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BRIDGING THE QUALITATIVE–QUANTITATIVE DIVIDE: GUIDELINES FOR CONDUCTING MIXED METHODS RESEARCH IN INFORMATION SYSTEMS[1]

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Mixed methods research is an approach that combines quantitative and qualitative research methods in the same research inquiry. Such work can help develop rich insights into various phenomena of interest that cannot be fully understood using only a quantitative or a qualitative method. Notwithstanding the benefits and repeated calls for such work, there is a dearth of mixed methods research in information systems. Building on the literature on recent methodological advances in mixed methods research, we develop a set of guidelines for conducting mixed methods research in IS. We particularly elaborate on three important aspects of conducting mixed methods research: (1) appropriateness of a mixed methods approach; (2) development of meta-inferences (i.e., substantive theory) from mixed methods research; and (3) assessment of the quality of meta-inferences (i.e., validation of mixed methods research). The applicability of these guidelines is illustrated using two published IS papers that used mixed methods.

Keywords: Meta-inferences, mixed methods, multimethod, positivist, qualitative, quantitative, research method, research design, validity

Introduction

Diversity in research methods is considered a major strength of information systems (IS) research (Lee 1999; Robey 1996; Sidorova et al. 2008). IS researchers have employed a plethora of different research methods that can, at one level, be broadly categorized into two: *quantitative* and *qualitative* (Lee and Hubona 2009; Myers and Avison 2002). One of the recurring issues in social and behavioral sciences research is the relative value of different research approaches, especially with intense debates on different epistemologies (e.g., positivist versus interpretive) and methodologies (e.g., qualitative versus quantitative). Although there have been increasing calls for going beyond the *rhetoric* of the differences among epistemologies and methodologies to develop a *disciplined methodological pluralism* (Landry and Banville

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1992; Weber 2004), there is limited research that has employed methodological pluralism in the IS literature (Kaplan and Duchon 1988; Mingers 2001, 2003). In particular, although the current state of methodological diversity in IS research is encouraging, there is a dearth of research in IS that employs a mixed methods[2] approach (i.e., use of *both* qualitative and quantitative methods in a single research inquiry)[3] that builds on a common scientific basis essential to advance and sustain the tradition of methodological diversity in IS research and to create a cumulative body of knowledge (Lee and Hubona 2009; Mingers 2001, 2003; Weber 2004).

Mixed methods research has been termed the *third methodological movement (paradigm),* with quantitative and qualitative methods representing the first and second movements (paradigms) respectively (Ridenour and Newman 2008; Teddlie and Tashakkori 2003, 2009). Although proponents of mixed methods research have suggested areas in which a mixed methods approach is potentially superior to a single method design, there has been intense debate regarding whether or not it is even appropriate to combine multiple methods that are often based on radically different paradigmatic assumptions (Denzin and Lincoln 1994; Guba 1987). Despite the several challenges associated with methodological pluralism based on the notion of the incompatibility thesis,[4] it has been suggested that it is, in fact, feasible to conduct research that cuts across multiple methodologies and paradigms (Mingers 1997, 2001; Ridenour and Newman 2008; Teddlie and Tashakkori 2003, 2009). Several researchers have reviewed prior calls for methodological combination and suggested that a *peaceful coexistence* of multiple methodologies is possible (Datta 1994; House 1994; Ridenour and Newman 2008; Rossi 1994). Others have called for a combination of research methods, particularly triangulation of qualitative and quantitative data, to develop a deeper understanding of a phenomenon (Denzin 1978; Jick 1979; Mingers 1997, 2001; Reichardt and Rallis 1994).

Despite such calls for methodological pluralism and the benefits of combining multiple methods, there has not been much research in IS that has employed a mixed methods approach. Our review of the IS literature suggests that less than 5 percent of the empirical studies published between 2001 and 2007 in the six major IS journals identified in the Senior Scholars' Basket of Journals (AIS 2007)[5] have employed mixed methods. Considering the strength of mixed methods research with respect to understanding and explaining complex organizational and social phenomena, there is clearly a need for IS researchers to conduct and publish research that employs mixed methods (Cao et al. 2006; Mingers 2001). However, we observe that although guidelines for conducting and evaluating different types of research (e.g., quantitative, positivist case study, interpretive case study, design science, and action research) have been widely available in the IS literature (e.g., Dubé and Paré 2003; Hevner et al. 2004; Klein and Myers 1999; Lee 1989; Mingers 2001; Myers and Klein 2011; Straub et al. 2004), guidelines for conducting and evaluating mixed methods research in IS are lacking. Further, mixed methods research has received much attention in the social and behavioral sciences recently (for a review, see Tashakkori and Creswell 2008), and we suggest that IS research can benefit from this research approach, especially with a broadening base of interdisciplinary research and calls for more of the same (see Venkatesh 2006).

Our view is consistent with researchers who suggest that a peaceful coexistence of multiple paradigms is feasible in a research inquiry. In fact, we suggest that if a mixed methods approach helps a researcher find theoretically plausible answers to his or her research questions and if the researcher is able to overcome the cognitive and practical barriers associated with conducting mixed methods research, he or she should undertake such research without much consideration of paradigmatic or cultural incommensurability. We encourage IS researchers to engage in mixed methods research to provide rich insights into various phenomena and develop novel theoretical perspectives. However, the decision to conduct mixed methods research should hinge on the *research question*, *purpose,* and *context*. In keeping with this view, we offer a set of guidelines for conducting and evaluating mixed methods research in IS. Our primary goal is to initiate and facilitate discourse on mixed methods research in IS, and encourage and assist IS researchers to conduct rigorous mixed methods research to advance the field.

[2]There is a conceptual distinction between multimethod and mixed methods research that is discussed later in the section titled "Mixed Methods Research."

[3]By single research inquiry, we mean an investigation of a phenomenon. The term should not be confused with a single paper. In fact, a single research inquiry could lead to multiple papers; likewise, multiple studies could be reported in a single paper.

[4]The incompatibility thesis suggests that compatibility "between quantitative and qualitative methods is impossible due to the incompatibility of the paradigms underlying the methods…researchers who combine the two methods are doomed to failure due to the differences in underlying systems" (Teddlie and Tashakkori 2003, p. 7).

[5]*European Journal of Information Systems, Information Systems Journal, Information Systems Research, Journal of the Association for Information Systems, Journal of Management Information Systems*, and *MIS Quarterly*.

Although we provide a set of general guidelines for conducting mixed methods research, we elaborate three important areas in our guidelines: (1) *appropriateness* of a mixed methods approach; (1) development of *meta-inferences* (i.e., substantive theory[6]) from mixed methods research; and (3) assessment of the quality of meta-inferences (i.e., *validation* of mixed methods research). We provide an in-depth discussion of these three areas because while much progress has been made in understanding the design issues related to mixed methods research, there has been limited discussion and understanding of when to conduct mixed methods research (i.e., appropriateness of mixed methods research), how to discover and develop integrative findings from mixed methods research (i.e., meta-inferences), and how to assess the quality of meta-inferences (i.e., validation). We illustrate the applicability of our guidelines using two exemplars of mixed methods research from the IS literature. We also discuss implications of our guidelines with respect to assessing the rigor and quality of mixed methods approaches employed by IS researchers.

The paper is organized as follows. First, we discuss mixed methods research. Then, we review the recent body of IS research employing a mixed methods approach. Next, we present guidelines for mixed methods research. Finally, we discuss two published mixed-methods papers in light of our proposed guidelines.

Mixed Methods Research

In this section, we provide an overview of mixed methods research and present a review of mixed methods research in IS.

Mixed Methods: A Combination of Qualitative and Quantitative Methods

Mixed methods research, at its core, involves a research design that uses *multiple methods*—more than one research method or more than one *worldview* (i.e., quantitative or qualitative research approaches)—in a research inquiry (Tashakkori and Teddlie 2003a, 2003b). Tashakkori and Teddlie identified two major types of multiple methods research: (1) mixed methods research, which is the focus of the current paper; and (2) multimethod research (Mingers 2001, 2003). Although the terms *mixed methods* and *multimethod* have been used interchangeably in social and behavioral sciences including IS, there are significant conceptual differences between the two. In multimethod research, researchers employ two or more research methods, but may (or may not) restrict the research to a single worldview (Mingers and Brocklesby 1997; Teddlie and Tashakkori 2003, 2009). For instance, a researcher may use participant observation and oral history to study a new IS implementation in an organization. Another researcher may use ethnography and case study to understand the same phenomenon. In both cases, the researchers are restricted to a single worldview (i.e., qualitative) but employ multiple methods of data collection and analysis. In fact, Mingers and Brocklesby (1997) classified methodology combination—combining two or more methodologies (e.g., survey and interviews in a research inquiry)—and multimethodology—partitioning methodologies and combining parts (e.g., two different methodologies within qualitative paradigms)—as two distinct types of multiple methods research. They suggested that multimethodology research can be conducted using either a single paradigm or multiple paradigms. In contrast, mixed methods research by definition is more in line with methodology combination, which essentially requires multiple worldviews (i.e., combination of qualitative and quantitative research methods).

Multimethod research is not limited to a qualitative worldview. In fact, in the quantitative paradigm, Campbell and Fiske (1959) developed the concept of the multitrait–multimethod matrix (MTMM) to assess the construct validity of a set of measures. They suggested the use of multiple methods to collect and analyze data to ensure a high degree of reliability and validity in quantitative analysis (e.g., survey and direct observations). Although this approach of using multiple methods is in line with the spirit of multimethod research, another approach of multimethod research within a quantitative worldview would be the use of two different quantitative methods (e.g., an experiment and a field study) to develop a holistic understanding of a phenomenon of interest. For example, Sun and Zhang (2006) conducted a multimethod study using two different quantitative methods (a field study and an experiment) to understand the causal relationships between perceived enjoyment and perceived ease of use in the context of an IS adoption.

Mixed methods research, in contrast, uses quantitative and qualitative research methods, either concurrently (i.e., independent of each other) or sequentially (e.g., findings from one approach inform the other), to understand a phenomenon of interest. For instance, Ang and Slaughter (2001) conducted a sequential mixed methods study (a quantitative study followed by a qualitative study) to understand differences in

[6]A substantive theory represents concepts and their interrelation into a set of theoretical statements for a given substantive area or issue (Glaser and Strauss 1965).

work attitudes, behaviors, and performance across two groups of information technology (IT) professionals (contract versus permanent). Therefore, all mixed methods research studies are, by definition, multimethod research, but all multimethod studies are not mixed methods research.

Proponents of mixed methods research appreciate the value of both quantitative and qualitative worldviews to develop a deep understanding of a phenomenon of interest. For example, a researcher may use interviews (a qualitative data collection approach) and surveys (a quantitative data collection approach) to collect data about a new IS implementation. Another researcher might employ an ethnography (a qualitative method) and a field experiment (a quantitative method) to understand the same phenomenon. Creswell and Clark (2007) suggested four major types of mixed methods designs: (1) triangulation (i.e., merge qualitative and quantitative data to understand a research problem); (2) embedded (i.e., use either qualitative or quantitative data to answer a research question within a largely quantitative or qualitative study); (3) explanatory (i.e., use qualitative data to help explain or elaborate quantitative results); and (4) exploratory (i.e., collect quantitative data to test and explain a relationship found in qualitative data). Other researchers proposed different typologies of mixed methods research with respect to the temporal sequence of data collection and analyses (for a review of these typologies, see Morse 2003; Teddlie and Tashakkori 2009). Regardless of the type of research design employed, the key characteristic of mixed methods research is the *sequential* or *concurrent* combination of quantitative and qualitative methods (e.g., data collection, analysis and presentation) within a single research inquiry.

Value and Purposes of Mixed Methods Research in IS

With the rapid advancement of a new and complex array of information technologies, organizations constantly face new challenges related to their understanding of IT capabilities, practices, usage, and impacts. Further, the diffusion of the Internet, the proliferation of numerous nonwork related systems and social media, and the availability of myriad IT-enabled devices have now made IT an integral part of individuals' lives. As a result of this rapidly changing environment, IS researchers often encounter situations in which existing theories and findings do not sufficiently explain or offer significant insights into a phenomenon of interest. Mixed methods design strategies provide a powerful mechanism for IS researchers to deal with such situations and subsequently make contributions to theory and practice.

Value of Mixed Methods Research

We discuss three major strengths of mixed methods research to depict the value of conducting such research in the IS literature. We provide specific examples where a mixed methods approach is more advantageous than a single method approach to make substantial theoretical contributions. First, mixed methods research has the ability to address confirmatory and exploratory research questions simultaneously (Teddlie and Tashakkori 2003, 2009). Although both qualitative and quantitative methods can arguably be used to address similar research questions, qualitative methods have typically been used more in IS and other social sciences for exploratory research in order to develop a deep understanding of a phenomenon and/or to inductively generate new theoretical insights (Punch 1998; Walsham 2006). In contrast, quantitative methods have typically been used more in IS for confirmatory studies, such as theory testing. We note that our statements refer to the typical situations in IS research. There are, of course, exceptions—for instance, Markus (1983) used a qualitative approach for theory testing. Mixed methods research, by combining both qualitative and quantitative methods, has the ability to address both exploratory and confirmatory questions within the same research inquiry.

For instance, when e-commerce was an emerging phenomenon and researchers began studying it, they employed exploratory qualitative studies to unearth factors related to individuals' perceptions of e-commerce. In one of the earlier studies on e-commerce, Keeney (1999) conducted interviews to understand individuals' perceptions of pros and cons of e-commerce. An exploratory approach was necessary at that time because extant theoretical models did not provide adequate insights on e-commerce. Subsequently, there was a series of confirmatory quantitative studies to test theoretical models of e-commerce adoption and use (e.g., Gefen et al. 2003; Koufaris 2002). Although these were primarily single method studies, Pavlou and Fygenson (2006) undertook mixed methods research to study e-commerce adoption and use. They first conducted an exploratory belief elicitation study to unearth the factors that individuals consider when making a decision about e-commerce adoption. They used a qualitative method (i.e., open-ended questions) for this belief elicitation study. Given that e-commerce was still an emerging phenomenon in the mid-2000s, with concerns related to privacy, security, and website capabilities, and existing theories were still lacking in terms of offering a comprehensive set of factors that individuals might consider when making the adoption decision, an exploratory qualitative study offered a rich mechanism to discover these factors. Pavlou and Fygenson subsequently included these factors in a research model of e-commerce adoption and tested the model using a confirmatory quantitative study.

