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The Evolving Intellectual Diversity of the IS Discipline: Evidence from the Referent Disciplines

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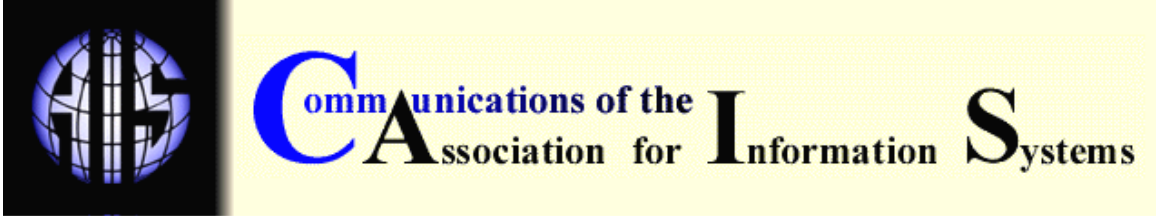
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THE EVOLVING INTELLECTUAL DIVERSITY OF THE IS DISCIPLINE: EVIDENCE FROM REFERENT THEORETICAL FRAMEWORKS

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ABSTRACT

For over 20 years, researchers expressed their concern for the lack of theoretical development in the Information Systems discipline and the lack of a cumulative research tradition. The aim of this study is to investigate the intellectual structure of the IS discipline through an analysis of 993 mainstream research articles published in selected journals and proceedings during the previous decade (1991-2000). We explore the variety of researcher perspectives in the discipline, based on the theoretical frameworks adopted by these studies. This examination shows the relative “mindshare” of different theoretical frameworks and informs the self-reflection that is frequently undertaken in our discipline. The study generates categorizations to map theories to frameworks, which are then located in a three-dimensional ontology. The resulting mappings should help researchers understand the scope of past IS research and identify gaps in theoretical development.

Keywords: IS research, theoretical frameworks

I. INTRODUCTION

“Sciences progress through a commitment to theory-driven programmatic research with a view to providing theoretical unity and coherence for a discipline”

Farhoomand and Drury [1999]

For over 20 years, researchers expressed their concern for the absence of original theories in the Information Systems discipline and the lack of a cumulative tradition [Alavi et al., 1989; Jones, 1997; Keen, 1980; Khazanchi and Munkvold, 2000; Teng and Galletta, 1990]. Together with methodological weakness [e.g., Orlikowski and Baroudi, 1991] the lack of theories [e.g.,

Khazanchi and Munkvold, 2000] is pointed to as a key issue afflicting Information Systems (IS) research. It is recognized that we do not have established theories to be used in confirmatory research.

The theory-related issues raised by these authors later resulted in discussions of the discipline's own theories. Over 15 years ago, it was proposed that we concentrate on the exploratory phase instead of confirmatory testing of theories [Kauber, 1986; Klein and Lyytinen, 1985]. A paper on the future directions for the discipline also suggests that the IS discipline needs to accelerate the materialization of "good grand theory" [Watson et al., 1999]. Benbasat and Zmud's [2003] argument that the IS field put more effort into creating a dominant set of its own theories, generated an intense debate about the constitution of the IS core in a series of articles in the Volume 12 of CAIS. As was summarized in an editorial by Gray [2003], most articles demonstrate divergent views on the issue.

In conjunction with the issue of endogenous IS theory, a great deal of reflection concerns what constitutes a scientific discipline in the context of the status of IS research [Banville and Landry, 1989; Cushing, 1990; King, 1993; Markus, 1999; Mingers, 1997; Watson, 2001]. For example, in an editorial in ISR, John King [1993, p. 293] suggested:

"...it is arguable that information systems probably is not even a field, but rather an intellectual convocation that arose from the confluence of interests among individuals from many fields who continue to pledge allegiance to those fields through useful ties of many kinds..."

On the contrary, Cheon et al. [1991], Cushing [1990], and Orlikowski and Baroudi [1991] concluded that research in the IS field made significant progress towards becoming a scientific discipline.

Closely related to the issue of theory in IS research, is the issue of ties to the reference disciplines. While many researchers recommend closer ties with reference disciplines to compensate for the lack of theories in IS [e.g., Banville and Landry, 1989, Holland 2003], others suggest breaking this "umbilical cord" and striving for a powerful and general theory to drive IS research endeavors [Baskerville and Myers 2002, Power 2003, Weber, 1987].

In this study we seek to begin a conversation about the theoretical underpinnings of IS research that is grounded in factual observation. Recognizing the value of theoretical frameworks and the IS-discipline identity debate, we seek to engage the issue of theory construction and use in IS research. Based on the foregoing discussion, it is clear that theoretical foundations are key to an emerging discipline such as information systems, which still faces questions about legitimacy and value [Benbasat and Zmud 2003].

In this initial exploration of the intellectual structure of IS field, we pose the following research questions:

- *Does the IS research output show evidence of diverse theoretical bases that fit with the complex and multi-dimensional nature of the phenomena that the field studies?*
- *Are there emerging theoretical frameworks that are endogenous to the discipline and reflect its coming of age as an independent field of study?*
- *What are the dominant theoretical frameworks used for different streams of research in IS and how have they evolved over time?*

This study differs from previous ones in that it specifically investigates the intellectual structure of IS field, in particular its theory development and use. Several conceptual opinion pieces on the issue exist, but empirical analysis to support arguments is rare. One exception is a study by Barkhi and Sheetz [2001] in which they identified theories from recent IS journals. Our study,

however, goes beyond Barkhi and Sheetz not only in terms of the coverage (number of years and journals), but also in identifying and categorizing theories and mapping

SIDEBAR 1. THEORIES, THEORETICAL FRAMEWORKS AND ONTOLOGY

Research in the IS discipline draws upon a large number of theories. Theories tend to be related to each other in terms of their areas of application, assumptions driving them, and the kind of constructs that they interrelate. Thus, theories may be meaningfully classified into a smaller number of frameworks that share these characteristics. These frameworks are then located in an ontology to help understand the kind of areas that are over-represented or under-represented in terms of theoretical development. Ontology refers to the specification of concepts and relationships that exist in a domain. A formal ontology helps people understand conceptualizations and enables communication among them about the domain.

As an example, the Technology Acceptance Model (TAM) is a well-used theory in IS research. It falls into the "Individual attitudes, beliefs, behavior" theoretical framework category. This idea is further mapped to descriptive, individual, and cognition categories in the ontology.

The results of the ontological mapping suggest that some areas are well-addressed (e.g., descriptive objectives and behavioral phenomena) while others (e.g., prescriptive objectives and design phenomena) did not receive as much attention.

them to an ontology that leads to analysis and discussion. In addition, Barkhi and Sheetz 's study was conducted in the early 1990s with data from earlier periods. Given continuing debate on the diversity in information systems research (e.g., Benbasat and Weber [1996] vs. Robey [1996], as well as Benbasat and Zmud [2003] and various responses), our study provides insights for charting the current the field's intellectual structure. Another value of our study is the identification of the theories that were used during the 1990s, together with citations to papers using them, which can be a useful reference for IS researchers and doctoral students.

II. METHODOLOGY

SELECTION OF JOURNALS AND ARTICLES

The following five journals that publish articles in various information systems areas were identified for the purpose of reviewing research in the discipline. These five include three IS journals and two relatively interdisciplinary journals:

- Information Systems Research (ISR)
- Management Information Systems Quarterly (MISQ)
- Journal of Management Information Systems (JMIS)
- Management Science (MS)
- Decision Sciences (DS)

We chose these journals for our analysis since they play an important role in the IS field and are the formal communication channel for exchanging intellectual knowledge among community members. The journals were widely used in other similar studies [Farhoomand and Drury, 1999; Gillenson and Stutz, 1991; Hamilton and Ives, 1983; Lee and Kozar, 2002; Nord and Nord, 1995; Walstrom et al., 1995].

We excluded articles from Management Science and Decision Sciences that were not considered to be mainstream IS in nature. We excluded other journals such as Communications of the ACM

and other IEEE journals, and Issues and Opinion articles in MISQ since they do not generally draw upon or develop theoretical frameworks, and research in computing disciplines often requires different approaches [Glass et al. 2004]. The period reviewed was 1991 through 2000.

THEORY CLASSIFICATION

Theories used in IS research are large in number and diverse. To facilitate analysis and presentation, we first need to come up with a list of theories and a framework for the right classification. However, classification of theories is a challenging task.

