveals an underrepresentation of research dwelling on person- and—even more prevalent—press-related concepts. However, research on creativity in other disciplines has shown that both person and press are highly relevant to understanding organizational creativity [e.g., Amabile, 1988].
- Regarding the level of analysis, in the set of analyzed papers there are only few studies focusing on the organizational level and not a single study relating to the market level. Also, it turned out that only a limited number of studies applies a multilevel perspective; this is notwithstanding the assertion that research on organizational creativity needs to consider all three levels of analysis [e.g., Woodman et al., 1993; Drazin et al., 1999].
- While Orlikowski and Iacono [2001] discuss five views on the IT artifact that are relevant to IS research, only three of those were used in the analyzed studies (tool, ensemble, nominal).
- The prevalent pattern of IS research on creativity analyzes the impact of IT use (as a process-related variable) on the potential of individuals and groups to generate creative outcomes (product-related variable). Moreover, creativity in the process of IT development is considered only to some extent. Yet, one must assume that there exists a variety of research problems demanding the applications of more diverse frameworks.
- Regarding the results of the analyzed studies, there is a prevalence of so-called variance theories [Webster and Watson, 2002] that incorporate independent variables that impact on dependent variables. At the same time, only few studies attempt to reveal the complex interplay of creativity-relevant concepts in a socio-

technical context. We argue, however, that this perspective in particular can greatly contribute to the understanding of creativity in socio-technical contexts.

- Empirical, qualitative research methods are underrepresented in the set of analyzed studies. Yet, qualitative research can contribute to a better understanding of the complexities of socio-technical contexts and help develop new theory on creativity-related phenomena in the IS discipline [van de Ven and Poole, 1995].

While the IS discipline has produced some remarkable results, we contend that there is much room for twisting the perspective to possible research topics beyond the prevailing patterns. Grounded in the above discussion, in the following we describe three research themes the IS discipline may benefit from, and exhibit how these interrelate, so as to form a future research agenda for our discipline. Similar to the identification of existent research patterns in the preceding section, the role of the IT artifact becomes the guiding dimension in pinpointing two of the three research themes. The third theme surfaced by contemplating on the nature of creativity and argues for overcoming a mere fixation about the IT artifact in creativity-related IS research in favor of the analysis of the socio-technical contexts underlying creativity-related phenomena. It is hoped that the proposed themes will stimulate forthcoming studies on creativity in our discipline.

Opening up the Black Box Around the IT Artifact

The first neglected view on the IT artifact our study reveals is the computational view [Orlikowski and Iacono, 2001]. Research of this type is not “interested in the interaction of people with technology in various social contexts ... [but in] the computational power of information technology” [Orlikowski and Iacono, 2001, p. 127]. An IT system is not regarded as a black box, but research aims at providing a rationale for the effective composition of a system’s components. By referring to the computational view, we by no means argue to waive the creative person from IS research in the context of creative work. Rather, we propose a more inside view of IT systems. While the majority of studies we analyzed investigate the impact of IT on the creative performance of individuals and groups, few studies explain how IT should be designed in order to support the creative process appropriately. In order to complement the prevailing stance of treating the IT system as a given factor, the discussion and implementation of well-informed IT system designs to support creative work will be a valuable contribution. The design research paradigm [March and Smith, 1995; Hevner et al., 2004] has increasingly gained popularity and is argued to provide appropriate means to guide research on this issue. The development of design theory is concerned with “*how to do something*” [Gregor, 2006, p. 628] and refers to form, function, methods, and theoretical knowledge used in IS development [Walls et al., 1992; Gregor and Jones, 2007]. From our own research we have learned that IT systems in creative contexts need to consider person-related variables such as cognitive style, knowledge, and personality factors of the individuals using a system. Moreover, research from different fields including psychology and organization theory has shown that the contextual conditions in which creativity takes place significantly impact creative performance [e.g., Edmonds et al., 2005]. All these factors need to be explicitly addressed when devising IT artifacts that aim at supporting the creative process.