Second, mixed methods research has the ability to provide stronger inferences than a single method or worldview (Teddlie and Tashakkori 2003, 2009). It is true that IS research that employs rigorous qualitative or quantitative methods offers rich insights on various IS phenomena; we still suggest that mixed methods research, by combining inferences from both qualitative and quantitative studies, can offset the disadvantages that certain methods have by themselves (Greene and Caracelli 1997). Mixed methods research can leverage the complementary strengths and nonoverlapping weaknesses of qualitative and quantitative methods, and offer greater insights on a phenomenon that each of these methods individually cannot offer (Johnson and Turner 2003). For example, interviews, a qualitative data collection approach, can provide depth in a research inquiry by allowing researchers to gain deep insights from rich narratives, and surveys, a quantitative data collection approach, can bring breadth to a study by helping researchers gather data about different aspects of a phenomenon from many participants. Together, these two data collection approaches can help IS researchers make better and more accurate inferences—that is, *meta-inferences*. Meta-inferences represent an integrative view of findings from qualitative and quantitative strands of mixed methods research, and are considered essential components of mixed methods research (Tashakkori and Teddlie 2008).

For example, in the IS literature, an important area of investigation is IS implementations in organizations. Prior IS implementation research from both qualitative (e.g., Boudreau and Robey 2005) and quantitative (e.g., Venkatesh et al. 2003) approaches has offered insights on how employees react to a new information system. However, we believe that much qualitative research on IS implementations did not offer insights on the breadth of issues and reactions from a vast majority of stakeholders due to the practical limitations related to the number of stakeholders who could be interviewed and topics that could be covered during the interviews. Similarly, quantitative studies failed to offer deep insights on the context of an IS implementation and failed to capture the depth of reactions from stakeholders. In this case, mixed methods research can potentially offer a holistic understanding of IS implementations (e.g., a substantive theory of IS implementation with a balance of breadth and depth) by facilitating high quality meta-inferences.

Finally, mixed methods research provides an opportunity for a greater assortment of divergent and/or complementary views (Teddlie and Tashakkori 2003, 2009). When conducting mixed methods research, a researcher may find different (e.g., contradictory and complementary) conclusions from the quantitative and qualitative strands. Such divergent findings are valuable in that they lead to a reexamination of the conceptual framework and the assumptions underlying each of the two strands of mixed methods research. These findings not only enrich our understanding of a phenomenon but also help us appraise the boundary conditions of a phenomenon or relationships among its components (i.e., substantive theory) and open new avenues for future inquiries. Complementary findings are equally valuable in the quest for generating substantive theories because these findings offer a holistic view of a phenomenon and additional insights into interrelations among its components.

For example, Venkatesh et al. (2003) theorized and found, using a quantitative approach, that performance expectancy and effort expectancy are two major determinants of IS adoption and use. Lapointe and Rivard (2005) conducted a qualitative study of three clinical IS implementations and developed a continuum of employees' reactions to new information systems from adoption to aggressive resistance. They found that different facets of perceived threats (e.g., work and economic, loss of status, loss of power, reorganization of work) play a critical role in determining an employee's position on the continuum of adoption and aggressive resistance. Although there is no major contradiction of findings between Venkatesh et al. and Lapointe and Rivard, there is a divergent and/or complementary view that suggests IS adoption is not necessarily a discrete decision and individuals consider a wide variety of positive and negative factors when making adoption vis-à-vis resistance decisions. Such divergent and/or complementary views provide an opportunity to discover, develop, extend, and test a substantive theory of IS adoption, in this case by unearthing a comprehensive set of factors or components and their interrelations, and can be accommodated in a single research inquiry using a mixed methods approach.

Purposes for Mixed Methods Research

Although a mixed methods approach is clearly a valuable methodological choice for IS researchers because of its strengths discussed in the previous section, we note that such an approach is not a panacea and does not always lead to the discovery, development, or extension of a substantive theory. Employment of a mixed methods approach in a research inquiry should serve certain purposes. We summarize seven purposes for mixed methods research that we adapted from prior research (Creswell 2003; Greene et al. 1989; Tashakkori and Teddlie 2008). These purposes include complementarity, completeness, developmental, expansion, corroboration/confirmation, compensation, and diversity (see Table 1). Tashakkori and Teddlie (2008, p. 103) noted that the reasons for

Table 1. Purposes of Mixed Methods Research*

Purposes	Description	Prior IS Research	
		Examples**	Illustration
Complementarity	Mixed methods are used in order to gain complementary views about the same phenomena or relationships.	Soffer and Hader (2007)	A qualitative study was used to gain additional insights on the findings from a quantitative study.
Completeness	Mixed methods designs are used to make sure a complete picture of a phenomenon is obtained.	Piccoli and Ives (2003) Hackney et al. (2007)	The qualitative data and results provided rich explanations of the findings from the quantitative data and analysis.
Developmental	Questions for one strand emerge from the inferences of a previous one (sequential mixed methods), or one strand provides hypotheses to be tested in the next one.	Becerra-Fernandez and Sabherwal (2001) Ho et al. (2003) Grimsley and Meehan (2007)	A qualitative study was used to develop constructs and hypotheses and a quantitative study was conducted to test the hypotheses.
Expansion	Mixed methods are used in order to explain or expand upon the understanding obtained in a previous strand of a study.	Ang and Slaughter (2001) Koh et al. (2004) Keil et al. (2007)	The findings from one study (e.g., quantitative) were expanded or elaborated by examining the findings from a different study (e.g., qualitative).
Corroboration/ Confirmation	Mixed methods are used in order to assess the credibility of inferences obtained from one approach (strand).	Bhattacherjee and Premkumar (2004)	A qualitative study was conducted to confirm the findings from a quantitative study.
Compensation	Mixed methods enable compensating for the weaknesses of one approach by using the other.	Dennis and Garfield (2003)	The qualitative analysis compensated for the small sample size in the quantitative study.
Diversity	Mixed methods are used with the hope of obtaining divergent views of the same phenomenon.	Chang (2006)	Qualitative and quantitative studies were conducted to compare perceptions of a phenomenon of interest by two different types of participants.

*Adapted from Creswell (2003), Greene et al. (1989), and Tashakkori and Teddlie (2003a, 2008).

**Many of these examples can be placed in multiple purpose categories. For example, although Bhattacherjee and Premkumar's (2004) paper is placed in the corroboration/confirmation category, it can also be placed in the expansion category because the authors noted that, in addition to confirming the findings of the quantitative study, the purpose of the qualitative analysis was to "possibly gain additional insights into the nature and causes of the hypothesized associations" (p. 246).

using mixed methods are not always "explicitly delineated and/or recognized" by researchers who conduct mixed methods research. The explication of the purposes for conducting mixed methods research is an onus on researchers conducting and reporting such work.

Understanding the purposes for which mixing qualitative and quantitative methods is deemed appropriate in a research inquiry is important for three reasons. First, we argue that unlike qualitative and quantitative approaches, a mixed methods approach is typically not a natural methodological choice in social and behavioral sciences. Researchers have to overcome considerable paradigmatic, cultural, cognitive, and physical challenges to be able to conduct mixed methods research (Mingers 2001). Therefore, we suggest that a mixed methods research approach should serve one or more purposes beyond the core purpose of a research methodology (i.e., help researchers conduct scientific research inquiries). Hence, researchers thinking about employing a mixed methods approach should be aware of different purposes for utilizing a mixed methods approach in their research. Table 1 offers a comprehensive set of purposes for mixed methods research summarizing the reasons for employing such an approach in a research inquiry instead of a single method approach.

Second, an explicit delineation and/or recognition of these purposes by researchers employing a mixed methods approach may help the reader better understand the goals and outcomes of a mixed methods research paper. For example, if the purpose for conducting mixed methods research is for completeness, the reader can expect that a mixed methods study will provide a more holistic view of the phenomenon of interest than its qualitative and quantitative components will alone. Finally, an unambiguous understanding of mixed methods research purposes will help researchers make informed decisions about the design and analysis aspects of a mixed methods inquiry. If, for instance, the purpose for conducting mixed methods research is developmental, a sequential mixed methods approach is perhaps more suitable than a concurrent or parallel approach.

Review of Mixed Methods Research in IS

In order to understand the current status of mixed methods research in IS, we reviewed the papers published in the six journals in the Senior Scholars' Basket of Journals (AIS 2007) over a seven-year period (2001–2007). Mingers (2001, 2003) reviewed a subset of the journals (he did not review *Journal of Management Information Systems* or *Journal of the Association for Information Systems*) for the period between 1993 and 2000 and found a paucity of multimethod research in IS (i.e., only about 13 percent of empirical papers employed multiple methods). Our review is different from Mingers' and other prior reviews (e.g., Orlikowski and Baroudi 1991; Walsham 1995) in two ways. First, we followed the guidelines of Tashakkori and Teddlie (1998) and Teddlie and Tashakkori (2003) to identify mixed methods research papers. The criteria we used were (1) the study must be empirical; (2) both quantitative (e.g., surveys) and qualitative (e.g., interviews) methods of data collection must be employed; and (3) both quantitative and qualitative data must be analyzed and presented. We noticed that some studies collected only qualitative data, but analyzed the data quantitatively (e.g., Bala and Venkatesh 2007; Sherif et al. 2006; Slaughter et al. 2006). We did not include these studies because they do not truly represent mixed methods research. Mingers' reviews were more inclusive than ours in that he included empirical studies that employed more than one research method regardless of whether the method was qualitative or quantitative—for example, papers with two quantitative (or qualitative) methods would qualify in Mingers' review as multimethod papers, whereas they would not qualify in our review as mixed methods papers. Second, we focused on appropriateness, meta-inferences, and validation aspects of mixed methods research, as our key interest was to understand the current state of mixed methods research from these three perspectives.

We searched the journals in two complementary ways. First, we searched these journals using EBSCO Academic Search Premier, a leading database for academic articles, for the following eight keywords: mixed, multi, mixed methods, multimethod, qualitative, quantitative, positivist, and interpretive. In addition, we identified the papers that cited the key papers on mixed methods research in IS: Kaplan and Duchon (1988) and Mingers (2001, 2003). We examined the research method section of these papers to ensure that they employed both quantitative and qualitative data collection and analysis. Second, we downloaded all articles published in these journals between 2001 and 2007, and read the research method and results sections to determine if the authors employed a mixed methods design. In both cases, we coded the articles on the following dimensions: purpose for employing a mixed methods approach, methods used and paradigmatic assumptions (e.g., positivist, interpretive, and critical research) made, and discussion of meta-inferences and validation. These two processes were accomplished by a research assistant and one of the authors, and their inter-rater reliability (IRR) was .93. Minor discrepancies were discussed and resolved and a 100 percent agreement was achieved. We found a total of 31 papers that employed a true mixed methods design. This represents approximately 3 percent of the total papers published in these six journals during this timeframe. Table 2 presents the list of the mixed methods papers along with a summary of coding for these papers.

Table 2 shows that developmental and completeness are the most dominant purposes for conducting mixed methods research in IS (32 percent and 26 percent respectively). Diversity (3 percent) and compensation (3 percent) are the least used purposes for mixed methods research. It is important to note that the reasons for conducting mixed methods research discussed in these papers would fit more than one purpose in many cases. We coded these purposes based on our interpretation of these reasons. Table 2 also shows that surveys and interviews are the most widely used data collection methods for quantitative and qualitative studies respectively. Brannen (2008) noted that a mixed methods researcher does not always have to treat both qualitative and quantitative studies equally. In other words, it is possible that, in some cases, the quantitative study is the dominant component and, in some other cases, the qualitative study dominates. We found that a quantitative study was dominant in a majority of mixed methods papers in (55 percent). We found that 65 percent of the papers provided an explicit discussion of meta-inferences (i.e., integrative findings from both quantitative and qualitative studies). Finally, validation of mixed methods research was not explicitly discussed in any of these papers (see Table 2).