1. Few studies could provide a basis for identifying and classifying the entire range of IS theories over this time period of time.
2. A gray area among theories, theoretical frameworks, and topics is always likely, given different interpretations and labels. For example, whether "structuration theory" is a theory in itself or a theoretical framework seems to be a matter of subjective judgment. Similarly, whether "absorptive capacity" is a theory or a phenomenological conceptualization is not clear.
3. Many papers do not outline their theoretical bases explicitly. In that case, it is necessary first to judge whether the study has a theoretical basis and then to identify theories by examining the constructs and hypotheses development.
4. With advances in the discipline the connotation of theoretical labels themselves may shift – for example, coordination theory may refer to the original proposed by March and Simon [1958] or the more recent work of Malone [Malone and Crowston, 1990].

Our development of a classification scheme of IS theories was first done following Barkhi and Sheetz [2001]. Understanding the difficulty of identifying theories, they first searched based on the keyword "theory" through the text, and then identified the names of theories. After following a similar process, we relied on a painstaking reading of the papers to further identify the theories used. Thus, more subjective judgment could be brought to bear on this process. In this process, we extend the scope of our examination to "theoretical frameworks",

Definition: we define theoretical frameworks as all theories, models, and frameworks that are explicitly mentioned in the articles, which provide an overall structure for examining a problem and serve as a guide to examining relationships among concepts.

The reason we extend the scope is because studies often use a model or a framework interchangeably. For example, while the technology acceptance model is widely considered as a theory, it uses the label 'model' instead of 'theory', and was excluded from Barkhi and Sheetz's [2001] identification.

Barkhi and Sheetz's [2001] methodology and our methodology offer different strengths. The former, while providing a more objective way of identifying theories, may miss out on the subtle identification issues that careful reading can bring to bear. The latter, on the other hand, is a little more subjective, but can identify the theoretical frameworks even when they may not be stated explicitly. The risk of this approach is that different researchers may interpret what constitutes theory and the distinctions between closely related theoretical frameworks differently. To minimize this risk, the coding process was clearly specified and repeated separately by each researcher on a sub-sample of 72 articles across journals and across time periods. After each researcher examined and listed the theories, the list was cross-validated by all three researchers to make sure any ambiguities about the process were ironed out.

Our overall evaluation resulted in 203 theories identified from 993 papers. The number is comparable to 111 theories identified by Barkhi and Sheetz from 273 papers. We needed to reclassify those theories into a smaller number of groups for meaningful analysis and

presentation. We first felt that we needed to organize theories into some high-level structured ontology.

A clarification and formulation of the ontological presuppositions of a research discipline is expected to help researchers understand the kind of questions the discipline asks and the kind of answers that make sense [Guignon, 1983]. O' Donovan and Roode [2002] specifically suggest that the Information Systems discipline needs to reflect on the possibilities for the consolidation and development of our field of enquiry, without being drawn into considerations based on superficial manifestations of progress: "we are more interested in defending what we have become than in questioning what we are." Uncovering the ontology of theories that the discipline draws upon is thus critical to explicate, define, and clarify its basic foundation.

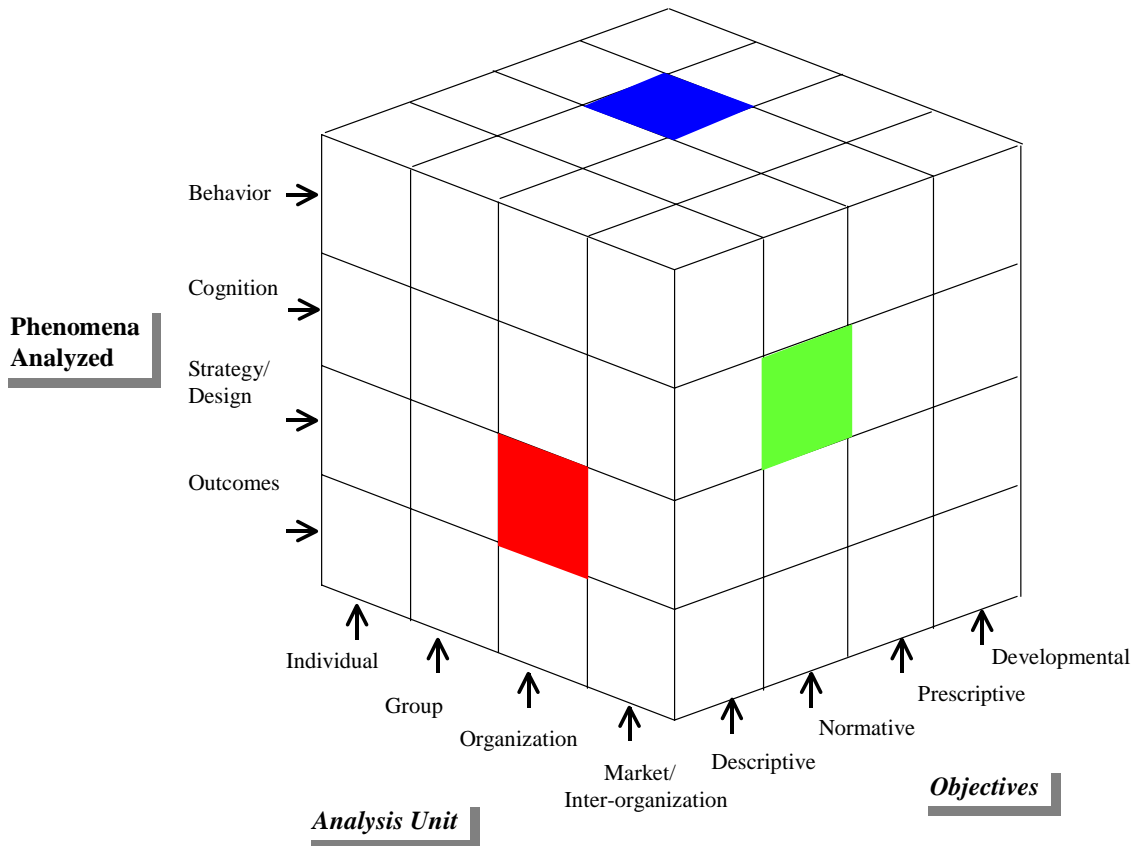


Figure 1: An Ontology of IS Theories

Figure 1 shows our explicit specification of the core dimensions that provide structure to the ontology construction. Theories may be classified on these three dimensions – (1) the nature of phenomena analyzed, (2) the analytical unit of interest, and (3) the purpose of the theoretical framework. For each of these dimensions we identify the range over which theories in the information systems discipline span.

Phenomena	behavior, cognition, design, and outcomes of interest
Unit of Analysis	individuals, groups, organizations or inter-organizational levels
Objectives of theoretical framework	descriptive, normative, prescriptive or developmental.

Bell et al. [1988] view descriptive models as concerned with how and why people behave the way they do. Normative approaches are concerned with ideal behavior, and prescriptive approaches are concerned with the ideal choice of real (as opposed to "ideal") people. In addition, given that phenomena surrounding information systems are focal to IS researchers, we propose an additional classification within objectives: developmental models are concerned with understanding system development, design, and implementation related choices.

This ontology highlights the broad range of theories that are applied in the information systems discipline. It can serve as a basis for communication among members of the discipline and also helps to identify gaps in theoretical development. However, we recognize that this ontology is provisional and would change as the field evolves with respect to the phenomena its studies and the perspectives that guide research change.

The three researchers worked closely to aggregate individual theories into broader "theoretical frameworks" based on Swanson and Ramiller [1993]. Inter-rater reliability was assessed using the kappa statistic since we are testing agreement for categorical variables [Siegel and Castellan, 1988]. The statistic indicated that our classification shows a significant consistency among three researchers ($p < 0.05$). Consistency of classification among all three researchers was 84.6% for the sample that was assessed by all three researchers. Therefore, we conclude that consistency in classification was obtained through broad agreement on the categorization procedure.

III. INITIAL RESULTS

A total of 993 papers were read to surface the theories used. First, 203 different theories were identified. The theories were first categorized into our IS theory ontology, then into a parsimonious list of 31 theoretical framework categories. A theoretical framework category denotes the aggregation of theories with similar conceptual frames. We found that 643 (64.8%) of 993 papers used at least one theory. Appendix I shows all theories identified under the framework and the reference papers identified. Appendix I also provides the relationships between theory, framework, and ontology. For example, media richness theory belongs to communication theory (framework) and to Behavior-Individual-Prescriptive (ontology).

Table 1 shows the number of papers per year per theoretical framework classes. We find that IS research draws on a broad variety of areas ranging from micro-level theories such as cognitive dissonance to macro-level theories such as structural contingency. The theoretical frameworks also span the entire gamut of perspectives – from the positivist predictions of production theory to the radical perspective of neo-humanism.

