JITTA

JOURNAL OF INFORMATION TECHNOLOGY THEORY AND APPLICATION

A Publication of the Association for Information Systems

Theories Used in Information Systems Research: Insights from Complex Network Analysis

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Abstract:

Effective application of theory is critical to the development of new knowledge in information systems (IS) research. However, theory foundations of IS research are understudied. Using Complex Network Analysis, we analyze theory usage in IS research published in two premier journals (*MIS Quarterly* and *Information Systems Research)* from 1998 to 2006. Four principal findings emerge from our analysis. First, in contrast with prior studies which found a lack of dominant theories at an aggregate level, we find stronger dominance of theory usage within individual streams of IS research. Second, IS research draws from a diverse set of disciplines, with Psychology emerging as a consistently dominant source of theories for IS during our study period. Moreover, theories originating in IS were found to be widely used in two streams of research ("IS development" and "IT and Individuals" streams) and more sparingly used in other streams. Third, IS research tends to form clusters of theory usage, with little crossover across clusters. Moreover, streams of IS research constitute distinct clusters of theory usage. Finally, theories originating from Economics, Strategy, and Organization Science tend to be used together, whereas those originating from Psychology, Sociology, and IS tend to be used together. Taken together, our results contribute to a scholarly understanding of theory foundations of IS research and illustrate methodological innovations in the study of theory use by employing Complex Network Analysis.

Keywords: IS theory, Complex Network Analysis, originating disciplines, IS identity, IS research issues

Volume 14, Issue 2, pp. 5–46, June 2013

Marcus Rothenberger acted as the Senior Editor for this Paper.

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INTRODUCTION

Explicating the theory foundations of Information Systems (IS) research is critical to knowledge development, given that "theory is the currency of our scholarly realm" (Corley and Gioia 2011, p. 12). Theories are used to provide guidance on analysis, explanation, and prediction of phenomena and for providing design and action guidelines (Gregor 2006). Put simply, while an empirical analysis may suggest correlated phenomena, theory tells us why they are correlated (Sutton and Staw 1995). Given the salience of theory in explaining why phenomena occur, leading journals strongly recommend that manuscripts be firmly rooted in theory (Straub 2009). Indeed, an enduring theme in the literature is continued calls for "good theory" in IS research (Watson 2001) and development of our "own" theory (Weber 2003).

The critical importance of theory in knowledge development would suggest a wellspring of scholarship on theory and its application in IS research. Numerous studies have examined theory structure, philosophical issues, types of theory, epistemology, and sociopolitical issues related to the role of theory in research (e.g., Davison et al. 2012; Gregor 2006; Markus and Robey 1988; Ngwenyama and Lee 1997; Weber 1987). In contrast, very few studies have examined questions related to the application of theory in IS research. Barkhi and Sheetz (2001) examine theories used in two leading journals by tabulating their occurrence. Similarly, Lee et al. (2004) develop a three-dimensional ontology for mapping theory use in leading IS journals, again drawing insights from tabulations of theory usage. In both these prior studies, a key finding is theoretical diversity, i.e., many different theories and few used often. However, insights are constrained by the use of descriptive statistics such as tabulations, a limitation acknowledged by the authors, who suggest that future researchers employ more rigorous analytical methods that "help to provide richer findings" (Lee et al. 2004, p. 560).

In this study, we respond to this call by using Complex Network Analysis (CNA) to examine networks of articles and theories in IS research: which theories are used, in which research streams,[1] from which disciplines are they drawn, whether the usage of some theories greatly exceeds the average, and how are articles and theories in IS research interrelated in terms of theory usage and research contexts. The use of CNA enables us to explore questions that can shed new light on fundamental issues regarding the use of theory in the IS discipline, issues which have not been explored empirically in prior research.

CONTRIBUTIONS

Our study contributes to the literature in three principal ways and builds on prior related research (Barkhi and Sheetz 2001; Lee et al. 2004). First, by analyzing the distribution of the number of theories by usage incidents, we examine whether there are particular theories used more heavily than the average (referred to as *dominant theories* in this study). Our power-law analysis indicates that a handful of theories account for a significant portion of theory usage, suggesting that new studies tend to build on prior studies by picking theories heavily used before—a phenomenon we refer to as "convergence of theory usage." This finding may seem contradictory to prior related studies (Barkhi and Sheetz 2001; Lee et al. 2004) which examine and conclude "diversity" and that "no such dominant theory exists in IS" (Barkhi and Sheetz 2001, p. 11). However, our study does not reject the "diversity" view, but rather uncovers a new finding when the issue of theory diversity is examined from new and disaggregated perspectives. Specifically, while a wide range of theories are used in IS research, there are few theories whose usage greatly exceeds the average. Furthermore, our further analysis at a granular (well-defined research stream) level reveals stronger dominance of theory usage within specific streams of IS level as compared to the IS field as a whole and significant difference across streams. The second contribution of our study is the usage of well-recognized methodologies from CNA (small-world analysis and cluster analysis) enabling us to uncover clusters of articles in terms of theory usage in IS research, while also identifying areas where potential opportunities for theory use may be enriched. This finding of disjointed clusters of articles suggests a lack of a core in terms of theory usage, reinforces the diversity of the discipline (Barkhi and Sheetz 2001; Lee et al. 2004; Sidorova et al. 2008), and suggests that IS research may be enriched by "blending" and combining theories to generate new knowledge (Oswick et al. 2011, p. 318). Finally, the study contributes by examining how IS researchers utilize theories from other disciplines. This analysis illuminates how IS researchers in various streams of IS draw theories from disciplines and how theories from sets of disciplines tend to be used together. Taken together, our findings contribute to the literature on analysis of the IS field from the important perspective of theory usage.

[1] By streams, we mean distinctive areas of research which share a research theme. Formally, we use the categorization of five research streams derived by Sidorova et al. (2008, p. A3).

There are several reasons why a new analysis using CNA to examine theory usage can benefit the IS discipline. First, analyzing theory application can help "facilitate the building of sound, cumulative, integrated, and practical bodies of theory in IS" (Gregor 2006, p. 635). Understanding the nuances of how theories are applied, such as homogeneity or heterogeneity within and across major research streams, is salient to theory building. Second, investigation of interrelationships among articles and theories using CNA techniques can provide new insights and methodological innovations. For example, construction of article networks provides insights about "theory siblings" (articles that use the same theory), while construction of theory networks can enable co-theory analysis (theories that tend to be used together). Understanding how theories are used together via co-theory (and other network) analysis, and the resultant communities of theory usage can provide a grounding for linkages among theories across boundaries, facilitating the accumulation of knowledge (Nevo and Wade 2010; Porra 2001). Such analysis facilitated by CNA can also shed light on shared phenomena across intellectual domains and can serve as a first step in building unified theories by "blending" existing theories (Oswick et al. 2011). Third, examining the originating disciplines of theories used in IS research helps shed light on "whether native IS theories represent a sizeable proportion of all the theories we employ, an influential proportion, an emergent proportion, or a trivial proportion": a question that is "still open to question" (Straub 2012, p. x). Fourth, various stakeholders benefit from enhanced understanding of theory application in IS research, such as scholars, doctoral students, and review teams. For example, systematic understanding of theories in use supplements reviewers' prior knowledge regarding which theories are widely (and not so widely) used in a given research stream and how to evaluate their application in a particular scholarly manuscript. Another example is scholars who seek to create new theory by blending existing theories (Oswick et al. 2011). Finally, scholarly understanding of diversity in IS research (Benbasat and Weber 1996; Benbasat and Zmud 2003; Robey 1996) can be enriched by enhanced analysis of the intellectual structure of the discipline from the theory usage perspective, for example, in specific streams of research within the discipline.

With this backdrop and motivation, we examine the following three research questions (RQ):

- *RQ 1. Are there dominant theories in IS research, from which discipline are they drawn, and how do they vary among different IS research streams? (Theory Dominance Analysis)*
- *RQ 2. How cohesively have IS researchers built knowledge around theories? Are there observable clusters or cores of theory usage in IS research? (Theory Sibling Analysis)*
- RQ 3. *Which theories are frequently used together? (Co-theory Analysis)*

To address these questions, we analyze the usage of theory in papers published in *MIS Quarterly* (MISQ) and *Information Systems Research* (ISR) in the period 1998–2006, consistent with studies of researcher productivity that focus on these two journals (Dennis et al. 2006). We use Complex Network Analysis for its ability to discover patterns of interaction in complex networks. A complex network refers to a wide variety of systems in nature and society, such as the World Wide Web (Adamic and Huberman 2000), film actor collaboration network (Watts and Strogatz 1998), neural network of worms (Barabasi and Albert 1999), and so on. In the last decade, boosted by the increased computing power, there has been explosive theoretical development in complex network research, in terms of new concepts and measures, which guide researchers to identify underlying patterns and organizing principles in complex networks (Albert and Barabasi 2002). In our context, CNA not only enables us to examine rigorously the distribution of theory usage, but also allows us to visualize the interrelationships between research articles and theories and to systematically identify clusters of research and articles with objective measures, based on their shared commonalities (interrelationships) with other research articles and theories. Such patterns are difficult or impossible to identify using traditional methods such as tabulations or regression analysis.

To enhance objectivity in our analysis, we adopt a strict definition of theory, consistent with Cushing (1990) and Gregor (2006). More specifically, we follow Gregor (2006) in defining theory as that which explains, analyzes, or predicts phenomena. As Gregor (2006, p. 619) notes, theory can have four broad purposes: (a) to analyze and describe a phenomenon of interest, (b) to provide an explanation for how and why things happen, (c) to predict what will happen, and (d) to provide a prescription. Consistent with this definition of theory, we treat a paper as using a theory if that paper explicitly makes a formal use of a theory in making arguments to analyze or describe a phenomenon of interest, to provide an explanation for how things happen, or how that phenomenon of interest is relevant to their current work. For example, if a paper uses Theory of Resource-based View (RBV) in making an argument related to effects of resources on firm performance, we considered that paper as using the theory of RBV.

To scientifically operationalize our adopted definition of theory, as explicated later, we search for the stem *"theo*" in each paper, and then verified that the paper actually used the theory to build its arguments and did not simply refer to the theory in passing. In adopting this scientific approach, we acknowledge that our definition may not cover all uses of theory. For instance, if a paper bases its arguments on concepts of resources, then our study does not consider it as using resource-based view theory unless it explicitly says so. Likewise, to enhance the scientific and

objective nature of our study, we dropped theories that may be considered to be too broad. For example, we considered organization theory as too broad or ambiguous. However, within what is classified as the broad organization theory (i.e., any theory related to studying organizational phenomenon), if the paper specifically uses an identifiable theory in building the arguments, we considered it as a theory. For instance, under the broad classification of "organization theory" if the paper uses an identifiable granular theory like "organizational learning theory" in its argument, we consider it as a theory in our analysis.

We structure the remainder of this article as follows. We start with a review of related prior literature and then describe our methodology. Subsequently, we describe the CNA analysis and findings. Finally, we discuss the limitations and contributions of our study.

LITERATURE REVIEW

Our study is broadly motivated by three key aspects of IS research: focus on theory, mapping of the IS field, and diversity of IS. We briefly review the literature related to these areas.

Focus on Theory

The application of theory to the study of IT artifacts provides a richer understanding of complex phenomena, helping researchers to ground their arguments and position their study in the appropriate context (Barkhi and Sheetz 2001; Gregor 2006; Orlikowski and Iacono 2001). Despite the importance of theory, few studies have analyzed IS research from the perspective of theory. Two notable exceptions in this regard are Barkhi and Sheetz (2001) and Lee et al. (2004). Analyzing papers from *Journal of Management Information Systems* (JMIS) and *MIS Quarterly* (MISQ) during the period 1994 to 1998, Barkhi and Sheetz (2001, p. 2) found no "grand/unified theory of information systems" (p. 2) and concluded the presence of "theoretical diversity" (p. 11). A similar finding was reported by Lee et al. (2004), who, in their analysis of theory frameworks used by papers in five journals in the 1991–2000 timeframe, found diversity and no presence of a dominant theory framework. Lee et al. (2004, p. 560) suggest that future researchers build on their work by using "more rigorous statistical methods" to "provide richer findings."

These studies underscore the importance of theory in IS and suggest that our understanding of the discipline will be enriched by a systematic analysis of the discipline from the perspective of theory (Gregor 2006; Lee et al. 2004).

Mapping the IS Field

Research that maps IS as a discipline has received renewed attention in recent studies (Agarwal and Lucas 2005; Banker and Kauffman 2004; Benbasat and Zmud 2003; Sidorova et al. 2008; Taylor et al. 2010). While early analysis developed and identified the IS field using frameworks and key issues (Culnan 1987; Nolan and Wetherbe 1980; Palvia et al. 1996), subsequent research has distilled the core and identity of the discipline by mapping the IS field using various criteria such as streams of research (Banker and Kauffman 2004; Sidorova et al. 2008), co-citations (Culnan 1987; Taylor et al. 2010), and executive perceptions (Claver et al. 2000; Niederman et al. 1991).

Although the aforementioned studies contribute to our understanding of the IS discipline from various important perspectives, scant research exists in terms of mapping the field from the perspective of theory (Lee et al. 2004).

Diversity

The issue of diversity has been prominent in the IS literature. The IS discipline is diverse from the point of view of problems addressed, theory foundations, reference disciplines, and methods used (Benbasat and Weber 1996; Vessey et al. 2002). Although diversity or loss of a central identity is on one hand argued to be detrimental to the development of the field as a whole (Benbasat and Weber 1996; Benbasat and Zmud 2003), diversity is beneficial because it "promotes creativity and helps attract top researchers from other disciplines" (Sidorova et al. 2008, p. 468; Robey 1996). Researchers have highlighted the diversity of IS from the perspective of multiplicity of theories used (Barkhi and Sheetz 2001; Lee et al. 2004).

The aforementioned studies suggest a variety of perspectives with regard to diversity of the IS field. Our study contributes to this literature by using a structured approach of CNA to shed new light on the diversity of IS from the perspective of *interrelationships* among theories used, which to our best knowledge, is not addressed in the extant literature and can provide new insights.

Synthesis

Despite recognition of the diversity in the IS field and emphasis on the importance of theory by various researchers, few studies to our best knowledge have analyzed the theory foundations underlying IS research. Moreover, researchers have demonstrated the importance of examining IS reference disciplines (Baskerville and Myers 2002; Grover et al. 2006; Vessey et al. 2002; Wade et al. 2006). Notwithstanding studies that have examined some of the

issues in isolation, there is a deficiency in our collective knowledge regarding theories used in IS research: what the dominant theories are, which disciplines are they drawn from, what clusters of theory usage exist, if any, across various streams of IS research, and which theories are used together. Hence, we focus on understanding the theory foundations of IS research, guided by our research questions described earlier.

RESEARCH METHODOLOGY

In this section we describe our sample, our approach to identification of theories and their originating disciplines, and our analysis methodology.

Data Collection

We selected papers (articles) published in ISR and MISQ from 1998 to 2006. These two journals are widely accepted as among the top journals in IS. Two primary considerations guided our selection of the time period 1998–2006. First, this period enabled us to map the articles to research streams identified by Sidorova et al. (2008), thus allowing us to examine the theories dominant within specific streams of IS research, which is one of our key research questions. Specifically, we utilized a subset of the data used by Sidorova et al. (2008), and we employed their coding scheme to classify the articles into the five different streams of IS research.[2] Second, we considered the nine-year period (1998–2006) to be comprehensive enough to serve as a representative sample of relatively recent IS research and to capture variation in theory use.

Each of three authors of our paper identified theories used in papers in both journals during three of the nine years. We excluded research commentaries and editors' comments. First, consistent with prior research (Barkhi and Sheetz 2001; Lee et al. 2004), an electronic search for preliminary identification of theory references in a paper was conducted to find the keyword "*theo.*" Electronic search is used to minimize human error. Then, specific analysis of the theory sections of the paper was undertaken to identify theory foundations. We then meticulously verified that the article used the theory for its argument(s) and did not just mention it in passing or as part of a literature review. To facilitate reliable classification of theories, we used a strict definition of theory (consistent with Cushing 1990). We also dropped theories which we deemed to be too broad or ambiguous. For example, Theory of Planned Behavior is an unambiguous theory, while Goal-sharing Theory was deemed ambiguous and Organization Theory is too broad.[3] Table 1 summarizes our approach to identifying theories (see Appendix 1 for a description of reliability checks).

Table 1: Theory Identification Methodology

Step#	Activity	Description
1	Select	Select MISQ and ISR articles from 1998–2006.
2	Filter	Drop commentaries and editorial notes.
3	Search	Electronic search for words beginning with "*theo.*"
4	Analyze	Analyze the article to ensure it used the theory. Do not consider theories too broad or ambiguous, and exclude frameworks.
5	Confirm	A different author repeats Step #3 and Step #4 for each article.
6	Resolve	Differences resolved by discussion among the three authors.