Table 2. Review of Mixed Methods Research Articles in IS (2001 to 2007)*

Papers	Purpose of Mixed Methods Research*	Methods Employed and Paradigms			Meta-inferences	Discussion of Validation		
		Quantitative	Qualitative	Dominant Method		Quantitative	Qualitative	Meta-inferences
Ang, S., and Slaughter, S. A. "Work Outcomes and Job Design for Contract Versus Permanent Information Systems Professionals on Software Development Teams," *MIS Quarterly* (2001)	Expansion	Survey; Positivist	Interviews; Positivist	None	Yes; a substantive theory developed.	Reliability and validity were reported	Inter-rater reliability discussed; rich description provided	None
Becerra-Fernandez, I., and Sabherwal, R. "Organization Knowledge Management: A Contingency Perspective," *Journal of Management Information Systems* (2001)	Developmental	Survey; Positivist	Interviews; Positivist	Quantitative	Yes; theoretical statements provided	Reliability and validity were reported	Validation was discussed	None
Geissler, G., Zinkhan, G., and Watson, R. T. "Web Home Page Complexity and Communication Effectiveness," *Journal of the Association for Information Systems* (2001)	Developmental	Experiments; Positivist	Focus groups; interviews; Interpretive	Quantitative	No	Reliability and validity were reported	None	None
Bowen, P. L., Heales, J., and Vongphakdi, M. T. "Reliability Factors in Business Software: Volatility, Requirements and End-Users," *Information Systems Journal* (2002)	Corroboration/ Confirmation	Survey; Positivist	Interviews; Positivist	None	Yes; theoretical statements provided	Reliability; validity was not reported	None	None
Shim, J. P., Shin, Y. B., and Nottingham, L. "Retailer Web Site Influence on Customer Shopping: Exploratory Study on Key Factors of Customer Satisfaction," *Journal of the Association for Information Systems* (2002)	Developmental	Objective data were collected based on website characteristics; Positivist	Interviews; Positivist	None	Yes; theoretical statements provided	Reliability; validity was not reported	Inter-rater agreement was discussed	None
Dennis, A. R., and Garfield, M. J. "The Adoption and Use of GSS in Project Teams: Toward More Participative Processes and Outcomes," *MIS Quarterly* (2003)	Compensation	Survey; Positivist	Observations, interviews, and transcripts; Interpretive	Qualitative	Yes; integrated findings discussed	None	None	None
Deltor, B. "Internet-Based Information Systems Use in Organizations: An Information Studies Perspective," *Information Systems Journal* (2003)	Completeness	Data were collected from web tracking; Positivist	Interviews; Positivist	None	No	None	None	None
Gallivan, M. J., and Keil, M. "The User-Developer Communication Process: A Critical Case Study," *Information Systems Journal* (2003)	Developmental	Survey; Positivist	Interviews, observations, documents; Interpretive	None	Yes; theoretical statements provided	None	None	None
Ho, V. T., Ang, S., and Straub, D. "When Subordinates Become IT Contractors: Persistent Managerial Expectations in IT Outsourcing," *Information Systems Research* (2003)	Developmental	Surveys; Positivist	Focus groups; Positivist	Quantitative	No	Reliability and validity were reported	None	None
Piccoli, G., and Ives, B. "Trust and the Unintended Effects of Behavior Control in Virtual Teams," *MIS Quarterly* (2003)	Completeness (also has elements of expansion)	Experiment; Positivist	Case studies; Positivist	Quantitative	Yes; theoretical statements provided	Reliability and validity were reported	None	None
Ramiller, N. C., and Swanson, E. B. "Organizing Visions for Information Technology and the Information Systems Executive Response," *Journal of Management Information Systems* (2003)	Completeness (also has elements of complementarity and expansion)	Survey; Positivist	Interviews; Interpretive	Quantitative	Yes; theoretical statements provided	None	Rich descriptions of the context, data collection and analysis	None

Table 2. Review of Mixed Methods Research Articles in IS (2001 to 2007) (Continued)*

Papers	Purpose of Mixed Methods Research*	Methods Employed and Paradigms			Meta-inferences	Discussion of Validation		
		Quantitative	Qualitative	Dominant Method		Quantitative	Qualitative	Meta-inferences
Shin, B. "An Exploratory Investigation of System Success Factors in Data Warehousing," *Journal of the Association for Information Systems* (2003)	Developmental	Survey; Positivist	Interviews; Positivist	Quantitative	Yes; synthesis of findings provided	Reliability and validity were reported	None	None
Bhattacherjee, A., and Premkumar, G. "Understanding Changes in Belief and attitude Toward Information Technology Usage: A Theoretical Model and Longitudinal Test," *MIS Quarterly* (2004)	Corroboration/ Confirmation (also has elements of expansion)	Survey; Positivist	Interviews; Positivist	Quantitative	Yes; theoretical statements provided	Reliability and validity were reported	Validation was discussed.	None
Koh, C., Ang, S., and Straub, D. W. "IT Outsourcing Success: A Psychological Contract Perspective," *Information Systems Research* (2004)	Expansion	Survey; Positivist	Interviews; Positivist	Quantitative	No	Reliability and validity were reported	Rich description provided	None
Hatzakis, T., Lycett, M., Macredie, R. D., Martin, V. A. "Towards the Development of a Social Capital Approach to Evaluating Change Management Interventions," *European Journal of Information Systems* (2005)	Completeness (also has elements of complementarity)	Survey; Positivist	Interviews; interpretive	None	Yes; theoretical statements provided	None	None	None
Newman, M., and Westrup, C. "Making ERPs Work: Accountants and the Introduction of ERP Systems," *European Journal of Information Systems* (2005)	Completeness	Survey; Positivist	Interviews; Positivist	Qualitative	Yes; brief theoretical statements provided	None	None	None
Blechar, J., Constantiou, I. D., and Damsgaard, J. "Exploring the Influence of Reference Situations and Reference Pricing on Mobile Service User Behavior," *European Journal of Information Systems* (2006)	Developmental	Survey; Positivist	Open-ended questions, focus groups, and interviews; Positivist	None	Yes; theoretical statements provided	None	None	None
Cao, J., Crews, J. M., Lin, M., Deokar, A. V., Burgoon, J. K., and Nunamaker Jr., J. F. "Interactions between System Evaluation and Theory Testing: A Demonstration of the Power of a Multifaceted Approach to Information Systems Research," *Journal of Management Information Systems* (2006)	Complementarity	Survey; Positivist	Open-ended questions; Positivist	Quantitative	No	None	None	None
Chang, H. H. "Technical and Management Perceptions of Enterprise Information System Importance, Implementation and Benefits," *Information Systems Journal* (2006)	Diversity	Survey; Positivist	Case study; Positivist	Quantitative	No	Reliability was reported; validity was not reported	None	None
Keil, M., and Tiwana, A. "Relative Importance of Evaluation Criteria for Enterprise Systems: A Conjoint Study," *Information Systems Journal* (2006)	Complementarity	Conjoint survey; Positivist	Past literature and interviews; Interpretive	Quantitative	Yes; synthesis of findings discussed	Reliability was not reported; validity was reported	None	None
van Oosterhout, M., Waarts, E., and Hillegersberg, J. "Change Factors Requiring Agility and Implications for IT," *European Journal of Information Systems* (2006)	Complementarity	Survey; Positivist	Interviews; Positivist	None	Yes; synthesis of findings discussed	None	None	None

Table 2. Review of Mixed Methods Research Articles in IS (2001 to 2007) (Continued)*

Papers	Purpose of Mixed Methods Research*	Methods Employed and Paradigms			Meta-inferences	Discussion of Validation		
		Quantitative	Qualitative	Dominant Method		Quantitative	Qualitative	Meta-inferences
Pavlou, P. A., and Dimoka, A. "The Nature and Role of Feedback Text Comments in Online Marketplaces: Implications for Trust Building, Price Premiums, and Seller Differentiation," *Information Systems Research* (2006)	Completeness	Coded from feedback text comments from online buyers and sellers	Feedback text comments from online buyers and sellers.	Quantitative	No	Reliability and validity were reported	Reliability and validity were discussed	None
Pavlou, P.A., and Fygenson, M. "Understanding and Predicting Electronic Commerce Adoption: An Extension of the Theory of Planned Behavior," *MIS Quarterly* (2006)	Developmental (also has the elements of corroboration/ confirmation)	Survey; Positivist	Interviews; Positivist	Quantitative	No	Reliability and validity were reported	None	None
Choi, H., Lee, M., Im, K. S., and Kim, J. "Contribution to Quality of Life: A New Outcome Variable for Mobile Data Service," *Journal of the Association for Information Systems* (2007)	Developmental	Survey; Positivist	Interviews; Positivist	Quantitative	No	Reliability and validity were reported	Reliability and validity were discussed	None
Grimsley, M., and Meehan, A. "E-Government Information Systems: Evaluation-Led Design for Public Value and Client Trust," *European Journal of Information Systems* (2007)	Developmental	Survey; Positivist	Case study; interpretive	None	Yes; theoretical framework developed	None	None	None
Hackney R. A., Jones S., and Losch A. "Towards an e-Government Efficiency Agenda: The Impact of Information and Communication Behaviour on e-Reverse Auctions in Public Sector Procurement," *European Journal of Information Systems* (2007)	Completeness	Survey; Positivist	Focus groups; Positivist	None	Yes; synthesis of findings provided	None	None	None
Hatzakis, T., Lycett, M., and Serrano, A. "A Programme Management Approach for Ensuring Curriculum Coherence in IS (higher) Education," *European Journal of Information Systems* (2007)	Complementarity	Survey; Positivist	Action research; Interpretive	Qualitative	Yes; theoretical framework proposed	None	Validation was discussed	None
Keil, M., Im, G. P., and Mahring, M. "Reporting Bad News on Software Projects: The Effects of Culturally Constituted Views of Face-Saving," *Information Systems Journal* (2007)	Expansion	Survey; Positivist	Interviews; Interpretive	Quantitative	No	Reliability was not reported; validity was reported	None	None
Santhanam, R., Seligman, L., and Kang, D. "Post-implementation Knowledge Transfers to Users and Information Technology Professionals," *Journal of Management Information Systems* (2007)	Completeness	Data collected from system log; Positivist	Data were collected from observations; Positivist	Quantitative	No	None	Inter-coder agreement was discussed	None
Soffer, P., and Hadar, I. "Applying Ontology-Based Rules to Conceptual Modeling: A Reflection on Modeling Decision Making," *European Journal of Information Systems* (2007)	Complementarity	Survey; Positivist	Observations and interviews; Positivist	None	Yes; theoretical statements provided	None	None	None
Tiwana, A., and Bush, A. A. "A Comparison of Transaction Cost, Agency, and Knowledge-Based Predictors of IT Outsourcing Decisions: A U.S.-Japan Cross-Cultural Field Study," *Journal of Management Information Systems* (2007)	Complementarity	Conjoint experiment; Positivist	Interviews; Positivist	Quantitative	Yes; synthesis of findings discussed	Validity was discussed	None	None

*In many cases, authors did not provide an explicit explanation or indication of the purpose of employing a mixed methods approach, paradigmatic assumptions, and validation. Hence, the coding reported in this table represents our interpretation of where each of these papers fit in this table based on our understanding of these papers.

Although this review provides useful information about mixed methods research in IS, we also searched for significant research programs in which IS researchers employed a mixed methods approach for collecting and analyzing data, but crafted separate papers for the qualitative and quantitative studies respectively. We conducted this search in two phases. In the first phase, we searched Web of Science for all qualitative papers published between 2001 and 2007 in one of the six journals.[7] Although we found several of these programs that offered deep insights on different phenomena of interest (see Table 3 for examples), we noticed that none of these programs could be considered a true mixed methods research program because the researchers did not offer meta-inferences of their findings. In other words, there was no visible effort to integrate the findings from qualitative and quantitative studies (i.e., to provide meta-inferences). Without such integration, it is difficult to classify a research program as truly being mixed methods research (Teddlie and Tashakkori 2003, 2009). In the second phase, our goal was to extend this search to include all authors who published in these six journals. However, given that we could not find a single research program that had a true mixed methods approach in the first phase, we did not conduct the second phase of search. This is consistent with Mingers (2001) who also could not find a significant research program in IS employing multiple research methods (see p. 252).

It is important to note that, in many cases, it was difficult to determine whether qualitative and quantitative papers were parts of one research program due to the lack of matching descriptions of research contexts in these papers. Although the outcome of this search process was not entirely fruitful, it confirmed our contention that there is a dearth of mixed methods research in IS. Despite its outcome, we discuss this search process because it depicts a situation of "interim struggles" in the research process (Runkel and Runkel 1984, p. 130). As we noted, although we found several research programs that had characteristics of mixed methods research, we were unable to confirm (or disconfirm) whether or not these programs were indeed examples of true mixed methods research programs due to the absence of an essential characteristic of mixed methods research (i.e., meta-inferences). In many cases, IS researchers published multiple articles without providing much detail to link these articles, thus making it difficult for the reader to integrate findings from the qualitative and quantitative studies. It may not be possible or desirable to publish all papers from such a research program as mixed methods papers because of different research questions and interests. In addition, researchers typically prefer to have multiple publications from a research program. We argue that publishing single method papers from a mixed methods research program can lead to at least two potential drawbacks: *contribution shrinkage* and *communal disutility*.

If IS researchers continue to publish single method papers from mixed methods programs, they are likely to miss the opportunity to discover, develop, or extend a substantive theory in richer ways than possible with single method papers. A mixed methods approach, particularly the associated meta-inferences, offers mechanisms for discovering substantive theory by allowing researchers to not only unearth components related to a phenomenon, but also unveil interrelations among these components and boundary conditions surrounding these interrelations. We suggest that papers from a mixed methods research program that only report findings from single method research thus miss opportunities to contribute substantially to the literature—hence, contribution shrinkage. Further, the entire community of researchers who are interested in this phenomenon fails to learn intricacies of the phenomenon because a holistic account is not provided, leading to communal disutility. Thus, publishing single method papers from mixed methods research programs is disadvantageous to a researcher and the academic community.

Validation in Mixed Methods Research

Validation is an important cornerstone of research in social sciences, and is a symbol of research quality and rigor (Cook and Campbell 1979; Shadish et al. 2002). There is a rich and long tradition of applying validation principles in both quantitative and qualitative studies. Although there is a general consensus among researchers with respect to the validation principles and processes in quantitative studies, researchers do not have any such agreement when it comes to applying validation principles in qualitative studies. However, there have been attempts in recent years to develop a cumulative body of knowledge of validation principles and processes for qualitative research (Lincoln and Guba 1985; Mertens 2005). In this section, we first briefly discuss validation in quantitative and qualitative research independently. This is particularly important in our discussion of mixed methods research because we suggest that the quantitative and qualitative strands in a mixed methods design are subject to the traditional validation principles from each of these strands respectively. We then discuss the notion of validation in mixed methods research. Building on the suggestions of scholars who advanced our knowledge of research methodologies (Cook and Campbell 1979; Lincoln and Guba 2000; Maxwell 1992; Nunnaly and Bernstein 1994; Patton 2002),

[7]We did not include unpublished work, such as working papers or doctoral dissertations.