Table 1. Theoretical Frameworks and Number of Papers Per Year

	Theoretical Framework Classes	91	92	93	94	95	96	97	98	99	00	Total
1	Economics Theory (Transaction costs, agency, and incomplete contracts theory)	5	5	5	10	2	11	12	5	7	12	74
2	Individual cognition and learning	11	7	7	5	7	11	5	3	9	5	70
3	Individual attitudes, beliefs, behavior (TAM, TPB)	6	1	0	4	8	7	10	7	9	3	55
4	Social information processing, social behavior, and social psychology theory	1	2	3	3	4	7	9	4	14	1	48
5	Contingency, and fit (alignment) theory	2	1	1	5	4	3	5	3	3	2	29
6	Firm strategies, capabilities, and resources	0	7	0	4	5	2	3	0	4	2	27
7	Operations (queuing, complementarily, graph, heuristics,	1	2	0	4	2	4	3	1	2	6	25

	Theoretical Framework Classes	91	92	93	94	95	96	97	98	99	00	Total
	and quality)											
8	Innovation, creativity, and leadership	2	0	2	5	1	2	4	2	3	2	23
9	Organizational learning, memory	3	0	2	1	1	3	2	3	3	2	20
10	Diffusion, adoption, and assimilation	1	2	2	3	1	3	4	3	1	0	20
11	Change, punctuated equilibrium, market, growth models	2	0	2	1	2	3	2	0	7	1	20
12	Individual decision making	0	5	3	1	1	3	0	0	1	4	18
13	Communication theory (Information richness, media richness, social interaction theory)	0	1	2	4	0	1	2	7	1	0	18
14	Teams, organization/group decision making, group dynamics	2	1	2	4	2	2	0	3	1	0	17
15	Organization – socio-political characteristics (trust, power, dependence)	1	0	0	1	0	4	3	4	4	0	17
16	Human computer interaction (systems design, modeling, validation)	0	7	1	0	0	1	1	0	1	2	13
17	Impact, technology determinism	0	2	1	1	0	3	2	2	1	1	13
18	Inter-organizational coordination, alliances, culture	0	0	1	2	0	2	1	3	2	1	12
19	Neo-humanism, gender, critical, and symbolism	1	0	2	3	2	1	2	0	1	0	12
20	Systems development, user participation, project management, and implementation	2	1	1	2	0	3	1	2	0	0	12
21	Bayesian theory, inductive/ deductive reasoning	0	1	4	1	1	0	1	0	3	1	12
22	Systems, Control, complexity, modularity	3	2	0	2	0	0	2	0	2	0	11
23	Career anchors, job involvement, job design	0	2	1	1	1	1	2	0	0	2	10
24	Individual expectations, motivation, needs, roles/conflict	1	1	2	1	1	1	1	0	1	1	10
25	Financial/Accounting Theory	0	2	0	1	0	2	1	2	1	1	10
26	Structuration, adaptive structuration	0	0	2	1	3	0	0	0	3	0	9
27	Methodological (process, grounded theory, metaphors...)	0	1	0	1	0	1	1	1	2	2	9
28	Process redesign/improvement	0	0	1	2	1	1	2	1	0	1	9
29	Fit (cognitive fit, task-technology fit, and dissonance)	0	0	1	0	1	1	2	1	0	2	8
30	Ethics, privacy, and security	0	2	0	0	0	2	0	2	2	0	8
31	Information theory, entropy, signal detection	1	0	1	0	0	0	2	0	1	0	5
	Total	45	55	49	73	49	85	85	59	89	54	643
	No Theory or Could not Assign	32	41	39	29	28	24	38	45	43	31	350
	Total	77	96	88	102	77	109	123	104	132	85	993

Figure 2 shows the percentage of papers based on our IS theories ontology.

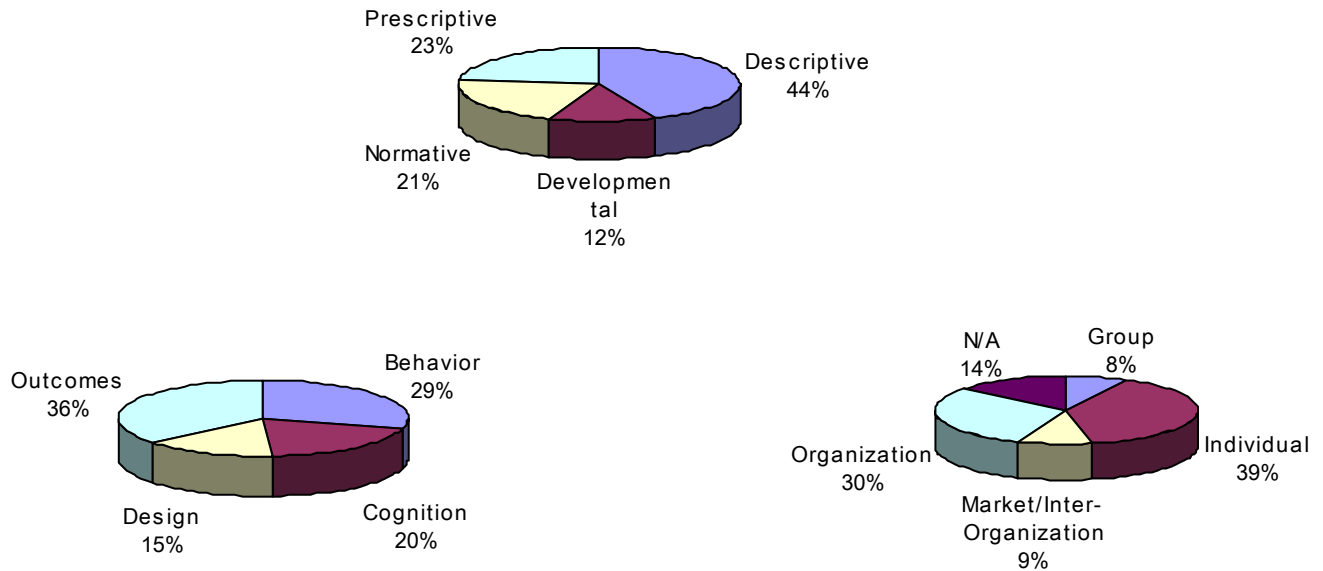


Figure 2: The Percentage of Papers Based on the Ontology (Phenomena Analyzed, Analysis Unit, and Objectives)

The ontological classification suggests that the theoretical application is not evenly distributed. Along the analysis unit dimension, for example, around 70% of theoretical frameworks used are individual and organizational related, and theories about groups and inter-organizational are relatively small. Since we do not capture base statistics about how many actual studies were individual or group based, the numbers do not indicate that those areas characterized by the small percentage of theories also reflect a lack of research in those areas. But the statistics suggest that, over the last decade of IS research, more outcome and behavior-focused theories were used compared to design theories, more individual or organizational related theories than group or inter-organizational theories, and more descriptive than developmental theories.

Table 1 shows that, at the individual level, theoretical frameworks dealing with individual cognition/learning (10.9%) and user attitudes and technology adoption behavior figure prominently (8.6%) These theoretical frameworks were extended over time. Note that theories may begin as extensions to existing well-established theories or as attempts to apply the results of a field of study laterally to something new. Therefore, we expect that over time IS theories will become more delineated from their roots in the reference disciplines.

Theories often take some time to move from the reference disciplines to their use in IS studies. The idea of absorptive capacity, for example, was first used in an IS study in 1994 in the sample, while the original perspective on learning and innovation was suggested by Cohen and Levinthal [1990].

IV. FURTHER FINDINGS AND DISCUSSION

Earlier self-reflection in the IS discipline suggested the lack of cumulative research tradition, lack of endogenous theoretical development and “storm-chasing” as some of the afflictions affecting IS (see Section I). This study provides an analysis of theoretical frameworks used in IS research to reflect on these concerns.

Our empirically derived categorization of theory classes (Table 1) provides one specific mapping of the terrain of IS theory. A number of disciplines embarked in recent years on efforts to make theory more accessible to practice and to clarify the connections between theories (e.g., The TIP database for psychology at <http://tip.psychology.org/index.html>). While other studies investigated the intellectual structure of the discipline based on research themes [e.g. Lee et al. 1999], this study is the first to investigate the research streams in IS research by considering the theoretical frameworks used in leading IS journals.