Identification of Originating Discipline of Theories

Our objective of studying how IS researchers draw theories from across disciplines entailed tracing theories used in IS research to their originating discipline. Since we did not find a formal guideline in the literature to identify the originating discipline of a theory, we adopted the following approach. First, the textual content and the references section of each paper were used to identify the originating disciplines. We used multiple sources of scholarly information, including *Business Source Complete*, *Google Scholar*, and the York University website,[4] to trace the origins of each theory. All such sources were utilized until the list of potential originating disciplines was narrowed down. If the theory appeared to belong to more than one discipline, a shortlist of possible originating disciplines for each theory was prepared. Second, we conducted further analysis to deduce the origins of each theory by examining prior studies related to it. For most theories, the originating discipline could be unambiguously identified. For example, the Theory of Self-efficacy (Bandura 1977) could be unambiguously traced to Psychology. A final check was conducted (by carefully reading the surrounding text) for the use of the theory in the paper to determine

[2] More details of the streams are provided later. Sidorova et al. (2008) analyzed 1615 research abstracts published in MISQ, ISR, and JMIS, in the period 1985 to 2006.

[3] Before any theory was deemed ambiguous (or broad), every effort was made to identify the theory's roots by searching scholarly resources and the Internet. While we acknowledge a certain amount of subjectivity in this step as a limitation of our study, the number of such ambiguous or broad theories left out was small. Hence, this is not likely to affect our results substantially.

[4] Theories used in IS Research Wiki, York University, online: http://www.fsc.yorku.ca/york/istheory/wiki/index.php/Main_Page.

the originating discipline for each theory. All results were then validated by an author other than the initial evaluator. This improved the validity and reliability of the data before further analysis. Some theories deemed to be originating from multiple disciplines were assigned to a discipline based on the context in the paper and a discussion among the authors. We acknowledge that tracing theories to their originating disciplines may be somewhat subjective in some cases. For example, it can be argued that the Resource-based View of the firm (RBV) originated in the field of Strategy (Barney 1991), whereas some may argue that RBV originated in Economics based on the concept of resources (Penrose 1959). Nevertheless, a very high proportion of theories in our dataset can be unambiguously traced to their originating discipline. A complete list of mapping of theories to originating discipline is provided in Appendix 3 (Table A2).

Analysis Method and Complex Network Analysis

Our choice of Complex Network Analysis (CNA) as a research methodology enables us to assess our research questions. CNA enables us to examine *relationships* among large number of research articles and theories with objective measures and graphical visualization. Specifically, we can visually observe and systematically identify clusters of articles and theories based on their shared commonalities with other articles and theories. Such patterns are difficult or impossible to identify using other methods. In addition, CNA produces objective measures for various network properties, from which we can infer what the relationships imply and why such relationships have emerged, based on insights from prior network research.

Despite the strength of CNA to map structural relationships, CNA has been rarely used for the purpose of structuring the IS field. To the best of our knowledge, CNA has been used only in this context in IS for analyzing relationships and influences among journals (Polites and Watson 2009), without examining questions regarding the interactions among individual articles—the focus of this study.

Network Construction

We first represent our data in a "usage" network, where an edge connects an article to a theory it uses (Article-Theory network in Figure 1).[5] Therefore, the number of links attached to an article represents the number of theories the article employs. Similarly, the number of links attached to a theory represents the number of articles employing that theory. We refer to the latter case as the number of *incidents* of theory usage. For example, in Figure 1, though there are only three theories, the total number of incidents of theory usage is six—two for Theory 1, one for Theory 2, and three for Theory 3. Because an article often uses more than one theory and a theory is often used by multiple articles, the number of incidents of theory usage is larger than the number of theories. In effect, the number of links attached to a theory in this network provides a measure of the popularity of the theory.

We then transformed this network into two types of network—the article network (network of articles as nodes) and the theory network (network of theories as nodes)—to examine the interrelationship between articles in terms of theory usage and the interrelationship between theories in terms of their application, respectively.

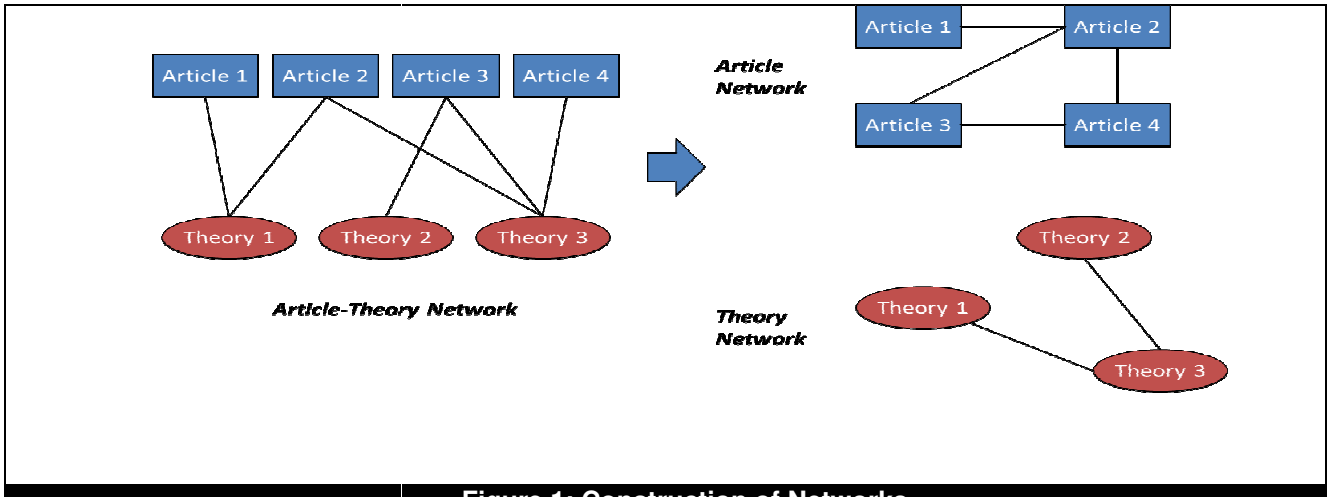


Figure 1: Construction of Networks

[5] These types of usage or affiliation networks are referred to as bipartite networks in graph theory. A bipartite network has two types of vertices (articles and theories in our case), and an edge between different types of nodes represents usage or affiliation. A bipartite network is often converted to a one-mode network for analysis purposes.

In the article network, articles are connected by a link if they share at least one theory. For example, Agarwal and Karahanna (2000, ISR) and Gefen et al. (2003, MISQ) are nodes in the article network and are connected by a link because they used the same theory, Technology Acceptance Model (TAM). Consequently, the number of links (edges) attached to an article is the number of other articles which share at least one theory with the article. Thus, a high degree (number of linkages) of an article indicates that the article has many "theory siblings"—other articles that share common theory with the article.

Moving to the theory network, in this network, two theories are connected if both theories are used by at least one article. For example, Zhu and Kraemer (2002, ISR) employed RBV and Theory of Dynamic Capabilities. Connection in the theory network is likely to suggest relatedness between theories, such as ability of both theories to explain a phenomenon (e.g., explanation of firm performance, in the case of RBV and Dynamic Capabilities) and/or the same originating disciplines. This analysis can also be considered "co-theory analysis," analogous to the co-citation concept used in prior research (Culnan 1987; Taylor et al. 2010). [6]

To address our research question pertaining to the identification of dominant theories (RQ 1), we examine the Article–Theory network. The article network and the theory network are investigated for RQ 2 and RQ 3 respectively. Because the purpose of each research question is diverse, we examine different network measures in each network, including the following: (a) power-law degree distribution, (b) small-world properties, and (c) community structures. These properties are aligned with our research purpose and are commonly analyzed in network research (Bampo et al. 2008). Next, we provide a brief overview of these three properties.

Power-law Degree Distribution

The analysis of power-law degree distribution is one of the most widely investigated network properties in network research because power-law degree distribution is so prevalent; it exists in many networks ranging from organization of Web pages (Adamic and Huberman 2000) to the neural network of worms (Barabasi and Albert 1999). In network research, the degree of a node refers to the number of connections of a node, the degree distribution refers to the frequencies of nodes by degree,[7] and the power-law degree distribution refers to the situation when the frequency of nodes varies as a power of degree. A network with power-law degree distribution has few nodes with very large degrees, which one would not see if the networks were formed completely independently. If a degree distribution follows a power-law, it exhibits a long-tail, and, when plotted on a log-log plot, it becomes linear.

One of the most promising mechanisms to explain the prevalence of power-law degree distribution is the growth-based preferential-attachment model proposed by Barabasi and Albert (1999). The preferential-attachment mechanism suggests that, as the network expands, if a new edge from a new node attaches to existing nodes with the probability proportional to the degree of the existing nodes (i.e., a node with high degree has higher probability to get a new edge), the resulting network has a power-law degree distribution.

Applying the above described phenomenon to our study's context, a power-law degree distribution of theories in the article-theory network would imply that new articles are building on extant work, picking with higher probability theories that are more heavily used in prior related literature. As a result, a well-used theory becomes even more popular as new articles, which build on extant literature, are added to the discipline. This process resembles the process of preferential attachment. Therefore, we expect to observe a power-law degree distribution.

Small-world

The "*small-world"* network refers to a class of network which has a relatively short path length despite a high level of clustering (Watts and Strogatz 1998). A well-known example is an acquaintanceship network, as (1) a person's acquaintances are also likely to know each other (high clustering), while (2) the number of intermediaries needed to reach to a stranger, on average, remains relatively short (short average path length). The "small-world" characteristic of networks has drawn attention from researchers in various disciplines because a "small-world" creates unique benefits in terms of information creation and diffusion. The reason for this is that many separate clusters enable the incubation of a diversity of specialized ideas, while short paths allow ideas to break out of their local clusters and mix into new and novel combinations (Uzzi et al. 2007). In our context, the presence of a "small-world" in the article network would suggest that even though the phenomena being studied by the studies are diverse, these diverse phenomena still draw on closely related theories.

[6] Co-theory analysis refers to the case when two theories are used in the same paper.

[7] Mathematically, when P(d) is the fraction of nodes that have degree d under a degree distribution P, a power-law degree distribution P(d) satisfies $P(d) = cd^{-\gamma}$. See Jackson (2008, p. 30) for more details.

Clustering measures the likelihood of the node's neighbors to be connected to each other (Watts and Strogatz 1998).[8] Shortest path length between two nodes is the minimum number of edges which a node has to pass to get to the other node. Whether the network has a "relatively short path length" and "relatively high degree of clustering" are determined by comparing the real network to a random graph with the same number of nodes and edges, but whose links among the nodes are made at random (Watts and Strogatz 1998). We used the most extensively used algorithm suggested by Edrös and Rényi (1961) for generating random networks.[9]

Community Structure

A "*community"* is a densely connected sub-network in a network. The examination of communities enables researchers to understand and visualize the structure of networks. Community detection algorithms are aimed at systematically discovering divisions of complex networks into groups. We used the edge-betweenness algorithm (Newman and Girvan 2004), which finds the edge in the network that is most "between" other vertices, meaning that the edge is, in some sense, responsible for connecting many pairs of vertices. Then the edge is removed. By doing this repeatedly, the network is divided into smaller and smaller components.

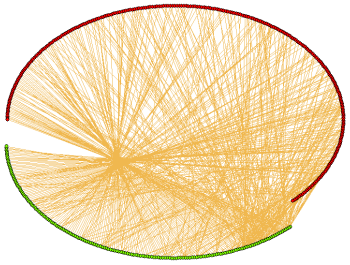
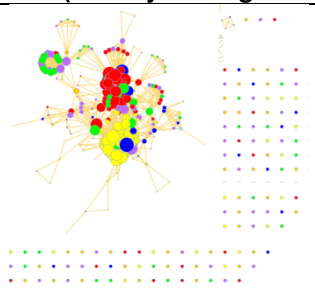
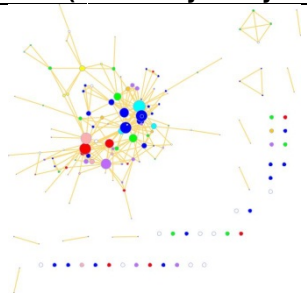
SAMPLE DESCRIPTION

Table 2: Number of Articles by Streams

Classification by Sidorova et al. (2008)	No Theory Identified	Theory Identified	Total
Not Identified	24 (29%)	60 (71%)	84 (100%)
IT and Organization (ITO)	17 (21%)	65 (79%)	82 (100%)
IS Development (ISD)	24 (46%)	28 (54%)	52 (100%)
IT and Individuals (ITI)	13 (18%)	61 (82%)	74 (100%)
IT and Markets (ITM)	7 (13%)	47 (87%)	54 (100%)
IT and Groups (ITG)	5 (13%)	34 (87%)	39 (100%)
Grand Total	90 (23%)	295 (77%)	385 (100%)

Note: According to Sidorova et al. (2008)'s analysis, 84 articles do not fall clearly within an IS stream. When an article loaded on more than two factors, the stream with maximum loading is selected.

Table 3: Visualization of Networks

Article–Theory Network (Theory dominance analysis)	**Article Network (Theory-sibling analysis)**	**Theory Network (Co-theory analysis)**
		
Nodes: 469 Articles (Red): 295[10] Theories (Green): 174	**Nodes (articles): 385** Color: research stream. Size scaled by # connections	**Nodes (theories): 174** Color: orig. discipline. Size scaled by # connections
Edges: 447 Represent usage of theory	**Edges: 1,773**	**Edges: 299**
Note: See RQ1 below for details.	Note: See RQ2 below for details.	Note: See RQ3 below for details.

[8] Mathematically, Clustering = 3 × (number of triangles in the graph) / (number of connected triples) where a triangle is a set of three nodes, each of which is connected to the other two. Therefore, the clustering coefficient represents the ratio of the real to the potential triangles in a network.

[9] Given the number of nodes n and the number of links m, a network is randomly chosen among the set of networks which have randomly chosen m links out of the n(n-1)/2 possible links.

[10] Among 385 research articles, ninety articles in which no theory is identified are excluded.

From 385 articles published in MISQ (201 articles) and ISR (184 articles) from 1998 to 2006, we identified 174 distinct theories. To examine the potential differences across sub-streams in IS research, we use a published classification from the results of Sidorova et al. (2008) who employed Latent Semantic Analysis to identify papers belonging to streams of IS research. The use of a published classification helps improve the validity and objectivity of our analysis. Table 2 shows the articles by the classification of IS streams defined by Sidorova et al. (2008).

Among the 385 articles, 295 articles employed at least one theory (MISQ: 152, ISR: 143). Except IS development, 70 percent or more articles in each stream use at least one theory. One potential explanation of the lower use of identifiable theory in ISD, despite the heavy emphasis on theories by the two journals, would be that articles in this stream used frameworks, not theory. Rather than implying a lack of scientific rigor, it may indicate the development stage of the stream (Gregor and Jones 2007; Walls et al. 1992). Alternately, it is possible that few theories exist that may be usefully applied to phenomena in this stream, or perhaps articles in this stream are theory-building in nature. Table 3 displays the article–theory network, article network, and theory network.

ANALYSIS AND RESULTS

In this section we provide analysis results and develop synthesizing findings to address our developed research questions: (1) Are there dominant theories in IS research, and from which disciplines do they originate? (2) How cohesively have IS researchers built knowledge around theories? and (3) Which theories are frequently used together?

Research Question 1: Are there dominant theories in IS research, and from which disciplines do they originate? (Theory Dominance Analysis)

We first reexamine whether there exist "*dominant*" theories by analyzing the degree distribution of theories in the article–theory network.[11] Though prior studies advocate the "diversity" of theory usage in IS field (Barkhi and Sheetz 2001; Lee et al. 2004), it is still plausible that with the expanding horizons of IS research, new articles leverage existing dominant theories to build new knowledge.

To empirically shed light on this issue, consistent with Barkhi and Sheetz (2001) and Lee et al. (2004), we counted the number of connections (usage incidents by theories). The total number of incidents of theory usage in our sample is 495.[12] It indicates that, on average, an IS research article employs 1.28 theories to develop its arguments.