Analyzing the Impact of IT in Creative Processes

The second view of the IT artifact that we did not encounter during our literature analysis is that of the proxy view [Orlikowski and Iacono, 2001]. This view, *inter alia*, focuses on technology as perceived by its users. “Perceptual, cognitive, and attitudinal responses to computers become the critical variable in explaining technology and its effects in the world” [Orlikowski and Iacono, 2001, p. 124]. As opposed to investigating the impact of a given system on creative performance, researchers may focus on humans’ perceptual, cognitive, and attitudinal responses to IT artifacts. The potential of such research becomes paramount against the background of studies on individual creativity that stress the importance of personal factors such as cognitive style, personality, and individual expertise [e.g., Woodman et al., 1993]. Such research has thus the potential to provide insights that, in turn, may inform the design of IT for effectively support creative individuals.

A second conceptualization of the proxy view that will be of interest to IS research on creativity is the understanding of technology as diffusion. This conceptualization of the IT artifact “concentrates on the diffusion and penetration of technologies within firms, industries, and economies” [Orlikowski and Iacono, 2001, p. 124]. This kind of research puts a stronger emphasis on the contextual factors of IT use and tries to understand barriers to its diffusion process. These tend to be caused by organizational or cultural factors [Orlikowski and Iacono, 2001]. Such research will thus pertain to the rather neglected organizational level and also to the market level. Analyzing the diffusion of different types of IT systems that are meant to affect creativity will help to obtain a more distinctive view of the status quo of IT-mediated and supported creative work. Identifying the barriers of the same may also encompass new directions for IS research in the context of creativity.



Understanding the Socio-Technical Contexts in which Creativity Unfolds

Our third research theme argues for the need to go beyond a mere fixation with the IT artifact that is both characteristic of [Sidorova et al., 2008; Nevo et al., 2009] and postulated for [Benbasat and Zmud, 2003; Weber, 2003] IS research and that has so much characterized prior IS research on creativity. Our literature analysis reveals that many of the models proposed by IS researchers are typical variance theories embodying an IT artifact. While such theories incorporate independent variables, causing variation in dependent variables [Webster and Watson, 2002], they usually do not shed much light on the dynamics of the underlying socio-technical processes. Process theories, on the contrary, “use events and states to help explain dynamic phenomena” [Webster and Watson, 2002, p. xix]. Grounded in the awareness that the use of IT impacts on and—even more importantly—is perceived in the context of the creative process, the creative person, the creative product, and the creative press, we consider it relevant to also understand the dynamics of those processes that involve IT. This is in accordance with a more contemporary understanding of the role of IT; the last decade has seen a considerable shift in the relationship among IT, its users, and the processes that underlie its use. Phenomena like Twitter, Wikipedia, or eBay exemplify that the practice of IT use evolves from the technology-focused support of individual or group performance to complex social interactions [Whitworth, 2009; Whitworth and Friedman, 2009]. Rather than being an artifact acting as an independent variable that *makes* things happen, nowadays IT often has to be understood as a medium that *allows* things to happen; it has shifted from being a process-related variable to a context- or press-related variable.¹ The focus on the social component of socio-technical processes becomes even more important when creativity is involved. Creativity is a fundamentally human process, as it is people who are creative in a highly influential environment and technology is one among many impacting factors. We thus strongly believe that the IS discipline can greatly benefit from the development of process theory that explains IT-enabled creative processes. In particular, such knowledge is deemed crucial when organizations seek to manage these processes and deploy the merits of the use of IT. Experimental research based on variance models, however, is typically not capable of catering for a variety of contextual factors.

What else becomes apparent is that such research will require the use of qualitative research methods: “In the same way that a survey contains indicators for the underlying constructs in a variance theory, narrative text contains indicators for an underlying process theory” [Pentland, 1999, p. 711]. The analysis of the literature has shown that case studies in particular are capable of accounting for the complexities impacting on creative processes; notably, the one study we identified that considers all four Ps, as well as all three levels of analysis, uses a case study approach [cf. Cooper, 2000]. Other research methods that can provide suitable means include the grounded theory method [Glaser and Strauss, 1967] and action research [Baskerville and Wood-Harper, 1996].