Table 3. Examples of Mixed Methods Research Programs in IS (2001–2007)

Authors	Description	Validation		
		Quantitative	Qualitative	Meta-inferences*
• Beaudry and Pinsonneault (2005) • Beaudry and Pinsonneault (2010)	Beaudry and Pinnsonneault (2005) developed and tested a model of the user adaptation process using a qualitative study. Beaudry and Pinsonneault (2010) developed a model of the role of affect in IT use based on the theoretical foundation of Beaudry and Pinsonneault (2005) and tested it using a quantitative study.	Validation was discussed in the quantitative study (i.e., Beaudry and Pinsonneault 2010).	Validation was discussed in the qualitative study (i.e., Beaudry and Pinsonneault 2005).	No discussion of meta-inferences and validation was provided.
• Espinosa et al. (2007a) • Espinosa et al. (2007b)	Espinosa et al. (2007a) studied coordination needs in geographically distributed software development teams using a qualitative approach. Espinosa et al. (2007b) studied how familiarity and coordination complexity interact with each other to influence performance of geographically distributed software development teams.	Validation was discussed in the quantitative study (i.e., Espinosa et al. 2007b).	Inter-rater reliability was discussed in the qualitative study (i.e., Espinosa et al. 2007a).	No discussion of meta-inferences and validation was provided.
• Kayworth and Leidner (2002) • Wakefield et al. (2008)	Kayworth and Leidner (2002) studied the role of effective leadership in global virtual teams using a qualitative study. Wakefield et al. (2008) developed and tested a model of conflict and leadership in global virtual teams using a quantitative study.	Validation was discussed in the quantitative study (i.e., Wakefield et al. 2008).	Validation was discussed in the qualitative study (i.e., Kayworth and Leidner 2002).	No discussion of meta-inferences and validation was provided.
• Smith et al. (2001) • Keil et al. (2002) • Snow and Keil (2002) • Keil et al. (2007)	In this research program, Keil and his colleagues conducted both qualitative and quantitative studies to examine communication processes in IT projects, particularly in projects that had major problems.	Validation was discussed in the quantitative studies (e.g., Smith et al. 2001).	Validation was discussed in the qualitative studies (e.g., Keil et al. 2002).	No discussion of meta-inferences and validation was provided.
• Venkatesh and Brown (2001) • Brown and Venkatesh (2005)	Venkatesh and Brown (2001) presented a model of home PC adoption based on a qualitative study. Brown and Venkatesh's (2005) paper was from the same broad program of research that tested a model of home PC adoption using a quantitative approach.	Validation was discussed in the quantitative study (i.e., Brown and Venkatesh 2005).	No discussion of validation was provided.	No discussion of meta-inferences and validation was provided.

*Given that these studies were published as separate journal articles, we believe that the authors did not have an opportunity to offer meta-inferences that cut across these studies.

we categorize the most widely used validation concepts from quantitative and qualitative research, summarize them in Table 4 and discuss them in this section.

Validation in Quantitative Research

Straub and his colleagues have provided detailed reviews and guidelines on validation in quantitative research (Boudreau et al. 2004; Gefen et al. 2000; Straub 1989; Straub et al. 2004). Typically, in quantitative research, two primary validation issues are addressed (i.e., reliability and validity of measures). These two validation approaches are applicable to both formative and summative validity as described by Lee and Hubona (2009). Reliability is related to the quality of measurement (Straub et al. 2004). A measure is considered reliable if it yields the same result over and over again. Types of reliability and guidelines for assessing reliability are discussed elsewhere (Straub et al. 2004). Without reliable measures, a quantitative study is considered invalid (Straub et al. 2004). Therefore, reliability is a precondition for validity of quantitative research.

Validity refers to the legitimacy of the findings (i.e., how accurately the findings represent the truth in the objective world). As shown in Table 4, there are three broad types of validity in quantitative research (Cook and Campbell 1979; Shadish et al. 2002): (1) *measurement validity* (e.g., content and construct validity); (2) *design validity* (i.e., internal and external validity); and (3) *inferential validity* (i.e., statistical conclusion validity). Measurement validity estimates how well an instrument measures what it purports to measure in

Table 4. Examples of Validity in Quantitative and Qualitative Research*

Quantitative Methods	
Design Validity	• *Internal validity*: The validity of the inference about whether the observed covariation between independent and dependent variables reflects a causal relationship (e.g., the ability to rule out alternative explanations).
	• *External validity*: The validity of the inference about whether the cause-effect relationship holds over variation in persons, settings, treatment variables, and measurement variables.
Measurement Validity	• *Reliability:* The term reliability means repeatability or consistency. A measure is considered to be reliable if it produces the same result over and over again. There are various types of reliability, such as inter-rater or inter-observer reliability, test-retest reliability, parallel-forms reliability, and internal consistency reliability. • *Construct validity*: The degree to which inferences can legitimately be made from the operationalizations in a study to the theoretical constructs on which those operationalizations are based. There are many different types of construct validity, such as face, content, criterion-related, predictive, concurrent, convergent, discriminant, and factorial.
Inferential Validity	• *Statistical conclusion validity*: The validity of inferences about the correlation (covariation) between independent and dependent variables.
Qualitative Methods	
Design Validity	• *Descriptive validity*: The accuracy of what is reported (e.g., events, objects, behaviors, settings) by researchers. • *Credibility*: Involves establishing that the results of qualitative research are credible or believable from the perspective of the participants in the research to convincingly rule out alternative explanations. • *Transferability*: The degree to which the results of qualitative research can be generalized or transferred to other contexts or settings.
Analytical Validity	• *Theoretical validity*: The extent to which the theoretical explanation developed fits the data and, therefore, is credible and defensible. • *Dependability*: Emphasizes the need for the researcher to describe the changes that occur in the setting and how these changes affected the way the researcher approached the study. • *Consistency*: Emphasizes the process of verifying the steps of qualitative research through examination of such items as raw data, data reduction products, and process notes. • *Plausibility*: Concerned with determining whether the findings of the study, in the form of description, explanation, or theory, fit the data from which they are derived (Sandelowski 1986).
Inferential Validity	• *Interpretive validity*: The accuracy of interpreting what is going on in the minds of the participants and the degree to which the participants' views, thoughts, feelings, intentions, and experiences are accurately understood by the researcher. • *Confirmability*: The degree to which the results could be confirmed or corroborated by others.

*This list is not exhaustive. There are many types of validity suggested for qualitative and quantitative methods. This table provides examples of some widely used validity types that were identified and defined by Cook and Campbell (1979), Shadish et al. (2002), and Teddlie and Tashakkori (2003).

terms of its match with the entire definition of the construct. Design validity encompasses internal and external validity. Internal validity is the extent of approximate truth about inferences regarding cause-effect or causal relationships in a scientific inquiry (Shadish et al. 2002). External validity is the extent to which the results of a research study can be generalized to other settings and groups. Finally, inferential or statistical conclusion validity is related to the findings of quantitative studies. It refers to the appropriate use of statistics to infer whether the presumed independent and dependent variables covary.

Quantitative research in IS has recognized the importance of reliability and validity. Norms and thresholds have been established over the years and have become generally accepted in the IS literature about how to report reliability and validity. Reviewers and editors are very particular about these norms and thresholds and it is unlikely that a quantitative paper that fails to follow the norms and meet the thresholds will be published in IS journals. Recent reviews on validation in IS research have confirmed the steady progress toward rigorous validation in quantitative IS research (Boudreau et al. 2004; Straub et al. 2004).

Validation in Qualitative Research

As noted earlier, unlike quantitative research that has generally accepted and largely undisputed guidelines for validation (Cook and Campbell 1979; Nunnally and Bernstein 1994), qualitative research does not have guidelines or evaluation criteria for validation that are generally accepted and/or widely used (Kirk and Miller 1986; Lee and Hubona 2009). The issue of validation in qualitative research is rather ambiguous and contentious (Maxwell 1992; Ridenour and Newman 2008). Some researchers, primarily from the positi-

vist paradigm, have suggested that the same set of criteria used in quantitative studies can be applied to qualitative studies, while other researchers, primarily interpretivist or constructivist, have suggested a different set of evaluation criteria. Some researchers have even suggested that the notion of validation, such as reliability and validity, should not even be considered a criterion for evaluating qualitative research (Guba and Lincoln 2005; Maxwell 1992; Stenbacka 2001). Others have suggested that although validation is important for qualitative research, it should be called something other than reliability and validity to distinguish it from what is done in quantitative research (Lincoln and Guba 1985; Patton 2002). Regardless of the different views of validation in qualitative research, there is some agreement that validation (or similar concepts) is essential in qualitative research to reduce misunderstanding of qualitative research and to develop a common scientific body of knowledge (Maxwell 1992). In the IS literature, Lee and Hubona (2009) recently highlighted the importance of establishing validity in qualitative research.

In qualitative research, *consistency* and *dependability* of data and analysis are two terms that are conceptually similar to reliability in quantitative research (Lincoln and Guba 1985). Lincoln and Guba (1985) suggested a process called *inquiry audit* to measure consistency and dependability of qualitative data. They argued that because reliability is a necessary condition for validity, demonstrating validity in qualitative research is sufficient to establish reliability. Validity, in the context of a qualitative study, is defined as the extent to which data are plausible, credible, and trustworthy, and thus can be defended when challenged. Maxwell (1992) suggested three types of validity in qualitative research: (1) *descriptive validity*: the accuracy of what is reported (e.g., events, objects, behaviors, and settings) by the researchers; (2) *interpretive validity*: the accuracy of interpreting what is going on in the minds of the participants and the degree to which the participants' views, thoughts, feelings, intentions, and experiences are accurately understood by the researchers; and (3) *theoretical validity*: the extent to which the theoretical explanation developed fits the data and, therefore, is credible and defensible.

Although Maxwell's suggestions about validity are broad, others have suggested more specific forms of validity for qualitative research. For example, Lincoln and Guba (2000) suggested three criteria for judging the soundness of qualitative research and explicitly offered these as an alternative to more traditional quantitatively oriented criteria. These are (1) *credibility* (as opposed to internal validity of quantitative research); (2) *transferability* (as opposed to external validity of quantitative research); and (3) *confirmability* (as opposed to statistical conclusion validity in quantitative research). Consistent with the classification of quantitative validity types presented in Table 4, we organized different types of validity for qualitative research into three broad categories: (1) *design validity* (e.g., descriptive validity, credibility, and transferability); (2) *analytical validity* (e.g., theoretical validity, dependability, consistency, and plausibility); and (3) *inferential validity* (e.g., interpretive validity and confirmability). This classification is consistent with Guba and Lincoln (2005) and Ridenour and Newman (2008) who discussed two types of validation issues in qualitative research: rigor in the application of methods (design validity) and rigor in the interpretation of data (analytical and inferential validities). Design validity refers to how well a qualitative study was designed and executed so that the findings are credible and transferable. Analytical validity refers to how well qualitative data were collected and analyzed so that the findings are dependable, consistent, and plausible. Finally, inferential validity refers to the quality of interpretation that reflects how well the findings can be confirmed or corroborated by others.

Given that there are no generally accepted guidelines, expectations, or norms to discuss validity in qualitative research, many IS researchers take an implicit approach of discussing validity in their work. Researchers who prefer an implicit approach typically do not offer a formal discussion of validation. Instead, they ensure rigor in their application of methods and interpretation of data by providing rich descriptions of their engagement, high quality data collection efforts, and rigorous data analyses and reporting (Guba and Lincoln 2005; Ridenour and Newman 2008). Although this approach is consistent with the approach taken by qualitative researchers more broadly (see Maxwell 1992), our view is that it is helpful if qualitative researchers provide an explicit discussion of validity. This view is consistent with Klein and Myers (1999) who provide a set of principles for conducting and evaluating interpretive research in IS and with Lee and Hubona (2009) who advocate for a more explicit and rigorous treatment of validity in both quantitative and qualitative research in IS in order to develop and maintain a common scientific basis.

Inference Quality in Mixed Methods Research

Although there has been much progress with respect to the design of mixed methods research, limited guidance is available in the literature for validation in mixed methods research. Creswell and Clark (2007, p. 145) noted that "the very act of combining qualitative and quantitative approaches raises additional potential validity issues." Some of the issues raised by Creswell and Clark are (1) how should validity be conceptualized in mixed methods research; (2) how and when to report and discuss validity for qualitative and quantitative strands of mixed methods research; (3) whether researchers

should follow the traditional validity guidelines and expectations; and (4) how to minimize potential threats to the validity related to data collection and analysis issues in mixed methods research. Overall, validation is a major issue in mixed methods research. Teddlie and Tashakkori (2003) argued that with so many different types of validity in quantitative and qualitative research (see Table 4), the term *validity* has lost the intended connotation. Teddlie and Tashakkori (2003, 2009) proposed the term *inference quality* to refer to validity in the context of mixed methods research. In contrast, Creswell and Clark argued that because the term *validity* is extensively used in quantitative and much qualitative research, it may be used in mixed methods research and, thus, new terminology is not essential. We believe that a mixed methods nomenclature for validation can be useful in order to differentiate mixed methods validation from quantitative and qualitative validation. Therefore, consistent with Teddlie and Tashakkori, we use the term *inference quality* to refer to validity and the term *data quality* to refer to reliability in mixed methods research.

Inference in mixed methods design is defined as

> a researcher's construction of the relationships among people, events, and variables as well as his or her construction of respondents' perceptions, behavior, and feelings and how these relate to each other in coherent and systematic manner (Tashakkori and Teddlie 2003b, p. 692).

Inference quality in mixed methods research refers to the accuracy of inductively and deductively derived conclusions in a study or research inquiry. Inference quality is an umbrella term that includes various types of validities. In contrast, data quality is associated with the quality of measures and/or observations—that is, reliability (Teddlie and Tashakkori 2003). Inference quality is pertinent to interpretations and conclusions from mixed methods research, whereas data quality refers to the degree to which collected data (results of measurement or observation) meet the standards of quality to be considered valid (e.g., trustworthiness) and reliable (e.g., dependable). Teddlie and Tashakkori (2003, 2009) suggested that inference quality consists of *design quality* (i.e., whether a mixed methods study adheres to commonly accepted best practices), and *interpretive rigor* (i.e., standards for the evaluation of accuracy or authenticity of the conclusion). Our guidelines for validation in mixed methods research are based on the notion of inference quality and its dimensions (i.e., design quality and interpretive rigor) proposed by Teddlie and Tashakkori.

Guidelines for Mixed Methods Research in IS

As we noted at the outset, there have been several important papers published in the leading IS journals that provide guidelines for conducting and evaluating research in areas that are not common in the IS literature. For example: (1) Lee (1989) for case studies in IS; (2) Klein and Myers (1999) for interpretive research in IS; (3) Mingers (2001) for multimethod research in IS; (4) Dubé and Paré (2003) for positivist case studies in IS; (5) Lee and Baskerville (2003) for generalizability in IS research; and (6) Hevner et al. (2004) for design science research in IS. These guidelines not only help authors craft and strengthen their manuscripts, but also help reviewers and editors to evaluate and make informed decisions about a paper. Consequently, IS researchers are able to better design, conduct, and report research inquiries and offer rich, theoretical insights on their phenomena of interest. In this section, we provide guidelines for mixed methods research, with a particular focus on three areas: appropriateness of mixed methods research, meta-inferences, and validation. Although we offer a set of broad guidelines on other important aspects of mixed methods research (e.g., research design, data collection, and analysis), we focus on these three aspects because they have received the least attention in the extant literature on mixed methods research (Teddlie and Tashakkori 2003, 2009). Our guidelines will help IS researchers conduct mixed methods research, and apply and evaluate validation principles.