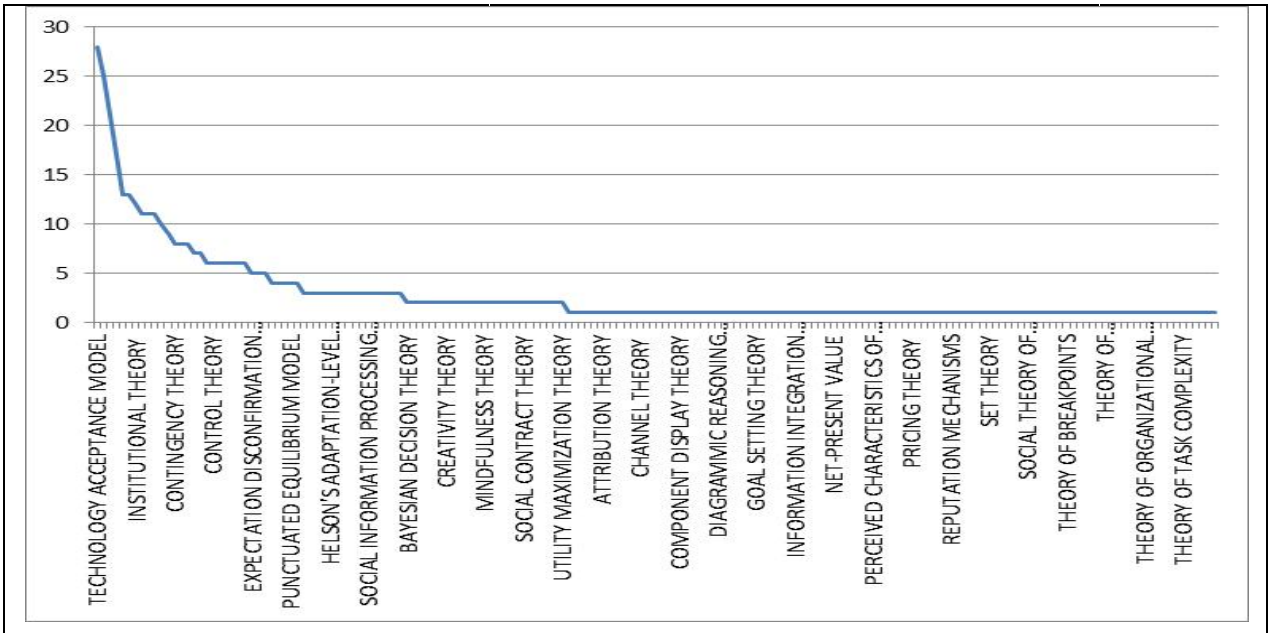


Figure 2: Number of Incidents of Theory Usage

Note: The number of theories identified is 174, and the total number of incidents of theory usage is 495.

[11] Consistent with Lee et al. (2004), in this paper, we refer to "dominant theories" as theories which are employed more frequently than others.

[12] As discussed earlier, because several studies employ multiple theories, there are more incidents of theory usage (495 incidents) than theories (174 theories).

Figure 2 shows the distribution of usage of theories in the article-theory network. Among the 174 distinct theories we identified, 101 theories (58 percent of total) are used only once. This finding is consistent with prior studies that found diversity of theory usage in IS research (Barkhi and Sheetz 2001; Lee et al. 2004). However, we note the significant disproportion in the usage of theories. The top five and twenty theories respectively account for roughly 21 percent and 53 percent of total theory usage in IS research as a whole. This finding, we believe, deserves further examination, which we next perform.

Figure 3 shows the degree distribution of theories in the article-theory network, a conventional approach in network research to examine the popularity of nodes and the existence of a power-law distribution. If the "lack of dominance" view of the prior studies holds, the graph on the left side should quickly converge to zero (i.e., we would expect to see almost no theories with high degree). However, the figure exhibits a "long-tail," which follows a linear function on log-log plot (right panel). This analysis reveals that the distribution follows a power-law distribution, indicating that there are a few theories with significantly higher number of connections. These theories constitute the long-tail and account for a significant portion of total theory usage; we refer to them as "dominant" theories in IS discipline. The preferential-attachment mechanism implies that that these theories become dominant and get more dominant as new IS articles tend to build on established theories.

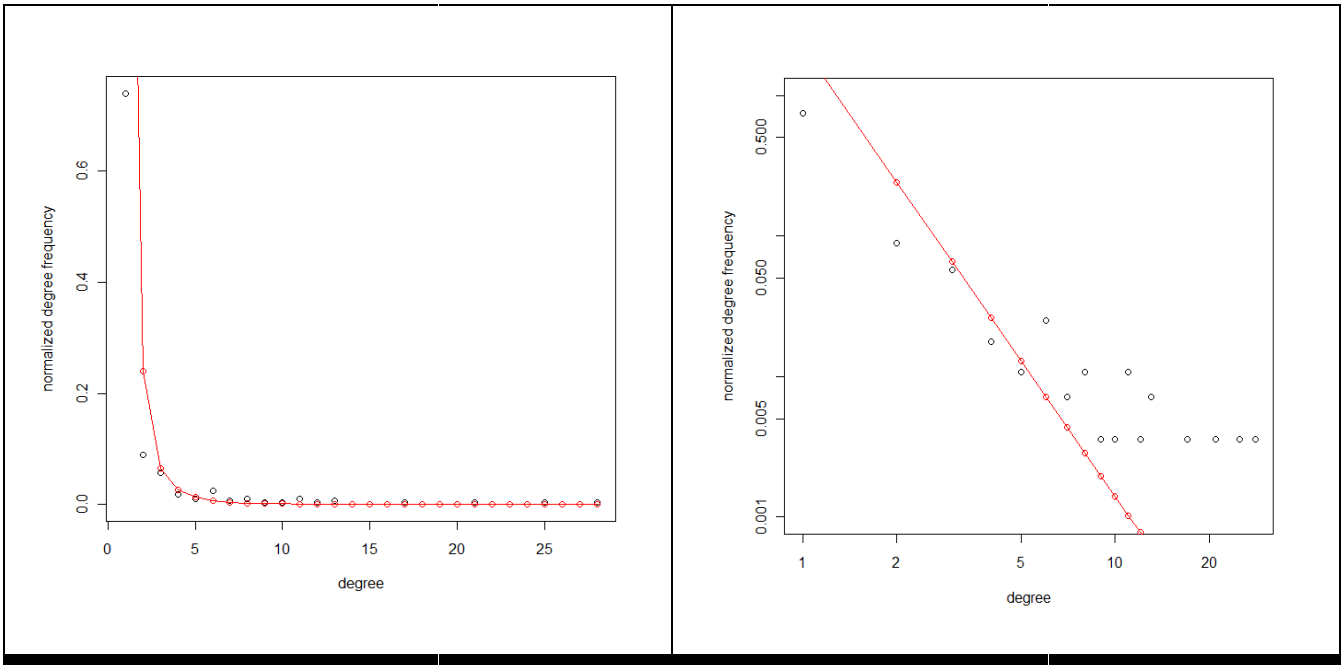


Figure 3: Degree Distribution of Theories in Article-Theory Network

Note: Both figures display the degree distribution. The figure on the right is on a log-log plot. The white dots represent the empirical data of degree distribution. The x-values are the degree of a node (the number of connections, or theory usage incidents), and the y-values are the number of theories (nodes) of the degree, normalized by the total number of theories (nodes). The red dots and line show the fitted values from MLE estimation ($\alpha = 3.1984$, $-2 \log L = 684.3994$) for a power-law distribution.

> *Finding 1A ("Established Theory Use Tendency"): Though a number of theories appear in IS research and many are used only once, a few theories account for a significant portion of theory usage (referred to as "dominant" theories in this study). The tendency to use already established theories in IS research may explain this finding.*

In addition, our new analysis at a more granular level reveals more insights on the usage of theories. Table 4 displays the top five most frequently used theories in IS research as a whole and in each of the research streams. Two key findings emerge from this analysis.

First, the analysis reveals the dominance of most frequently used theories in the streams of IS than in the IS field taken as a whole. Especially, in ITI and ITM, the top five theories account for close to 50 percent of theory usage, roughly double the figure for overall IS research (21 percent). This finding emerges from our analysis of separate streams which helps remove the noise from aggregation, because the theories used in each stream are diverse. For example, while TAM appears to be the most frequently used theory in IS research, it is used only in ITI stream. The same finding holds for Game Theory in ITM. Therefore, while it may be hard to see the dominance of theories in

overall IS research (Barkhi and Sheetz 2001; Lee et al. 2004), there is a strong dominance in particular streams of IS.

Table 4: Top 5 Most Frequently Used Theories by Streams

	Total	#	%	IT and Organizations	#	%	IS Development	#	%
1	Technology Acceptance Model	28	6	Resource Based View	17	16	Decision Theory	4	11
2	Resource Based View	25	5	Dynamic Capability Theory	7	7	Cognitive Fit Theory	3	8
3	Game Theory	21	4	Organizational Learning Theory	6	6	Bayesian Decision Theory	2	6
4	Theory of Reasoned Action	17	3	Transaction Cost Theory	5	5	Activity Theory	1	3
5	Theory of Planned Behavior	13	3	Absorptive Capacity Theory	4	4	Agency Theory	1	3
	Others	391	79	Others	66	63	Others	25	69
	Total	495	100	Total	105	100	Total	36	100
	IT and Individuals	#	%	IT and Markets	#	%	IT and Groups	#	%
1	Technology Acceptance Model	25	19	Game Theory	13	19	Media Richness Theory	5	7
2	Theory of Reasoned Action	11	8	Transaction Cost Theory	6	9	Resource Based View	3	4
3	Innovation Diffusion Theory	9	7	Network Externality	4	6	Social Presence Theory	3	4
4	Theory of Planned Behavior	9	7	Option Theory	4	6	Channel Expansion Theory	2	3
5	Social Cognitive Theory	6	5	Production Theory	4	6	Media Choice Theory	2	3
	Others	70	54	Others	37	54	Others	52	78
	Total	130	100	Total	68	100	Total	67	100

Note: The total number of usage incidents (495) exceeds the total number of distinct theories (174) in our dataset. This is because some articles used multiple theories.

Second, the dominant theories in each stream are directly related to the main research question in the stream, providing a clue for why these theories have been frequently employed in a particular stream and not as frequently in others. For example, studies in the ITO stream focus on the "implications of IT use for organizations, such as the strategic role of IT, the impact of IT investment on organizational performance, and the effect of IT on business processes" (Sidorova et al. 2008, p. 475). In that sense, the use of RBV in the ITO stream is appropriate, as it examines firms' resources, such as IT artifacts or IT capabilities, and their impact on organizational performance. Conversely, RBV is not as relevant in examining research questions in other streams, such as psychological aspects of human–computer interactions in ITI.

In sum, classification by streams reveals that (1) there exist dominant theories, especially in ITI, ITO, and ITM streams, and (2) the dominant theories are directly related to the theme of each research stream.

> *Finding 1B ("Stream-wise Dominance"): The dominance of theory usage is stronger in particular streams of IS research, compared to dominance of theory usage in IS research as a whole. Furthermore, the dominant theories vary greatly across streams and, in some streams, are significantly different from the dominant theories in IS research as a whole.*

We also examined from which disciplines the theories used in IS research originated to understand how theories drawn from outside disciplines enhance theory building in IS (Oswick et al. 2011). We measure usage of a discipline as the number of theories from that discipline used in an article (Table 5).[13]

Similar to the case of dominant theories, originating disciplines are diverse in IS as a whole, but each stream is strongly related to a particular discipline. For example, ITI and ITM draw theories heavily (roughly 50 percent or more), from Psychology and Economics, respectively. Similarly, ITO heavily relies (more than 50 percent) on the

[13] For example, if an article used RBV and Dynamic Capabilities (both from Strategy), we consider the article as using two theories from Strategy. This measure is also consistent with the counting scheme for the theory usage incidents discussed earlier. The mapping of theories to originating their discipline is provided in Appendix 3 (Table A3).

theories from Strategy and Organizational Science, while ITG relies (more than 50 percent) on the theories from Psychology and Sociology.

With regard to the use of native IS theories (Straub 2012), we find that, although Information Systems is among the top five originating disciplines in every stream of IS research, the proportion of papers drawing on IS theories is greater than 10 percent in only two streams, IS Development and "IT and Individuals." This suggests that IS researchers may not be drawing on core IS theories uniformly across streams.

Finding 1C ("Diversity and Dominance in Origin"): Theories used in IS research originate from a diverse set of disciplines, but each research stream draws most theories from a couple of disciplines.

Table 5: Top 5 Originating Disciplines by Streams

	Total	#	%	IT and Organizations	#	%	IS development	#	%
1	Psychology	128	26	Strategy	35	33	Info. Systems	6	17
2	Economics	84	17	Org. Science	19	18	Statistics	6	17
3	Sociology	70	14	Economics	18	17	Psychology	4	11
4	Strategy	62	13	Psychology	15	14	Economics	3	8
5	Info. Systems	50	10	Sociology	12	11	Mathematics	3	8
	Others	101	20	Others	6	6	Others	14	39
	Total	495	100	Total	105	100	Total	36	100
	IT and Individuals	#	%	IT and Markets	#	%	IT and Groups	#	%
1	Psychology	61	47	Economics	40	59	Psychology	18	27
2	Info. Systems	31	24	Psychology	8	12	Sociology	17	25
3	Sociology	16	12	Strategy	6	9	Communication	11	16
4	Marketing	7	5	Info. Systems	4	6	Info. Systems	5	7
5	Org. Science	6	5	Marketing	3	4	Linguistics	4	6
	Others	9	7	Others	7	10	others	12	18
	Total	130	100	Total	68	100	Total	67	100

Research Question 2: How cohesively have IS researchers built knowledge around theories? Are there observable clusters or cores of theory usage in IS research? (Theory Sibling Analysis)

To address this research question, we employ the article network (Figure 4). The article network contains 385 nodes, each of which represents an article, and 1773 edges, each of which indicates use of the same theory by the two articles at its ends. The size of a node is proportional to the number of connections (edges) linking that node to other nodes. Hence, a large-sized node indicates that the article uses a theory that is also used in many other articles. The width of the edge indicates the number of theories that two articles share. We find that in cases where theories are shared by two articles, 96 percent of such articles share only one theory. Many articles are connected via one or more shared theories, forming a big connected network which contains 237 articles (61 percent of total nodes).

The diversity debate applied to the context of usage of theory raises two diverging possibilities. On one hand, the presence of diversity of IS research, when applied to theory usage, provides a rationale for the presence of clusters of theory usage with few articles that build knowledge across clusters. On the other hand, a core in IS would suggest an absence of clusters in terms of theory usage. CNA enables us to empirically investigate this issue by examining whether the article network exhibits the "small-world" phenomenon by comparing it to an Edrös and Rényi's (1961) random network with the same number of nodes and edges. In a small-world network, the degree of clustering tends to be high, while the average shortest path length is low.

A comparison between the article network and a random network (Table 6) fails to reveal evidence of a small world. Though the clustering coefficient is substantially high (0.72 compared to 0.045 of the random network), the average shortest path length of the real network is 3.14, which is higher than 2.56 of the random network. The high clustering coefficient and long average shortest path suggest that, though there are cohesive research sub-groups within which researchers apply a similar set of theories, there is little research applying theories across groups. Thus, based on SNA research conventions, due to a lack of connection across groups, the article network is not a small world and may be considered to be disconnected, potentially reinforcing concerns of a lack of distinctive intellectual core in IS (Benbasat and Zmud 2003). Our finding suggests that, from the perspective of theory usage, the IS field consists of a few distinctive clusters of research instead of a single core.

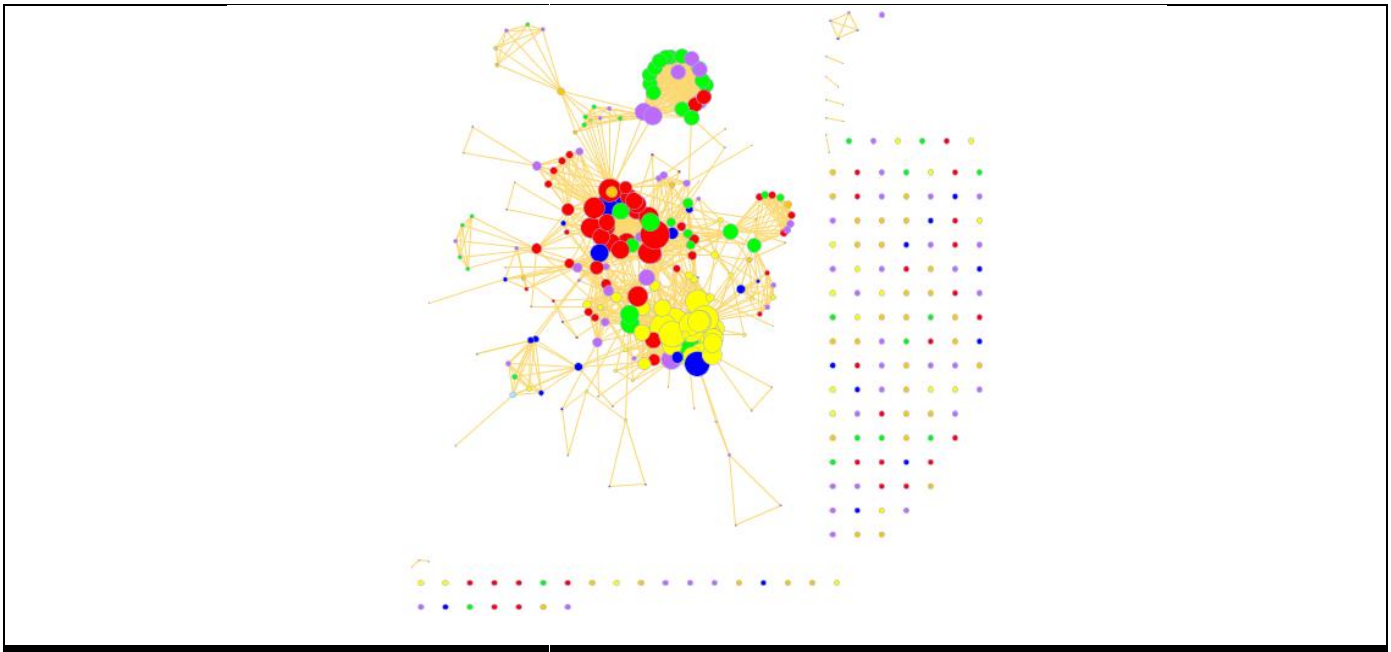


Figure 4: Visualization of Article Network

Note: The classification is based on Sidorova et al. (2008): Red—"ITO"; Orange—"ISD"; Yellow—"ITI"; Green—"ITM"; Blue—"ITG"; Purple—Not categorized. We resized nodes according to the degree (the number of connections) of nodes.