Interrelationships among the Identified Themes

Based on the identified research themes we now have to answer the following question: How do the three themes interrelate and how can we put forward an agenda for future IS research on creativity-related phenomena? We argue that the track record of IS research in this field tends to put the cart before the horse. The predominant pattern of research revealed by our study examines how a given IT artifact affects the performance of individuals or groups. We contend, however, that there is need for much more fundamental research. In order to effectively support creative processes with IT, research first needs to analyze and understand the nature and contextual conditions of successful creative performance in the socio-technical contexts prevalent in contemporary organizations and societies. We argue that one response will be the development of process theory on creativity in socio-technical contexts. The identified factors can, in turn, trigger the development of well-informed, appropriate IT support for creative work. Such novel IT must then become subject to rigorous scientific evaluation. This assessment needs to go beyond the mere evaluation of individual and group performance; the analysis needs to also consider perceptual, cognitive, and attitudinal responses to the use of IT. Moreover, socio-technical processes have evolved beyond the boundaries of organizations; consequently, IS research must extend the examination to the level of organizations and even markets.

VI. CONCLUSION

This study was motivated by our perception that IS research can make an important contribution to both academia and practice by paying attention to the concept of creativity. We were thus interested in the research problems that our discipline should focus on. This, in turn, required us to first understand the status quo of IS research in this field. We conducted a literature analysis guided by a six-dimensional framework. This analysis framework addresses the initially formulated research questions (RQ1–RQ6) regarding the applied perspectives, the chosen level of analysis, the role of the IT artifact, the structure of applied research models, the applied methods, and the results of research on creativity-related phenomena in the IS discipline. First, our findings suggest that there are considerably little

¹ We thank an anonymous reviewer for insightful comments on this aspect.

contributions from the IS field. Merely twenty-seven research articles published between 1977 and 2009 in eight premier journals of our discipline relate to the concept of creativity. Second, there is a predominant pattern of IS research on creativity that focuses on the impact of IT use on the creative performance of individuals and groups.

Taking off from this ex-post analysis we pinpointed relevant, but underemphasized, fields of research in order to provide a future research agenda for IS studies on creativity (RQ7). We argue that IS research has taken in a too narrow focus on the topic of creativity and, likewise, has neglected important issues from this field. We sketched three different, but interrelated, themes that may stimulate future inquiry. We conclude that future IS research on creativity must (1) theorize about the socio-technical context in which creativity unfolds—a challenge that will require the application of a variety of qualitative research methods in order to investigate the complex interplay of creative persons, products, processes, and (IT enabled) contexts at the individual, group, organizational, and market levels. This understanding can then (2) inform the development of IT artifacts that can nourish the creative process. We motivate IS researchers to unfold the black box set around the IT artifact by the majority of current IS studies. Analyzing and explaining how IT should be designed in order to support the creative process, rather than assessing the effect of a given system on creative performance, will amplify the existing body of IS knowledge—a challenge that will require the application of methods originating from the realm of design research. Finally, researchers are (3) required to evaluate IT artifacts in socio-technical contexts. We believe that IS research can benefit from shifting the focus from laboratory settings to organizational contexts. We expect the analysis of human perception of IT artifacts in creative processes or barriers to diffusion of the same to offer valuable insights in the way that IT artifacts can support creative work. In addition to the proposed research agenda, we hope that the framework by itself will sensitize researchers for relevant aspects when studying creativity and also positioning their own research toward the studies of their fellow colleagues.