Although we argue that mixed methods research can potentially offer insights into IS phenomena that a single method may not be able to offer, we do not suggest nor do we expect that every research inquiry in IS should employ a mixed methods approach. In fact, we note that mixed methods research is not a substitute for rigorously conducted single method studies in IS. Instead, it is an *additional* approach for gaining further insights on phenomena that are of interest to IS researchers. In this section, we offer a set of guidelines for IS researchers to consider in making decisions regarding whether to employ a mixed methods approach in their research. These guidelines will also help editors, reviewers, and readers of IS research to assess and appreciate the overall appropriateness and quality of mixed methods research.

Appropriateness of Mixed Methods Approach

Before undertaking mixed methods research, IS researchers need to carefully consider the appropriateness of employing

a mixed methods approach in their research. Although there are considerable disagreements regarding the utility, design strategies, and inference quality in mixed methods research, there is a remarkable consistency of views with respect to how and why researchers should employ a mixed methods approach in their research (Creswell and Clark 2007; Ridenour and Newman 2008; Teddlie and Tashakkori 2003, 2009). The general agreement is that the selection of a mixed methods approach should be driven by the research questions, objectives, and context (Creswell and Clark 2007; Mingers 2001; Ridenour and Newman 2008; Teddlie and Tashakkori 2003, 2009). Earlier, we discussed a set of purposes of mixed methods research that we suggest will help IS researchers assess the suitability of a mixed methods approach and make strategic research design decisions. Understanding these purposes (shown in Table 1) will facilitate sound decision making with respect to the appropriateness and value of a mixed methods approach in different types of research inquiries.

We suggest that when IS researchers think about their research questions, objectives, and contexts, they also need to carefully think about the three broad strengths of mixed methods research that we discussed earlier. Our view is that IS researchers should employ a mixed methods approach only when they intend to provide a holistic understanding of a phenomenon for which extant research is fragmented, inconclusive, and equivocal. In particular, we suggest that it is the context of a phenomenon that should drive the selection of methodology (Johns 2006; Rousseau and Fried 2001). Given the nature of IT artifacts and associated phenomena, we suggest that IS researchers are in an ideal position to explore the role of context in their research. A mixed methods approach will be a powerful mechanism to interject context into a research inquiry. For example, although there has been much research on the impacts of IS use on employees' performance, there is no conclusive evidence of either a positive or a negative impact. Mixed methods research can offer a holistic view of the circumstances under which IS use can have a positive (or negative) influence on employees' performance.

If, however, the objective of a research inquiry is to test a model that was developed from a well-established theoretical perspective and the context of the research is not significantly different from the context in which the theoretical perspective was developed, we suggest that there is no need to conduct mixed methods research. For example, if an IS researcher develops a research model based on the unified theory of acceptance and use of technology (UTAUT; Venkatesh et al. 2003) and plans to survey employees of an organization in the United States, there is probably no need for a mixed methods approach. However, if this study is going to be conducted in a rural village in India, a mixed methods approach may unearth factors that are not typically common in a developed country in the West. In that context, leveraging qualitative research, in addition to quantitative, can likely help improve understanding of relationships in UTAUT that work differently (see Johns 2006), or the breakdown of UTAUT (see Alvesson and Kärreman 2007), and result in the emergence of insights possible only from induction (Lee and Baskerville 2003, Locke 2007). For example, Venkatesh et al. (2010) employed a mixed methods approach to study the influence of an information system on employees' job characteristics and outcomes in a developing country using the widely adopted job characteristics model (JCM; Hackman and Oldham 1980). They found that although the new IS had a positive influence on job characteristics, employees reported significantly lower job satisfaction and job performance following the implementation of the IS. Although JCM was not able to explain these puzzling findings, their qualitative study revealed a set of contextual factors that explained these findings and offered insights on important boundary conditions of JCM's predictive validity.

We also urge IS researchers, editors, and reviewers to consider the broad purposes of mixed methods research described in Table 1, and evaluate how the overall research questions, objectives, and context of a mixed methods study fit with one or more of these purposes. If there is no clear fit (e.g., a mixed methods approach does not serve the purpose of providing plausible answers to a research question), it is likely that mixed methods research is not appropriate. For instance, if the goal of a research inquiry is to understand the role of personality characteristics in IS adoption decisions, a mixed methods approach may not be useful because, due to the rich theory base related to personality characteristics and IS adoption, there is limited opportunity to meet the purposes of conducting mixed methods research.

Building on our earlier discussion related to the incompatibility or paradigmatic incommensurability thesis, we suggest that IS researchers have at least three options with respect to mixed methods research paradigms: (1) alternative paradigm stance (i.e., use of new, emergent paradigms to reconcile paradigmatic incommensurability); (2) *aparadigmatic* stance (i.e., the practical characteristics and demands of the inquiry, instead of paradigms, should be the guiding principle in a research inquiry); and (3) substantive theory stance (i.e., traditional or emergent paradigms may be embedded in or intertwined with substantive theories) (Greene 2007, 2008; Teddlie and Tashakkori 2003). Although we acknowledge these stances as valid and powerful paradigmatic positions for mixed methods research, we suggest that a substantive theory

stance is a more appropriate paradigmatic stance for IS research due to the dynamic nature of the field and the need for developing novel theoretical perspectives. If IS researchers prefer to embrace an alternative paradigm as the epistemological foundation of mixed methods research, there are at least three mixed methods research paradigms from which they can choose: (1) *pragmatism*, (2) *transformative–emancipatory*, and (3) *critical realism*.

Pragmatism considers practical consequences and real effects to be vital components of meaning and truth. Although a quantitative approach is primarily based on deduction and a qualitative approach is based on induction, a pragmatic approach is based on abduction reasoning that moves back and forth between induction and deduction. This iterative approach supports the use of both qualitative and quantitative methods in the same research study and thus rejection of the incompatibility thesis (Howe 1988; Maxcy 2003). Pragmatists believe in the dictatorship of the research questions. They place the greatest importance on the research questions and select a method and paradigm that fit with the research questions. Pragmatism rejects a forced choice between existing paradigms with regard to logic, ontology, and epistemology. In sum, pragmatism presents a practical and applied research philosophy. Some mixed methodologists suggest that pragmatism is the best paradigm for justifying the use of mixed methods research (Datta 1994; Howe 1988; Teddlie and Tashakkori 2003). A detailed discussion of pragmatism is beyond the scope of this paper and provided elsewhere (e.g., Maxcy 2003).

The *transformative–emancipatory* paradigm is another paradigm for mixed methods research (Mertens 2003, 2005). The basic thesis of this paradigm is that the creation of a more just and democratic society should be the ultimate goal for conducting research. It places central importance on the experiences of individuals who suffer from discrimination or oppression. It focuses on the interaction between the researcher and the participants, and suggests that this interaction requires understanding and trust. For example, researchers engaging in the transformative–emancipatory paradigm believe that they should be aware of power differentials in the context of their research, and should promote social equity and justice through their research. It supports mixed methods research due to its ability to address the concerns of diverse groups in an appropriate manner (Mertens 2003).

Finally, *critical realism* is a widely used paradigm that is particularly suitable for mixed methods research. It offers a robust framework for the use of a variety of methods in order to gain better understanding of the meaning and significance of a phenomenon of interest (Archer et al. 1998; Bhaskar 1978; Danermark et al. 2002; Houston 2001; Mingers 2004a; Patomaki and Wight 2000; Sayer 2000). Critical realism does not recognize the existence of some absolute truth or reality to which an object or account can be compared (Maxwell 1992). Critical realism is an ideal paradigm for mixed methods research because it accepts the existence of different types of objects of knowledge—namely, physical, social, and conceptual—that have different ontological and epistemological characteristics and meaning. Therefore, it allows a combination of employing different research methods in a research inquiry to develop multifaceted insights on different objects of research that have different characteristics and meaning.

We suggest that the paradigm should not be an obstacle to conducting mixed methods research in IS. Our view is that in order to find plausible and theoretically sound answers to a research question and to develop substantive theory for various phenomena related to information systems, IS researchers should be able to mix and match their paradigmatic views and still conduct rigorous mixed methods research. The three paradigmatic choices that we describe here will help IS researchers justify their paradigmatic (e.g., epistemological and ontological) positions. Although we do not suggest superiority of any particular paradigm of mixed methods research, we note that critical realism has gained much attention in the IS literature recently (Mingers 2004a, 2004b, 2004c). Drawing on Mingers, we suggest that critical realism is a particularly suitable paradigmatic choice for mixed methods IS research because of the dynamic nature and contextual richness of the IS discipline (e.g., different types of object of knowledge—physical, social, and conceptual) that can be adequately examined and theorized using a variety of methods in the same research study.

Strategy for Mixed Methods Design

As noted earlier, mixed methods scholars have suggested several design strategies. Two of the most widely used mixed methods research designs are: *concurrent* and *sequential* (Creswell et al. 2003). In a concurrent design, quantitative and qualitative data are collected and analyzed in parallel and then merged for a complete understanding of a phenomenon or to compare individual results. In contrast, in a sequential mixed methods design, quantitative and qualitative data collection and analyses are implemented in different phases and each is integrated in a separate phase. Although both design options have advantages and disadvantages, we suggest that IS scholars should develop a design strategy in keeping with their research questions and objectives. If the

broad goal of an IS research inquiry is to understand a phenomenon as it happens (e.g., a new IS implementation, a software development project), a concurrent mixed methods design approach should be employed. In contrast, if researchers expect that findings from a qualitative (or a quantitative) study will theoretically and/or empirically inform a later quantitative (or a qualitative) study, a sequential approach should be taken. For example, in the context of IS research, if the goal of a researcher is to understand the impacts of an IS implementation on employees' job characteristics, a concurrent mixed methods research is perhaps appropriate because researchers will not be able to capture the immediate impacts of an IS on employees' jobs in a sequential design. Also, if the goal of a research inquiry is to study changes in employees' perceptions during an IS implementation (e.g., Boudreau and Robey 2005; Compeau and Higgins 1995; Morris and Venkatesh 2010), a concurrent approach would help to capture changes over time, both quantitatively and qualitatively. A concurrent approach is preferred due to the nature of the changes being studied and the potential impact of time on the changes. A sequential approach could make it difficult to discern, for example, whether the changes that are identified are associated with the timing of the change or with the method of data collection.

If, however, the objective of a research effort is to understand employees' reactions toward a new type of IS and the researcher expects to develop a set of new factors, he or she can take a sequential approach in which a core set of factors related to employees' reactions is developed from interviews and then a theory leveraging these factors is developed. The researcher could then conduct a quantitative study among a larger sample of employees to garner further empirical support for the new theory. Unlike the concurrent approach, the sequential approach requires IS researchers to think carefully about whether a qualitative or a quantitative study should be conducted first. Our suggestion is that if IS researchers plan to conduct a study for which a strong theoretical foundation already exists, but the context of the research is novel or previous findings were fragmented and/or inconclusive, they may consider conducting a quantitative study first followed by a qualitative study to offer additional insights based on the context-specific findings or reasons for fragmented and/or inconclusive results in previous studies. In contrast, if there is no strong theoretical foundation for a research inquiry, we suggest that IS researchers conduct a qualitative study first to inductively develop a theoretical perspective (e.g., constructs and relationships) followed by a quantitative study to validate this theory. Regardless of the approach taken, the goal of a sequential research design is to leverage the findings from the first study to inform the second study and add richness to the overall study.

Strategy for Mixed Methods Data Analysis

Data analysis in mixed methods research should be done rigorously following the standards that are generally acceptable in quantitative and qualitative research. In our review of mixed methods research in IS, we found that there is typically a dominant study in mixed methods papers (see Table 2). The dominant study is usually characterized by rigorous data collection and analysis, whereas the nondominant study is often presented in a manner that appears less rigorous with respect to data collection and/or analysis. For instance, in Pavlou and Fygenson (2006), the quantitative study was the dominant component of mixed methods research. The authors did not provide many details about their data collection and analysis for the nondominant qualitative study. In general, if the objective of a mixed methods research study is to generate a set of factors from a qualitative study and then test these factors in a quantitative study, we observed a tendency to conduct the data analysis in the qualitative study without the rigor that typically characterizes qualitative data analysis.

Similarly, we noticed that if a qualitative study is the main thrust of a mixed methods research study, the quantitative analysis is presented with less detail than would typically be expected in a quantitative study. Dominance of one particular study in mixed methods research is sometimes desirable due to the nature of the research inquiry. Neither of the situations that we just discussed is appropriate for or desirable in mixed methods research. We urge IS researchers to develop a strategy for mixed methods data analysis in which both quantitative and qualitative data are analyzed rigorously so that useful and credible inferences can be made from these individual analyses. More importantly, the quality of inferences from qualitative and quantitative studies contributes greatly to the process of developing high quality meta-inferences, which we discuss in greater detail in the next point. Given that the actual process of analyzing qualitative and quantitative data in IS depends on the research questions, model, and contexts, a detailed discussion of this process is beyond the scope of the paper.

Development of Meta-Inferences

We define meta-inferences as theoretical statements, narratives, or a story inferred from an integration of findings from quantitative and qualitative strands of mixed methods research. Our review of IS research employing a mixed methods approach revealed that, in many cases, researchers did not offer meta-inferences (see Table 2). They kept the findings from the qualitative and quantitative studies separate and did not offer a holistic explanation of the phenomenon of

interest by combining findings from both qualitative and quantitative studies. We suggest that drawing meta-inferences is a critical and essential aspect of mixed methods research and IS researchers, editors, and reviewers need to be aware of the importance of meta-inferences in mixed methods research. In fact, if researchers fail to provide and explain meta-inferences, the very objective of conducting a mixed methods research study is not achieved. Development of high quality meta-inferences largely depends on the quality of the data analysis in the qualitative and quantitative studies of mixed methods research. Although we do not intend to provide specific guidelines regarding the length and structure of how meta-inferences should be written in a paper, we suggest that the length and structure will depend on the context and insights gained from each strand (i.e., quantitative or qualitative study) of mixed methods research. For instance, Ang and Slaughter (2001) updated their research model based on the findings from a mixed methods study and proposed a substantive theory of IS professionals' job characteristics and job outcomes integrating the findings from quantitative and qualitative studies. In contrast, Ramiller and Swanson (2003) provided brief theoretical statements triangulating findings from their mixed methods study.

