Communications of the Association for Information Systems

Volume 22

Article 7

1-2008

A Review of the Literature on the Empathy Construct Using Cluster Analysis

Tomasz Miaskiewicz University of Colorado Boulder

David E. Monarchi University of Colorado at Boulder

Follow this and additional works at: https://aisel.aisnet.org/cais

Recommended Citation

Miaskiewicz, Tomasz and Monarchi, David E. (2008) "A Review of the Literature on the Empathy Construct Using Cluster Analysis," *Communications of the Association for Information Systems*: Vol. 22, Article 7. DOI: 10.17705/1CAIS.02207 Available at: https://aisel.aisnet.org/cais/vol22/iss1/7

This material is brought to you by the AIS Journals at AIS Electronic Library (AISeL). It has been accepted for inclusion in Communications of the Association for Information Systems by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Communications of the Association for Information Systems

A REVIEW OF THE LITERATURE ON THE EMPATHY CONSTRUCT USING CLUSTER ANALYSIS

Tomasz Miaskiewicz

Leeds School of Business University of Colorado at Boulder <u>miaskiew@colorado.edu</u>

David E. Monarchi

Leeds School of Business University of Colorado at Boulder

Abstract:

Empathy plays a central role in human behavior and is a key aspect of social functioning. The extensive research on the empathy construct in fields such as psychology, social work, and education has revealed many positive aspects of empathy. Through the use of cluster analysis, this research takes a new approach to reviewing the literature on empathy and objectively identifies groups of empathy research. Next, this study relates the information systems (IS) discipline's focus on empathy research through the projection of IS empathy paragraphs into those clusters, and identifies areas of empathy research that are currently being largely overlooked by the IS field. The use of cluster analysis and projection for conducting a literature review provides researchers with a more objective approach for reviewing relevant literature.

Keywords: empathy, cluster analysis, projection, literature review, text mining

Volume 22. Article 7. pp. 117-142. February 2008

A REVIEW OF THE LITERATURE ON THE EMPATHY CONSTRUCT USING CLUSTER ANALYSIS

I. INTRODUCTION

Empathy, the understanding of and identification with the thoughts, feelings, and motives of another individual, plays a central role in human behavior [Hogan 1969]. Empathy has been linked to pro-social behavior (i.e., voluntary actions intended to help others) [Eisenberg and Strayer 1987] and increased social functioning [Davis 1996]. In addition to its basis in psychology, the empathy construct has received considerable attention from researchers in fields such as medicine, social work, and education. These fields are linked by their focus on care-giving professionals where humanistic skills are critical. For example, nurse empathy has been positively related to patient welfare [Olson 1995; Patterson and Zderad 1976]. A lack of physician empathy has been linked to malpractice suits [Beckman et al. 1994]. Teacher empathy has been associated with success in urban schools [Darling-Hammond 2000].

The positive aspects of empathy in fields such as education and medicine are apparent, but why should IS researchers care about empathy? Many would argue that the IS field is far removed from these disciplines, and that IS research has a very different focus. However, one can also argue that the interactions between a nurse and his or her patients, or a teacher and his or her students, are humanistic relations that are not fundamentally different from the interactions that are common in the IS environment such as between a manager and system developers, or a system designer and the end users. The IS discipline has a people component as well as technology and organizational components [Kozar 1989]. In a classroom, in a hospital, and on a systems development team, empathy plays a central role in our social behavior and functioning. Even though disciplines such as medicine are not traditional reference disciplines, IS researchers can still learn from the extensive research in these disciplines to identify possible research endeavors.

There are specific areas of IS research that could clearly benefit from exploring the role of empathy. For example, in systems analysis and design research, empathy has long been considered important to the development of systems. Empathy is essential to successful systems development efforts because "the developer must constantly think about *how the user perceives* the system" [Kozar 1989, p. 277]. During systems development, the developers and designers must be able to understand the users, and to identify with their goals, needs, and frustrations. Empathy must be present. As usability expert Donald Norman explains, in the design of modern systems and products empathy is vital "to ensure that [users] will be able to take advantage of the product, to use it readily and easily—not with frustration but with pleasure" [Norman 2004]. IS research projects could investigate interesting research questions such as how a system designer's empathy for the target users affects the system quality of the resulting solution and how readily it is adopted by the users.

Through this paper, we hope to raise a greater awareness of the empathy construct in the IS community, and to identify possibly fruitful IS research projects that could incorporate the construct. Specifically, this study attempts to relate the limited IS empathy research to empathy research in the education, medicine, social work, and psychology fields (referred to as "other disciplines" for simplicity). Through the use of cluster analysis and the projection of IS empathy paragraphs, this study aims to uncover areas of empathy research that have been overlooked by the IS field.

By studying empathy in other disciplines and in the IS field, this research makes three contributions:

- 1. It supplies IS researchers with an example of a nontraditional and objective approach for literature reviews. By applying cluster analysis and document projection, this study analyzes 1,721 abstracts about empathy from peer-reviewed journals in the other disciplines and 219 paragraphs about empathy from the IS field.
- 2. It provides a grouping of empathy research. By using cluster analysis, six clusters of empathy research in other disciplines are uncovered.
- 3. It identifies areas of empathy research that the IS field has concentrated on, and areas that the discipline has largely neglected. Through the projection of paragraphs of IS empathy research into a semantic space, this study objectively compares the IS discipline's treatment of empathy with the six clusters of empathy research from other disciplines.

II. METHOD

The data analysis of the empathy-related abstracts from other disciplines was performed using SAS Enterprise Miner, one of the leading enterprise data mining applications. For this research, the SAS Text Miner (SAS TM[™]) component of the application was used for analysis of the empathy-related abstracts. SAS TM[™] provides text mining functionality for large sets of textual documents.

The following sections explain the data selection and preparation processes, and elaborate on the unit of analysis. Then, the clustering algorithm that was used to cluster the research from other disciplines and the subsequent projection of the IS empathy-related research into the cluster space are described. Finally, we provide background information on our approach and discuss how it relates to previous research.