This research has some limitations. First, our study focuses on the analysis of eight top-ranked IS journals. We justify this selection by the identity-defining role of these journals [Orlikowski and Iacono, 2001; Benbasat and Zmud, 2003; Ives et al., 2004; Sidorova et al., 2008; Association for Information Systems, 2007; Nevo et al., 2009] and argue that their analysis provides a good account of high-impact IS research that has been published over the last years. However, we are aware that this approach excludes more specific research outlets from the scope of our analysis. Research on human computer interaction, for example, has a long track record of studies that open up the black box around the IT artifact. Our findings thus only pertain to the substantive area of analysis, being the eight journals under review. Second, other researchers may come up with additional, or different, dimensions that can be used in order to analyze IS studies on creativity-related phenomena. Third, we cannot claim that our attempt to identifying relevant research problems has been exhaustive; we did not present *the* research agenda for creativity in the IS discipline, but a research agenda. It is, however, our belief that the proposed areas of research can meaningfully contribute to the IS body of knowledge and, in the long run, lead to the development of practically relevant IT artifacts that can nourish the creative process. It must be noted that other researchers have also argued for the development and integration of IT tools to support the creative process. Shneiderman [1998], for example, proposes the Genex framework that suggests the integration of a set of existing IT tools so as to provide an appropriate environment of IT-mediated creativity support.

In his foreword to Carl Otto Scharmer's book *Theory U. Learning from the Future as It Emerges*, Peter Senge writes: "Understanding the creative process is the foundation of genuine mastery in all fields" [Scharmer, 2009, p. xi]. Nowadays, IT creates an unprecedented environment that has great potential to nourish the creativity of individuals, organizations, and even societies. Yet, much about the underlying socio-technical processes remains unknown. It is our strong belief that the IS discipline can meaningfully contribute to our understanding of the creative process and how it can deliberately be nourished by IT. It is astonishing how little attention the IS discipline has paid to the human phenomenon of creativity and how it unfolds in socio-technical processes. It will be fascinating to see how our discipline will benefit from, and contribute to, the multidisciplinary research on the human phenomenon of creativity.

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APPENDIX

Results of Literature Search		
Study	Journal	Relevance
Aaen, I. (2008) "Essence: Facilitating Software Innovation", <i>European Journal of Information Systems</i> (17)5, pp. 543–553.	EJIS	Relevant
Avital, M. and D. Te'eni (2009) "From Generative Fit to Generative Capacity: Exploring an Emerging Dimension of Information Systems Design and Task Performance", <i>Information Systems Journal</i> (19)4, pp. 345–367.	ISJ	Relevant
Cooper, R.B. (2000) "Information Technology Development Creativity: A Case Study of Attempted Radical Change", <i>MIS Quarterly</i> (24)2, pp. 245–276.	MISQ	Relevant
Couger, J.D., L.F. Higgins, S. C. McIntyre (1993) "(Un)Structured Creativity in Information Systems Organizations", <i>MIS Quarterly</i> (17)4, pp. 375–397.	MISQ	Relevant
Datta, P. (2007) "An Agent-Mediated Knowledge-in-Motion Model", <i>Journal of the Association for Information Systems</i> (8)5, pp. 288–311.	JAIS	Relevant
Dean, D.L., et al. (2006) "Identifying Quality, Novel, and Creative Ideas: Constructs and Scales for Idea Evaluation", <i>Journal of the Association for Information Systems</i> (7)10, pp. 646–698.	JAIS	Relevant
Dennis, A.R., R.M. Daniels Jr., J.F. Nunamaker Jr. (1993) "Methodology-Driven Use of Automated Support in Business Process Re-Engineering", <i>Journal of Management Information Systems</i> (10)3, pp. 117–138.	JMIS	Relevant
Doyle, J.R. (1991) "Problems with Strategic Information Systems Frameworks", <i>European Journal of Information Systems</i> (1)4, pp. 273–280.	EJIS	Irrelevant
Easton, G.K., et al. (1990) "Using Two Different Electronic Meeting System Tools for the Same Task: An Experimental Comparison", <i>Journal of Management Information Systems</i> (7)1, pp. 85–100.	JMIS	Relevant
Elam, J.J. and M. Mead (1990) "Can Software Influence Creativity?" <i>Information Systems Research</i> (1)1, pp. 1–22.	ISR	Relevant
Fowler Jr., F.P. (1979) "The Executive Intelligence System as a Design Strategy", <i>MIS Quarterly</i> (3)4, pp. 21–29.	MISQ	Irrelevant
Garfield, M.J., et al. (2001) "Research Report: Modifying Paradigms-Individual Differences, Creativity Techniques, and Exposure to Ideas in Group Idea Generation", <i>Information Systems Research</i> (12)3.	ISR	Relevant
Gupta, A., et al. (2009) "Use of Collaborative Technologies and Knowledge Sharing in Co-Located and Distributed Teams: Towards the 24-H Knowledge Factory", <i>The Journal of Strategic Information Systems</i> (18)3, pp. 147–161.	JSIS	Irrelevant