Table 6: Comparison of Article Network with Random Network with the Same Number of Vertices and Edges

	Diameter	Average Shortest Path Length	Clustering Coefficient
Article Network	7	3.14	0.72
Random Network	4	2.56	0.045

Finding 2A ("Clusters as Islands"): IS research does not exhibit a small world; though there are clusters each of which represents a cohesive group of research built on a common theory, there are limited studies that synthesize knowledge developed from distinct research groups.

We now probe deeper into how the theories are used within the clusters. On the one hand, if theories are used across streams (levels) of IS research (consistent with multi-level research paradigms), then we might expect no clear dominance of clusters by articles of particular streams. Conversely, if theories are used strongly within particular streams of research, it would be reflected in the dominance of clusters by particular streams of IS. To empirically shed light on this issue, we systematically identified clusters in the article network[14] using the edge-betweenness algorithm, and subsequently colored each node by the research streams defined by Sidorova et al. (2008).[15] Thus, the communities were first identified independent of the Sidorova et al. (2008) classification. Figure 5 shows the identified community structure in the article network.

[14] Since we are not aware of formal guidelines that specify the point at which the clustering process should be stopped, we stopped the procedure when, in the next iteration, no new cluster (which, in our definition, contains more than three nodes) was formed. In other words, we stopped when only a dyad was separated from the cluster that existed in the previous iteration.

[15] For papers which loaded on multiple factors in Sidorova et al. (2008)'s classification, we considered only the highest loading.

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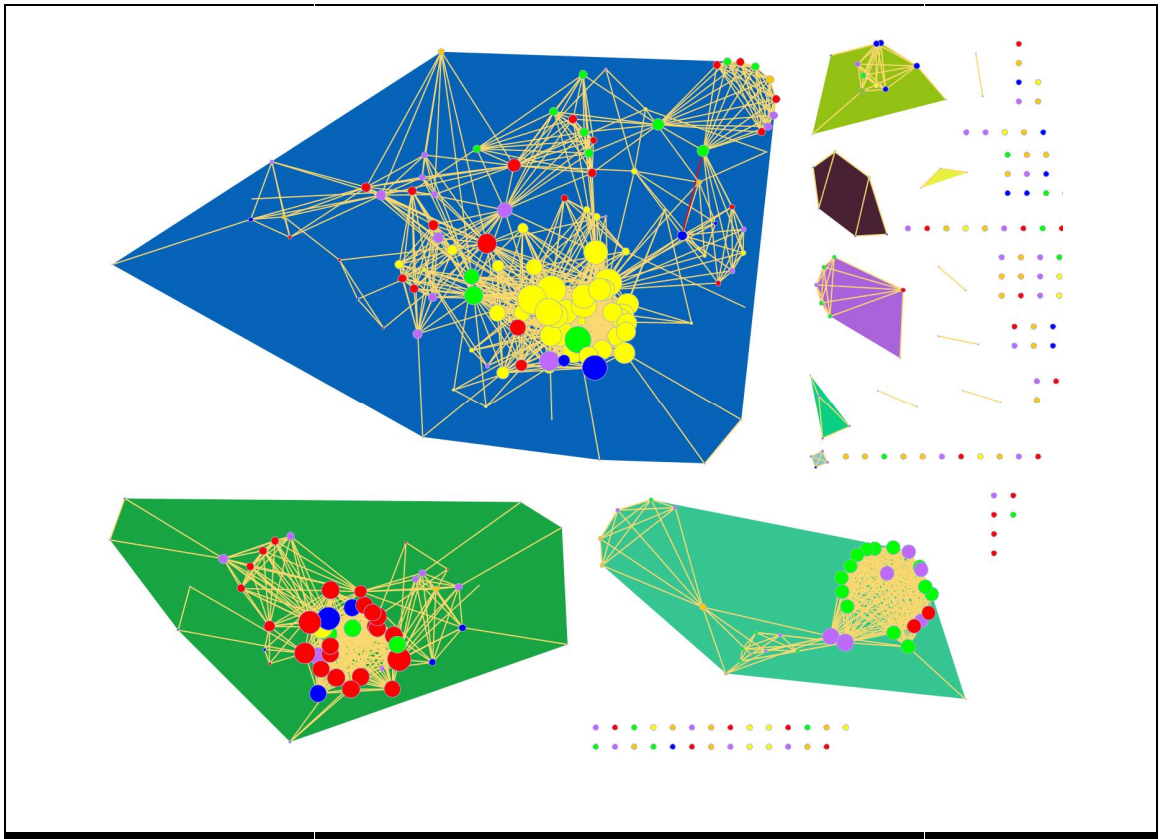

Figure 5. Community Structure in Article Network

Note: The classification is based on Sidorova et al. (2008): Red—"ITO"; Orange—"ISD"; Yellow—"ITI"; Green—"ITM"; Blue—"ITG"; Purple—Not categorized. We resized nodes according to the degree (the number of connections) of nodes.

From the cluster analysis, we find three major clusters where at least one theory is used in more than four papers. We also find that these clusters are a close match with the Sidorova et al. (2008) classification. The clusters are dominated by yellow (ITI), red (ITO), and green (ITM) nodes, respectively.[16] This suggests that IS researchers in these streams draw from dominant theories in the stream. The large ITO (in red) and ITI (in yellow) nodes explicitly indicate the popularity of theories used in the article, implying that researchers in the ITO and ITI streams share a common set of theories and use them heavily. On the other hand, the size of most nodes in ITG, ITM, and ISD is small, suggesting a fragmented use of theories in these streams.

Unlike other streams, ITG and ISD are not identified as having their own communities, which might suggest that a strong theory base has not yet evolved in these streams.[17] The isolated nodes are predominantly ITG (in blue) and ISD (in orange), suggesting the diversity of theories in these fields. We infer that research in ITG, for example, draws from a variety of Psychology theories (potentially also contributing to the long tail of theories found earlier in Figure 2). This is in contrast to papers in the other three streams which tend to locate close to clusters dominated by papers in their own streams.

> *Finding 2B ("Stream-wise Theory Cohesiveness"): Streams of IS research constitute distinct clusters in terms of theory usage. In other words, articles belonging to a particular stream ground their arguments in commonly used theories in the stream. In particular, ITI, ITO, and ITM present relatively stronger theory-based cohesiveness.*

[16] We find articles that may be exceptions. We find that they used theories common in other streams. For example, Nicolaou and McKnight (2006, ISR) is the large blue node in the yellow community. This study uses TAM and Theory of Reasoned Action, two of the most popular theories in the ITI stream. This article loaded on two factors in Sidorova et al. (2008) (ITI: 0.171, ITG: 0.1755). Another example is the red node (Fan et al. 2003, ISR) in the green community. This article, though classified as an ITO article, uses game theory, which is heavily used in the ITM stream. Though it appears to be an anomaly in the community, it reflects that the article could not be unambiguously classified into a single stream by Sidorova et al. (2008).

[17] The relatively less number of articles in these streams may account for the absence of community. Alternately, ITG and ISD works might be published in other journals in the future.

Research Question 3: Which theories are frequently used together? (Co-theory Analysis)

As discussed earlier, analysis of how theories are used together in IS research can provide insights into how theories can be merged to generate new knowledge or to explain phenomena (e.g., Nevo and Wade 2010). To shed light on how IS research combines theories, we analyze the theory network to see whether certain theories tend to be used together. In the theory network (Figure 6), nodes represent theories, and edges indicate the articles that use the theories. This theory network contains 174 nodes and 299 edges. We identified communities (right-hand side of Figure 6) using the same algorithms as used for the article-network, and then we colored each node by the originating field of the theory.

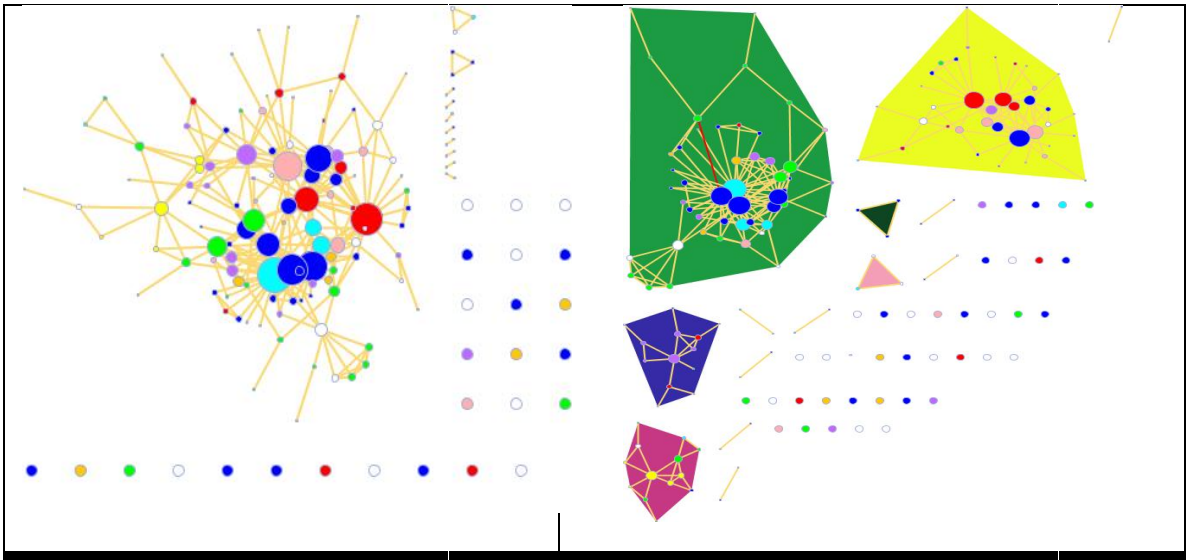

Figure 6: Visualization of Theory Network and Community Structure

Note: The color of node represents its originating discipline: Economics in red, Strategy in pink, Psychology in blue, Sociology in green, Information Systems in cyan, Organizational Science in purple, Marketing in orange, Communication in yellow, and Others in white. We resized nodes according to the degree (the number of connections) of nodes.

Two large, distinct clusters of theories are identified. One community (yellow green community in Figure 6) consists mainly of theories from Economics (in red), Strategy (in pink), and Organizational Science (in purple), indicating that the theories from these disciplines tend to be used together. Examples of theories in this cluster include RBV, Agency Theory, Transaction Cost Economics, Organizational Learning, and Dynamic Capabilities. The second community (green community in Figure 6) consists of theories from Psychology (in blue), Sociology (in green), and IS (in cyan). Examples of theories in this cluster include TAM, Theory of Reasoned Action and Theory of Planned Behavior.

> *Finding 3 ("Groupings by Origin"): Theories used together tend to belong to one of the following groups: (1) Economics, Strategy, and Organizational Science, and (2) Psychology, Sociology, and Information Systems.*

Table 7 summarizes our research questions and corresponding findings.

DISCUSSION AND CONTRIBUTIONS

The objective of this study was to examine the use of theories in IS research, especially with respect to how they interrelate with one another in the context of their use. Intuitively, our approach was analogous to studying the interactions of firms in, for example, alliance networks. We followed the suggestions of prior research to go beyond descriptive statistics and tabulations to generate new insights in the study of theory use. We did this by using Complex Network Analysis as our primary analysis method.

Table 7: Summary of Research Questions and Findings	
Research Questions	Findings
Research Question 1: Are there dominant theories in IS research, and from which disciplines do they originate? (Theory Dominance Analysis)	Finding 1A ("Established Theory Use Tendency"): Though a number of theories appear in IS research and many are used only once, a few theories account for a significant portion of theory usage (referred to as "dominant" theories in this study). The tendency to use already established theories in IS research may explain this finding.
	Finding 1B ("Stream-wise Dominance"): The dominance of theory usage is stronger in particular streams of IS research, compared to dominance of theory usage in IS research as a whole. Furthermore, the dominant theories vary greatly across streams and, in some streams, are significantly different from the dominant theories in IS research as a whole.
	Finding 1C ("Diversity and Dominance in Origin"): Theories used in IS research originate from a diverse set of disciplines, but each research stream draws most theories from a couple of disciplines.
Research Question 2: How cohesively have IS researchers built knowledge around theories? Are there observable clusters or cores of theory usage in IS research? (Theory Sibling Analysis)	Finding 2A ("Clusters as Islands"): IS research does not exhibit a small world; though there are clusters, each of which represents a cohesive group of research built on a common theory, there are limited studies that synthesize knowledge developed from distinct research groups.
	Finding 2B ("Stream-wise Theory Cohesiveness"): Streams of IS research constitute distinct clusters in terms of theory usage. In other words, articles belonging to a particular stream ground their arguments in commonly used theories in the stream. In particular, ITI, ITO, and ITM present relatively stronger theory-based cohesiveness.
Research Question 3: Which theories are frequently used together? (Co-theory Analysis)	Finding 3 ("Groupings by Origin"): Theories used together tend to belong to one of the following groups: (1) Economics, Strategy, and Organizational Science, and (2) Psychology, Sociology, and Information Systems.

The contributions of this study to the literature are several. First, we examined what theories dominate IS research in the aggregate and in specific well-defined streams of IS research (Sidorova et al. 2008). Our study, unlike related prior studies (Barkhi and Sheetz 2001; Lee et al. 2004), is thus conducted at a granular (research stream) level and identifies the variation of theory usage across research streams. This analysis will help researchers ascertain which theories are most relevant to their research, given their context and stream of research focus. More specifically, it will help researchers to begin a focused investigation into applicable theories by first looking at which research stream their work falls into, what are the dominant theories used in that stream, and what theories they can be used in conjunction with. For example, Table 5 shows that ITO is dominated mainly by strategy theories. If a doctoral student is looking into organizational aspects, looking at strategy literature can be a good starting point.[18] Our study will also be helpful for reviewers when they assess theory foundations of a manuscript. For example, examining Table 4 or Table A1 (Appendix 1), a reviewer can identify whether a study applies a "new" or less dominant theory in a particular stream or whether a study applies an existing theory in an innovative way and interprets a phenomenon from a new perspective.

Our second key contribution lies in shedding new light on the diversity debate via our analysis of theories in well-defined streams. While prior research identified the diversity of theory usage (Barkhi and Sheetz 2001; Lee et al. 2004), our study provides a richer understanding on this issue. Specifically, by examining the streams of IS research at a granular level, we find stronger dominance of theory usage within particular streams of IS. This suggests that "diversity" at the aggregate level and "centrality" of theory usage at the stream-level can coexist. The time analysis (Appendix 5), though not long enough to fully examine historical patterns, offers a glimpse into the trends of theory usage over time, instead of looking at a static average. Our result shows that the pattern is stable over time.

The third key contribution is our article-network analysis which reveals that the IS field consists not of a single core of theory usage but of a few distinctive cohesive groups of research that share a theory base. Analogous to agglomerations of urban developments in geographical regions, this reflects the buildup of "cumulative, integrated …

[18] Our study also compares theory usage across the two journals (Appendix 4), MISQ and ISR, and discovers notable differences in the types of theories favored by each journal. This substantiates implicit knowledge among IS researchers that ISR has an inclination toward Economics compared to MISQ. Across the two journals, we also find notable differences in the number of papers in various research streams (Table A4). These results could be considered vital for researchers deciding on a publication outlet for their research.

bodies of theory" (Gregor 2006, p. 635) in IS, suggesting an accumulation of knowledge around theory bases. Nevertheless, while agglomeration of knowledge may suggest a maturation of fields of knowledge, an intriguing finding from our analysis is that there are limited studies that synthesize knowledge developed from the distinctive cores. This represents an opportunity for integrative future research that cross-pollinates and merges knowledge from across the theory-driven cores of knowledge. For example, Figure 5 shows communities dominated by ITI and ITO but very few nodes that bridge these communities. This can potentially represent opportunities for researchers to usefully integrate theories from the ITI and ITO streams to enrich existing knowledge or generate new knowledge in these streams. Nevo and Wade (2010) is an illustrative example of recent IS research which fruitfully blends theories to enrich understanding of phenomena. Our finding of disjointed clusters suggests that there is a need for more such studies, particularly across streams of IS research to generate new knowledge. Our finding also suggests a lack of a core in terms of theory usage, reinforcing the diversity of the discipline (Barkhi and Sheetz 2001; Lee et al. 2004; Sidorova et al. 2008).