Data Selection

Empathy in Other Disciplines

The CSA Illumina research database was used to gather empathy-related abstracts from peer-reviewed journals in the psychology, social work, medicine, and education fields. These four fields were selected because each of them has a strong focus on empathy research. The CSA Illumina database is separated into field-specific databases (e.g., the MEDLINE database for medical research), which permitted an analysis of the empathy research separately in each of the selected disciplines. The search of the field-specific databases for the word "empathy" in the title of an article yielded 1,347 results from psychology journals,¹ 221 results from medical journals, 106 results from education journals, and 47 results from social work journals. The titles of the articles were searched for the word "empathy" because titles typically provide the most precise description of an article's contents. When an article contained empathy in the title, we were fairly certain that the empathy concept played a significant role in the article.

Empathy in the Information Systems (IS) Field

Due to a limited number of IS empathy-related articles, IS empathy research was gathered by performing searches for the word empathy in the full-text versions of research papers. If the word empathy was contained in the abstract of an article, then the abstract was used for the analysis. However, the word empathy occurred in the abstract of only seven IS articles. Consequently, in order to reach a more complete representation of IS empathy-related research, if the word empathy did not occur in the abstract then the paragraphs within the article containing the empathy term were used to capture the empathy focus of the study.²

The IS empathy research was collected from the top 40 IS journals as specified by the Saunders [2005] IS World journal rankings. The Saunders rankings consolidate nine IS journal rankings [Rainer and Miller 2005; Lowry et al. 2004; Katerattanakul et al. 2003; Peffers and Tang 2003; Mylonopoulus and Theoharakis 2001; Whitman et al. 1999; Hardgrave and Walstrom 1997; Walstrom et al.,1995], and therefore provide a representative view of the journals that most IS researchers judge as having a significant impact on the IS field. In addition to the 40 IS journals, the proceedings of the AMCIS and ICIS conferences were included. The combination of 40 journals and 2 research conferences was judged to provide a representative sample of empathy research in the IS field. Appendix A lists the journals and conference proceedings that were used in this study together with the years of access to the electronic versions of the articles. Appendix B contains a listing of the 129 IS articles that were used in the analysis, which had a total of 219 paragraphs and abstracts that contained the word empathy.

Volume 22

¹ The psychology research has some overlap in its focus with the education, medicine, and social work disciplines. For instance, the psychology literature studies subjects such as elementary school students.

² Searching for the word "empathy" within the body of an article is prone to finding articles that are unrelated to the empathy concept. However, through document projection (described in a later section) we determined the similarity of each of the paragraphs from the IS articles to the areas of empathy research in the other disciplines. Hence, IS paragraphs that were unrelated to the empathy concept did not bias our conclusions about the focus of the IS discipline on empathy research. Also, we took into account two additional considerations when choosing not to manually verify each of the IS paragraphs: (1) the determination of whether a paragraph is sufficiently about the empathy concept would require difficult and subjective judgments; and (2) the generalizability of the proposed approach to applications where thousands of related articles exist would be compromised if each of the selected articles required manual verification.

Unit of Analysis

In the following sections, the abstracts and paragraphs of empathy research from the 129 IS articles are referred to as IS paragraphs about empathy. Also, the 1,721 abstracts from the other disciplines are called paragraphs about empathy. In order to relate the IS empathy research to the empathy research in other disciplines, the unit of analysis should be identical. Therefore, a paragraph (as opposed to a sentence or a word) was chosen as the unit of text to be analyzed.

Abstracts are a reasonable proxy for paragraphs. Generally, an abstract consists of one or more sentences that are discussing a single thought, idea, or topic, similar to a typical paragraph within the body of a research paper. Also, like a paragraph, an abstract typically consists of one cohesive textual unit (i.e., is not separated by any line breaks). A review of the abstracts in the other disciplines did not reveal any abstracts that were composed of multiple paragraphs. Additionally, abstracts and paragraphs are similar in length. The abstracts in this study were typically composed of three to eight lines of 12-point font text, which is comparable to most paragraphs within a body of a research paper.

The primary difference between an abstract and a paragraph is that an abstract possesses a focus different than that of a typical paragraph in the body of a research paper because an abstract summarizes the contents of an entire article (e.g., the objective of the study, a summary of the results, and the contributions). However, such variability could also be observed when comparing two paragraphs within the body of a paper. For example, paragraphs in the introduction of the paper have a broader focus because they are providing an overview of the rest of the study, whereas paragraphs in the literature review or background section are typically describing a specific research area or concept.

In summary, even though some issues exist with equating abstracts to paragraphs, these units of text do share clear similarities, and the paragraph seems to be an appropriate unit of analysis for this research.

Data Preparation

After the 1,721 paragraphs were collected, the stop words were removed from the analysis by using SAS TM[™]. Stop words are words that have little or no meaning (e.g., prepositions) when taken out of a sentence and simply provide structure to it. Also, field-specific words such as psychology, teacher, doctor, and nurse were removed from the subsequent analysis.

Next, the remaining words were reduced to their roots to remove the morphological variance in the corpus. For instance, words such as "running" and "runs" were reduced to their root form, "run." This process reduces the dispersion created by the various forms of a word.

After the words were reduced to their roots, the *m* terms and *n* documents were arranged in a very sparse $m \ge n$ term-by-document matrix, i.e., a term-frequency matrix (TF). In a TF, the *ij* cell represents the number of times that term *i* occurred in document *j*. This matrix was then transformed using both local (log) and global (entropy) weighing. Then the fully transformed matrix was decomposed into three matrices using singular value decomposition (SVD). One matrix is related to the terms, one to the columns, and another contains the weights of the dimensions extracted by the decomposition. Only the most important dimensions, as measured by their weights, are retained for subsequent analysis. The determination of the number of dimensions to retain is an ongoing research question (e.g., [Berry and Browne 2005; Belew 2000]). For this study, SAS TMTM chose 75 SVD dimensions for the analysis.

Cluster Analysis

Cluster analysis separates data into groups that are represented by clusters, which are meaningful, useful, or both [Tan et al. 2006]. The clusters are constructed to be as internally homogenous as possible while also being as externally heterogeneous as possible. Numerous clustering algorithms have been used for the analysis of quantitative and qualitative data, and interested readers are encouraged to read the review of data clustering by Jain et al. [1999]. For this analysis, the Expectation-Maximization (EM) clustering algorithm (see [Dempster et al. 1977]) implemented within SAS TM[™] was used.