Given that meta-inferences are essentially theoretical statements about a phenomenon, its interrelated components, and boundary conditions, the process of developing meta-inferences is conceptually similar to the process of theory development from observation—in this case, the observations are the findings from the qualitative and quantitative analyses. The core process of developing meta-inferences is essentially an inductive one (e.g., moving from specific observations to broader generalizations and theories). However, this process can be a part of a research inquiry that is either inductive or deductive. Locke (2007) provided a detailed discussion of inductive theory building and called for journal editors to make changes in editorial policies to encourage articles that develop theories inductively. We suggest that Locke's guidelines for developing theories inductively are pertinent to the process of developing meta-inferences. In particular, he suggested that researchers should first develop a substantial body of observations (or data) to be able to formulate valid concepts that are fundamental building blocks of a theory. According to Locke, researchers then need to look for evidence of causality and identify causal mechanisms. Given that researchers conducting mixed methods research analyze both qualitative and quantitative data, they are in a position to develop a substantial and authoritative body of observations that can be used to formulate a unified body of valid concepts and theoretical mechanisms—that is, meta-inferences.

Once researchers have valid inferences from qualitative and quantitative studies separately, we suggest they develop a meta-inference *analysis path*: the route they will take to develop meta-inferences. The analysis path could be one of the following, depending on the mixed methods design strategies:

- merging of qualitative and quantitative findings → meta-inferences
- quantitative findings → qualitative findings → meta-inferences
- qualitative findings → quantitative findings → meta-inferences

These paths suggest that meta-inferences can be developed irrespective of mixed methods design strategies. The purpose of this path is to help researchers manage potential information overload. Once the path is set, IS researchers can then take one of the following two approaches as they develop meta-inferences: *bracketing* and *bridging* (Lewis and Grimes 1999). Bracketing is the process of incorporating a diverse and/or opposing view of the phenomenon of interest. The goal of bracketing is to ensure that researchers capture contradictions and oppositions from qualitative and quantitative findings and attempt to theorize the nature and source of these contradictions and/or oppositions. This process is well suited for concurrent mixed methods research, particularly when the quantitative and qualitative findings do not agree. The concept of bracketing is consistent with the notion of exploration and exploitation of breakdowns in which empirical findings cannot easily be explained by available theories (Alvesson and Kärreman 2007). The process of breakdown can help researchers develop new understanding from mysteries or surprises in findings. We suggest that when researchers encounter a breakdown in either qualitative or quantitative strands in mixed methods research, they take this opportunity to solve the mystery in the findings by developing meta-inferences. Bridging is the process of developing a consensus between qualitative and quantitative findings. Bridging helps a researcher understand transitions and other boundary conditions related to his or her research model and context. Although bridging can be a valuable process for generating meta-inferences from a concurrent design, we suggest that it is particularly suitable for sequential mixed methods research in which researchers seek to provide a developmental or expanded view of a phenomenon of interest. We suggest that IS researchers will be able to develop a theoretically plausible integrative understanding from qualitative and quantitative studies through a process of induction that incorporates different theory development processes, such as bracketing and bridging. This understanding is essentially what we refer to as meta-inferences. The overarching goal of developing meta-inferences is to go beyond the findings from each study and develop an in-depth theoretical understanding that a

single study cannot offer: a substantive theory of a phenomenon of interest.

Assessing the Quality of Meta-Inferences

Table 2 shows that a majority of mixed methods papers did not provide an explicit discussion of validation related to the mixed methods design and findings. Further, although these papers discussed validation of quantitative measures and results, a majority of them did not offer such a discussion for the qualitative part of the study. This review naturally suggests that there is a need in the IS literature to develop guidelines regarding validation of mixed methods research. These guidelines will help editors, reviewers, and readers to assess the quality and extent of rigor of mixed methods research. IS researchers will be able to follow these guidelines when conducting and reporting mixed methods research. Building on recent guidelines for mixed methods research (Creswell and Clark 2007; Onwuegbuzie and Johnson 2006; Tashakkori and Teddlie 2008; Teddlie and Tashakkori 2003, 2009), we offer the following broad guidelines for validation in mixed methods research in IS. Table 5 provides a summary of these guidelines.

Quantitative and Qualitative Validation

IS researchers should discuss the validity of their design, analysis, and findings within the context of both quantitative and qualitative research. In other words, researchers should discuss validation in quantitative research and qualitative research independently before discussing validation for the mixed methods meta-inferences. As suggested by Lee and Hubona (2009), IS researchers should attempt to validate the formation (i.e., formative validity) and the testing (i.e., summative validity) of their theoretical propositions in both quantitative and qualitative studies that are conducted as part of the mixed methods design. Lee and Hubona offered detailed guidelines on how researchers can establish formative and summative validity for both quantitative and qualitative research, and the interested reader is referred to their extensive discussion. Given that quantitative research has a long tradition of assessing and reporting validation, traditional approaches to validation in quantitative studies (i.e., design validity, measurement validity, and inferential validity; see Table 4) should not be avoided in mixed methods research.

As noted earlier, unlike quantitative methods, qualitative methods do not offer generally accepted validation guidelines. Our view is that while a majority of IS qualitative research takes an implicit approach to validation by providing rich and immersive discussions of research contexts, data collection processes, and data analysis approaches, there is still a need to consider how these discussions address the three major groups of qualitative validation presented in Table 4: design validity, analytical validity, and inferential validity. Although the choice of a specific validation type within each category remains a decision of the researcher, we believe that an explicit, albeit short, discussion of validation in qualitative research will help not only develop a healthy tradition of qualitative research in IS, but also create a bridge between quantitative and qualitative worldviews by creating a common language of research.

We suggest that after discussing validation in both qualitative and quantitative strands, IS researchers need to explicitly discuss validation for the mixed methods part of their research. In particular, they need to provide a rigorous assessment of validation of the meta-inferences derived from mixed methods research. We discuss this further below. We urge that, when evaluating theoretical contributions of mixed methods research, editors, reviewers, and readers of IS research need to assess the quality and rigor of the validation aspects of all three components of mixed methods research (i.e., qualitative, quantitative, and mixed methods meta-inferences). In the next section, we offer an integrated framework for assessing validation of these three components.

Mixed Methods Validation

When it comes to validation, we suggest that IS researchers use mixed methods research nomenclature that has been proposed recently in order to avoid conceptual confusion related to validation in a mixed methods approach, and in qualitative and quantitative research (Teddlie and Tashakkori 2003, 2009). We suggest that when IS researchers discuss validation in quantitative and qualitative research, they should use the well-accepted nomenclature within quantitative or qualitative research paradigms in IS. However, when discussing validation in mixed methods research, the nomenclature developed by Teddlie and Tashakkori (2003, 2009) can help differentiate mixed methods validation from quantitative or qualitative validation. If the use of mixed methods research nomenclature becomes a norm in the IS literature, it will help editors, reviewers, and readers better understand the discussion of mixed methods research validation.

Validation in mixed methods research is essentially assessing the quality of findings and/or inference from all of the data (both quantitative and qualitative) in the research inquiry (Teddlie and Tashakkori 2003, 2009). In other words, inference quality has to be assessed on the overall findings from

Table 5. Summary of Mixed Methods Research Guidelines

Area	Guideline	Author Considerations	Editor/Reviewer Evaluations
General Guidelines	(1) Decide on the appropriateness of a mixed methods approach.	Carefully think about the research questions, objectives, and contexts to decide on the appropriateness of a mixed methods approach for the research. Explication of the broad and specific research objective is important to establish the appropriateness and utility of mixed methods research.	Understand the core objective of a research inquiry to assess whether mixed methods research is appropriate for an inquiry. For example, if the theoretical/causal mechanisms/processes are not clear in a quantitative paper, after carefully considering the practicality, ask authors to collect qualitative data (e.g., interview, focus groups) to unearth these mechanisms and processes.
	(2) Develop a strategy for mixed methods research design.	Carefully select a mixed methods design strategy that is appropriate for the research questions, objectives, and contexts (see Table 6 for the definition of design suitability and adequacy).	Evaluate the appropriateness of a mixed methods research design from two perspectives: research objective and theoretical contributions. For example, if the objective of a research inquiry is to identify and test theoretical constructs and mechanisms in a new context, a qualitative study followed by a quantitative study is appropriate (i.e., sequential design).
	(3) Develop a strategy for analyzing mixed methods data.	Develop a strategy for rigorously analyzing mixed methods data. A cursory analysis of qualitative data followed by a rigorous analysis of quantitative data or vice versa is not desirable.	While recognizing the practical challenges of collecting, analyzing, and reporting both qualitative and quantitative data in a single research inquiry, apply the same standards for rigor as would typically be applied in evaluating the analysis quality of other quantitative and qualitative studies.
	(4) Draw meta-inferences from mixed methods results.	Integrate inferences from the qualitative and quantitative studies in order to draw meta-inferences.	Ensure that authors draw meta-inferences from mixed methods research. Evaluation of meta-inferences should be done from the perspective of the research objective and theoretical contributions to make sure the authors draw and report appropriate meta-inferences.
Validation	(1) Discuss validation within quantitative and qualitative research.	Discuss validation for both quantitative and qualitative studies.	Ensure that authors follow and report validity types that are typically expected in a quantitative study. For the qualitative study, ensure that the authors provide either explicit or implicit (e.g., rich and detailed description of the data collection and analyses) discussion of validation.
	(2) Use mixed methods research nomenclature when discussing validation.	When discussing mixed methods validation, use mixed methods research nomenclature.	Ensure that the authors use consistent nomenclature for reporting mixed methods research validation.
	(3) Discuss validation of mixed methods findings and/or meta-inference(s).	Mixed methods research validation should be assessed on the overall findings from mixed methods research, not from the individual studies.	Assess the quality of integration of qualitative and quantitative results. The quality should be assessed in light of the theoretical contributions.
	(4) Discuss validation from a research design point of view.	Discuss validation from the standpoint of the overall mixed methods design chosen for a study or research inquiry.	Assess the quality of meta-inferences from the standpoint of the overall mixed methods design chosen by IS researchers (e.g., concurrent or sequential).
	(5) Discuss potential threats and remedies.	Discuss the potential threats to validity that may arise during data collection and analysis.	Evaluate the discussion of potential threats using the same standard that is typically used in rigorously conducted qualitative and quantitative studies.

mixed methods research (i.e., meta-inferences). We suggest that, while IS researchers need to establish validity of qualitative and quantitative strands of mixed method research, they also need to provide an explicit discussion and assessment of how they have integrated findings (i.e., meta-inferences) from both qualitative and quantitative studies and the quality of this integration (i.e., inference quality). This discussion will help editors, reviewers, and readers understand whether meta-inferences are consistent with the research objectives and make substantive theoretical contributions.

Consistent with Creswell and Clark (2007), we suggest that IS researchers discuss validation from the standpoint of the overall mixed methods design chosen for a research inquiry. Creswell and Clark proposed that the discussion of validation should be different for concurrent designs as opposed to sequential designs because researchers may employ different approaches to develop meta-inferences in these designs. For example, in a concurrent design, researchers tend to *merge* qualitative and quantitative data by transforming one type of data to make qualitative and quantitative data comparable (Creswell and Clark 2007). Although some researchers may choose not to transform data as such, the process of merging in both approaches (transforming or not-transforming) is challenging and requires additional discussion to achieve adequate inference quality. In the case of sequential design, we suggest that IS researchers discuss validation in keeping with whether they conducted the qualitative study first or the quantitative study first. Meta-inferences and associated discussions of inference quality will be different in both designs because the process of developing meta-inferences was essentially different. Research goals and intended contributions are also different in these two design approaches. We urge editors, reviewers, and readers to assess the quality of meta-inferences from the standpoint of the overall mixed methods design.

Finally, we suggest that IS researchers discuss the potential threats to validity that may arise during data collection and analysis. This discussion should be provided for both qualitative and quantitative strands of mixed methods research. IS researchers should also discuss what actions they took to overcome or minimize these threats. The types of threats may vary among different types of mixed methods research designs. Regardless, it is important to discuss them in order to enhance the overall inference quality of mixed methods research.

An Integrative Framework for Validation in Mixed Methods Research in IS

Building on the recent literature on mixed methods research, we present an integrative framework for assessing inference quality in mixed methods research in IS (see Table 6). The integrative framework provides definitions and examples of a set of quality criteria that mixed methods research needs to have to facilitate accurate and meaningful inferences. In addition to the framework, we present a diagram showing the process of conducting mixed methods research and assessing inference quality (see Figure 1). We expect that the framework and the process diagram presented in this article will help IS researchers conduct high quality mixed methods research and apply appropriate validation principles.

The integrative framework has three key characteristics. First, it offers a rigorous set of criteria for assessing the inference quality of mixed methods research. We suggest that conducting high quality quantitative and qualitative studies in mixed methods research does not necessarily guarantee high inference quality of mixed methods research. Therefore, IS researchers need to focus on how they leverage inferences from quantitative and qualitative studies to generate meta-inferences. Second, the integrative framework focuses primarily on the integration aspects of mixed methods research that are often overlooked in much mixed methods research in IS. As noted earlier, the fundamental goal of mixed methods research is to integrate inferences from quantitative and qualitative studies. This integration can be done through the process of compare, contrast, infuse, link, and blend (Bryman 2007). Our framework offers practical guidelines for the integration of qualitative and quantitative findings. Finally, the integrative framework does go beyond what we currently know about validation quality in quantitative and qualitative research. The framework essentially suggests that although quantitative and qualitative studies have their own validation principles (that should be applied during a mixed method research study), the focus should be on the quality of integrative inferences or meta-inferences that provide holistic insights on the phenomena of interest.