Identification of the theories used in IS research, together with seminal articles for each theoretical framework can serve as a useful starting point for initiatives to compare and contrast alternate theories and to produce repositories that convey the current state of theory development in the discipline. Above all, through these efforts, we found trends in current IS research, and can suggest a sense of direction for future IS research. Important findings based on these results include:

- Evidence of multi-paradigmatic regime in IS research
- Evidence of theory-grounded research in IS research
- Continuous evolution of IS theoretical frameworks (A shift from the individual entities to more collectivities)
- Emergence of endogenous frameworks in IS research
- We next explain these findings one by one drawing upon our data.

EVIDENCE OF MULTI-PARADIGMATIC REGIME IN IS RESEARCH

The IS community continuously debates the issue of diversity in information systems research. The two distinctive positions about the pros and cons of diversity in IS research are:

1. The challengers of diversity criticize the current high level of diversity in IS research. For example, Benbasat and Weber [1996] argued that IS research should clearly define its own territory and develop its own theory so as not to be taken over by other disciplines. Benbasat and Zmud [2003] also pointed out that diversity is one of the major reasons why the IS discipline has not developed a central identity.
2. Meanwhile, a supportive position on diversity developed. For example, Robey [1996] insisted that diversity provides extensive knowledge foundations, fosters creativity, attracts researchers into the IS field, and provides IS scholars academic freedom. He believes it is the responsibility of IS researchers during their research to make diversity in IS research “a source of pride and a sign of continued vitality” [1996, p. 400]. Other supporters of diversity [e.g. Alter 2003; Power 2003, Wu and Saunders 2003] also asserted that “diversity is a way of guarding against a detrimental narrowing of focus of acceptable topics in the IS discipline” [Wu and Saunders, 2003, p. 564].

To investigate whether the theoretical frameworks show a consistent diversity, or whether diversity increased or decreased for the last ten years, we first simply counted number of theoretical frameworks used for each year and calculated variance of theoretical frameworks. Since the total number of articles varies across years, the total number of theoretical frameworks used per year should be interpreted carefully. If the number of different theoretical frameworks decreases or the variance decreases, it indicates convergence into more dominant theoretical frameworks. Figure 3 shows the result.

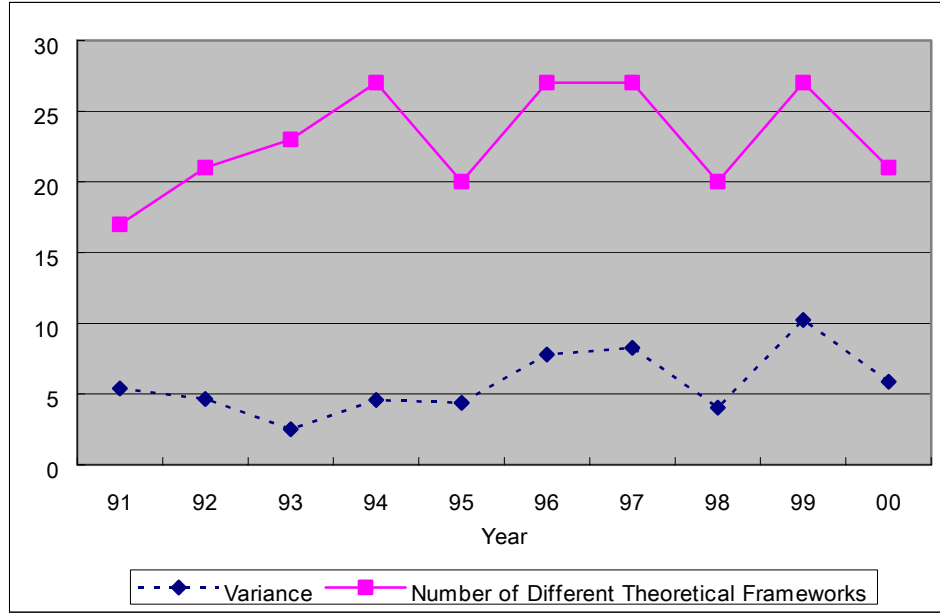


Figure 3. Number of Different Theoretical Frameworks

Figure 3 suggest that the theoretical frameworks continue to show a reasonable diversity. In fact, the numbers indicate that the diversity trend has not changed much, if not slightly increased, over the ten years period despite the different number of total articles. The variance has not changed much, and it shows a slight increasing trend. Our result is consistent with some earlier findings. Through an analysis of submitted articles at Information Systems Research during 1987-1992, Swanson and Ramiller [1993] found that the IS field relied on significantly different reference disciplines. Similarly, Farhoomand and Drury [1999] found that the reliance of the IS field on the reference disciplines increased over the past two decades based on their analysis of over 2000 IS articles.

To understand the diversity trend better, we also analyzed the number of theories *first* used per year during the past ten years. Among 203 theories identified during the last ten years, we investigated when a theory is first used from 1991 and 2000, and then counted the number of the theories first used per year. A significant increase or decrease in theories first used each year also indicates a change in the diversity trend in theories used in IS research. Given the different number of articles per year, we normalized the numbers by the average number of total articles. Figure 4 shows the cumulative number of theories first used during the last ten years, and Table 2 shows the number of theories first used during the ten-year period.

Table 2: Number of First Used Theories (1991 - 2000)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Number of First used theories	27	16	18	27	22	25	19	24	14	11
Normalized	34.8	16.6	20.3	26.3	28.4	22.8	15.3	22.9	10.5	12.9

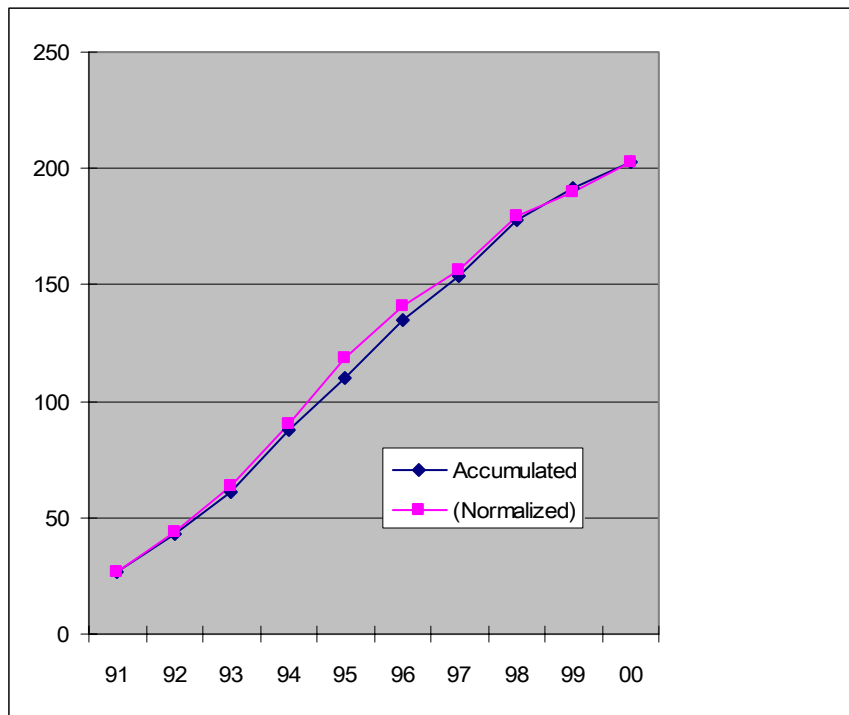


Figure 4. Accumulated Number of Theories First Used

The graph shows a linear trend although it plateaus towards the last two years of the decade. A chi-square equality test shows that the numbers are uniformly distributed across the years at the 95% level. Together with the earlier diversity measures of the number of different frameworks per year and variance, our results indicate no significant change in diversity of IS fields in terms of theories used during the last decade. But the results also indicate that there is a steady increase of different theories used across years.

Our results also suggest that no dominant framework appears to be emerging. Although some ebb and flow can be observed, IS research shows continued diversity in its use of various theoretical frameworks. The evidence from this analysis confirms that the IS disciplines employs multiple theoretical paradigms. The top four theoretical framework categories are general economics/accounting theories, individual cognition/learning theories, individual attitude theories, and organizational/social information processing. Each framework accounts for more than 7.5% of total articles that used a theory. The next six categories are contingency-fit theories, firm strategies (including resources theories), operation theories (including queuing and graph theories), innovation theories, organizational learning and memory, and diffusion, adoption and assimilation theories (Table 3).

As Table 3 shows, no single theoretical framework dominates; the largest share of a category of frameworks is only 11.5%. The emergence of a distinct stream of work using theories from neo-institutional economics such as transaction cost economics, agency and incomplete contracts theory is to be especially noted because it is not one of the main reference disciplines identified by earlier studies.