Document Projection

The process of projection related the IS empathy research to the clustering that resulted from the analysis of the empathy research in other disciplines. To project a new text unit (e.g., a paragraph) into a k-dimensional space obtained from a SVD of a corpus, perform the following steps:

- 1) Using the set of root words from the original analysis, construct a term-frequency (TF) column containing the frequency of each root in the new text unit. This will be an $m \ge 1$ matrix. Label this column *x*.
- 2) Weight the column from (1).
 - a. Using the same local weighting algorithm (e.g., $\log (1 + tf)$), weight the TF column, x.
 - b. Using the global weight values computed from the original corpus, multiply the results from (2a) by the corresponding global weight for each term. Label this column *a*.
- 3) Project *a* into the k-dimensional space resulting from the SVD of the original corpus. $z^{T} = S_{a}^{-1} U_{K}^{T} a$

where

$$A_{K} = U_{K} S_{K} V_{K}^{T}$$

So z^{T} corresponds a column of V_{K}^{T} . That is, z is the 1 x k projection of a pseudo-document into this space. 4) Compute the cosine between the z vector and any other text unit weighted by the singular value for each dimension.

The resulting cosine from the projection is commonly referred to as the measure of semantic relatedness [Wolfe et al. 1998], where a cosine of one indicates maximal relatedness and a cosine of zero indicates minimal relatedness [Magliano et al. 2002]. Cosines have been shown to reliably match human similarity judgments of documents [Landauer and Dumais 1997]. Even though past research has referred to cosines as measures of semantic similarity, we are uncomfortable with using this terminology because it has never been empirically validated. Instead, we refer to cosines as a measure of similarity in the following sections because a cosine simply determines the angle between two vectors in a k-dimensional space.

Background

The clustering of documents has been used effectively for a variety of applications such as finding gene relationships [Homayouni et al. 2005], identifying software components [Maletic and Markus 2000], grouping conference papers [Smeaton et al. 2003], and categorizing documents on the World Wide Web [Boley et al. 1999]. All of these applications apply one of a variety of clustering approaches to a large corpus of text to cluster the documents into distinct groups. Additionally, projection is a commonly used technique that is frequently employed in the information retrieval area [Berry and Browne 2005]. Therefore, the techniques that are at the core of the approach used in this study to review literature are not novel. However, we are not aware of any research that has combined cluster analysis and projection for the purpose of performing a literature review—our contribution is leveraging these two techniques for a new application.

III. RESULTS

In this section, each of the clusters of empathy research is described and the relationships between the clusters are analyzed. Subsequently, the relationship between the IS paragraphs and the clusters is examined.

Resulting Clusters of Empathy Research

EM clustering was performed on the 1,721 paragraphs from the four selected disciplines (psychology, medicine, social work, and education), yielding six clusters for further analysis. SAS TM[™] also generated three descriptive terms for each cluster. The descriptive terms are determined using the frequency counts of the root words in the documents in the clusters. The words with the highest frequencies are selected as the descriptive terms.

Table 1 conceptualizes the six clusters by providing the three descriptive terms, a description of the cluster³, and example abstracts that were clustered within the cluster. The six clusters provide an objective grouping of the empathy research in the other disciplines. Additionally, Tables 2 and 3 provide a further breakdown of the number of paragraphs in each cluster by discipline.

³ The researchers created the description of the cluster by using the combination of the descriptive terms that were generated and by reading the abstracts that were included in the cluster.

Table 1. Six Clusters of Empathy Research							
Cluster 1 (of	fact response relationships): Besearch about how empathy is related to factors and/or						
constructs ar	ad how other factors and/or constructs affect empathy						
Education	"Investigates the importance of courselor sex race and empathy on clients' perceptions of the						
Luudullon	counselor Counselors were rated high on all variables if they used an empathetic approach"						
	[Redfern et al. 1993 p. 300]						
Medicine	"The purpose of the present study was to access the relationship between brain metabolism and						
meanente	empathetic response the subjects' empathy scores were positively correlated with metabolism in						
	the medical aspects of the superior frontal gyrus" [Shamay-Tsoory et al. 2005, p. 468].						
Psychology	"Explored the possibility that persons identified as highly empathic would be less influenced than						
	others by dehumanizing and depersonalizing factors. It was hypothesized that there would be an						
	interaction between 48 psychology students' measured level of empathy and the effect of high noise						
	on intrusion on another's personal space or body buffer zone" [Mathews et al. 1974, p. 367].						
Social Work	"The relationship between empathy, burnout, and emotional separation are compared in the case of						
	social workers revealed that increased burnout was associated with loss of emotion separation						
	and increased empathy" [Corcoran 1989, p. 141].						
Cluster 2 (ma	n, woman, gender): Research about measuring and distinguishing between empathy in men						
and women in	a certain setting						
Education	"Assessed the relative contribution of gender role orientation to empathy and its development in 119						
	Israeli 8 th - and 11 th -graders" [Karniol et al. 1998, p. 45].						
Medicine	"The author investigated the influence of dispositional empathy on alcohol-related aggression in						
	men and women Dispositional empathy was measured with the Interpersonal Reactivity Index						
	Men with lower empathy levels exhibited the most aggression followed by men with higher empathy						
	levels" [Giancola, 2003 p. 275].						
Psychology	"Empathy is a major component of a satisfactory doctor-patient relationship and the cultivation of						
	empathy is a learning objective proposed by the Association of American Medical Colleges (AAMC)						
	for all American medical schools. We designed this study to test two hypotheses: firsti, that medical						
	students with higher empathy scores would obtain higher ratings of clinical competence in core						
	Empathy scores were associated with ratings of clinical competence and gender, but not with						
	performance in objective examinations such as the Medical College Admission Test (MCAT) and						
	Steps 1 and 2 of the US Medical Licensing Examinations (USMLE)" [Hojat et al. 2002, p. 522]						
Social Work	"Examines the possible effects of client-counselor gender and ethnic congruency on perceived						
	counselor empathy, client engagement in treatment, and maintenance of abstinence during and						
	after outpatient drug treatment" [Fiorentine and Hillhouse 1999, p. 59].						
Cluster 3 (chi	Id, behavior, measure): Research about the relationship between levels of empathy and social						
behavior. In	particular, research describing the negative behavioral aspects of a lack of empathy such as						
child abuse, a	ggressiveness, and lack of moral reasoning						
Education	"Two scales were used to measure the cognitive (Hogan's Empathy Scale) and emotional						
	(Questionnaire Measure of Emotional Empathy) components of empathy. Results indicate that						
	incarcerated child molesters (N=29) were, related to non-offenders, deficient in both cognitive and						
	emotional components of generalized empathy" [Marshall and Maric 1996, p. 101].						
Medicine	"Physically abused youth are often described as more aggressive and noncompliant in comparison						
	with normal children results suggest a strong, positive relationship between empathy and lower						
	rates of interpersonal aggression and a strong positive relationship between empathy and higher						
	rates of behavioral compliance" [LeSure-Lester 2000, p. 153].						