The integrative framework presented in Table 6 incorporates two aspects of inference quality: *design quality* and *explanation quality*. Our view of design quality is consistent with Teddlie and Tashakkori (2003, 2009) in that we suggest IS researchers need to rigorously develop a design strategy for mixed methods research. We go beyond their guidelines by suggesting that for both quantitative and qualitative strands, IS researchers need to think about design and analytic adequacies. In particular, we suggest that IS researchers need to ensure that both qualitative and quantitative studies are designed and executed rigorously following the norms and expectations in the IS literature. Our view of explanation quality is different from Teddlie and Tashakkori's (2003, 2009) interpretive rigor in that we suggest IS researchers should follow the generally accepted validation principles for quantitative and qualitative studies. In addition, IS researchers need to develop a rigorous strategy for the integration of findings and inferences from quantitative and qualitative studies so that they can offer accurate and useful meta-inferences with a high degree of explanation quality.

The key elements of our framework are the three validation criteria for meta-inferences from mixed methods research: *integrative efficacy* (i.e., inferences are effectively integrated into a theoretically consistent meta-inference), *integrative correspondence* (i.e., meta-inferences satisfy the initial purpose of doing a mixed methods research study), and *inference*

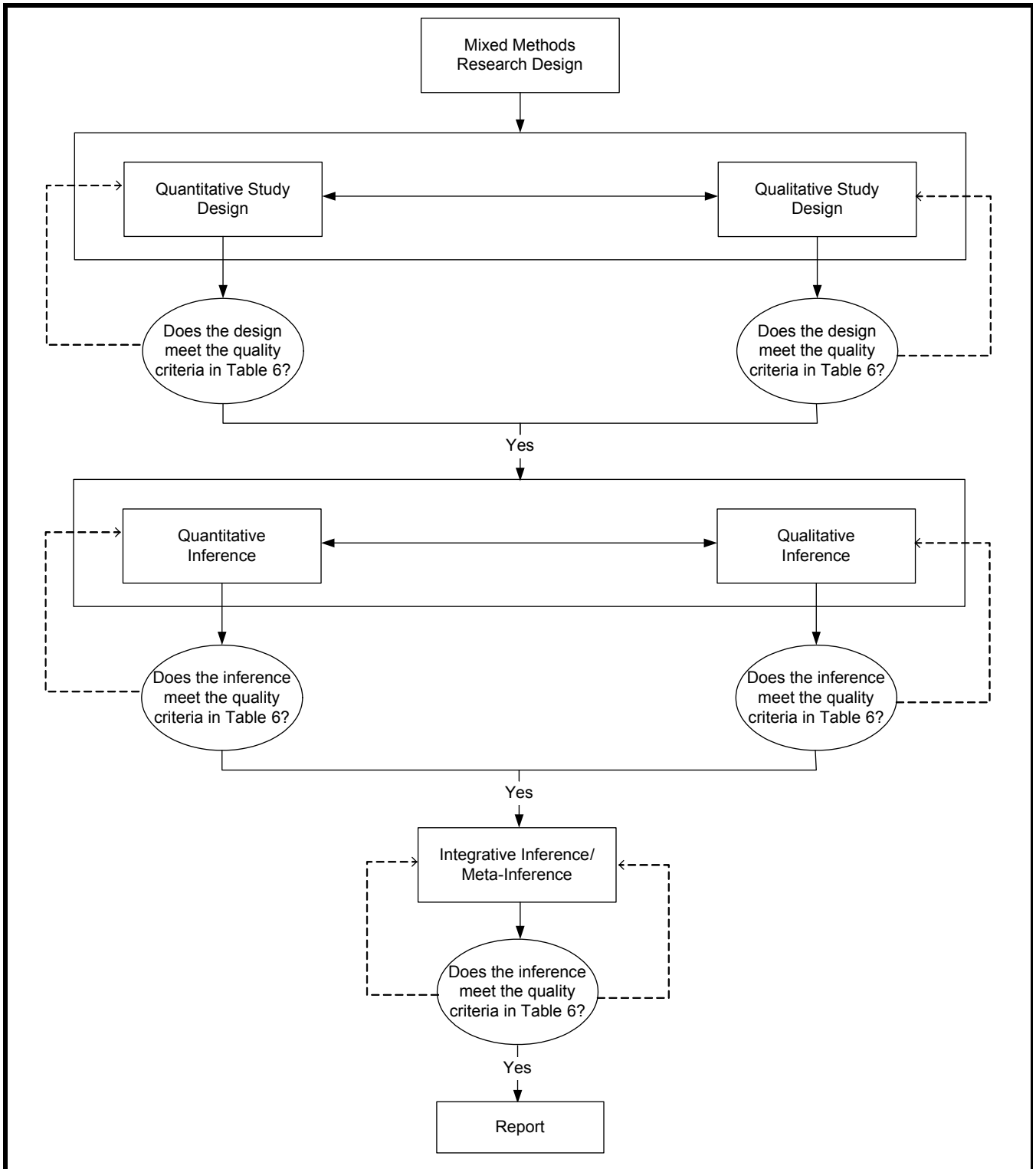

Figure 1. The Process of Mixed Methods Research and Inference Quality (Adapted from Teddlie and Tashakkori 2009)

Table 6. Integrative Framework for Mixed Methods Inference Quality*

Quality Aspects	Quality Criteria	Description
Design quality: The degree to which a researcher has selected the most appropriate procedures for answering the research questions (Teddlie and Tashakkori 2009).	Design suitability/ appropriateness	The degree to which methods selected and research design employed are appropriate for answering the research question. For example, researchers need to select appropriate quantitative (e.g., survey) and qualitative (e.g., interview) methodologies and decide whether they will conduct parallel or sequential mixed methods research.
	Design adequacy	*Quantitative:* The degree to which the design components for the quantitative part (e.g., sampling, measures, data collection procedures) are implemented with acceptable quality and rigor. Indicators of inference quality include reliability and internal validity (Shadish et al. 2002; Teddlie and Tashakkori 2009).
		Qualitative: The degree to which the qualitative design components are implemented with acceptable quality and rigor. Indicators of inference quality include credibility and dependability (Teddlie and Tashakkori 2009).
	Analytic adequacy	*Quantitative:* The degree to which the quantitative data analysis procedures/strategies are appropriate and adequate to provide plausible answers to the research questions. An indicator of inference quality is statistical conclusion validity (Shadish et al. 2002).
		Qualitative: The degree to which qualitative data analysis procedures/strategies are appropriate and adequate to provide plausible answers to the research questions. Indicators of quality include theoretical validity and plausibility.
Explanation quality: The degree to which credible interpretations have been made on the basis of obtained results (Lincoln and Guba 2000; Tashakori and Teddlie 2003b).	Quantitative inferences	The degree to which interpretations from the quantitative analysis closely follow the relevant findings, consistent with theory and the state of knowledge in the field, and are generalizable. Indicators of quality include internal validity, statistical conclusion validity, and external validity.
	Qualitative inferences	The degree to which interpretations from the qualitative analysis closely follow the relevant findings, consistent with theory and the state of knowledge in the field, and are transferable. Indicators of quality include credibility, confirmability, and transferability.
	Integrative inference/ meta-inference	*Integrative efficacy:* The degree to which inferences made in each strand of a mixed methods research inquiry are effectively integrated into a theoretically consistent meta-inference.
		Inference transferability: The degree to which meta-inferences from mixed methods research are generalizable or transferable to other contexts or settings.
		Integrative correspondence: The degree to which meta-inferences from mixed methods research satisfy the initial purpose (see Table 1) for using a mixed methods approach.

*Adapted from Tashakkori and Teddlie (2008) and Teddlie and Tashakkori (2009, 2003). While Teddlie and Tashakkori used the term *interpretive rigor* as the second aspect of inference quality, we refer it as explanation quality in this table to avoid the potential confusion with *interpretive* research, a major paradigm of qualitative research in the IS literature.

transferability (i.e., meta-inferences are generalizable to other contexts and settings). Integrative efficacy does not necessarily mean that findings from qualitative and quantitative studies will have to produce a single understanding of the phenomenon of interest (Tashakkori and Teddlie 2008; Teddlie and Tashakkori 2009). Instead, it refers to the quality of comparison, contrast, infusion, linkage, and blending of findings from both strands of mixed methods research (Bryman 2007). Integrative correspondence is important to ensure that researchers employ a mixed methods research approach in keeping with an overarching research objective. In other words, if quantitative and qualitative studies are conducted to achieve different research objectives, it will be difficult to justify that the mixed methods approach has a high degree of integrative correspondence, even if the studies were conducted within the same research project. Finally, we suggest that IS researchers discuss boundary conditions (e.g., contexts) of meta-inferences from mixed methods research to delineate the generalizability of meta-inferences to other contexts.

Figure 1 provides an overview of the process for conducting mixed methods research and assessing inference quality. This process is consistent with our fundamental position on mixed methods research that IS researchers need to ensure a high quality design and incorporate inferences for both qualitative and quantitative strands of mixed methods research. Once these criteria are met, IS researchers can move to the integrative inference and/or meta-inference stage and assess whether their meta-inferences meet the criteria mentioned in the inte-

grative framework (i.e., integrative efficacy, integrative correspondence, and inference transferability). As shown in to Figure 1, if these inference quality criteria are met, IS researchers can feel confident about the overall inference quality of mixed methods research and be able to report findings from mixed methods research. Thus, the process diagram will help IS researchers combine the general guidelines for conducting mixed methods research (Table 5) and the integrative framework for assessing inference quality in mixed methods research (Table 6) by highlighting specific decision points in which researchers have to compare the quality and rigor of their work to the guidelines provided in the integrative framework for assessing inference quality.

Applying the Guidelines: Two Illustrations

We illustrate the applicability of our guidelines using two published mixed methods papers from the IS literature. The first paper, by Bhattacherjee and Premkumar (2004), studied changes in users' beliefs about usefulness and attitudes toward IS use. The second paper, by Piccoli and Ives (2003), examined the role of behavioral control on trust decline in virtual teams. Both papers were published in *MIS Quarterly*. It is important to note that the purpose of this discussion is not to critique the application of the mixed methods approach in these papers. Instead, our goal is to demonstrate how our guidelines can be used to understand and apply the process of conducting and validating mixed methods research in IS. Further, we expect that this discussion will help to demonstrate the value of meta-inferences and inference quality.

Bhattacherjee and Premkumar

Bhattacherjee and Premkumar (2004), studied one of the most enduring questions in IS research: *Why do individuals use an IS?* Although much prior research employing the technology acceptance model (TAM; for a review, see Venkatesh et al. 2003) and other user acceptance models has provided rich insights to answer this question, Bhattacherjee and Premkumar offered an alternative conjecture. They hypothesized that a change in users' beliefs and attitudes toward an IS over time could explain why and how users form intentions to continue using an IS. They postulated a two-stage model of cognition change in which a pre-usage belief (i.e., perceived usefulness of an IS) and attitude toward an IS influence the usage stage belief and attitude respectively. Pre-usage perceived usefulness was also theorized to influence usage stage disconfirmation and satisfaction. Finally, the usage stage, perceived usefulness, and attitude were expected to influence users' continuance intention. Bhattacherjee and Premkumar conducted two longitudinal studies to test their research model. They used a survey methodology to collect quantitative data and open-ended interview questions to collect qualitative data. The model was tested using a quantitative approach in which constructs were measured using prevalidated items and a statistical technique (i.e., partial least squares; PLS) was used to analyze the quantitative data. Qualitative data were content analyzed to create general themes representing the core constructs of the research model.

Application of the General Guidelines

In this section, we discuss the selection and application of mixed methods by Bhattacherjee and Premkumar using the general guidelines of mixed methods research that we presented earlier (see Table 5). First, although Bhattacherjee and Premkumar did not offer an explicit discussion of the appropriateness of a mixed methods approach, they did mention that their sole purpose for conducting qualitative analysis was to triangulate and validate their quantitative results. We suggest that a clear depiction of the purpose of employing a mixed methods approach is critical to demonstrate the appropriateness of conducting mixed methods research. Given that Bhattacherjee and Premkumar were interested in providing a novel theoretical perspective in the context of IS adoption and use and they were conducting two different longitudinal studies, we believe that they were expecting unanticipated results from the quantitative analysis. Therefore, they were likely interested in using the qualitative analysis to validate the findings from the quantitative analysis. Overall, we believe that they satisfied two purposes of conducting mixed methods research from Table 1: corroboration/confirmation and expansion. Although corroboration/confirmation was the explicit purpose mentioned by Bhattacherjee and Premkumar because they wanted to use the qualitative study to garner additional credibility for their quantitative findings, expansion was an implicit purpose for them because they wanted to gain additional insights into the nature and causes of hypothesized relationship in the research model.

Second, Bhattacherjee and Premkumar adopted a concurrent mixed methods design strategy in which qualitative and quantitative data were collected simultaneously. Given that this was a longitudinal study to understand change in users' beliefs about usefulness and attitudes toward IS use over time, it was critical that both qualitative and quantitative data were collected at the same time so that change could be measured and interpreted accurately using both types of data. Further,

given that the purpose of the qualitative analysis was to validate the findings from the quantitative analysis, if quantitative and qualitative data were collected sequentially, it would have been difficult to achieve this objective because users' perceptions of IS might change by the time qualitative data would have been collected. Bhattacherjee and Premkumar developed a convincing strategy to analyze both quantitative and qualitative data. Quantitative data were analyzed using well-established statistical tools. Quantitative validation was assessed rigorously. Qualitative data were analyzed using a content analysis approach performed by three independent judges who were not aware of the objective of this study. Overall, the strategy for analyzing mixed methods data was executed well in this paper.

Finally, Bhattacherjee and Premkumar integrated the findings from quantitative and qualitative analyses and offered insightful meta-inferences. Consistent with our guidelines, Bhattacherjee and Premkumar compared and merged findings from both qualitative and quantitative studies to develop meta-inferences. For example, they noted (p. 247):

> These responses validated our choice of usefulness as the most salient belief driving IT usage behaviors and the core belief of interest to this study. However, other beliefs, such as usability (e.g., "The program takes too long to load"), lack of time (e.g., "It is helpful, but I worry that I will not have the time to use it"), and compatibility (e.g., "The software is extremely negative because I don't want to be taught by a computer"), also influenced subjects' CBT usage intentions, albeit to a lesser extent, and may have contributed to some of the unexplained variance in our PLS models. Subject responses corroborated the central role of disconfirmation in influencing later-stage usefulness perceptions and intentions.