Table 3. Major Theoretical Framework Categories

	Theoretical Framework Category	% Share of all theories
1	Economics Theory (Transaction costs, agency, and incomplete contracts theory)	11.5%
2	Individual cognition and learning	10.9%
3	Individual attitudes, beliefs, behavior (TAM, TPB)	8.5%
4	Social information processing, social behavior, and social psychology theory	7.5%
5	Contingency, and fit (alignment) theory	4.5%
6	Firm strategies, capabilities, and resources	4.2%
7	Operations (queuing, complementarily, graph, heuristics)	3.9%
8	Innovation, creativity, and leadership	3.6%
9	Organizational learning, memory	3.1%
10	Diffusion, adoption, and assimilation	3.1%

EVIDENCE OF THEORY-GROUNDED RESEARCH IN IS

Straub et al. [1994] and Baskerville and Myers [2002] pointed out that a theory is the most important criterion by which to judge the quality and maturity of IS research. Rao and Jarvenpaa [1991] stated that theory provides the commonality to develop a clear and rapid understanding between researchers, indicating “theory provides the story that gives meaning to data....Theories are nets cast to catch what we call ‘the world’: to rationalize, to explain, and to master it” (p.1348). Further, Alavi et al. [1989] stated that a theory helps not only for the creation of propositions linking concepts, but also draws attention to the right variables that need to be conceptualized and observed.

IS researchers point out that employing theories yields insights into the nature of the IS phenomena because the IS field is still relatively immature and still a lack of understanding of many fundamental phenomena [Teng and Galletta, 1990]. For example, Robey and Boudreau [1999] assert that theoretical frameworks help in richer explanations of contradictory findings. They showed that contradictory findings linking IT and radical change could be explained by using a logic of opposition that explains organizational change by identifying forces both promoting change and impeding change.

Despite an appreciation of the importance of theories, IS research is often criticized for the lack of theories. Farhoomand [1987] indicated that

“it is important to note that even though the domain of IS is more or less distinguishable, its theoretical structure has not received a great deal of attention because of a severe lack of substantive theories in the area.... Not surprisingly, the rather insignificant scientific progress of IS can be attributed, to a large degree, to the fact that IS lacks articulated theories of its own (p. 55).”

Alavi et al. [1989] also raised similar questions for the progress of the IS field stating that only fifteen articles out of the hundreds of sampled ones are theory-oriented. They warned that, under the absence of IS theories, the clear relationships among variables are difficult to detect.

Our research found evidence of greater use of theories. Of the 993 articles identified as IS-related, an underlying theoretical framework could be identified for 643 articles (64.8% of the total). Figure 5 shows the percentage of articles using theoretical frameworks over the 10 year period.

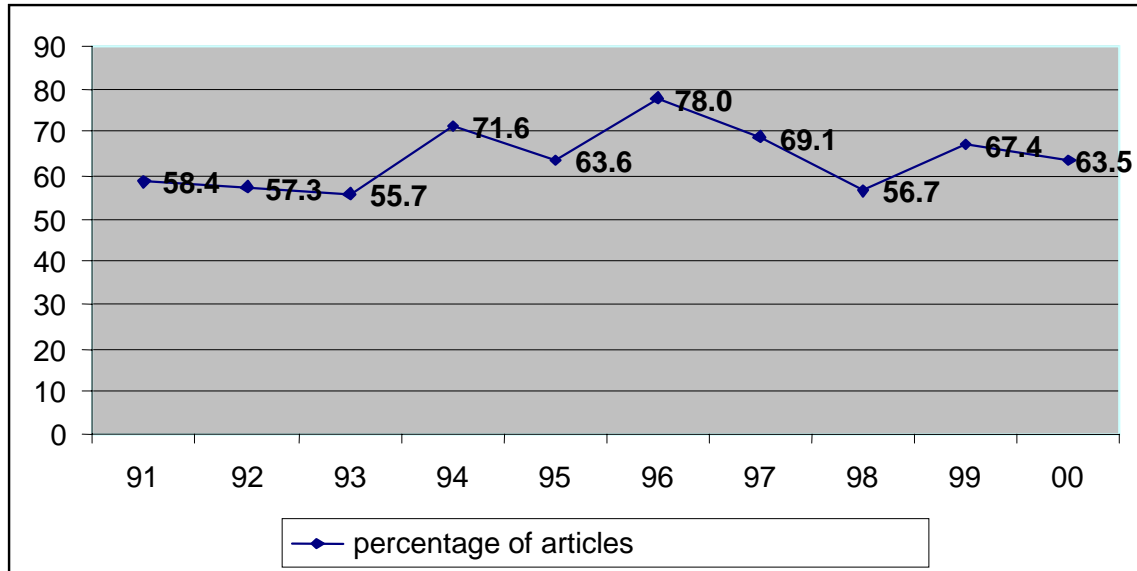


Figure 5. Percentage of Articles Using Theoretical Frameworks

A chi-square test shows that the number did not change significantly over the years. We found that the numbers remained steady across years although the first three years record lower averages than the rest. Our number compares favorably with other research in the related discipline of information science. A recent study of articles appearing in six information science journals over the 1993-98 periods reported that theory was discussed in 34.1% of the articles [Pattigrew and McKechnie, 2001]. Barkhi and Sheetz [2001] report that 52% of the papers mentioned theory. One possible reason of the gap between the 2001 studies and our study is that the former only counted explicitly mentioned theories whereas this study identified theories by a careful reading of the papers.

CONTINUOUS EVOLUTION OF IS THEORETICAL FRAMEWORKS (A SHIFT FROM THE INDIVIDUAL ENTITIES TO MORE COLLECTIVITIES)

The earlier analysis on multi-paradigmatic frameworks shows that IS research did not converge into dominant theoretical frameworks over the years. Instead we observed progress towards IS becoming a more diverse discipline. Next, we identified dominant theoretical framework categories of the 1991-1995 period and the 1996-2000 period and compared how the list has changed during these 10 years.

Table 4 shows that while the list of top theoretical frameworks did not change much, the rank changed greatly. Economic theories including transaction costs, agency, and incomplete contracts gained slightly in popularity in the later 1990s. Individual cognition, learning, and information processing which accounted for about 14% of the first five years decreased to 9% in the second five years. Organization and social information processing, on the other hand, jumped from 4.8% in the early '90s to the 9.4% in the late '90s, becoming the third most dominant theoretical frameworks. Firm strategies (capabilities, resources and planning), one of top dominant theoretical frameworks in the early years account only 3.0% of the theoretical frameworks in the later years and was eliminated from the dominant list. Organizational socio-political characteristics theoretical framework, on the contrary, became one of the dominant theoretical frameworks in the late 90's although it accounted for only 0.7% in the early research.

Table 4. Change of Dominant Theoretical Frameworks

The First Five years (1991- 1995)			The Second Five Years (1996 - 2000)		
1	Individual cognition, learning, information processing	13.7%	1	Economics Theories	12.6%
2	Economics Theories	10.0%	2	Individual attitudes, behavior	9.7%
3	Individual attitudes, behavior	7.0%	3	Org/Social Information Processing, Social Behavior, Social Psychology	9.4%
4	Firm strategies, capabilities, resources, planning theories	5.9%	4	Individual cognition, learning, information processing	8.9%
5	Contingency, fit (alignment)	4.8%	5	Contingency, fit (alignment) theories	4.3%
6	Org/Social Information Processing, Social Behavior, Social Psychology	4.8%	6	Operations (queuing, complementarily, graph, heuristics, and quality)	4.3%
7	Innovation, Creativity and leadership Decision Making (tied)	3.7%	7	Organization – socio-political characteristics (trust, power, dependence)	4.0%

One distinctive phenomenon that draws our attention is that IS research shifted from the individual entities (individuals, single groups, single enterprises) to more collectivities (e.g., groups of enterprises together or individuals embedded in social contexts). Although individual attitude and behavior toward IS adoption has been a continuously important theoretical framework throughout the years, greater attention is being devoted to Organizational/Social Information Processing, Social Behavior, Social Psychology and Organization, as well as socio-political characteristics such as in trust, power, and dependence theories. As networking and communication technologies enable and support the formation of new types of ties between individuals and organizations, IS research is also starting to recognize the importance of relationships and social embeddedness of individuals.

EMERGENCE OF ENDOGENOUS FRAMEWORKS

Although it was not surprising to know that theoretical paradigms from other disciplines are continually being borrowed, in recent years there have been some concerns about the few paradigms that are endogenous to the IS discipline [Benbasat and Zmud 2003; Stolen, 1993; Wu and Saunders 2003]. The emergence of distinct research paradigms is considered as the sign of maturation of a discipline, and this goal seems to have eluded IS research.