Volume 22

Article 7

Psychology	Examined the relationship between empathy and two measures of moral development (pro-social
	moral reasoning and helping) with a sample of 72 Ss in Grades 9, 11, and 12 Empathy was
	significantly related to moral reasoning for both sexes and to helping for males" [Eisenberg-Berg and
	Mussen 1978, p. 185].
Social Work	"The purpose of the study was to explore cognitive and affective empathy in aggressive boys
	Results confirmed the main hypothesis; i.e., aggressive boys showed a lower level of affective
	empathy, although the groups did not differ in cognitive empathy" [Shechtman 2002, p. 211].
Cluster 4 (pro	gram, skill, group): Research about programs that train a particular group of individuals (e.g.,
social workers	s) to develop more empathy or train the group of individuals on the importance of empathy
Education	"Investigated effects of affective/cognitive training program on empathy level in 24 aggressive
	adolescent girls in residential treatment center Training significantly increased affective empathy
	level; increases in cognitive empathy were unremarkable" [Pecukonis 1990, p. 59].
Medicine	"Research indicates that empathy, a quality regarded as fundamentally important to nursing
	practice, is a teachable skill This article discusses the place of empathy as a criterion variable in
	the evaluation of a professional development program for palliative care nurses" [Yates et al. 1998,
	p. 402].
Psychology	"Hypothesized that empathy training is effective and that the individual who values being expressive
, 0,	(active) in his/her environment will learn that skill more easily than the impressive (passive)
	individual. 29 undergraduate psychology students participated in a training program for enhancing
	helping relations skills" [Dubé et al. 1987, p. 16].
Social Work	"Empathy is a necessary ingredient for helping professionals. Since the aesthetic and film industries
	have studied how to produce emotional reactions, trying to increase levels of empathy in students in
	helping professions using film media was explored" [Vinton and Harrington 1994, p. 71].
Cluster 5 (con	cept, process, understanding): Research about the understanding of the concept of empathy,
empathy's dim	nensions, and the process involved in exhibiting empathy towards others
Education	"Contends that empathy is a powerful tool for understanding history. Discusses theories and
	meaning of historical empathy drawing from previous research on these concepts" [Foster and
	Yeager 1998, p. 1].
Medicine	"This article updates and extends Jeanette Gagan's Methodological notes on empathy The
	evolving conceptualization of empathy as a complex, intra-psychic, and interpersonal process that
	the inconclusiveness and apparent contradictions of research to date might be substantially clarified
	by considering data from a multidimensional perspective" [Bennett 1995, p. 36].
Psychology	"Discusses the wave in which the terms compatible and empetitive have been used in power-leave and
	Discusses the ways in which the terms sympathy and empathy have been used in psychology and
	suggests that these terms (a) have different historical roots; (b) have been utilized in different
	suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that
	suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be
	suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be obfuscated" [Wispé 1986, p. 314].
Social Work	biscusses the ways in which the terms sympathy and empathy have been used in psychology and suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be obfuscated" [Wispé 1986, p. 314].
Social Work	 Discusses the ways in which the terms sympathy and empathy have been used in psychology and suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be obfuscated" [Wispé 1986, p. 314]. "An attempt is made to clarify the meaning of empathy by examining its use in clinical social work. Empathy is seen as less involved than sympathy, but less removed than insight Empathy cannot
Social Work	 Discusses the ways in which the terms sympathy and empathy have been used in psychology and suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be obfuscated" [Wispé 1986, p. 314]. "An attempt is made to clarify the meaning of empathy by examining its use in clinical social work. Empathy is seen as less involved than sympathy, but less removed than insight Empathy cannot be forced, but operates via involuntary and temporary identifications" [Raines 1990, p. 57].
Social Work	 Discusses the ways in which the terms sympathy and empathy have been used in psychology and suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be obfuscated" [Wispé 1986, p. 314]. "An attempt is made to clarify the meaning of empathy by examining its use in clinical social work. Empathy is seen as less involved than sympathy, but less removed than insight Empathy cannot be forced, but operates via involuntary and temporary identifications" [Raines 1990, p. 57]. ng, measure, scale): Research about developing, validating, and applying scales that measure
Social Work Cluster 6 (ratin empathy	 Discusses the ways in which the terms sympathy and empathy have been used in psychology and suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be obfuscated" [Wispé 1986, p. 314]. "An attempt is made to clarify the meaning of empathy by examining its use in clinical social work. Empathy is seen as less involved than sympathy, but less removed than insight Empathy cannot be forced, but operates via involuntary and temporary identifications" [Raines 1990, p. 57]. mg, measure, scale): Research about developing, validating, and applying scales that measure
Social Work Cluster 6 (ratin empathy Education	 Discusses the ways in which the terms sympathy and empathy have been used in psychology and suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be obfuscated" [Wispé 1986, p. 314]. "An attempt is made to clarify the meaning of empathy by examining its use in clinical social work. Empathy is seen as less involved than sympathy, but less removed than insight Empathy cannot be forced, but operates via involuntary and temporary identifications" [Raines 1990, p. 57]. mg, measure, scale): Research about developing, validating, and applying scales that measure "A Swedish empathy test for professional helpers, the Affect Reading Scale, was developed and
Social Work Cluster 6 (ratin empathy Education	 Discusses the ways in which the terms sympathy and empathy have been used in psychology and suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be obfuscated" [Wispé 1986, p. 314]. "An attempt is made to clarify the meaning of empathy by examining its use in clinical social work. Empathy is seen as less involved than sympathy, but less removed than insight Empathy cannot be forced, but operates via involuntary and temporary identifications" [Raines 1990, p. 57]. mg, measure, scale): Research about developing, validating, and applying scales that measure "A Swedish empathy test for professional helpers, the Affect Reading Scale, was developed and tested on several occasions with 1000 caregivers in different sectors. Results support the
Social Work Cluster 6 (ratin empathy Education	 Discusses the ways in which the terms sympathy and empathy have been used in psychology and suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be obfuscated" [Wispé 1986, p. 314]. "An attempt is made to clarify the meaning of empathy by examining its use in clinical social work. Empathy is seen as less involved than sympathy, but less removed than insight Empathy cannot be forced, but operates via involuntary and temporary identifications" [Raines 1990, p. 57]. ng, measure, scale): Research about developing, validating, and applying scales that measure "A Swedish empathy test for professional helpers, the Affect Reading Scale, was developed and tested on several occasions with 1000 caregivers in different sectors. Results support the conceptual validity of the scale and demonstrate that it is responsive to educational experiences that
Social Work Cluster 6 (ratin empathy Education	 Discusses the ways in which the terms sympathy and empathy have been used in psychology and suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be obfuscated" [Wispé 1986, p. 314]. "An attempt is made to clarify the meaning of empathy by examining its use in clinical social work. Empathy is seen as less involved than sympathy, but less removed than insight Empathy cannot be forced, but operates via involuntary and temporary identifications" [Raines 1990, p. 57]. ng, measure, scale): Research about developing, validating, and applying scales that measure "A Swedish empathy test for professional helpers, the Affect Reading Scale, was developed and tested on several occasions with 1000 caregivers in different sectors. Results support the conceptual validity of the scale and demonstrate that it is responsive to educational experiences that influence empathy" [Holm 1996, p. 239].
Social Work Cluster 6 (ratin empathy Education	 "An attempt is made to clarify the meaning of empathy by examining its use in clinical social work. Empathy is seen as less involved than sympathy, but less removed than insight Empathy cannot be forced, but operates via involuntary and temporary identifications" [Raines 1990, p. 57]. "A Swedish empathy test for professional helpers, the Affect Reading Scale, was developed and tested on several occasions with 1000 caregivers in different sectors. Results support the conceptual validity of the scale and demonstrate that it is responsive to educational experiences that influence empathy" [Holm 1996, p. 239].
Social Work Cluster 6 (ratin empathy Education	 Discusses the ways in which the terms sympathy and empathy have been used in psychology and suggests that these terms (a) have different historical roots; (b) have been utilized in different research paradigms; and (c) have been involved in different kinds of theorizing It is argued that these are different psychological processes and that the differences between them should not be obfuscated" [Wispé 1986, p. 314]. "An attempt is made to clarify the meaning of empathy by examining its use in clinical social work. Empathy is seen as less involved than sympathy, but less removed than insight Empathy cannot be forced, but operates via involuntary and temporary identifications" [Raines 1990, p. 57]. ng, measure, scale): Research about developing, validating, and applying scales that measure "A Swedish empathy test for professional helpers, the Affect Reading Scale, was developed and tested on several occasions with 1000 caregivers in different sectors. Results support the conceptual validity of the scale and demonstrate that it is responsive to educational experiences that influence empathy" [Holm 1996, p. 239].