Results of Literature Search		
Study	Journal	Relevance
Hender, J.M., et al. (2002) "An Examination of the Impact of Stimuli Type and GSS Structure on Creativity: Brainstorming versus Non-Brainstorming Techniques in a GSS Environment", <i>Journal of Management Information Systems</i> (18)4, pp. 59–85.	JMIS	Relevant
Hevner, A.R., et al. (2004) "Design Science in Information Systems Research", <i>MIS Quarterly</i> (28)1, pp. 75–105.	MISQ	Irrelevant
Iacovou, C.L. (1999) "The Ipac Project: When It Hits the Fan", <i>Journal of Information Technology</i> (14)3, pp. 267–275.	JIT	Irrelevant
Ives, B., et al. (2004) "Phylogeny and Power in the IS Domain: A Response to Benbasat and Zmud's Call for Returning to the IT Artifact", <i>Journal of the Association for Information Systems</i> (5)3, pp. 108–124.	JAIS	Irrelevant
Lee-Partridge, J.E., T.S.H. Teo, V.K.G. Lim (2000) "Information Technology Management: The Case of the Port of Singapore Authority", <i>The Journal of Strategic Information Systems</i> (9)1, pp. 85–99.	JSIS	Relevant
Lee, A. (2000) "Executive Overview: Information Technology Development Creativity: A Case Study of Attempted Radical Change", <i>MIS Quarterly</i> (24)2, p. 197.	MISQ	Irrelevant
Lee, H. and B. Choi (2003) "Knowledge Management Enablers, Processes, and Organizational Performance: An Integrative View and Empirical Examination", <i>Journal of Management Information Systems</i> (20)1, pp. 179–228.	JMIS	Relevant
Lilley, S. (1992) "Overcoming the Disabling Effects of Executive Information Systems", <i>Information Systems Journal</i> (2)4, pp. 281–292.	ISJ	Relevant
Masseti, B. (1996a) "An Empirical Examination of the Value of Creativity Support Systems on Idea Generation", <i>MIS Quarterly</i> (20)1, pp. 83–97.	MISQ	Relevant
Masseti, B. (1996b) "Executive Overview: An Empirical Examination of the Value of Creativity Support Systems on Idea Generation", <i>MIS Quarterly</i> (20)1, p. 1.	MISQ	Irrelevant
Masseti, B. (1998) "An Ounce of Preventative Research Design Is Worth a Ton of Statistical Analysis Cure", <i>MIS Quarterly</i> (22)1, pp. 89–93.	MISQ	Relevant
Nagasundaram, M. and R.P. Bostrom (1994) "The Structuring of Creative Processes Using GSS: A Framework for Research", <i>Journal of Management Information Systems</i> (11)3, pp. 87–114.	JMIS	Relevant
Nunamaker Jr., J.F., L.M. Applegate, B.R. Konsynski (1987) "Facilitating Group Creativity: Experience with a Group Decision Support System", <i>Journal of Management Information Systems</i> (3)4, pp. 5–19.	JMIS	Relevant
Ocker, R., et al. (1995) "The Effects of Distributed Group Support and Process Structuring on Software Requirements Development Teams: Results on Creativity and Quality", <i>Journal of Management Information Systems</i> (12)3, pp. 127–153.	JMIS	Relevant
Ocker, R., et al. (1998) "Effects of Four Modes of Group Communication on the Outcomes of Software Requirements Determination", <i>Journal of Management Information Systems</i> (15)1, pp. 99–118.	JMIS	Relevant
Rouibah, K. and S. Ould-ali (2002) "Puzzle: A Concept and Prototype for Linking Business Intelligence to Business Strategy", <i>The Journal of Strategic Information Systems</i> (11)2, pp. 133–152.	JSIS	Irrelevant
Santanen, E.L., R.O. Briggs, G.-J. De Vreede (2004) "Causal Relationships in Creative Problem Solving: Comparing Facilitation Interventions for Ideation", <i>Journal of Management Information Systems</i> (20)4, pp. 167–197.	JMIS	Relevant
Satzinger, J.W., M.J. Garfield, M. Nagasundaram (1999) "The Creative Process: The Effects of Group Memory on Individual Idea Generation", <i>Journal of Management Information Systems</i> (15)4, pp. 143–160.	JMIS	Relevant
Schenk, K.D., N.P. Vitalari, K.S. Davis (1998) "Differences Between Novice and Expert Systems Analysts: What Do We Know and What Do We Do?" <i>Journal of Management Information Systems</i> (15)1, pp. 9–50.	JMIS	Relevant
Shepherd, M.M., et al. (1995) "Invoking Social Comparison to Improve Electronic Brainstorming: Beyond Anonymity", <i>Journal of Management Information Systems</i> (12)3, pp. 155–170.	JMIS	Relevant
Shibata, Y., M. Fukuda, M. Katsumoto (1996) "A Hypermedia-Based Design Image Database System Using a Perceptual Link Method", <i>Journal of Management Information Systems</i> (13)3, pp. 25–44.	JMIS	Irrelevant
Taylor-Cummings, A. (1998) "Bridging the User-IS Gap: A Study of Major Information Systems Projects", <i>Journal of Information Technology</i> (13)1, pp. 29–54.	JIT	Irrelevant