Fourth, our theory-network analysis (Finding 3) reveals disciplines from which theories are used together. This will be helpful for researchers in identifying how to potentially combine theory bases for their arguments based on the domain of research and originating discipline of potential theories. For example, researchers working at the intersection of Psychology and IS can learn that application of theories of Sociology and Psychology may provide synergies for their research, based on prior utilization of the theories in these fields. Alternately, researchers can look to combine theories from across groups of disciplines whose theories are less often used together (Gregor 2006), providing opportunities for new knowledge to emerge. Similarly, the findings from the theory-network analysis will also help reviewers provide more constructive feedback in terms of application of theory. Our study also sheds light on the extent to which IS uses its own theories compared to using theories from other disciplines, as called for by Straub (2012). Our finding suggests (Table 5) that theories originating in IS (native IS theories) are used more widely in particular streams of IS research (IS Development, IT and Individuals), whereas they are being used rather sparingly in other streams of IS research (IT and Markets, IT and Groups, IT and Organizations).

Fifth, this study facilitates IS researchers moving from adapting and borrowing theories to "blending based on difference" to develop new theories (Oswick at al. 2011, p. 330). For example, Nevo and Wade (2010) illustrate the "conceptual synthesis of two complementary theories" (p. 175), systems theory and RBV, to explain the role of IT assets in forming IT-enabled resources. Our study takes a first step to understanding the range of theories available for blending and promoting a new style of theory development that has great potential to enhance new knowledge building. It enables new perspectives on theory application by understanding which theories are used in different research streams at different levels of analysis. By developing "a gist (a holistic representation of the literature)," our study can enable researchers to focus on specific aspects of the literature to identify focal and divergent themes, serving as a starting point for novel theorizing (Shepherd and Sutcliffe 2011, p. 362). This promotes better matching of theory with application as well as creativity in applying new theories to new contexts.

LIMITATIONS

Notwithstanding our attention to detail in identifying theory and analyzing the resulting article and theory data, our work is not without limitations. First, there may be concerns over the classification and identification of theories and originating disciplines. Despite our effort to keep the identification and classification as objective as possible, we cannot completely eliminate subjectivity. We minimized subjectivity by adopting a well-defined procedure and by employing crosschecks among the authors in case of disagreements. Our findings concerning the top five disciplines in each stream provide some face validity to our classification of theories to disciplines. The good inter-rater reliability further enhances the validity of our findings. In the absence (to our knowledge) of a formal guideline in the literature, this was the best approach we could take; nevertheless, a certain amount of subjectivity remains. Second, during our analysis of originating disciplines, we dropped theories that could not be clearly or unanimously classified into disciplines. Though this might result in some loss of accuracy, we believe it does not significantly influence or bias our results, because the number of such ambiguous or unclear theories was relatively small. Third, our approach to consider papers which used frameworks using "No theory" (in line with Cushing 1990) may be considered a limitation, precluding generalizability to particular research paradigms, such as design science, for example. Likewise, our use of a methodical approach to identify theory use may have resulted in some papers being classified as "not using any theory," although it may have used conceptual arguments related to a theory. For instance, if a paper presents a solution that is built on sets but did not explicitly say that it used "set theory," it would be classified in our study as a "no theory" article. More generally, if a paper does not contain the keyword "*theo*," does not have a theory section, and does not use a theory for making an argument, we considered it as a "no theory" paper.[19] Fourth, our dataset might be considered not recent enough. While, as earlier discussed, using a time period that overlapped with Sidorova et al. (2008) dataset timeframe to facilitate stream-wise analysis was a

[19] We thank an anonymous reviewer for motivating this discussion.

main reason for our selection of this timeframe, future research can examine generalizability by replicating our analysis using more recent data or even past data which pre-dates the period of our study. Finally, we restricted our attention to papers published in MISQ and ISR, suggesting that our sample is representative of the top papers published in IS. To what extent our findings are generalizable beyond these two journals is a question which can be addressed by future research.

CONCLUSION

Calls for research into what types of theories are borrowed, where they are borrowed from and how borrowed theories are used are not unique to the IS discipline. For instance, in the Organizational Management Theory discipline, Oswick et al. (2011) illuminate the importance of these questions to develop an understanding of the opportunities and constraints in new theory building within disciplines. Our study examines these important issues in the IS discipline. Our work adds support to past evidence of diversity (Robey 1996; Sidorova et al. 2008) in IS research. It also yields evidence about the dominance of theories. The multidimensional relationships in our network analysis uncover the relatedness, focal areas, and influential theory contributions in IS research. Our paper can help researchers by being a primer about theory foundations of the IS field and where to position their own research. In sum, our analysis contributes to scholarly knowledge regarding the theory foundations of IS research.

ACKNOWLEDGEMENTS

We thank the co-editor, Dr. Marcus Rothenberger, and the review team for their helpful comments, suggestions, and insights during the review process of this paper; their inputs significantly improved this paper. We are grateful to Dr. A. Sidorova, Dr. N. Evangelopoulos, Dr. J. Valacich, and Dr. T. Ramakrishnan for providing the data from Sidorova et al. (2008). We gratefully acknowledge the inputs of participants, reviewers, associate editor, and track chairs at the International Conference on Information Systems (ICIS) 2009 where an earlier version of this paper was presented. We also thank seminar participants of the Ross School of Business at the University of Michigan for helpful comments on earlier versions of this paper. Any errors that might remain in this paper are ours alone.

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APPENDICES

Appendix 1: Reliability Check for Article–Theory Mapping

We performed two checks to ensure confidence in the reliability of our approach. First, Steps #3 and #4 were independently repeated by another author. Any discrepancies were settled through discussion among the authors. Second, we conducted an assessment of inter-rater reliability with ten doctoral students (raters) from various business disciplines to judge the reliability of our process of theory identification. Using raters from across business disciplines minimizes potential for biases of raters. We randomly selected twenty papers from our sample (sixteen using one theory; four using no theory) and distributed them so that each rater assessed six papers. Thus each paper was independently analyzed by three different raters. We asked each rater to identify theories used in the papers assigned to him/her, based on the heuristic we provided, which is the same procedure we used to identify theories (Table 1). After collation of responses from the raters, we calculated the inter-rater reliability using the Fleiss Kappa statistic (Fleiss 1971). The Fleiss Kappa statistic is relevant since our categories are nominal. The calculation of this statistic requires that each paper be placed in a single category. The Fleiss Kappa statistic was 0.765, which falls in the range described as "substantial strength of agreement" (Landis and Koch 1977, p. 165). This suggests that our method of identification of theories is reliable, replicable, and not largely dependent on subjective human judgment. In sum, though our identification of theories is imperfect, our well-defined methodology and good inter-rater reliability score suggest that we can be confident in the validity and reliability of our results. Table A1 (Appendix 2) provides the list of identified theories used in each research article.

Appendix 2: Research Articles, Streams, and Theories

Table A1: List of Research Articles, Streams, and Theories

Article (Year)	Journal	Research Stream	Theory
Hemant et al. 1998	MISQ	Not identified	Gestalt fit theory
Banerjee et al. 1998	MISQ	IT and Individuals	Theory of planned behavior
Banerjee et al. 1998	MISQ	IT and Individuals	Theory of reasoned action
Watson et al. 1998	MISQ	IT and Individuals	Theory of organizational change
Kambil and van Heck 1998	ISR	IT and Markets	Transaction cost theory
Griffith et al. 1998	ISR	IT and Groups	Socio-technical systems theory
Marakas and Elam 1998	ISR	IS Development	Not identified
Wright et al. 1998	ISR	IS Development	Not identified
Tam 1998	ISR	IT and Organizations	Production theory
Nidumolu and Knotts 1998	MISQ	IT and Individuals	Not identified
Segars and Grover 1998	MISQ	IT and Organizations	Not identified
El-Shinnawy and Vinze 1998	MISQ	IT and Groups	Persuasive arguments theory
El-Shinnawy and Vinze 1998	MISQ	IT and Groups	Social comparison theory
Kumar et al. 1998	MISQ	IT and Organizations	Transaction cost theory
Kumar et al. 1998	MISQ	IT and Organizations	Theory of competitive advantage
Francalanci and Galal 1998	MISQ	IT and Organizations	Agency theory
Francalanci and Galal 1998	MISQ	IT and Organizations	Information processing theory
Francalanci and Galal 1998	MISQ	IT and Organizations	Transaction cost theory
Guinan et al. 1998	ISR	IT and Groups	Graph-theory
Marakas et al. 1998	ISR	IT and Individuals	Social learning theory
Marakas et al. 1998	ISR	IT and Individuals	Self-efficacy theory
Iivari et al. 1998	ISR	IS Development	Not identified

Dennis and Carte 1998	ISR	Not identified	Cognitive fit theory
Agarwal and Prasa 1998	ISR	IT and Individuals	Technology acceptance model
Webster 1998	MISQ	Not identified	Innovation characteristics theory
Webster 1998	MISQ	Not identified	Media richness theory
Pinsonneault and Rivard 1998	MISQ	IT and Organizations	Not identified
Zigurs and Buckland 1998	MISQ	IT and Groups	Task-technology fit
Carlson and Davis 1998	MISQ	IT and Groups	Media richness theory
Carlson and Davis 1998	MISQ	IT and Groups	Social presence theory
Carlson and Davis 1998	MISQ	IT and Groups	Media choice theory
Dewan et al. 1998	ISR	IT and Organizations	Production theory
Lyytinen et al. 1998	ISR	IS Development	Socio-technical systems theory
Dennis and Kinney 1998	ISR	IT and Groups	Media richness theory
Datta 1998	ISR	IS Development	Not identified
Goodman and Darr 1998	MISQ	IT and Groups	Organizational learning theory
Nissen 1998	MISQ	IT and Organizations	Not identified
Choudhury et al. 1998	MISQ	IT and Markets	Transaction cost theory
Straub and Welke 1998	MISQ	IS Development	Deterrence theory
Ang and Straub 1998	MISQ	IT and Markets	Production theory
Kraemer and Dedrick 1998	ISR	IT and Organizations	Production theory
Wong 1998	ISR	IT and Organizations	Game theory
Jarvenpaa and Leidner 1998	ISR	IT and Organizations	Resource based view
Jarvenpaa and Leidner 1998	ISR	IT and Organizations	Dynamic capability theory
Parthasarathy and Bhattacherjee 1998	ISR	IT and Individuals	Innovation diffusion theory
Gopal and Sanders 1998	ISR	Not identified	Not identified
Talmor and Wallace 1998	ISR	Not identified	Not identified
Mendelson and Pillai 1998	ISR	IT and Organizations	Contingency theory
Smith and Hasnas 1999	MISQ	Not identified	Stakeholder theory
Smith and Hasnas 1999	MISQ	Not identified	Social contract theory
Dennis et al. 1999	MISQ	IT and Groups	Act theory
Klein and Myers 1999	MISQ	Not identified	Not identified
Walsham and Sahay 1999	MISQ	IT and Organizations	Actor-network theory
Gordon and Moore 1999	ISR	Not identified	Speech act theory
Porra 1999	ISR	IS Development	Theory of open systems
Benaroch and Kauffman 1999	ISR	IT and Markets	Option theory
Sethi and King 1999	ISR	IT and Individuals	Information integration theory
Sethi and King 1999	ISR	IT and Individuals	Theory of cognitive integration
Barrett and Walsham 1999	ISR	IT and Organizations	Social theory of transformation
Broadbent et al. 1999	MISQ	IT and Organizations	Not identified
Karahanna et al. 1999	MISQ	IT and Individuals	Innovation diffusion theory
Karahanna et al. 1999	MISQ	IT and Individuals	Theory of reasoned action
Compeau et al. 1999	MISQ	IT and Individuals	Social cognitive theory
Compeau et al. 1999	MISQ	IT and Individuals	Self-efficacy theory
Ross et al. 1999	MISQ	IT and Organizations	Pricing theory
Sambamurthy and Zmud 1999	MISQ	Not identified	Contingency theory
Venkatesh 1999	MISQ	IT and Individuals	Technology acceptance model
Venkatesh 1999	MISQ	IT and Individuals	Cognitive evaluation theory
Venkatesh 1999	MISQ	IT and Individuals	Behavioral decision theory
Venkatesh 1999	MISQ	IT and Individuals	Social influence theory
Pinsonneault et al. 1999	ISR	Not identified	Not identified
Hitt 1999	ISR	IT and Organizations	Production theory
Sussman and Sproull 1999	ISR	IT and Groups	Politeness theory

Sussman and Sproull 1999	ISR	IT and Groups	Theory of self-monitoring
Robey and Boudreau 1999	ISR	IT and Organizations	Organizational politics
Robey and Boudreau 1999	ISR	IT and Organizations	Organizational culture theory
Robey and Boudreau 1999	ISR	IT and Organizations	Institutional theory
Robey and Boudreau 1999	ISR	IT and Organizations	Organizational learning theory
Lee et al. 1999	ISR	IT and Markets	Not identified
Brown 1999	MISQ	IT and Organizations	Organization theory
Nambisan et al. 1999	MISQ	IT and Organizations	Organizational learning theory
Reich and Kaarst-Brown 1999	MISQ	IT and Organizations	Not identified
Sawy et al. 1999	MISQ	IT and Organizations	Not identified
Tractinsky and Meyer 1999	MISQ	Not identified	Theory of self-presentation
Segars and Grover 1999	ISR	IT and Organizations	Not identified
Gattiker and Kelley 1999	ISR	IT and Individuals	Domain theory of moral development
Fichman and Kemerer 1999	ISR	Not identified	Network externality
Fichman and Kemerer 1999	ISR	Not identified	Diffusion theory
Sein and Santhanam 1999	ISR	Not identified	Act theory
Grover and Ramanlal 1999	MISQ	IT and Markets	Transaction cost theory
Gregor and Benbasat 1999	MISQ	IS Development	Learning theory
Gregor and Benbasat 1999	MISQ	IS Development	Toulmin's model of argumentation
Abdel-Hamid et al. 1999	MISQ	IT and Organizations	Goal setting theory
Wastell 1999	MISQ	IT and Groups	Psychodynamic theory
Wastell 1999	MISQ	IT and Groups	Educational theory
Wastell 1999	MISQ	IT and Groups	Theory of organizational ill health
Weill and Vitale 1999	MISQ	Not identified	Not identified
Burke and Chidambaram 1999	MISQ	IT and Groups	Media characteristics theory
Burke and Chidambaram 1999	MISQ	IT and Groups	Social information processing theory
Burke and Chidambaram 1999	MISQ	IT and Groups	Media richness theory
Burke and Chidambaram 1999	MISQ	IT and Groups	Time/interaction and performance theory
Burke and Chidambaram 1999	MISQ	IT and Groups	Bandwidth theory
Kraut et al. 1999	ISR	Not identified	Not identified
Armstrong and Sambamurthy 1999	ISR	IT and Organizations	Knowledge-based theory of the firm
Armstrong and Sambamurthy 1999	ISR	IT and Organizations	Resource based view
Tan and Harker 1999	ISR	IS Development	Production theory
Raghunathan et al. 1999	ISR	IT and Individuals	Strategic grid framework
Todd and Benbasat 1999	ISR	IS Development	Behavioral decision theory
Reich and Benbasat 2000	MISQ	IT and Organizations	Not identified
Bharadwaj 2000	MISQ	IT and Organizations	Resource based view
Schultze 2000	MISQ	IS Development	Bourdieu's theory of practice
Trauth and Jessup 2000	MISQ	IT and Groups	Not identified
Moore 2000	MISQ	IT and Individuals	Not identified
Venkatesh and Morris 2000	MISQ	IT and Individuals	Technology acceptance model
Dey and Sarkar 2000	ISR	IS Development	Bayesian decision theory
Basu and Blanning 2000	ISR	IS Development	The theory of metagraphs
Marcolin et al. 2000	ISR	IT and Individuals	Task-technology fit
Kaufman et al. 2000	ISR	IT and Markets	Network externality
Menon et al. 2000	ISR	Not identified	Production theory
Hunter and Bock 2000	ISR	IT and Organizations	Repertory grids
Taudes et al. 2000	MISQ	IT and Markets	Option theory
Taudes et al. 2000	MISQ	IT and Markets	Net-present value
Benaroch and Kauffman 2000	MISQ	IT and Markets	Option theory