Medicine	"The operational measurement of physician empathy, as well as the question of whether empathy
	could change at different levels of medical education, is of interest to medical educators. To
	address this issue, 98 internal medicine residents from all three years of training were studied. The
	Jefferson Scale of Physician Empathy was administered, and residents' empathy scores correlated
	with ratings on humanistic attributes made by postgraduate program directors" [Mangione et al.
	2002, p. 370].
Psychology	"Assessed the correspondence between the R.R. Carkhuff (1969) and the C.B. Truax (1967) scales
	for measurement of empathy Responses were rated on both scales by trained, interdependent
	raters. An overall correlation of .89 was found" [Engram and Vandergoot 1978, p. 349].

Table 2. Breakdown of the Ir	ndividual Cluste	rs by Discipline	
Cluster & Size	Discipline	% Discipline's	Rank by
		Paragraphs	Discipline ⁴
Cluster 1: effect, response, relationships	Education	15/106=14%	3
353 paragraphs	Medicine	57/221=24%	2
	Psychology	270/1347=20%	3
	Social Work	11/47=23%	2
Cluster 2: man, woman, gender	Education	9/106=9%	5
98 paragraphs	Medicine	17/221=8%	5
	Psychology	68/1347=4%	6
	Social Work	4/47=9%	5
Cluster 3: child, behavior, measure	Education	31/106=29%	2
492 paragraphs	Medicine	59/221=27%	1
	Psychology	387/1347=28%	1
	Social Work	15/47=32%	1
Cluster 4: program, skill, group	Education	33/106=31%	1
249 paragraphs	Medicine	33/221=15%	4
	Psychology	173/1347=13%	4
	Social Work	10/47=21%	3
Cluster 5: concept, process, understanding	Education	14/106=13%	4
347 paragraphs	Medicine	43/221=20%	3
	Psychology	283/1347=21%	2
	Social Work	7/47=15%	4
Cluster 6: rating, measure, scale	Education	4/106=4%	6
182 paragraphs	Medicine	12/221=5%	6
	Psychology	166/1347=12%	5
	Social Work	0/47=0%	6

⁴ The rank by discipline refers to the percentage of a specific discipline's paragraphs that are contained in a specific cluster. For example, a rank of "1" for the education discipline signifies that the cluster contains the highest percentage of the education field's paragraphs that we analyzed.

Table 3. Distribution of Each of the Discipline's Paragraphs in the Six Clusters										
	Cluster 1 Cluster 2 Cluster 3 Cluster 4 Cluster 5 Cluster 6									
	(n=353)	(n=98)	(n=492)	(n=249)	(n=347)	(n=182)				
Education	15/353=4%	9/98=9%	31/492=6%	33/249=13%	14/347=4%	4/182=2%				
Medicine	57/353=16%	17/98=17%	59/492=12%	33/249=13%	43/347=12%	12/182=7%				
Psychology	270/353=76%	68/98=69%	387/492=79%	173/249=70%	283/347=82%	166/182=91%				
Social Work 11/353=3% 4/98=4% 15/492=3% 10/249=4% 7/347=2% 0/182=0%										

Analysis of the Six Clusters of Empathy Research

The clustering of empathy research in other disciplines presented in Table 1 separates the empathy research into six groups. An examination of the six clusters reveals that some of the clusters are related to each other. Specifically, clusters 1, 2, and 3 contain empathy research topics that share clear similarities:

- 1. Cluster 1, the second largest cluster, includes research that studies the relationships between empathy and other constructs and factors. The cluster seems to be a general group of empathy research, whereas clusters 2 and 3 contain research that study how empathy is related to more specific constructs or factors.
- Cluster 2, the smallest cluster, has a specific focus on the differences in empathy based on gender. The cluster contains a high proportion of research from the social work, education and medicine disciplines (see Table 3).
- 3. Cluster 3, the largest cluster, contains research that specifically measures the relationship between empathy and social behavior. Clearly, the role of empathy in social behavior is a strong focus of empathy research, since cluster 3 is the largest cluster of research.