Results of Literature Search		
Study	Journal	Relevance
Tiwana, A. and E. R. McLean (2005) "Expertise Integration and Creativity in Information Systems Development", <i>Journal of Management Information Systems</i> (22)1, pp. 13–43.	JMIS	Relevant
Vandenbosch, B. and C. Higgins (1996) "Information Acquisition and Mental Models: An Investigation into the Relationship Between Behaviour and Learning", <i>Information Systems Research</i> (7)2, pp. 198–214.	ISR	Irrelevant
Vandenbosch, B. and S.L. Huff (1997) "Searching and Scanning: How Executives Obtain Information from Executive Information Systems", <i>MIS Quarterly</i> (21)1, pp. 81–107.	MISQ	Irrelevant
Verjans, S. (2005) "Bricolage as a Way of Life—Improvisation and Irony in Information Systems", <i>European Journal of Information Systems</i> (14)5, pp. 504–506.	EJIS	Irrelevant
Weber, E.S. (1986) "Systems to Think With: A Response To 'A Vision for Decision Support Systems'", <i>Journal of Management Information Systems</i> (2)4, pp. 85–97.	JMIS	Relevant
Webster, J. and J.J. Martocchio (1992) "Microcomputer Playfulness: Development of a Measure with Workplace Implications", <i>MIS Quarterly</i> (16)2, pp. 201–226.	MISQ	Irrelevant
Wierenga, B. and G.H. Van Bruggen (1998) "The Dependent Variable in Research into the Effects of Creativity Support Systems: Quality and Quantity of Ideas", <i>MIS Quarterly</i> (22)1, pp. 81–87.	MISQ	Relevant

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