Cooper 2000	MISQ	IT and Organizations	Creativity theory
Swanson and Dans 2000	MISQ	Not identified	Not identified
Keil et al. 2000	MISQ	Not identified	Risk theory
Lim et al. 2000	ISR	Not identified	Not identified
Konana et al. 2000	ISR	IS Development	Pricing theory
Gurbaxani et al. 2000	ISR	Not identified	Production theory
West and Dedrick 2000	ISR	Not identified	Sunken cost theory
Montealegre and Keil 2000	MISQ	Not identified	Not identified
Ravichandran and Rai 2000	MISQ	IT and Organizations	Not identified
Lim and Benbasat 2000	MISQ	IS Development	Task-technology fit
Lim and Benbasat 2000	MISQ	IS Development	Helson's adaptation-level theory
Nelson et al. 2000	MISQ	IS Development	Not identified
Gopal and Prasad 2000	MISQ	IT and Groups	Not identified
Banker and Slaughter 2000	ISR	IS Development	Not identified
Palmer and Markus 2000	ISR	IT and Organizations	Not identified
Sarkar and Ramaswamy 2000	ISR	IS Development	Not identified
Kim et al. 2000	ISR	IS Development	Diagrammic reasoning framework
Nault and Vandenbosh 2000	ISR	IT and Markets	Game theory
Westland 2000	ISR	Not identified	Not identified
Cooper et al. 2000	MISQ	IT and Organizations	Not identified
Majchrzak et al. 2000	MISQ	IT and Groups	Adaptive structuration theory
Agarwal and Karahanna 2000	MISQ	IT and Individuals	Technology acceptance model
Agarwal and Karahanna 2000	MISQ	IT and Individuals	Self-perception theory
Agarwal and Karahanna 2000	MISQ	IT and Individuals	Social cognitive theory
Agarwal and Karahanna 2000	MISQ	IT and Individuals	Theory of reasoned action
Mennecke et al. 2000	MISQ	IS Development	Cognitive fit theory
Mennecke et al. 2000	MISQ	IS Development	Theory of image processing
Keil et al. 2000b	MISQ	Not identified	Self-justification theory
Keil et al. 2000b	MISQ	Not identified	Prospect theory
Keil et al. 2000b	MISQ	Not identified	Agency theory
Keil et al. 2000b	MISQ	Not identified	Approach avoidance theory
Agarwal et al. 2000	ISR	IT and Individuals	Self-efficacy theory
Agarwal et al. 2000	ISR	IT and Individuals	Technology acceptance model
Bordestsky and Mark 2000	ISR	IS Development	Organizational memory
Limayem and DeSanctis 2000	ISR	IS Development	Theory of breakpoints
Venkatesh 2000	ISR	IT and Individuals	Technology acceptance model
Venkatesh 2000	ISR	IT and Individuals	Self-efficacy theory
Johnson and Marakas 2000	ISR	IT and Individuals	Self-efficacy theory
Boudreau et al. 2001	MISQ	IT and Individuals	Not identified
Wixom and Watson 2001	MISQ	IT and Organizations	Not identified
Chatterjee et al. 2001	MISQ	IT and Organizations	Not identified
Venkatesh and Brown 2001	MISQ	IT and Individuals	Theory of planned behavior
Venkatesh and Brown 2001	MISQ	IT and Individuals	Motivation theory
Alavi and Leidner 2001	MISQ	IT and Organizations	Resource based view
Alavi and Leidner 2001	MISQ	IT and Organizations	Knowledge-based theory of the firm
Sabherwal and Chan 2001	ISR	IT and Organizations	Contingency theory
Moore 2001	ISR	Not identified	Speech act theory
Lerch and Harter 2001	ISR	IS Development	Not identified
Im et al. 2001	ISR	IT and Markets	Not identified
Barki and Hartwick 2001	MISQ	IT and Groups	Conflict resolution theory
Dennis et al. 2001	MISQ	IT and Groups	Contingency theory
Dennis et al. 2001	MISQ	IT and Groups	Task-technology fit
Dennis et al. 2001	MISQ	IT and Groups	Appropriation theory

Malhotra et al. 2001	MISQ	IT and Groups	Theory of swift trust
Malhotra et al. 2001	MISQ	IT and Groups	Time/interaction and performance theory
Te'eni 2001	MISQ	IT and Groups	Theory of communicative action
Te'eni 2001	MISQ	IT and Groups	Media richness theory
Te'eni 2001	MISQ	IT and Groups	Uncertainty reduction theory
Orlikowski and Barley 2001	MISQ	IT and Organizations	Not identified
Subramani and Walden 2001	ISR	IT and Markets	Resource based view
Berlanger et al. 2001	ISR	IT and Individuals	Contingency theory
Kiang and Kumar 2001	ISR	Not identified	Not identified
Austin 2001	ISR	Not identified	Agency theory
Plouffe et al. 2001	ISR	IT and Individuals	Technology acceptance model
Plouffe et al. 2001	ISR	IT and Individuals	Perceived characteristics of innovating
Ang and Slaughter 2001	MISQ	IT and Individuals	Social comparison theory
Bhattacherjee 2001	MISQ	IT and Individuals	Expectation disconfirmation theory
Bhattacherjee 2001	MISQ	IT and Individuals	Technology acceptance model
Yoo and Alavi 2001	MISQ	IT and Groups	Social presence theory
Yoo and Alavi 2001	MISQ	IT and Groups	Media richness theory
Yoo and Alavi 2001	MISQ	IT and Groups	Channel expansion theory
Mingers 2001	ISR	IS Development	Control theory
Mingers 2001	ISR	IS Development	Systems theory
Dutta 2001b	ISR	IT and Markets	Systems dynamics
Krishnan et al. 2001	ISR	IS Development	Not identified
Chwelos et al. 2001	ISR	IT and Individuals	Not identified
Garfield et al. 2001	ISR	Not identified	Act theory
Sircar et al. 2001	MISQ	IS Development	Not identified
Fichman 2001	MISQ	IT and Individuals	Innovation diffusion theory
Piccoli et al. 2001	MISQ	IT and Groups	Learning theory
Piccoli et al. 2001	MISQ	IT and Groups	Motivation theory
Piccoli et al. 2001	MISQ	IT and Groups	Attribution theory
Piccoli et al. 2001	MISQ	IT and Groups	Information processing theory
Piccoli et al. 2001	MISQ	IT and Groups	Component display theory
Butler 2001	ISR	IT and Groups	Resource based view
Raghu et al. 2001	ISR	Not identified	Game theory
Raghunathan and Yeh 2001	ISR	IT and Markets	Game theory
Bodart et al. 2001	ISR	Not identified	Semantic network theory
Chari 2002	ISR	IS Development	Not identified
Sia et al. 2002	ISR	IT and Groups	Social comparison theory
Sia et al. 2002	ISR	IT and Groups	Persuasive arguments theory
Salisbury et al. 2002	ISR	IT and Individuals	Adaptive structuration theory
Kudyba and Diwan 2002	ISR	IT and Markets	Production theory
Christiaanse and Venkatraman 2002	MISQ	Not identified	Channel theory
Christiaanse and Venkatraman 2002	MISQ	Not identified	Resource based view
Tan and Hunter 2002	MISQ	Not identified	Personal construction theory
Wheeler 2002	ISR	IT and Organizations	Dynamic capability theory
Wheeler 2002	ISR	IT and Organizations	Nebic theory
Zahra and George 2002	ISR	IT and Organizations	Dynamic capability theory
Zahra and George 2002	ISR	IT and Organizations	Nebic theory
Agarwal and Venkatesh 2002	ISR	IT and Individuals	Not identified
Torkzadeh and Dhillon 2002	ISR	IT and Individuals	Not identified
Koufaris 2002	ISR	IT and Markets	Technology acceptance model

Koufaris 2002	ISR	IT and Markets	Flow theory
Koufaris 2002	ISR	IT and Markets	Theory of planned behavior
Koufaris 2002	ISR	IT and Markets	Theory of reasoned action
Koufaris 2002	ISR	IT and Markets	Achievement motivation theory
Palmer 2002	ISR	IT and Individuals	Media richness theory
Chatterjee et al. 2002	MISQ	IT and Organizations	Institutional theory
Chatterjee et al. 2002	MISQ	IT and Organizations	Structuration theory
Tillquist et al. 2002	MISQ	IT and Organizations	Resource dependence theory
Biros et al. 2002	MISQ	Not identified	Signal detection theory
Jiang et al. 2002	MISQ	IT and Individuals	Not identified
Kim and Lee 2002	ISR	IT and Individuals	Not identified
Chen and Hitt 2002	ISR	IT and Markets	Switching cost theory
Chen and Hitt 2002	ISR	IT and Markets	Random utility model
McKinney et al. 2002	ISR	IT and Individuals	Expectation disconfirmation theory
Zhu and Kraemer 2002	ISR	IT and Individuals	Dynamic capability theory
Zhu and Kraemer 2002	ISR	IT and Individuals	Resource based view
Devaraj et al. 2002	ISR	IT and Individuals	Technology acceptance model
Devaraj et al. 2002	ISR	IT and Individuals	Transaction cost theory
Devaraj et al. 2002	ISR	IT and Individuals	Service quality
McKnigh et al. 2002	ISR	IT and Individuals	Theory of reasoned action
Markus et al. 2002	MISQ	IS Development	Is design theory
Schultz and Leidner 2002	MISQ	Not identified	Not identified
Ba and Pavlou 2002	MISQ	IT and Markets	Not identified
Massey et al. 2002b	MISQ	IT and Organizations	Resource based view
Massey et al. 2002b	MISQ	IT and Organizations	Knowledge-based theory of the firm
Wand and Weber 2002	ISR	IS Development	Not identified
Lyytinen and Yoo 2002	ISR	IT and Organizations	Not identified
Sarathy and Muralidhar 2002	ISR	IS Development	Not identified
Alavi et al. 2002	ISR	IT and Groups	Social learning theory
Nadiminti et al. 2002	ISR	Not identified	Game theory
Gallaugher and Wang 2002	MISQ	IT and Markets	Network externality
Davidson 2002	MISQ	Not identified	Social cognitive theory
Walsham 2002	MISQ	Not identified	Structuration theory
Thatcher and Perrewe 2002	MISQ	IT and Individuals	Social learning theory
Jasperson et al. 2002	MISQ	Not identified	Not identified
Fan et al. 2003	ISR	IT and Organizations	Game theory
Aalst and Kumar 2003	ISR	IT and Markets	Petri-net theory
Sussman and Siegal 2003	ISR	IT and Individuals	Technology acceptance model
Sussman and Siegal 2003	ISR	IT and Individuals	Information influence theory
Ho et al. 2003	ISR	Not identified	Belief preservance theory
Ho et al. 2003	ISR	Not identified	Agency theory
Miranda and Saunders 2003	ISR	IT and Groups	Social construction theory
Miranda and Saunders 2003	ISR	IT and Groups	Social presence theory
Miranda and Saunders 2003	ISR	IT and Groups	Task closure theory
Chen and Png 2003	ISR	IT and Markets	Game theory
Teo et al. 2003	MISQ	IT and Individuals	Institutional theory
Gefen et al. 2003	MISQ	IT and Individuals	Technology acceptance model
Susarla et al. 2003	MISQ	IT and Individuals	Expectation disconfirmation theory
Santhanam and Hartono 2003	MISQ	IT and Organizations	Resource based view
Enns et al. 2003	MISQ	IT and Organizations	Not identified
Kohli and Devaraj 2003	ISR	IT and Individuals	Not identified
Yi and Davis 2003	ISR	IT and Individuals	Social cognitive theory
Fisher et al. 2003	ISR	IS Development	Decision theory

Chin et al. 2003	ISR	Not identified	Contingency theory
Benbasat and Zmud 2003	MISQ	Not identified	Not identified
Lamb and Kling 2003	MISQ	Not identified	Dynamic capability theory
Lamb and Kling 2003	MISQ	Not identified	Socio-technical systems theory
Sambamurthy et al. 2003	MISQ	IT and Organizations	Dynamic capability theory
Griffith et al. 2003	MISQ	IT and Groups	Dynamic capability theory
Griffith et al. 2003	MISQ	IT and Groups	Resource based view
Dennis and Garfield 2003	MISQ	IT and Groups	Not identified
Lee and Baskarville 2003	ISR	IS Development	Not identified
Bapna et al. 2003	ISR	IT and Markets	Auction theory
Purao et al. 2003	ISR	IS Development	Not identified
Choudhury and Sabherwal 2003	ISR	IT and Organizations	Control theory
Choudhury and Sabherwal 2003	ISR	IT and Organizations	Agency theory
Levina and Ross 2003	MISQ	IT and Markets	Complementarity theory
Piccoli and Ives 2003	MISQ	IT and Groups	Control theory
Piccoli and Ives 2003	MISQ	IT and Groups	Psychological contract theory
Speier and Morris 2003	MISQ	IS Development	Decision theory
Speier and Morris 2003	MISQ	IS Development	Cognitive fit theory
Venkatesh et al. 2003	MISQ	IT and Individuals	Theory of reasoned action
Venkatesh et al. 2003	MISQ	IT and Individuals	Technology acceptance model
Venkatesh et al. 2003	MISQ	IT and Individuals	Motivation theory
Venkatesh et al. 2003	MISQ	IT and Individuals	Theory of planned behavior
Venkatesh et al. 2003	MISQ	IT and Individuals	Social cognitive theory
Carte and Russell 2003	MISQ	IT and Individuals	Not identified
Bassellier et al. 2003	ISR	IT and Organizations	Theory of reasoned action
Basu and Blanning 2003	ISR	IS Development	Graph-theory
Sharma and Yetton 2003	MISQ	IT and Individuals	Institutional theory
Sharma and Yetton 2003	MISQ	IT and Individuals	Structuration theory
Lyytinen and Rose 2003	MISQ	IT and Organizations	Innovation diffusion theory
Dube and Pare 2003	MISQ	IS Development	Not identified
Dehning et al. 2003	MISQ	IT and Organizations	Not identified
Lewis et al. 2003	MISQ	IT and Individuals	Technology acceptance model
Lewis et al. 2003	MISQ	IT and Individuals	Institutional theory
Lewis et al. 2003	MISQ	IT and Individuals	Social information processing theory
Lewis et al. 2003	MISQ	IT and Individuals	Social cognitive theory
Lewis et al. 2003	MISQ	IT and Individuals	Innovation diffusion theory
Chiang and Mookerjee 2004	ISR	Not identified	Not identified
Bhargava and Choudhary 2004	ISR	IT and Markets	Game theory
Pavlou and Gefen 2004	ISR	IT and Markets	Institutional theory
Pavlou and Gefen 2004	ISR	IT and Markets	Theory of reasoned action
Hong et al. 2004	ISR	Not identified	Visual search theory
Hong et al. 2004	ISR	Not identified	Central capacity theory
Hong et al. 2004	ISR	Not identified	Associative network model
Schultze and Orlikowski 2004	ISR	IT and Markets	Brockerage
Schultze and Orlikowski 2004	ISR	IT and Markets	Social embeddeness
Schultze and Orlikowski 2004	ISR	IT and Markets	Social capital
Dennis and Reinicke 2004	MISQ	Not identified	Time/interaction and performance theory
Dennis and Reinicke 2004	MISQ	Not identified	Technology acceptance model
Bapna et al. 2004	MISQ	IT and Markets	Game theory
Subramani 2004	MISQ	IT and Markets	Organizational learning theory
Subramani 2004	MISQ	IT and Markets	Transaction cost theory
Hevner et al. 2004	MISQ	IS Development	Not identified

Wade and Hulland 2004	MISQ	IT and Organizations	Resource based view
Lee et al. 2004	ISR	IT and Organizations	Residual right theory
Lee et al. 2004	ISR	IT and Organizations	Transaction cost theory
Fichman 2004	ISR	IT and Organizations	Resource based view
Fichman 2004	ISR	IT and Organizations	Organizational learning theory
Fichman 2004	ISR	IT and Organizations	Network externality
Asvanund et al. 2004	ISR	IT and Markets	Network externality
Karimi et al. 2004	ISR	IT and Individuals	Task-technology fit
Karimi et al. 2004	ISR	IT and Individuals	Information processing theory
Jones et al. 2004	ISR	Not identified	Information overload
Albert et al. 2004	MISQ	IT and Markets	Not identified
Bhattacherjee and Premkumar 2004	MISQ	IT and Individuals	Expectation disconfirmation theory
Melville et al. 2004	MISQ	IT and Organizations	Resource based view
Lilien et al. 2004	ISR	IS Development	Cognition theory
Lilien et al. 2004	ISR	IS Development	Fit-appropriation model
Hu et al. 2004	ISR	IT and Markets	Game theory
Jarvenpaa and Shaw 2004	ISR	IT and Groups	Punctuated equilibrium model
Thatcher and Pingry 2004	ISR	IT and Markets	Production theory
Sundararajan 2004	ISR	IT and Markets	Game theory
Braa et al. 2004	MISQ	IT and Organizations	Actor-network theory
Kohli and Kettinger 2004	MISQ	Not identified	Control theory
Kohli and Kettinger 2004	MISQ	Not identified	Agency theory
Iversen et al. 2004	MISQ	Not identified	Software process improvement
Lindgren et al. 2004	MISQ	Not identified	Structuration theory
Lindgren et al. 2004	MISQ	Not identified	Learning theory
Street and Meister 2004	MISQ	IT and Organizations	Punctuated equilibrium model
Martensson and Lee 2004	MISQ	Not identified	Not identified
Raghu et al. 2004	ISR	IS Development	Decision theory
Raghu et al. 2004	ISR	IS Development	Agency theory
Raghu et al. 2004	ISR	IS Development	Theory of coordination
Raghu et al. 2004	ISR	IS Development	Multi-attribute utility theory
Malhotra et al. 2004	ISR	IT and Individuals	Social contract theory
Malhotra et al. 2004	ISR	IT and Individuals	Theory of reasoned action
Koh et al. 2004	ISR	Not identified	Psychological contract theory
Kirsch 2004	ISR	IT and Organizations	Control theory
Krishnan et al. 2004	ISR	IS Development	Decision theory
Swanson and Ramiller 2004	MISQ	IT and Organizations	Mindfulness theory
Barua et al. 2004	MISQ	IT and Markets	Resource based view
Potter and Balthazard 2004	MISQ	IT and Groups	Memory cognition model
Pawlowski and Robey 2004	MISQ	Not identified	Learning theory
Bassellier and Benbasat 2004	MISQ	IT and Organizations	Theory of planned behavior
Bassellier and Benbasat 2004	MISQ	IT and Organizations	Theory of reasoned action
Heijden 2004	MISQ	IT and Individuals	Motivation theory
Heijden 2004	MISQ	IT and Individuals	Technology acceptance model
Garud and Kumaraswamy 2005	MISQ	IT and Organizations	Organizational learning theory
Garud and Kumaraswamy 2005	MISQ	IT and Organizations	Resource based view
Garud and Kumaraswamy 2005	MISQ	IT and Organizations	Adaptive structuration theory
Wasko and Faraj 2005	MISQ	IT and Groups	Social capital
Wasko and Faraj 2005	MISQ	IT and Groups	Collective action theory
Ko et al. 2005	MISQ	IT and Organizations	Absorptive capacity theory
Bock et al. 2005	MISQ	IT and Individuals	Theory of reasoned action
Bock et al. 2005	MISQ	IT and Individuals	Knowledge-based theory of the firm