Clusters 4, 5, and 6 contain empathy research that is different from the first three clusters:

1. Cluster 4 includes research that deals with the training of a group of individuals either to increase empathy or to gain awareness on the importance of empathy. As shown in Table 3, the cluster contains a high proportion of research from the education, social work, and medical fields, most likely because empathy training includes groups of individuals within these fields such as teachers, social workers, and nurses.

2. Cluster 5 contains research that studies the dimensions of the concept of empathy and the process involved in exhibiting empathy towards others. This cluster has a high proportion of research from the psychology discipline and low representations by the social work, medicine, and education disciplines.

3. Cluster 6, the second smallest cluster, includes research that specifically focuses on empathy measurement scales. The psychology discipline primarily contributed to this cluster (over 91 percent of the cluster's paragraphs) and is involved in validating and creating empathy scales such as the Hogan Empathy Scale [Hogan 1969].

Relation of IS Empathy Research

Examination of the Cosine Results

The results of the projection of the IS paragraphs into the semantic space and compared to the six clusters is reported in Table 4. The table includes the mean cosine between the IS paragraphs and the centroid of each cluster, and the number of IS paragraphs that had cosines in specific cosine ranges. Only the highest cosine for each IS paragraph is included in Table 4 (i.e., the cluster to which the IS paragraph was most similar). An ANOVA of the cosines between the IS paragraphs and the individual clusters showed that there were significant differences (F(5, 1308) = 39.74, p < .0001) among the projections of the IS paragraphs relative to the centroids of the six clusters.

The first observation one can make when examining the results reported in Table 4 is that the mean cosines of the document projections are all relatively low. Cluster 2 has the highest mean cosine of .591, but the cluster only had two paragraphs projected into it. For all clusters with 30 or more IS paragraphs projected into them, the mean cosine is below .40. A cosine of one indicates perfect similarity and a cosine of zero indicates no similarity, so the mean cosines are closer to the no similarity end of the range. Furthermore, the results presented in Table 4 also identify clear differences among the mean cosines of the document projections. For instance, cluster 5 had a higher mean cosine than cluster 1, suggesting that overall the IS empathy research was more about the concept of empathy (cluster 5) than about how empathy is related to other factors and constructs (cluster 1).

Differences among the projections of the IS paragraphs can also be identified by examining the distribution of the projections within specific cosine ranges. The cluster of empathy research that was most similar to the IS paragraphs was cluster 5, which contains research that studies the concept of empathy. Cosines between three IS

paragraphs and the cluster were greater than .60; the other five clusters had a combined total of three paragraphs in this cosine range. Also, cosines between 12 paragraphs and cluster 5 were between .60 and .50, whereas no other cluster had more than 4 paragraphs in this cosine range. These results indicate that most of the IS papers we examined are simply focusing on the concept of empathy. For instance, cluster 3 (research studying the relationship between levels of empathy and social behavior) contained cosine measures for the IS paragraphs that were all lower than .40. Consequently, the IS discipline seems to be lacking a research focus on how empathy is related to social behavior in the IS environment.

A potential issue with using each paragraph that contained the word "empathy" in the analysis (as reported in Table 4) is the influence of IS papers that contained multiple paragraphs with the word empathy. For instance, if a paper contained eight paragraphs that contained the word empathy, then the paper could bias the results if all of the paragraphs were projected into the same cluster. To negate the bias, another analysis was performed and only a single cosine measure for each IS paper was included. In this analysis, if a majority of a paper's paragraphs yielded the highest cosine when projected into a specific cluster (e.g., if three paragraphs yielded the highest cosine when projected into cluster 6), then only the paragraph from this majority with the highest cosine was included. If there was no majority in the projections into the clusters (e.g., if one paragraph yielded the highest cosine when projected into cluster 5 and one paragraph when projected into cluster 6), then only the paragraph with the highest cosine when projected into cluster 5 and one paragraph when projected into cluster 6), then only the paragraph with the highest cosine was utilized. The results of the projection of these 129 paragraphs (i.e., one paragraph per IS paper) are reported in Table 5. An examination of the results yields similar conclusions as were drawn when using all of the IS paragraphs in the analysis. As shown in Table 5, cluster 5 is still the cluster of empathy research that is most similar to the IS paragraphs. The projections into the other five clusters also share a pattern similar to that reported in Table 4.

	-		Table 4. I	Projection	of the IS P	aragraphs			_
				Cosir	e Ranges				
Cluster	Cluster	<i>x</i> ≥.6	.5 <u><</u> x<.6	.4 <u><</u> x<.5	.3 <u><</u> x<.4	.2 <u><</u> x<.3	.1 <u><</u> x<.2	.0 <u><</u> x<.1	# of
Number	Mean								docs
Cluster 1	0.306	0	3	7	16	34	4	0	64
Cluster 2	0.591	1	1	0	0	0	0	0	2
Cluster 3	0.231	0	0	0	1	2	0	1	4
Cluster 4	0.330	0	2	8	5	12	1	1	29
Cluster 5	0.383	3	12	16	21	18	3	0	73
Cluster 6	0.360	2	4	8	15	17	1	0	47
	# of	6	22	39	58	83	9	2	219
	docs								