Although it is difficult to make an objective assessment of whether IS theories moved to more endogenous frameworks, we can point to some evidence of the trend. Our research shows that while the trend of drawing on reference discipline theories continues, the IS discipline seems to be extending and applying these theories to the specific nature of IS phenomena rather than becoming tied down by the frames of borrowed theories.

Some theoretical frameworks are highly applicable to core IS issues. The technology acceptance model (TAM) stemming from theory of reasoned action (TRA) is a representative example. TAM was used to investigate user's technology acceptance behavior during the 10 year period. It successfully addresses behavior across different technologies, environment, task, and gender. As Lee and Kozar [2002] reported, TAM study is moving towards a new decade with the introduction of TAM II models [Venkatesh and Davis, 2000]. In addition, starting from group theory in the organizational behavior discipline, decision support system (DSS) studies evolved to group decision support systems (GDSS) and then to virtual teams research. Many distinctive theoretical findings were accumulated. Thus DSS and GDSS research is considered as an area that develops unique IS theory.

The extension and modification of original theories from other disciplines to fit into the IS context was also observed. The following are some examples:

- Compeau and Higgins [1994] developed computer self-efficacy based on the self-efficacy concept of social learning theory proposed by Bandura [1986].
- The theory of planned behavior (TPB) also was adopted in the IS field and modified to fit into the IS context. Taylor and Todd [1995] proposed decomposed TPB that identified and incorporated a number of determinants of major constructs of original TPB under a computing facility usage context.
- SERVQUAL was originally developed by Parasuraman et al. [1985] in the marketing discipline, but was adopted and modified for IS Service Quality after considerable refinement, debate, and modification [e.g. Pitt et al. 1997].
- While the issue of alignment between organization strategy and IS strategy has been theorized using the familiar contingency theory perspectives, the notion of alignment was specifically elaborated upon to consider the nature of IT capabilities. The dynamic nature of alignment further developed in more recent versions of this theory and the best-aligned organizations are noted to co-evolve IT strategy and organization strategy over time.

V. LIMITATIONS AND FUTURE RESEARCH

Although this study provides a valuable overview of how different theories were employed in five journals, it contains a number of limitations.

1. While the researchers took great care to ensure a consistent process of examining articles and identifying the overarching theoretical framework, this process is still fairly subjective. Through pre-test and inter-rater analysis, we believe we minimize the problems. A different categorization scheme may only alter the basic findings marginally.
2. The published articles examined do not represent a complete set, but, in our view, represent the major “share of voice” in our field.
3. The analysis of the data using descriptive statistical methods is a limitation with respect to “rigor”. While descriptive statistics are useful in this exploratory phase of research, time series analysis with longer-term data sets would permit better empirical validation.
4. Study with larger selection of journals covering broader periods and more rigorous statistical methods will help to provide richer findings.
5. Cross-comparison with other disciplinary areas for investigating the scientific progress is another area is yet to be explored.
6. A longitudinal investigation of IS intellectual structure from a Kuhnian perspective is an avenue for future work.

VI. CONCLUSION

Through this study we hope to inform IS researchers about the state of theory in the discipline and to guide future theory development and use. We find that the field continues to be supplied with many different theories during the last decade, accumulating over 200 different theories in IS research. The number of theories first used per year is approximately constant, suggesting that the number of theories incrementally added is persistent through the years. While our results suggest changes in theoretical frameworks applied over the years, we find that that different theories tend to be used under the same theoretical frameworks over time.

We can interpret this situation in two ways:

1. We can regard it as a healthy sign of research progress. IS is making significant progress towards becoming a scientific discipline by extending theories for conceptualizing similar phenomena from many different perspectives.
2. We can also see this situation as a sign of a lack of cumulative tradition and storm-chasing different phenomena [Lee et al. 1999].

When it comes to the debate about the benefit of diversity in research, it is difficult to judge whether our findings on diversity in IS theories represents a lack of maturity or a healthy cumulative tradition. We can, however, conservatively conclude that our findings support opinions on both sides. Dynamic change in the business and technology environment inevitably require new theoretical perspectives. Thus as Baskerville and Myers [2002] asserted, it can be a strength of the IS field to adapt flexibly to a changing environment. In this situation, it is natural for IS researchers to adapt diverse and new theoretical lenses ceaselessly. Meanwhile, our study also found a few endogenous theories in IS fields, and a trend of extension and accumulation of IS theories. It reflects a moving of IS field toward a normal science in a Kuhnian view, and may reduce the concern about the lack of relevant theoretical frameworks [Checkland and Holwell, 1998]. Therefore, our study provides empirical results that support the notion that "we need both a paradigm and diversity in the IS discipline" [Benbasat and Weber, 1996 p. 397].

Finally, we hope that IS researchers, and particularly doctoral students, will find this study useful in their endeavors to explore theories that were used in past IS research and to help identify the ones that may be most applicable to their studies. We also hope to see researchers undertake theory development for specific phenomena and using perspectives that are under-theorized.

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APPENDIX I. LIST OF IS THEORIES

	THEORY	Origin of Theory	Theoretical Framework	Phenomena Analyzed	Analysis Unit	Objectives	Reference
1	Absorptive Capacity Theory	SOC/OB	26	O	O	P	Boynton et al. (1994)
2	Action Theory	SOC	27	O	N/A	D	Clemons et al. (1994)
3	Activation Theory of Learning and Recall	PSY	2	C	I	D	Hsinchun and Kim (1995)
4	Activity Based Accounting Theory	ACC	25	O	O	N	Stuchfield and Weber (1992)
5	Actor-Network Theory	SOC	7	D	N/A	DV	Walsham and Sahay (1999)
6	Adaptation Level Theory	IS/OB	10	O	I/O	D	Kettinger and Lee (1994)
7	Adaptive Structuration Theory	OB/SOC	26	O	O	P	Gopal et al. (1993)
8	Agency Theory	ECON/FIN	1	B	O	N	Choudhury and Sampler (1997)
9	Alienation Theory	OB	5	O	O	D	Abdul-Gader and Kozar (1995)
10	Alignment Theory	OB	5	O	M	P	Reich and Benbasat(2000)
11	Amabile-4P model	OB	8	O	O	P	Couger et al. (1993)
12	Anonymity Theory	PSY	2	B	I	D	Pinsonneault and Nelson (1998)
13	Assimilation Theory	OB	10	B	I/O	D	Davis and Bostrom (1993)
14	Attribution Theory	PSY/ETHIC	30	B	I	D	Igbaria and Baroudi (1995)
15	Auction Theory	ECON/MKG	1	O	I	N	Kauffman and Wang (2001)
16	Bateson's Model of Level of Learning	OB	2	B	I	D	Star and Ruhleder 91996)
17	Bayesian Theory	STAT/OR	21	O	N/A	N	Dey and Sarkar (2000)
18	Boehn's Spiral Model	CS/SE	20	D	N/A	DV	Back (1994)
19	Brown and Bostrom's Contingency Model	OB	5	B	O	P	Brown and Bostrom (1994)
20	Business Process Reengineering	IS	28	O	O	N	Thong et al. (2000)
21	Career Anchor Model	OB	23	B	I	P	Jiang and Klein (2000)
22	Change Resistance Theory	OB	11	B	M	D	Clemons and Hann (1999)