Kankanhalli et al. 2005	MISQ	IT and Individuals	Social exchange theory
Kankanhalli et al. 2005	MISQ	IT and Individuals	Social capital
Malhotra et al. 2005	MISQ	IT and Organizations	Absorptive capacity theory
Majchrzak et al. 2005	ISR	IT and Groups	Critical social theory
Majchrzak et al. 2005	ISR	IT and Groups	Theory of communicative action
Cavusoglu et al. 2005	ISR	Not identified	Decision theory
Bandyopadhyay et al. 2005	ISR	IT and Markets	Game theory
Zhu and Kraemer 2005	ISR	IT and Organizations	Innovation diffusion theory
Zhu and Kraemer 2005	ISR	IT and Organizations	Resource based view
Wixom and Todd 2005	ISR	IT and Individuals	Technology acceptance model
Wixom and Todd 2005	ISR	IT and Individuals	Theory of reasoned action
Wixom and Todd 2005	ISR	IT and Individuals	Expectancy theory
Wixom and Todd 2005	ISR	IT and Individuals	Theory of acceptance and use of technology
Lin et al. 2005	MISQ	Not identified	Game theory
Poston and Speier 2005	MISQ	Not identified	Information processing theory
Ryu et al. 2005	MISQ	IS Development	Activity theory
Chen and Edgington 2005	MISQ	IT and Organizations	Resource based view
Chen and Edgington 2005	MISQ	IT and Organizations	Learning theory
Chen and Edgington 2005	MISQ	IT and Organizations	Absorptive capacity theory
Chen and Edgington 2005	MISQ	IT and Organizations	Human capital theory
Chen and Edgington 2005	MISQ	IT and Organizations	Transaction cost theory
Chen and Edgington 2005	MISQ	IT and Organizations	Agency theory
Chen and Edgington 2005	MISQ	IT and Organizations	Cognitive decay
Chen and Edgington 2005	MISQ	IT and Organizations	Organizational memory
Chen and Edgington 2005	MISQ	IT and Organizations	Complementarity theory
Tanriverdi 2005	MISQ	IT and Organizations	Complementarity theory
Tanriverdi 2005	MISQ	IT and Organizations	Information processing theory
Tanriverdi 2005	MISQ	IT and Organizations	Resource based view
Levina and Vaast 2005	MISQ	Not identified	Bourdieu's theory of practice
Van de Ven 2005	MISQ	IT and Organizations	Transaction cost theory
Levina 2005	ISR	IT and Organizations	Practice theory
Jiang et al. 2005	ISR	Not identified	Decision theory
Chidambaram and Tung 2005	ISR	IT and Groups	Social impact theory
Adomavicius and Gupta 2005	ISR	Not identified	Not identified
Gal-Or and Ghose 2005	ISR	Not identified	Game theory
Dellarocas 2005	ISR	IT and Markets	Reputation mechanisms
Dellarocas 2005	ISR	IT and Markets	Game theory
Agarwal and Lucas 2005	MISQ	Not identified	Not identified
Brown and Venkatesh 2005	MISQ	IT and Individuals	Technology acceptance model
Brown and Venkatesh 2005	MISQ	IT and Individuals	Household lifecycle theory
Brown and Venkatesh 2005	MISQ	IT and Individuals	Theory of planned behavior
Ahuja and Thatcher 2005	MISQ	IT and Individuals	Technology acceptance model
Ahuja and Thatcher 2005	MISQ	IT and Individuals	Innovation diffusion theory
Ahuja and Thatcher 2005	MISQ	IT and Individuals	Creativity theory
Ahuja and Thatcher 2005	MISQ	IT and Individuals	Organizational stress theory
Ahuja and Thatcher 2005	MISQ	IT and Individuals	Theory of reasoned action
Ahuja and Thatcher 2005	MISQ	IT and Individuals	Theory of trying
Ahuja and Thatcher 2005	MISQ	IT and Individuals	Social information processing theory
Ahuja and Thatcher 2005	MISQ	IT and Individuals	Demand–control theory
Lapointe and Rivard 2005	MISQ	Not identified	Not identified
Beaudry and Pinsonneault 2005	MISQ	IT and Individuals	Coping theory
Beaudry and Pinsonneault 2005	MISQ	IT and Individuals	Theory of acceptance and use of

			technology
Beaudry and Pinsonneault 2005	MISQ	IT and Individuals	Innovation diffusion theory
Beaudry and Pinsonneault 2005	MISQ	IT and Individuals	Theory of planned behavior
Beaudry and Pinsonneault 2005	MISQ	IT and Individuals	Task-technology fit
Jasperson et al. 2005	MISQ	IT and Organizations	Agency theory
Jasperson et al. 2005	MISQ	IT and Organizations	Punctuated equilibrium model
Jasperson et al. 2005	MISQ	IT and Organizations	Structuration theory
Jasperson et al. 2005	MISQ	IT and Organizations	Theory of acceptance and use of technology
Jasperson et al. 2005	MISQ	IT and Organizations	Theory of planned behavior
Gattiker and Goodhue 2005	MISQ	IT and Organizations	Organizational information processing theory
Ferratt et al. 2005	ISR	IT and Organizations	Resource based view
Ferratt et al. 2005	ISR	IT and Organizations	Configuration theory
Menon et al. 2005	ISR	IS Development	Not identified
Tam and Ho 2005	ISR	IT and Markets	Elaboration likelihood model
Ji et al. 2005	ISR	Not identified	Control theory
Ramayya et al. 2005	ISR	IS Development	Set theory
Chiasson and Davidson 2005	MISQ	IT and Organizations	Institutional theory
Kettinger and Lee 2005	MISQ	IT and Individuals	Not identified
Ray et al. 2005	MISQ	IT and Organizations	Resource based view
Ray et al. 2005	MISQ	IT and Organizations	Absorptive capacity theory
Majchrzak et al. 2005b	MISQ	IT and Groups	Collaborative elaboration theory
Suh and Lee 2005	MISQ	IT and Markets	Cognitive fit theory
Walden 2005	MISQ	Not identified	Contract theory
Porra et al. 2005	MISQ	IT and Organizations	Systems theory
Porra et al. 2005	MISQ	IT and Organizations	Punctuated equilibrium model
Piccoli and Ives 2005	MISQ	IT and Organizations	Dynamic capability theory
Piccoli and Ives 2005	MISQ	IT and Organizations	Organizational learning theory
Wu et al. 2005	ISR	Not identified	Utility maximization theory
Wu et al. 2005	ISR	Not identified	Learning theory
Bakos et al. 2005	ISR	IT and Markets	Game theory
Pavlou and Gefen 2005	ISR	IT and Markets	Cognitive dissonance theory
Pavlou and Gefen 2005	ISR	IT and Markets	Theory of planned behavior
Pavlou and Gefen 2005	ISR	IT and Markets	Expectation disconfirmation theory
Pavlou and Gefen 2005	ISR	IT and Markets	Agency theory
Pavlou and Gefen 2005	ISR	IT and Markets	Social exchange theory
Chellappa and Shivendu 2005	ISR	IT and Markets	Game theory
Chellappa and Shivendu 2005	ISR	IT and Markets	Contract theory
Kim et al. 2005	ISR	Not Identified	Theory of acceptance and use of technology
Awad and Krishnan 2006	MISQ	IT and Markets	Utility maximization theory
Shaft and Vessey 2006	MISQ	Not identified	Cognitive fit theory
Shaft and Vessey 2006	MISQ	Not identified	Theory on dual-task problem solving
Tanriverdi 2006	MISQ	IT and Organizations	Resource based view
Tanriverdi 2006	MISQ	IT and Organizations	Complementarity theory
Massey and Montoya-Weiss 2006	MISQ	IT and Groups	Theory of knowledge creation
Massey and Montoya-Weiss 2006	MISQ	IT and Groups	Resource based view
Massey and Montoya-Weiss 2006	MISQ	IT and Groups	Media choice theory
Massey and Montoya-Weiss 2006	MISQ	IT and Groups	Channel expansion theory
Pavlou and Fygenson 2006	MISQ	IT and Individuals	Theory of planned behavior

Pavlou and Fygenson 2006	MISQ	IT and Individuals	Technology acceptance model
Pavlou and Fygenson 2006	MISQ	IT and Individuals	Theory of implementation intentions
Nissen and Sengupta 2006	MISQ	Not identified	Behavioral decision theory
Moores and Chang 2006	MISQ	IT and Individuals	Theory of reasoned action
Moores and Chang 2006	MISQ	IT and Individuals	Contingency theory
Moores and Chang 2006	MISQ	IT and Individuals	Theory of planned behavior
Moores and Chang 2006	MISQ	IT and Individuals	Theory of marketing ethics
Moores and Chang 2006	MISQ	IT and Individuals	Gender socialization theory
Venkatesh and Ramesh 2006	MISQ	IT and Individuals	Technology acceptance model
Ghose et al. 2006	ISR	IT and Markets	Welfare theory
Galletta et al. 2006	ISR	IT and Individuals	Information foraging theory
Galletta et al. 2006	ISR	IT and Individuals	Theory of task complexity
Burton-Jones and Meso 2006	ISR	IS Development	Representation model
Burton-Jones and Meso 2006	ISR	IS Development	Theory of decomposition
Burton-Jones and Meso 2006	ISR	IS Development	Semantic network theory
Dinev and Hart 2006	ISR	IT and Individuals	Theory of reasoned action
Dinev and Hart 2006	ISR	IT and Individuals	Theory of planned behavior
Dinev and Hart 2006	ISR	IT and Individuals	Expectancy theory
Khatri et al. 2006	ISR	IS Development	Cognitive fit theory
Butler and Gray 2006	MISQ	IT and Individuals	Cognition theory
Butler and Gray 2006	MISQ	IT and Individuals	Mindfulness theory
Rai et al. 2006	MISQ	IT and Organizations	Resource based view
Padmanabhan et al. 2006	MISQ	IS Development	Not identified
Allen and March 2006	MISQ	IS Development	Not identified
Stewart and Gosain 2006	MISQ	IT and Groups	Not identified
Banker et al. 2006	MISQ	Not identified	Dynamic capability theory
Sherif et al. 2006	MISQ	Not identified	Learning theory
Sherif et al. 2006	MISQ	Not identified	Conflict resolution theory
Sherif et al. 2006	MISQ	Not identified	Theory of coordination
Leidner and Kayworth 2006	MISQ	IT and Organizations	Organizational culture theory
Leidner and Kayworth 2006	MISQ	IT and Organizations	Bourdieu's theory of distinction
Stewart et al. 2006	ISR	Not identified	Institutional theory
Ranganathan and Brown 2006	ISR	IT and Organizations	Organizational integration theory
Ranganathan and Brown 2006	ISR	IT and Organizations	Organizational information processing theory
Ranganathan and Brown 2006	ISR	IT and Organizations	Organizational learning theory
Ranganathan and Brown 2006	ISR	IT and Organizations	Option theory
Hong and Tam 2006	ISR	IT and Individuals	Technology acceptance model
Banker et al. 2006b	ISR	IT and Markets	Transaction cost theory
Banker et al. 2006b	ISR	IT and Markets	Contract theory
Markus et al. 2006	MISQ	Not identified	Collective action theory
Markus et al. 2006	MISQ	Not identified	Stakeholder theory
Markus et al. 2006	MISQ	Not identified	Institutional theory
Nickerson and Muehlen 2006	MISQ	Not identified	Institutional theory
Nickerson and Muehlen 2006	MISQ	Not identified	Theory of organizational ecology
Nickerson and Muehlen 2006	MISQ	Not identified	Structuration theory
Weitzel et al. 2006	MISQ	Not identified	Network externality
Weitzel et al. 2006	MISQ	Not identified	Game theory
Zhu et al. 2006	MISQ	IT and Markets	Network externality
Zhu et al. 2006	MISQ	IT and Markets	Path dependency theory
Chen and Forman 2006	MISQ	IT and Markets	Not identified
Hanseth et al. 2006	MISQ	Not identified	Actor-network theory
Hanseth et al. 2006	MISQ	Not identified	Risk theory

Hanseth et al. 2006	MISQ	Not identified	Theory of reflective modernization
Hanseth et al. 2006	MISQ	Not identified	Complexity theory
Hanseth et al. 2006	MISQ	Not identified	Theory of high modernity
Fitzgerald 2006	MISQ	Not identified	Option theory
Allen et al. 2006	MISQ	Not identified	Trespass theory
Gregor 2006	MISQ	IS Development	Not identified
Cotteleer and Bendoly 2006	MISQ	IT and Organizations	Flow theory
Webster and Ahuja 2006	MISQ	Not identified	Not identified
Srite and Karahanna 2006	MISQ	IT and Individuals	Technology acceptance model
Soh et al. 2006	MISQ	IT and Markets	Resource based view
Soh et al. 2006	MISQ	IT and Markets	Theory of competitive advantage
Miranda and Kim 2006	MISQ	Not identified	Transaction cost theory
Miranda and Kim 2006	MISQ	Not identified	Institutional theory
Oh and Lucas 2006	MISQ	IT and Markets	Theory of market transparency
Pavlou and El Sawy 2006	ISR	IT and Organizations	Dynamic capability theory
Burton-Jones and Straub 2006	ISR	IT and Individuals	Not identified
Masuda and Whang 2006	ISR	IT and Markets	Game theory
Li and Sarkar 2006	ISR	IS Development	Bayesian decision theory
Dellarocas 2006	ISR	IT and Markets	Game theory
Kim and Benbasat 2006	ISR	Not identified	Toulmin's model of argumentation
Kim and Benbasat 2006	ISR	Not identified	Helson's adaptation-level theory
Slaughter and Kirsch 2006	ISR	Not identified	Knowledge-based theory of the firm
Karahanna et al. 2006	MISQ	IT and Individuals	Technology acceptance model
Karahanna et al. 2006	MISQ	IT and Individuals	Innovation diffusion theory
Bhattacherjee and Sanford 2006	MISQ	IT and Individuals	Elaboration likelihood model
Bhattacherjee and Sanford 2006	MISQ	IT and Individuals	Innovation diffusion theory
Benaroch et al. 2006b	MISQ	IT and Markets	Option theory
Tam and Ho 2006	MISQ	IT and Individuals	Social cognitive theory
Tam and Ho 2006	MISQ	IT and Individuals	Consumer research theories
Tam and Ho 2006	MISQ	IT and Individuals	Depth of processing theory
Tam and Ho 2006	MISQ	IT and Individuals	Organizational information processing theory
Slaughter et al. 2006	MISQ	IT and Markets	Theory of competitive advantage
Slaughter et al. 2006	MISQ	IT and Markets	Production theory
Mitchell 2006	MISQ	IT and Organizations	Dynamic capability theory
Mitchell 2006	MISQ	IT and Organizations	Learning theory
Komiak and Benbasat 2006	MISQ	IT and Groups	Theory of reasoned action
Kuechler and Vaishnavi 2006	MISQ	IS Development	Not identified
Nicolaou and McKnight 2006	ISR	IT and Groups	Theory of interorganizational relations
Nicolaou and McKnight 2006	ISR	IT and Groups	Technology acceptance model
Nicolaou and McKnight 2006	ISR	IT and Groups	Theory of reasoned action
Nicolaou and McKnight 2006	ISR	IT and Groups	Risk theory
Banker et al. 2006c	ISR	IT and Markets	Media richness theory
Sun et al. 2006b	ISR	Not identified	Not identified
Pavlou and Dimoka 2006	ISR	IT and Markets	Not identified
Heninger et al. 2006	ISR	IT and Groups	Not identified
Kumar and Benbasat 2006	ISR	IT and Individuals	Information processing theory
Kumar and Benbasat 2006	ISR	IT and Individuals	Helson's adaptation-level theory