		Table	5. Projectio	on of Only	One Parag	raph Per IS	S Article		
				Cosir	ne Ranges				
Cluster	Cluster	<i>x</i> <u>></u> .6	.5 <u><</u> x<.6	.4 <u><</u> x<.5	.3 <u><</u> x<.4	.2 <u><</u> x<.3	.1 <u><</u> x<.2	.0 <u><</u> x<.1	# of
Number	Mean								docs
Cluster 1	0.312	0	2	3	7	13	3	0	28
Cluster 2	0.591	1	1	0	0	0	0	0	2
Cluster 3	0.000	0	0	0	0	0	0	0	0
Cluster 4	0.339	0	1	6	3	12	1	0	23
Cluster 5	0.400	3	10	8	13	14	2	0	50
Cluster 6	0.392	1	3	6	10	6	0	0	26
	# of	5	17	23	33	45	6	0	129
	docs								

Face Validity of the Cosines Measures

Article 7

The face validity of the cosine differences among the projections of the paragraphs into clusters can be verified by examining some of the IS paragraphs. For example, the three paragraphs that had cosines greater than .60 when

projected into cluster 5 were paragraphs in Pitt et al. [1997], Sahan [2004], and Avgerou [2005]. Pitt et al. discuss the concept of empathy in the context of the SERVQUAL service quality measurement, and explain the combining of the concepts of understanding and access into the concept of empathy within the SERVQUAL instrument. Sahan discusses the concept of empathy in the context of Western education, and talks about how the Western model of education emphasizes individualism instead of empathy and sympathy. Avgerou analyzes critical research and claims that the researcher cannot claim an objective truth because critical research builds empathy for a study's subjects. The paragraphs in these three papers clearly discuss the concept of empathy, and not aspects of empathy research such as the role of gender in empathy (cluster 2) or a group program to create empathy (cluster 4). Furthermore, cluster 6 (research dealing with developing, validating, and using empathy scales) had one IS paragraph with a cosine greater than .60. This is the Van Dyke et al. [1999] study that discusses the unidimensionality of the subscales of the SERVQUAL measurement, and states that the empathy subscale that is part of SERVQUAL is the only multidimensional subscale. So, the high cosine with cluster 6 is expected because the paragraph discusses an empathy scale and the reliability of the overall SERVQUAL instrument. Again, the face validity of the high cosine measure seems warranted. The Van Dyke et al. paragraph clearly is more similar to cluster 6 than to any other cluster.

The face validity of the results can be further analyzed by examining the low cosines that occurred when the IS paragraphs were projected into each of the six clusters of empathy research. The IS paragraphs whose projections into each of the clusters resulted in very low cosines should represent IS research that discusses empathy in a context that is different from all of the six clusters of empathy research or represent articles that are not closely related to the empathy concept.

One of the paragraphs of the Preece [2004] paper had the lowest cosine of all the IS paragraphs when projected into the six clusters (the high value was .071 when projected into cluster 3). Preece discusses the importance of etiquette in online communication (specifically in cyber-communities). The paragraph in the Preece [2004, p. 58] paper that resulted in the low cosine states, "In each culture, norms preserve or enforce comfort and empathy in the community. Consequently, when norms of etiquette are broken, discomfort, confusion, annoyance, embarrassment, and even fear may ensue." The context in which empathy is discussed is not similar to any of the six clusters of empathy research. The paragraph does not discuss empathy and its relationship to other factors (cluster 1), the differences in empathy between men and women (cluster 2), the role of empathy in social behavior (cluster 3), the development of empathy in a group of individuals (cluster 4), the concept of empathy or the process involved in exhibiting empathy (cluster 5), or the development and validation of empathy scales (cluster 6). The low cosine is clearly warranted because the Preece paragraph is discussing empathy in a way that differs from the research that is contained within the six clusters.

In addition, one of the paragraphs of the Lieberman et al. [2004] paper had the second lowest cosine (the high value was .098 when one of the two paragraphs was projected into cluster 4). The paragraph discusses an e-mail application that was built by the researchers called Empathy Buddy, which reacts to the user with facial expressions as he or she writes an email message. Once again, the low cosine seems appropriate because the paragraph is simply describing a software application, which should warrant a low cosine because this research is not related to the research in the six clusters.

IV. DISCUSSION AND LIMITATIONS

The clusters of empathy research and projection results that were reported in the previous section not only provide researchers with an objective grouping of empathy research, but also identify the IS field's focus on the empathy construct. The following sections first discuss the use of cluster analysis and projection for literature reviews in the IS field. Then, the implications of the IS field's focus on empathy are explored. Finally, the limitations of this research are addressed.

The Use of Cluster Analysis and Projection for Reviewing Literature

Possible Uses

A significant contribution of this research is illustrating how cluster analysis and document projection can be applied to literature reviews. When conducting a literature review, researchers typically identify relevant literature, read the papers, classify the papers into categories or general areas for discussion purposes, and identify gaps in the research that their research attempts to address. The application of cluster analysis and projection in this study followed the same general process. However, the content of the articles was analyzed, grouped, and related to other research through cluster analysis and document projection.

Volume 22

Article 7

It should also be noted that IS researchers could use variations of the process that was used in this study. For instance, cluster analysis and/or projection can be used for the following purposes:

- To conduct a literature review of research in the IS field alone. For example, a researcher might collect all electronic versions of abstracts from IS journals that are in the human-computer interaction (HCI) area of IS research. Next, by applying cluster analysis, the clustering might reveal a specific cluster of HCI research in which the researcher is interested, such as interface design. Next, the researcher could analyze the contents of the specific cluster (either through projection or by reading the articles) to identify exactly how his or her topic is related to the IS papers in this cluster.
- 2. To identify which research articles are most similar to a topic of interest. For example, an IS researcher can compute cosines between the abstract of his or her paper that is in the HCI area of IS research and the abstracts of all other HCI articles. The cosine measurements would indicate how similar each of the articles are to the individual's research topic. Additionally, this approach could also be useful for journals when choosing reviewers for a submitted article.
- 3. To aid with scale development. In the early stages of scale development, researchers typically review relevant literature to identify the possible dimensions of the construct for which they are developing a measurement scale. Cluster analysis can be used to analyze the appropriate literature and provide evidence for dimensionality of the construct through the resulting clusters.

Advantages

The literature review process with the use of cluster analysis and projection has several advantages. First, much larger quantities of text can be analyzed when conducting the review. In this study over 1,700 abstracts were used, but this number can be significantly larger (SAS TM[™] has been tested with up to 600,000 abstracts). Due to the large body of relevant literature that is sometimes available to researchers when writing about a specific topic, it is often infeasible to read even the abstracts of all the papers that could be pertinent. However, with the use of cluster analysis, a program such as SAS TM[™] can group the abstracts or even the full-text of articles, and conclusions can be drawn quickly about their contents.