	THEORY	Origin of Theory	Theoretical Framework	Phenomena Analyzed	Analysis Unit	Objectives	Reference
23	Channel Expansion Theory	COMM	13	O	I	P	Yoo and Alavi (2001)
24	Classification Theory	CS/LAN	27	D	N/A	N	Parsons (2003)
25	Cognitive Behavioral Theory	PSY	2	C	I	D	Money (1996)
26	Cognitive Bias Theory	PSY	14	C	G/O	D	Lim and Benbasat (1997)
27	Cognitive Absorption Theory	PSY/OB	12	C	I	D	Agarwal and Karahanna (2000)
28	Cognitive Dissonance Theory	PSY	27	C	N/A	P	Szajna and Scamell (1993)
29	Cognitive Information Processing Theory	PSY/IT	2	C	I	D	Vessey and Galletta (1991)
30	Cognitive Learning Theory	PSY	2	C	I	D	Vandenbosch and Higgins (1996)
31	Cognitive Mapping Theories	PSY/CS	27	C	N/A	P	Sheetz et al. (1997)
32	Communication Coordination Theory	COMM	14	O	G/O	P	Horton and Biolsi (1994)
33	Communication Theory	COMM	13	O	I/G/O	N	Burgoon et al. (2000)
34	Complementarity Theory	ECON	7	B	O	P	Hitt and Brynjolfsson (1997)
35	Complexity Theory	SE/CS	22	O	I	D	Flynn and Flynn (1999)
36	Comprehension Theory	LAN	2	B	I	D	Shaft and Vessey (1995)
37	Contingency Theory	OB	5	O	O	P	Sambamurthy, and Zmud (1999)
38	Contingency-Fit Theory	OB	5	B	O	P	Dennis and Carte (1998)
39	Control Theory	SE	22	O	N/A	DV	Grant and Higgins (1991)
40	Cooperative Learning Theory	OB	9	B	O/M	D	Alavi (1994)
41	Coordination Theory	OB	18	B	O	P	Kumar and van Diesel (1996)
42	Cost-Benefit Theory	ACC/FIN	1/25	O	O	N	Goodhue et al. (1992)
43	Creativity Theory	OB	8	O	I/O	D	Cooper (2000)
44	Critical Social Theory	COMM	13	B	I	D	Ngwenyama and Lee (1997)
45	Decision Dilemma Theory	OB/ETHICS	30	B	I	D	Newman and Sabherwal (1996)
46	Decision Making Theory	OB/OR	12	O	I	P	Burgoon et al. (2000)
47	Delone & McLean Model of IS Success	IS	10	B	I	D	Seddon (1997)
48	Deontological and Teleological Theory	ETHICS	30	O	N/A	N	Thong and Yap (1998)
49	Design Theory for User Calibration	CS	16	O	N/A	DV	Kasper (1996)
50	Distraction/Conflict Theory	OB	24	C	I	D	Speier (1999)
51	Domain Theory of Moral Development	ETHICS	30	C	I	D	Gattiker and Kelley (1999)
52	Eccles Model of Transfer Pricing	ECON	1	O	O	N	Ross et al. (1999)
53	Economic Theory Between Firms (Duopoly)	ECON	1	O	O/M	N	Barua et al. (1991)
54	Economic Theory Between Seller-Buyer	ECON	1	B	O/M	N	Bakos (1991)
55	Economic Theory (consumer surplus)	ECON	1	O	I	N	Hitt and Brynjolfsson (1996)
56	Economic Theory (economic production theory)	ECON	1	O	M	N	Hu et al. (1998)
57	Economic Theory (economics of scale)	ECON/FIN	1	O	M	N	West (1994)
58	Economic Theory (Financial slack theory of IS outsourcing)	ECON/FIN	1/25	O	O	N	Ang and Straub (1998)
59	Economic Theory (increase market efficiency theory)	ECON	1	O	M	N	Lee and Clark (1997)
60	Economic Theory (information pricing)	ECON	1	O	O	N	West (2000)

	THEORY	Origin of Theory	Theoretical Framework	Phenomena Analyzed	Analysis Unit	Objectives	Reference
61	Economic Theory (new firm entrance)	ECON	1	O	M	N	Clemons (1996)
62	Economic Theory (Theory of Production)	ECON/OB	1	O	M	N	Hitt and Brynjolfsson (1996)
63	Economic Theory (theory of Multiparty negotiation)	ECON	1	O	M	N	Swaab et al. (2002)
64	Economic Theory (Transfer Price Determination)	ECON	1	O	M	N	Sarkar and Zangwill (1992)
65	Electronic Markets Theory	ECON/MKG	18	O	M	D	Choudhury et al. (1998)
66	Embeddedness Theory	SOC	4	O	O/G	D	Chatfield and Yetton (2000)
67	Equity-Implementation Theory	SOC	11	D	O	DV	Joshi (1991)
68	Escalation Theory (Commitment)	PSY	12	O	I	D	Keil et al. (2000)
69	Event Theory	ACC	25	O	N/A	DV	Chatterjee et al. (2002)
70	Evolutionary Theory of Economic Change	ECON	11	O	M	D	Rai et al. (1996)
71	Excitation Transfer Theory	PSY/MKG	2	C	I	D	Reinig et al. (1996)
72	Expectance Theory	ECON/OB	24	B	I	N	Burton et al. (1993)
73	First Impressing Bias Theory	PSY	2	C	I	D	Lim et al. (2000)
74	Fit Theory	OB	5	C	I	P	Jain et al. (1998)
75	Flexible Pricing Theory	ECON	1	O	O/M	D	Clemons et al. (1994)
76	Game Theory	ECON	1	O	O/M	N	Hui and Tam (2002)
77	Gender Theory	SOC	19	B	I	P	Baroudi and Igarria (1995)
78	General Deterrence Theory	CRIM	30	B	I	P	Straub and Welke (1998)
79	Genre Theory	LAN	27	D	N/A	N	Yates et al. (1997)
80	Goal Setting Theory	OB	24	O	I	D	Rasch and Tosi (1992)
81	Graph Theory	CS	7	D	N/A	DV	Hornig et al. (1994)
82	Grossman-Hart-Moore Incomplete Contract Theory of Firm	ECON	1	O	O	N	Sivaramakrishnan (1994)
83	Grounded Theory	OB	27	O	N/A	N	Orlikowski (1993)
84	Group Conflict Resolution Theory	OB	14	B	G/O	D	Robey et al. (1993)
85	Group Theory of Human Behavior	OB	14	B	G/O	D	Bernard et al. (1998)
86	Hofstede's Theory	SOC	18	O	M	P	Walsham (2002)
87	Human Cognition Theory	PSY	2	C	I	D	Rao et al. (1992)
88	Human Error Detection Theory	PSY/CS	2	D	I	DV	Klein et al. (1997)
89	Human Memory Theory	PSY/CS	2	C	I	D	Weber (1996)
90	Imagery Theory	PSY	2	C	I	D	Zmud et al. (1993)
91	Implementation Process Theory	SE/IS/CS	28	D	I	DV	Webster (1998)
92	Incentive Theory	OB	24	B	I	P	Post et al. (1995)
93	Inductive Learning Theory	SOC/PHIL	21	C	I	P	Tessmer et al. (1993)
94	Information Influence Theory	COMM	12	B	I	D	Dennis (1996)
95	Information Processing Theory	IT	31	B	I/O	D	Loy (1992)
96	Information System Design Theory	IS/CS	20	D	I/G	DV	Walls et al. (1992)
97	Information Theory(Entropy)	IT	31	O	I/O	N	Tessmer et al. (1993)
98	Innovation Characteristic Theory	OB/SOC	8	B	O	P	Webster (1998)
99	Innovation Diffusion Theory	IS/OB/MKG	10	D	I/O	D	Parthasarathy and Bhattacharjee (1998)

	THEORY	Origin of Theory	Theoretical Framework	Phenomena Analyzed	Analysis Unit	Objectives	Reference
100	Integrated Theory of Innovation Process and Characteristics	OB	8	D	O	P	Fichman (2001)
101	Integrative Complexity Theory	PSY	2	C	I	D	Grise and Gallupe (2000)
102	IT Adoption and Assimilation Theory	IS/OB	10	B	I/O	D	Tillquist (1996)
103	Job Characteristics Theory	OB	23	B	I	P	Thatcher et al. (2003)
104	Job Design Theory	OB	23	O	O	D	Gill (1996)
105	Leadership Theory	OB	8	B	O	P	Anson et al. (1995)
106	Lewin Change Model to Interorganization	OB	11	O	M	D	Sheffield and Gallupe (1995)
107	Information Center Phase Theory	PSY	2	O	I	D	Igbaria and Guimaraes (1993)
108	Market Segmentation Theory	MKG	18	O	M	N	Raghunathan (2000)
109	Market Signaling Theory	MKG	15	O	M	P	Hoxmeier (2000)
110	McClelland's Theory of Learned Needs	OB/PSY	24	C	I/O	D	Smits et al. (1993)
111	McGrath's Framework of Group Behavior	OB	14	B	G/O	P	Fjermestad and Hiltz (1991)
112	Media Richness Theory	COMM	13	B	I	P	Dennis and Kinney (1998)
113	Metagraph Math Model	CS	27	D	N/A	DV	Muhanna and Pick (1994)
114	Minority Influence Theory	SOC	19	B	G	D	Rao and Jarvenpaa (1991)
115	Normative Influence Theory	SOC	4	B	O/G	P	Dennis (1996)
116	Option Pricing Theory	ECON/FIN	25	O	O	N	Benaroch and Kauffman (1999)
117	Organization Change Theory	OB	11	O	O	D	Orlikowski (1993)
118	Organizational Climate Theory	OB	8	O	O	D	Tuttle et al. (1997)
119	Organizational Commitment Theory	OB	14	B	G/O	D	Igbaria and Tor (1999)
120	Organizational Information Processing Theory	OB/COMM	14	O	G/O	D	Palvia et al. (1992)
121	Organizational Learning Theory	OB	14	C	G/O	D	Templeton et al. (2002)
122	Participative Decision-Making Theory	IS/OB	20	D	I/G	P	Edberg and Bowman (1996)
123	Performance Evaluation and Verification Theory	SE/CS	22	D	N/A	DV	Silverman (1992)
124	Perkin's Theory of Understanding	EDUC	2	C	I	D	Steiger (1998)
125	Persuasive Argument Theory	PSY	2	C	I	D	Dennis (1996)
126	Playfulness/Cognitive Spontaneity Theory	IS/PSY	3	C	I	D	Webster and Martocchio (1992)
127	Porter's Strategic Framework	OB	6	O	O/M	P	Kettinger and Grover (1995)
128	Power Theory	OB/SOC	15	B	O/M	D	Levine and Rossmoore (1995)
129	Principal-Agent Model	ECON	1	D	N/A	DV	Banker and Kemerer (1992)
130	Privacy Theory	ETHICS	30	C	I	D	Webster (1998)
131	Problem Solving Theory	OR	12	B	I	P	Massey et al. (2002)
132	Procedural Justice Theory	PSY/ETHICS	30	B	I/O	P	Hunton and Beeler (1997)
133	Process Efficiency Theory	OR/SE/CS	7	D	O	DV	Lee and Menon (2000)
134	Process Theory	OR	28	D	N/A	DV	Robey et al. (2003)
135	Prospect Theory	ECON/OB	1	B	O	D	Keil et al. (2000)
136	Psychodynamic Theory	PSY	2	C	I	D	Wastell (1999)
137	Queuing Theory	OR	7	O	N/A	N	Dewan (1996)