Appendix 3: Theories and Originating Disciplines

Table A2: Mapping of Theories to Originating Disciplines	
Theory	**Originating Discipline**
Absorptive capacity theory	Strategy
Achievement motivation theory	Psychology
Act theory	Psychology
Activity theory	Psychology
Actor-network theory	Sociology
Adaptive structuration theory	Sociology
Agency theory	Economics
Approach avoidance theory	Psychology
Appropriation theory	Linguistics
Associative network model	Psychology
Attribution theory	Psychology
Auction theory	Economics
Bayesian decision theory	Statistics
Behavioral decision theory	Economics
Belief perservance theory	Psychology
Bourdieu's theory of distinction	Sociology
Bourdieu's theory of practice	Sociology
Capm	Finance
Central capacity theory	Psychology
Channel expansion theory	Communication
Channel theory	Communication
Cognition theory	Psychology
Cognitive decay	Psychology
Cognitive dissonance theory	Psychology
Cognitive evaluation theory	Psychology
Cognitive fit theory	Information Systems
Collaborative elaboration theory	Psychology
Collective action theory	Sociology
Complexity theory	Computer science
Component display theory	Education
Configuration theory	Organizational science
Conflict resolution theory	Psychology
Contingency theory	Strategy
Contract theory	Economics
Control theory	Organizational science
Coping theory	Psychology
Decision theory	Statistics
Depth of processing theory	Psychology
Deterrence theory	Political Science
Diagrammic reasoning framework	Mathematics
Diffusion theory	Sociology
Domain theory of moral development	Psychology

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Dynamic capability theory	Strategy
Elaboration likelihood model	Psychology
Expectancy theory	Organizational science
Expectation disconfirmation theory	Marketing
Facet theory	Psychology
Flow theory	Psychology
Game theory	Economics
Gender socialization theory	Sociology
Gestalt fit theory	Psychology
Goal setting theory	Psychology
Graph-theory	Mathematics
Helson's adaptation-level theory	Psychology
Household lifecycle theory	Psychology
Human capital theory	Economics
Impression management theory	Sociology
Information foraging theory	Psychology
Information influence theory	Sociology
Information integration theory	Psychology
Information overload	Organizational science
Information processing theory	Psychology
Innovation diffusion theory	Psychology
Institutional theory	Sociology
IS design theory	Information Systems
Knowledge-based theory of the firm	Strategy
Learning theory	Psychology
Media characteristics theory	Communication
Media choice theory	Communication
Media richness theory	Communication
Memory cognition model	Psychology
Mindfulness theory	Psychology
Motivation theory	Psychology
Multi-attribute utility theory	Engineering
Option theory	Economics
Organization theory	Organizational science
Organizational culture theory	Organizational science
Organizational information processing theory	Organizational science
Organizational integration theory	Organizational science
Organizational learning theory	Organizational science
Organizational memory	Organizational science
Organizational politics	Organizational science
Organizational stress theory	Organizational science
Path dependency theory	Economics
Perceived characteristics of innovating	Information Systems
Personal construction theory	Psychology
Persuasive arguments theory	Psychology

Petri-net theory	Mathematics
Politeness theory	Linguistics
Practice theory	Sociology
Pricing theory	Marketing
Production theory	Economics
Prospect theory	Psychology
Psychodynamic theory	Psychology
Psychological contract theory	Psychology
Punctuated equilibrium model	Biology
Random utility model	Economics
Repertory grids	Psychology
Representation model	Information Systems
Reputation mechanisms	Information Systems
Residual right theory	Economics
Resource based view	Strategy
Resource dependence theory	Strategy
Risk theory	Finance
Self justification theory	Sociology
Self-efficacy theory	Psychology
Self-perception theory	Psychology
Semantic network theory	Linguistics
Service quality	Marketing
Set theory	Mathematics
Signal detection theory	Physics
Social capital	Sociology
Social construction theory	Sociology
Social contract theory	Sociology
Social embeddeness	Sociology
Social exchange theory	Sociology
Social impact theory	Sociology
Social influence theory	Psychology
Social information processing theory	Sociology
Social learning theory	Sociology
Social presence theory	Sociology
Social theory of transformation	Sociology
Socio-technical systems theory	Sociology
Speech act theory	Linguistics
Stakeholder theory	Strategy
Strategic grid framework	Strategy
Structuration theory	Sociology
Sunken cost theory	Economics
Switching cost theory	Economics
Systems dynamics	Physics
Systems theory	Biology
Task closure theory	Information Systems

Task-technology fit	Information Systems
Technology acceptance model	Information Systems
Theory of acceptance and use of technology	Information Systems
Theory of breakpoints	Sociology
Theory of cognitive integration	Psychology
Theory of communicative action	Linguistics
Theory of competitive advantage	Strategy
Theory of coordination	Strategy
Theory of decomposition	Ontology
Theory of graph comprehension	Psychology
Theory of high modernity	Sociology
Theory of implementation intentions	Psychology
Theory of interorganizational relations	Organizational science
Theory of knowledge creation	Psychology
Theory of market transparency	Marketing
Theory of marketing ethics	Marketing
Theory of open systems	Physics
Theory of organizational change	Organizational science
Theory of planned behavior	Psychology
Theory of reasoned action	Psychology
Theory of reflective modernization	Sociology
Theory of self-monitoring	Psychology
Theory of self-presentation	Psychology
Theory of swift trust	Sociology
Theory of task complexity	Psychology
Theory of technology dominance	Information Systems
Theory of trying	Marketing
Time/interaction and peformance theory	Sociology
Transaction cost theory	Economics
Uncertainty reduction theory	Communication
Utility maximization theory	Economics
Visual search theory	Psychology
Welfare theory	Economics
Theory of self-monitoring	Psychology
Theory of self-presentation	Psychology
Theory of swift trust	Sociology
Theory of task complexity	Psychology
Theory of technology dominance	Information Systems
Theory of trying	Marketing
Time/interaction and peformance theory	Sociology
Transaction cost theory	Economics
Uncertainty reduction theory	Communication
Utility maximization theory	Economics
Visual search theory	Psychology
Welfare theory	Economics

As a summary, Table A3 shows the number of theories by originating discipline. Among 174 theories identified, theories from Psychology and Sociology account for 30 percent and 18 percent respectively of the total. Economics and Organizational Science with 10 percent each also are prominent.

Table A3: Number of Theories by Originating Discipline		
Originating Discipline	Total	%
Psychology	52	30%
Sociology	31	18%
Economics	17	10%
Organizational science	17	10%
Information Systems	10	6%
Strategy	10	6%
Marketing	7	4%
Communication	6	3%
Linguistics	5	3%
Mathematics	4	2%
Others	15	9%
Total	174	100%

Appendix 4: Theory Usage by Journal

Is there a notable difference between articles published in MSQ and ISR in terms of the usage of theories?

Journal publication is the main communication channel for researchers to share the crux of their years of endeavor. As each journal may have a unique flavor, selection of journal outlet for submission of their manuscripts is a critical decision for researchers. This decision is usually not only influenced by the chance and the time taken for publication, but also by the review process, including the styles of editors and reviewers, which may potentially significantly reshape the manuscript. Therefore, understanding the style of each journal is valuable knowledge for researchers in deciding a publication outlet for their research. Table A4 shows the articles by research streams and published journal and the percentage of articles that employed at least one theory.

Table A4: Number of Articles by Journals						
Research Stream	*MISQ*			*ISR*		
	No theory identified	Theory identified	Total	No theory identified	Theory identified	Total
Not Identified	13 (28%)	33 (72%)	46 (23%)	11 (29%)	27 (71%)	38 (21%)
IT and Organization (ITO)	14 (26%)	40 (74%)	54 (27%)	3 (11%)	25 (89%)	28 (15%)
IS Development (ISD)	8 (50%)	8 (50%)	16 (8%)	16 (44%)	20 (56%)	36 (20%)
IT and Individuals (ITI)	6 (15%)	33 (85%)	39 (19%)	7 (20%)	28 (80%)	34 (19%)
IT and Markets (ITM)	4 (20%)	16 (80%)	20 (10%)	3 (9%)	31 (91%)	34 (18%)
IT and Groups (ITG)	4 (15%)	22 (85%)	26 (13%)	1 (8%)	12 (92%)	13 (7%)
Grand Total	49 (24%)	152 (76%)	201 (100%)	41 (22%)	143 (78%)	184 (100%)

The result shows that ITO (fifty-four papers in MISQ vs. twenty-eight papers in ISR) and ITG (twenty-six papers in MISQ vs. thirteen papers in ISR) research tend to be published more in MISQ than in ISR, while ITM (twenty papers in MISQ vs. thirty-four papers in ISR) and ISD (sixteen papers in MISQ vs. thirty-six papers in ISR) research tend to be published more in ISR than in MISQ. ITI, on the other hand, has seen roughly the same number of papers published in both journals (thirty-nine in MISQ vs. thirty-four in ISR) during the time period of our study. Both journals emphasize theory foundations of research findings, with a high proportion of articles employing at least one theory. The slightly lower proportion in ISR may be attributed to its high proportion of articles in ISD, the stream in which an

established theory is not frequently used. In each stream, the proportion of the articles that employ at least one theory is similar across the two journals.

Table A5 shows the top ten theories used in articles published in each journal, and Table A6 shows top five originating disciplines.

Table A5: Top 10 Theories by Journals

	MISQ			*ISR*		
	Theory	**#**	**%**	**Theory**	**#**	**%**
1	RESOURCE BASED VIEW	17	6%	GAME THEORY	18	9%
2	TECHNOLOGY ACCEPTANCE MODEL	17	6%	TECHNOLOGY ACCEPTANCE MODEL	11	5%
3	INNOVATION DIFFUSION THEORY	9	3%	PRODUCTION THEORY	9	4%
4	INSTITUTIONAL THEORY	9	3%	RESOURCE BASED VIEW	8	4%
5	THEORY OF PLANNED BEHAVIOR	9	3%	THEORY OF REASONED ACTION	8	4%
6	THEORY OF REASONED ACTION	9	3%	AGENCY THEORY	5	2%
7	TRANSACTION COST THEORY	9	3%	DECISION THEORY	5	2%
8	LEARNING THEORY	7	2%	DYNAMIC CAPABILITY THEORY	5	2%
9	DYNAMIC CAPABILITY THEORY	6	2%	CONTINGENCY THEORY	4	2%
10	SOCIAL COGNITIVE THEORY	6	2%	CONTROL THEORY	4	2%
Note: # indicates the number of usage incidents						

Table A6: Top Five Originating Disciplines by Journals

	MISQ			**ISR**		
	Originating Discipline	**#**	**%**	**Originating Discipline**	**#**	**%**
1	Psychology	83	29%	Economics	52	25%
2	Sociology	48	17%	Psychology	45	21%
3	Strategy	41	14%	Sociology	22	10%
4	Economics	32	11%	Information Systems	21	10%
5	Information Systems	29	10%	Strategy	21	10%
Note: # indicates the number of usage incidents						

Consistent with the finding that MISQ tends to publish more of ITO articles (roughly 27 percent of MISQ articles during the time period), the most frequently used theory in MISQ is Resource Based View (RBV), the top theory used in ITO research. On the other hand, Game Theory and Production Theory are ranked as the first and the third accordingly in ISR, consistent with the finding that ISR is found to publish more articles in the ITM stream.

Appendix 5: Analysis over Time

We also examined whether there have been significant changes in the dominance of theories over time. Figure A1 show the progression of usage of these theories during the period of our study, by segregating the top-10 most dominant theories into three 3-year time periods.[20] We observe that some theories, such as RBV and Game Theory, gained prominence toward the latter periods of our study. However, no theory received a significant surge in attention or faded completely, indicating that the pattern is relatively stable. In particular, TAM appears as the most frequently used theory in IS in two periods (1998–2000 and 2001–2003).

[20] Aggregation allows us to mitigate yearly fluctuation (e.g., special issues) and increase reliability.

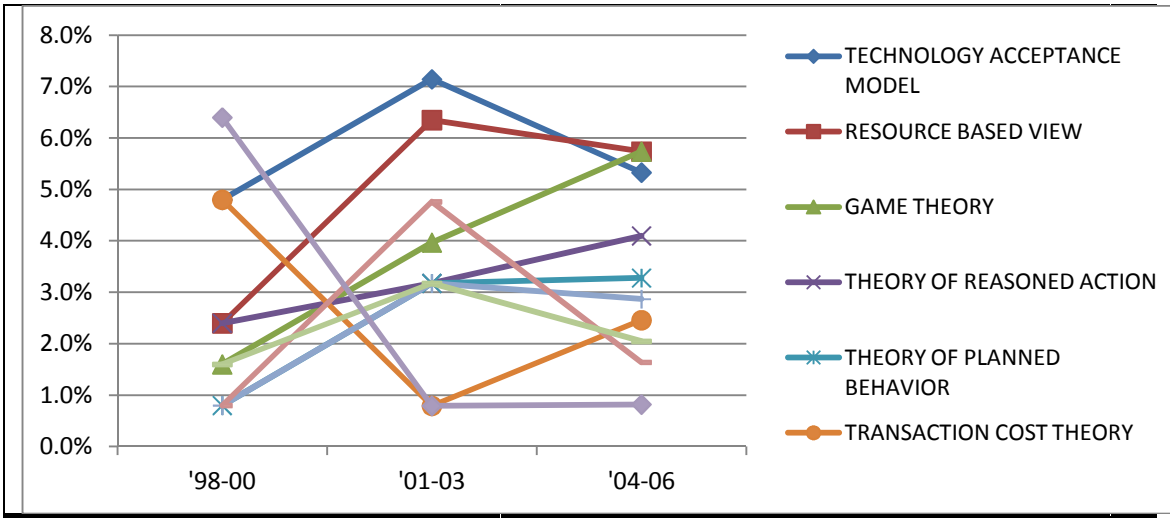

Figure A1: Usage of Theories over Time

Note: Institutional Theory overlaps exactly with Theory of Planned Behavior and is, hence, not separately visible.

Similarly, the pattern of originating disciplines also remains relatively stable (Figure A2), although Economics and Organizational Science experienced a slight drop in 2001–2003. Psychology theories clearly dominate in IS over all periods of our study. Sociology and Economics come a close second and third respectively. Psychology and Sociology together account for about 45 percent of theory use in IS in the periods 1998–2000 and 2001–2003. Information Systems constitutes 10–15 percent of theory use throughout the period of the study.

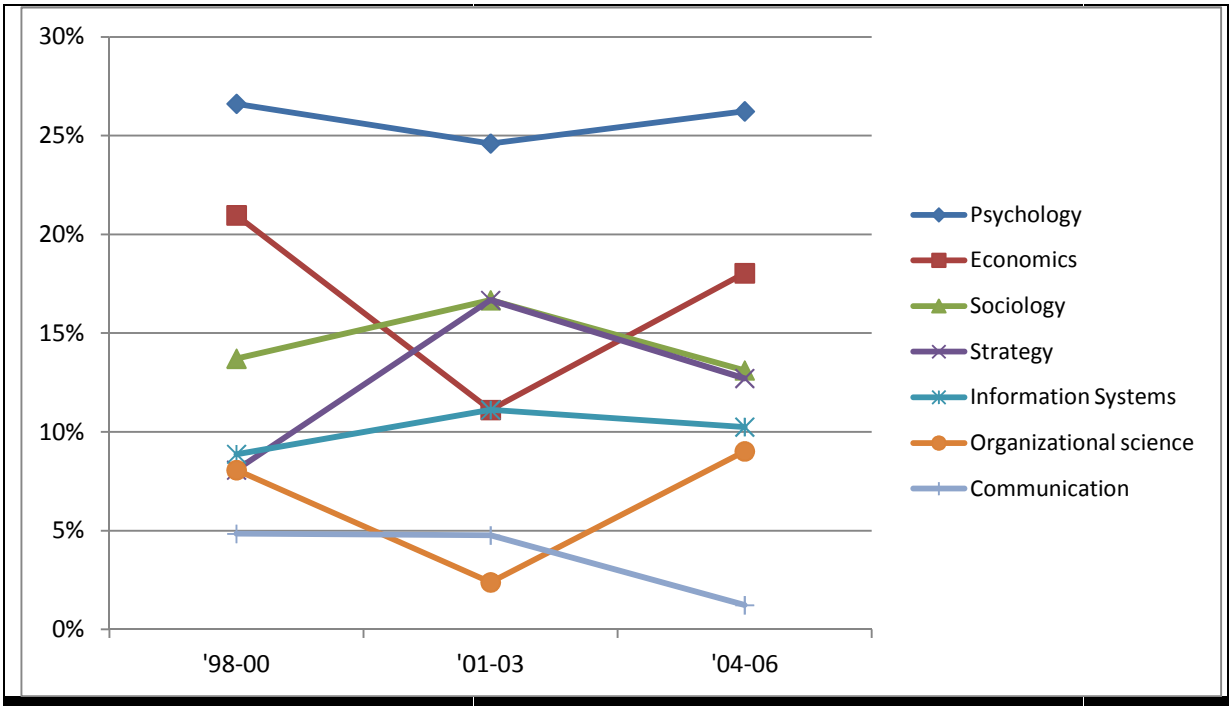

Figure A2: Originating Discipline over Time

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JOURNAL OF INFORMATION TECHNOLOGY THEORY AND APPLICATION

JITTA

JOURNAL OF INFORMATION TECHNOLOGY THEORY AND APPLICATION

JITTA IS A PUBLICATION OF THE ASSOCIATION FOR INFORMATION SYSTEMS
ISSN: 1532-3416