Although Bhattacherjee and Premkumar could have elaborated on the meta-inferences, particularly in light of the three research questions they mentioned in the introduction, we acknowledge their rigorous data analysis approach for the quantitative and qualitative strands of the mixed methods approach and discussion of meta-inferences to integrate the findings from both strands. This discussion clearly suggests that our general guidelines for conducting mixed methods research can be useful to understand how IS researchers make and execute important decisions related to the appropriateness of mixed methods research, selection of mixed methods research design, and data analysis strategies and presentation of meta-inferences from mixed methods results.

Application of the Validation Framework

When we assess the paper in light of the integrative framework for mixed methods inference quality, we see that the paper had a high inference quality. The paper has substantial *design quality* (see Table 6) because the authors selected appropriate and rigorous design and analytic approaches for both quantitative and qualitative studies. For example, the authors reported reliability and validity of measures in the quantitative analysis. Although not the only way to assess reliability, they discussed inter-rater reliability related to their qualitative data analysis. Further, although the authors did not explicate it in the paper, the use of independent judges and a theoretically developed classification scheme for coding purposes helped ensure theoretical validity and plausibility of the qualitative findings. With respect to *explanation quality*, we observe that the quality of quantitative and qualitative inferences was high. However, there was no explicit discussion regarding the validity of qualitative inferences, such as credibility, confirmability, and transferability. Although we suggest that an explicit discussion of validity is helpful, we believe that the discussion of the data collection and analysis in Bhattacherjee and Premkumar provides adequate evidence of credibility, confirmability, and transferability.

When we examine the quality of integrative and/or meta-inferences, we clearly see an effort to ensure a high degree of integrative efficacy and correspondence. In other words, the authors were able to integrate their findings from the quantitative and qualitative analyses into a theoretically consistent meta-inference. The meta-inference was also consistent with the proposed research model and relationships. Although the authors did not explicitly mention the transferability of meta-inference, they acknowledged it as a limitation of the study. Based on the validation guidelines, we suggest that this paper has high inference quality. Overall, although we believe that the Bhattacherjee and Premkumar paper could offer a richer theoretical discussion of meta-inferences, we still consider it an exemplar of a well-conducted mixed methods research study in the IS literature for the purpose of corroborating/confirming and/or expansion.

Piccoli and Ives

The Piccoli and Ives (2003) paper is different from the Bhattacherjee and Premkumar paper in that the purpose of the mixed methods approach in this paper is *completeness* or *expansion* as opposed to corroboration/confirmation (see Table 1). Piccoli and Ives conducted a longitudinal study of virtual teams to understand the impact of behavioral control

on trust. They found that behavioral control had a negative influence on trust. In particular, they found that a high degree of behavioral control led to declining trust in virtual teams. They employed a concurrent mixed methods approach in which trust (i.e., dependent variable) was measured using a quantitative approach and various aspects of behavioral control (i.e., independent variables) were assessed using a qualitative approach.

Application of the General Guidelines

As we found in the Bhattacherjee and Premkumar paper, the appropriateness of mixed methods research was also not clearly described in the Piccoli and Ives paper. Although the authors mentioned that the use of a mixed methods approach would minimize the threat of mono-method variance, our guidelines suggest that the appropriateness of mixed methods research should primarily be driven by the research questions, objectives, and contexts. This aspect of our guidelines was not followed in this paper. However, the other aspects of our general guidelines, such as selection of the mixed methods research design, data analysis approach, and presentation of meta-inferences, were clearly incorporated. The authors provided a rigorous discussion of how they developed and executed the research design. Although they discussed the generally accepted quantitative validation principles, they took an implicit approach in terms of addressing the issues related to qualitative validity. They provided rich and immersive descriptions of their data collection and analysis.

In terms of the data analysis, the quantitative data were analyzed using appropriate statistical techniques (e.g., t-tests and ANCOVA), and the qualitative data were analyzed using a coding and data reduction approach. Given that the dependent variable was measured using a quantitative approach and independent variables were assessed using a qualitative approach, we suggest that the authors did not have to offer a separate discussion of meta-inferences because the results section already provides a substantial discussion of meta-inferences. By triangulating quantitative and qualitative results, the authors offered rich insights on the process by which behavioral control has a negative influence on trust in virtual teams. An example of meta-inferences from Piccoli and Ives (p. 386) is

> In summary, behavior control mechanisms do appear to increase team members' vigilance and the salience of reneging and incongruence incidents the team experiences during the project. In so doing, they increase the likelihood that these incidents will be detected and lead to trust decline. Conversely, in teams that experience no incidents, or that only experience some early incidents, behavior control has no detectable effect on trust.

Application of the Validation Framework

Consistent with our integrative framework of inference quality, the authors did provide a discussion of *design quality*. In particular, they discussed the data collection procedure and analysis approach for both qualitative and quantitative strands of a mixed methods approach. The authors discussed the design adequacy of the quantitative data (e.g., reliability, validity). However, they did not provide an explicit discussion of design adequacy for the qualitative data (e.g., credibility). They did provide rich descriptions of their data collection and analysis strategies. In fact, their data analysis discussion indicated a great deal of rigor and legitimacy. Similarly, Piccoli and Ives did not provide an explicit discussion of the *explanation quality* of qualitative data (e.g., confirmability, transferability). Although we note that Piccoli and Ives provided a rich description of their context, data collection process, and data analysis approach, indicating that there is certainly a high degree of credibility, confirmability, and transferability of their findings, we suggest that an explicit discussion of how different aspects of their data collection and analysis process addressed these types of validity would be beneficial to the broad IS research community.

Nonetheless, we found that the inference quality of meta-inferences was substantially high because the authors were able to effectively integrate the findings from qualitative and quantitative data to demonstrate a high quality of integrative efficacy. With respect to integrative correspondence, it is clear that the authors were able to achieve the objective of mixed methods research that they articulated at the outset of the paper. By measuring dependent and independent variables separately, the authors were able to minimize the threat of mono-method variance. However, as we noted earlier, the objective of employing a mixed methods approach (i.e., to minimize the threat of mono-method variance) was not clearly aligned with the overall research objective and context of this paper (i.e., to understand the impact of behavioral control on trust), thus limiting our ability to assess the value of mixed methods research in this context. Nevertheless, we suggest that the Piccoli and Ives paper is an exemplar of a well-conducted mixed methods research study in the IS literature for the purpose of completeness or expansion.

Discussion

Our primary goal in this paper is to facilitate discourse on mixed methods research in IS, with a particular focus on encouraging and assisting IS researchers to conduct high quality, rigorous mixed methods research to advance the IS discipline. We are sensitive to the issue that a paper such as this can be misinterpreted in at least two ways. First, it could be viewed that mixed methods research is now an imperative for publication in journals, such as *MIS Quarterly*. Second, these guidelines could be seen as legislative. In this section, in addition to reiterating that neither of these viewpoints represents our intention or perspective, we discuss contributions and implications of this work. Although a mixed methods approach clearly has certain advantages over a mono-method approach, it is not a silver bullet to problems that are associated with any single method. There are also a few limitations with the mixed methods guidelines proposed here that must be acknowledged. One important limitation is that the typical amount of time and effort involved in collecting, analyzing and validating both quantitative and qualitative data are significantly greater than work that employs only one method. Overall, although our guidelines have the potential to offer a way to integrate the strengths of two data collection methods, it may not always be feasible or desirable to do so. We urge IS researchers to carefully think about their research objectives, theoretical foundations, and context before conducting mixed methods research. This paper serves as a call for further work to examine the integration of quantitative and qualitative data collection methods within a single study.

Theoretical Contributions

Our key contributions are three-fold. Our first contribution is the delineation of an overview of mixed methods research based on recent advances in this area. We reviewed six leading IS journals identified in the Senior Scholars' Basket of Journals (AIS 2007) to understand the state of mixed methods research in IS. Our review suggests that there is a dearth of mixed methods research in IS, and there are no standards or guidelines for conducting and evaluating such research in IS. We also provided a set of general guidelines for conducting mixed methods research in IS. We focused on three important areas in our guidelines: (1) *appropriateness* of a mixed methods approach; (2) development of *meta-inferences* (i.e., substantive theory) from mixed methods research; and (3) assessment of the quality of meta-inferences (i.e., *validation* of mixed methods research). We provided in-depth discussions of these three areas because there has been limited discussion and understanding of when to conduct mixed methods research (i.e., appropriateness), how to discover and develop integrative findings from mixed methods research (i.e., meta-inferences), and how to assess the quality of meta-inferences (i.e., validation). This paper should initiate scholarly discourse regarding these three areas to encourage IS researchers to engage in high quality mixed methods research.

Our second contribution is related to developing meta-inferences. We suggest that meta-inferences are essential components of mixed methods research. If researchers fail to develop meta-inferences from mixed methods research, it is difficult to develop substantive theory or make theoretical contributions. If researchers do not intend to develop meta-inferences and instead plan to publish mixed methods research in multiple publications as single method articles, the very purpose of conducting mixed methods research will not be achieved. The shortage of true mixed methods research programs seems to indicate that IS researchers indeed publish single method articles from mixed methods research programs. Although researchers may do so to avoid paradigmatic, cultural, cognitive, and physical challenges associated with conducting mixed methods research and developing meta-inferences, we argued that such a practice will lead to contribution shrinkages and communal disutility in the IS literature.

Our third contribution is the development of an integrative framework for performing and assessing validation (quality of) for mixed methods research in IS. Although much progress has been made on mixed methods research design and data analysis in other social sciences disciplines, there has not been much discussion of validation (Teddlie and Tashakkori 2003). We developed these guidelines from the recent work on mixed methods research and discussed it in the context of IS research. We expect that these guidelines will be useful in conducting and evaluating mixed methods research in IS. Lee and Hubona (2009) recently provided a valuable discussion of the importance of validation in quantitative and qualitative IS research. This work augments their suggestions by offering and illustrating validation guidelines for mixed methods research in IS.

Theoretical Implications

We believe that IS phenomena are socially constructed and not fully deterministic. Therefore, a purely quantitative research approach may not always provide rich insights into IS phenomena. Similarly, a purely qualitative approach may not provide findings that are robust and generalizable to other settings because of the difficulty to collect qualitative data from many different sources. Consequently, a mixed methods approach provides an opportunity for IS researchers to be

engaged in rich theory development processes, such as bracketing, breakdown, and bridging. We suggest that mixed methods research is appropriate for IS research because of the opportunity to develop novel theoretical perspectives. We call for going beyond the debates on the incompatibility of methodology and paradigmatic incommensurability, and suggest that IS researchers take a more pragmatic approach. We also call for conducting more mixed methods research in IS as it offers substantial benefits over and above mono-method research by answering research questions that a single method cannot answer, providing better (stronger) inferences, and presenting a greater diversity of views. That being said, we suggest that IS researchers do not need to conduct qualitative and quantitative studies to publish a single paper unless there is clearly a need for doing so. Our view is that, on most occasions, the process of crafting a manuscript is likely to be business as usual. A combination of both methods in one inquiry or paper is another arrow in a researcher's quiver for occasions when it is appropriate. Further, there may now be occasions when well-designed and well-executed mixed methods studies can result in a third paper that focuses on the meta-inferences (e.g., development of a substantive theory on an emerging area in IS) that neither study by itself can reveal.

IS is a relatively new applied social science, with roots in multiple disciplines, such as quantitative sciences (e.g., mathematics, statistics), computer science and engineering, and organizational behavior and social psychology. IS researchers have backgrounds in these disciplines, thus setting up an ideal situation for conducting mixed methods research. A researcher who has a strong background in quantitative sciences can collaborate with a qualitative researcher to investigate a phenomenon that is of interest to both researchers. Thus, IS researchers will be able to complement each other and offer unique perspectives as they develop meta-inferences in a mixed methods research inquiry.

A potential future area of inquiry related to mixed methods research in IS relates to the increasing use of primary social network data (see Sykes et al. 2009). In this highly quantitative methodology, for pragmatic reasons, despite their known limitations, single items are used, which is indeed consistent with how this methodology is applied in other fields (e.g., Sykes et al. 2011). An opportunity exists to develop guidelines for mixed methods research that integrate social network methods with qualitative methods in order to get the best of both worlds so to speak.

With respect to evaluating the quality of meta-inferences, we suggest that the criteria we discussed in this paper are no different from what is used to evaluate findings from qualitative and quantitative studies. The key, in our opinion, is to develop insightful meta-inferences that, as we observed in our review of prior research, are missing in many articles that employed a mixed methods approach. Insights that help extend theory and practice will be important, as always**.** In order to encourage and evaluate work resulting from mixed methods inquiries, journal editors should find a pool of reviewers who can provide coverage of various methodological aspects. It is also important to instruct such reviewers to focus only on their areas of expertise and suspend their biases about other methods. Ideally, one or both reviewers can provide their expertise on the phenomenon and/or theory bases being used. Ultimately, more so than any other paper, the editor's role becomes important as biases of reviewers favoring one particular method may tend to bury or dismiss the value of mixed methods research. We call for editors to buffer the authors from such biases and take risks when the value of the insights, particularly the meta-inferences, or the theoretical or practical insights, outweigh minor methodological issues. Just as we recommended to the editors to watch out for reviewers' biases, we encourage reviewers to suspend their biases about methods and focus on the insights being gained.

Conclusions

We set out to review the current state of mixed methods research in IS and provide guidelines to conduct mixed methods research in IS, with a particular focus on three important aspects of conducting mixed methods research: (1) appropriateness of a mixed methods approach in IS; (2) development of meta-inferences or substantive theory from mixed methods research; and (3) assessment of the quality of meta-inferences of mixed methods research. Considering the value of mixed methods research in developing novel theoretical perspectives and advancing the field, we urge IS researchers to go beyond the rhetorical debate related to the use of multiple methods and paradigmatic incommensurability and consider undertaking mixed methods research if they feel that such an approach will help them find plausible theoretical answers to their research questions. We present a set of guidelines for conducting and assessing mixed methods research in IS. We hope that this paper will be a launching pad for more mixed methods research in IS and the guidelines presented here will help IS researchers conduct and evaluate high quality mixed methods research.

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