	THEORY	Origin of Theory	Theoretical Framework	Phenomena Analyzed	Analysis Unit	Objectives	Reference
138	Relational Database Theory	CS	22	D	N/A	DV	Leitheiser and March (1996)
139	Reliability Theory	SE	22	D	N/A	DV	Panko (1999)
140	Resource Based Theory	OB	6	B	O	P	Jarvenpaa and Leidner (1998)
142	Resource Dependence Theory	OB	6	B	O	P	Abdul-Gader and Kozar (1995)
143	Risk Theory in Management	OB	6	B	I	D	Lyytinen et al. (1998)
144	Role Theory	OB/SOC	24	C	I	D	Zigurs and Kozar (1994)
145	Schema Theory	CS/LAN	27	D	N/A	DV	Parsons (2003)
146	Self-Efficacy Theory	IS/SOC	3	C	I	D	Compeau et al. (1999)
147	Self-Justification Theory	SOC/PSY	30	C	I	D	Keil et al. (2000)
148	Self-Presentation Theory	PSY	24	C	I	D	Keil et al. (2000)
149	SERVQUAL	IS/MKG	24	O	I	P	Jiang et al. (2002)
150	Set Theory	CS/OR	7	D	N/A	DV	Horng et al. (1994)
151	Signal Detection Theory	IT	31	O	I	P	Biros et al. (2002)
152	Social Cognitive Theory	PSY/SOC	4	C	O/G	D	Compeau et al. (1999)
153	Social Comparison Theory	SOC	4	B	O/G	D	Dennis (1996)
154	Social Contract Theory	SOC/OB	4	D	O/G	N	Smith and Hasnas (1999)
155	Social Decision Schema Theory	SOC	4	C	O/G	N	Sengupta and Te'eni (1993)
156	Social Definition Theory	COMM/SOC	13	B	I	D	King and Xia (1997)
157	Social Exchange Theory	SOC	4	B	O/G	D	Gefen and Ridings (2002)
158	Social Influence Theory	COMM	13	B	I	D	Carlson and Davis (1998)
159	Social Information Processing Theory	COMM/SOC	4	C	O/G	D	Chidambaram (1996)
160	Social Interaction Theory	COMM/SOC	13	B	I	D	Carlson and Davis (1998)
161	Social Judgment Theory	SOC	4	C	O/G	D	Sengupta and Te'eni (1993)
162	Social Learning Theory	SOC	9	C	I	D	George et al. (1998)
163	Social Presence Theory	COMM/SOC	13	B	I	P	Carlson and Davis (1998)
164	Social Regulation Theory	SOC	14	O	G/O	D	Clemons and Thatcher (1997)
165	Social Theory of Transformation	SOC	11	O	O	D	Barrett and Walsham (1999)
166	Sociotechnical Systems Theory	SOC	18	D	N/A	DV	Ryan et al. (2002)
167	Software Process Management Theory	CS	20	D	I/G	DV	Nidumolu and Knotts (1998)
168	Speech Act Theory	LAN	27	B	N/A	N	Gordon and Moore (1999)
169	Stakeholder Theory	OB/FIN	5	B	O	P	Smith and Hasnas (1999)
170	Status Congruence Theory	OB/PSY	19	B	I	D	Tan et al. (1998)
171	Stockholder Theory	FIN	25	B	O	P	Smith and Hasnas (1999)
172	Strategy Theory	OB	6	O	O	D	Sampler and Short (1994)
173	Structural Contingency Theory	OB	5	O	O	D	Nidumolu (1996)
174	Structural Programming Theory	CS	20	D	N/A	DV	Dworman et al. (1996)
175	Structural Theory of Socialization	OB/SOC	5	D	O	N	King and Sethi (1998)
176	Structuration theory	OB	26	D	O	N	Walsham (2002)
177	Swanson's Tri-core Model of Innovation	IS	8	O	O	D	Grover et al. (1997)
178	Systems Contingency Theory	SE	5	D	N/A	DV	Li and Shani (1991)

	THEORY	Origin of Theory	Theoretical Framework	Phenomena Analyzed	Analysis Unit	Objectives	Reference
179	Systems Theory	SE	22	D	N/A	DV	Wrigley and Dexter (1991)
180	TAM	IS	3	B	I	D	Gefen et al. (2003)
181	Task-Technology Fit	IS/OB	29	B	I	P	Marcolin et al. (2000)
182	Team Development Theory	OB	14	O	G/O	D	Janz et al. (1997)
183	Team Theory	OB	14	O	G/O	P	Janz et al. (1997)
184	Team Productivity Theory	OB	14	O	G/O	P	Andres and Zmud (2002)
185	Techno-Economic Theory	ECON	1	O	N/A	N	Kumar et al. (1998)
186	Technology-Fit Theory	OB/IS	29	C	I	P	Marcolin et al. (2000)
187	Theory of Brainstorming	PSY	12	O	I/G	N	Dennis et al. (1996)
188	Theory of Cognitive Fit	PSY	29	C	I	P	Ritu et al. (2000)
189	Theory of Electronic Integration	ECON/MKG/IS	18	O	O/G	N	Kambil and Short (1994)
190	Theory of Ethical Relativism	ETHICS	30	C	I	D	Tuttle et al. (1997)
191	Theory of Information Sharing	OB/COMM/IS	2	B	I/G	D	Constant et al. (1994)
192	Theory of Persuasive	SOC/PSY	14	C	G/O	D	El-Shinnawy and Vinze (1998)
193	Theory of Retail Outlet Deployment	MKG	18	O	O	N	Kauffman and Lally (1994)
194	Toulmin Model of Argument	EDUC/LAN	12	C	I	D	Ye and Johnson (1995)
195	TPB	PSYC	3	B	I	D	Venkatesh and Brown (2001)
196	TQM Theory	OR	7	O	O	P	Ravichandran and Rai (2000)
197	TRA	PSYC	3	B	I	D	Hartwick and Barki (1994)
198	Trait Theory of Media Selection	COMM	13	B	I	P	Carlson and Davis (1998)
199	Transactional Cost Theory	ECON/FIN	1/25	O	I/O	N	Grover et al. (1996)
200	Triandis's Theory of Behavior	OB	10	B	I	D	Thompson et al. (1991)
201	Trust Theory	OB	15	C	I/O	D	Nelson and Coopride (1996)
202	User Participation and Involvement Theory	OB/IS	20	D	I	DV	Hunton and Beeler (1997)
203	Value-Expectancy Model	PSY/MKG	12	B	I	N	Abdul-Gader and Kozar (1995)

Theoretical Framework: Each number represents a theoretical framework in Table 2. Refers to the number in Table 2,
Phenomena Analyzed: B: Behavior, C: Cognition, D: Design, O: Outcomes,
Analysis Unit: I: Individual, G: Group, O: Organization, M: Market/Inter-organization,
Objectives: D: Descriptive, N: Normative, P: Prescriptive, DV: Developmental

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