A second advantage of applying cluster analysis is that the grouping is created objectively. For instance, this study found six groups of research within the area of interest. Without the use of cluster analysis, the researchers would have had to read as many articles as possible, and then conceptually group the studies to the best of their ability. Cluster analysis removes the subjective human component, and groups of research are uncovered using just the textual information.

Finally, as this research shows, cluster analysis with the use of document projection can be used to objectively determine how similar an article (which was not part of the original analysis) is to a group of research. Once the clusters are uncovered, projection uses a measure (e.g., a cosine) to provide an objective measurement of similarity. For instance, a high cosine tells the researcher that a specific article is very similar to a cluster of research. Without projection, a researcher must subjectively determine through his or her comprehension of the article how related it is to a specific group of research.

The IS Focus on Empathy

The results of the projections reported in Table 4 also provide some interesting insights into how the IS field has treated empathy and the areas of empathy research that could be expanded in the IS discipline. Cluster 5, which contains research on the concept of empathy, was the most representative of the IS empathy research. The cluster had the highest mean cosine with the IS paragraphs, and the highest number of paragraphs with cosines greater than .60, between .60 and .50, and between .40 and .30. This result indicates that the IS discipline has studied the concept of empathy and its dimensions, and has largely neglected other aspects of empathy research.

Cluster 4, which discusses how empathy can be promoted in a group of people, did not contain any paragraphs with a cosine higher than .60 and only two with a cosine higher than .50. As a result, there seems to be an opportunity for IS researchers to study groups of professionals, such as systems designers, and to discover how empathy for a system's users can be promoted in this group of individuals.

Clusters 1 and 2 represent research focusing on how other factors and constructs (specifically, gender in cluster 2) are related to empathy. Only five IS paragraphs had a cosine greater than .50 when projected into these clusters. Thus, the IS discipline has not had a significant research focus on how empathy is related to common IS constructs such as IS usefulness and IS success. For example, a future study might concentrate on building empathy in a group of system designers for a certain societal group (e.g., blind users of a system), and then study how the increased empathy affects the ease of use and the usefulness of the resulting system. Also, future research could consider how gender relates to empathy in the IS context, since women typically are able to exhibit greater empathy

than men [Hojat et al. 2002]. For example, research in the HCI area could examine if gender plays a role in the ability of a designer or developer to create an empathetic connection with the users for which the interface is being designed.

Cluster 3 (research about how empathy is related to social behavior) did not have a cosine greater than .40 with any IS paragraphs. This result suggests that the IS field has not investigated how low empathy affects the social dynamics of groups of IS professionals, such as IS development teams.

Cluster 6 (research about developing, validating, and applying scales that measure empathy) was the cluster of empathy research that had the second highest focus in the IS field. A measurement of empathy is part of the extensively researched SERVQUAL measurement [Parasuraman et al.1988], so the moderate focus on measuring empathy is consistent with the data.

These results suggest that many areas of empathy research that are evident in other fields are currently receiving minimal (if any) attention from IS researchers. IS researchers have an opportunity to focus on other areas of empathy research that are evident in other disciplines, and study the consequences of empathy in the IS context.

Limitations

This study has several limitations that need to be addressed. First, the limitation of using the full-text versions of articles for this analysis are: (1) not all online databases contain full-text journal search features, and (2) some full-text versions of articles could not be accessed due to university licensing agreements. Both of these limitations were encountered in this research (see Appendix A) and therefore a complete analysis of the IS empathy research could not be performed.

Second, the clustering of empathy research from other disciplines was performed without human judgment, but the researchers created the cluster descriptions by interpreting the descriptive terms and abstracts that were included in the cluster analysis. Consequently, the cluster naming procedure was not completely free from human judgment. Cluster naming techniques different from the one implemented within SAS TM[™] exist (e.g., [Illiopoulos et al. 2001; Popescul and Ungar 2000]), but all of these naming techniques still only provide the researcher(s) with a set of words that describe a cluster. The researcher(s) must interpret these words to define a specific cluster.

Third, a limitation of the document projection approach used in this study is that the similarities were interpreted using the cosine measure, and we are not aware of any research that explicitly defines what a high versus a low cosine measure is and what a particular cosine means. Many research papers have used cosines as a measure of similarity (e.g., [Moss et al. 2006; Dong 2005; Wolfe et al. 1998]) for research topics such as grading of handwritten essays and studying of team communication. However, there is no universal interpretation of cosine measures. For instance, Britt et al. [2004] define a high cosine as 0.70 or greater and a low cosine as 0.20 or smaller, but do not provide the reasoning behind their interpretation of cosine measures. An interpretation of the results of this research seem to indicate that a cosine of greater than 0.50 is "high" (i.e., represents significant similarities), a cosine lower than about 0.15 is "low" (i.e., does not contain similarities), and all the cosines in between represent varying degrees of moderate similarities. Future research needs to define what a particular cosine measure means (i.e., if it represents semantic similarities), and how to best interpret cosine results (i.e., a definition of a high cosine).

Finally, a possible weakness of the document projection approach used in this study is that the cosine measure was calculated between the centroid (or center) of the clusters and the IS paragraphs. Therefore, if the IS paragraph was closer to points on the perimeter of the cluster, then the cosine measure would have been higher. As a result, if the cosine was calculated between different points, some of the cosines that were reported in Table 4 could have been higher or lower. However, the results reported in Table 4 are encouraging because 6 paragraphs had cosines greater than .60 and 22 paragraphs had cosines between .50 and .60. Hence, even though the centroid of the cluster was used for the calculation, the clusters of empathy research and the IS paragraphs still shared strong similarities.

V. CONCLUSION

Empathy is a critical aspect of human social behavior, and the positive consequences of greater empathy are evident. An understanding of research on empathy in disciplines that have focused extensively on the empathy construct will hopefully help IS researchers identify opportunities to expand the field's focus on empathy. This study identified multiple areas of research that could be explored by IS researchers.

Also, this research has demonstrated an approach for identifying clusters and determining if these clusters exist in other fields. Cluster analysis revealed the clusters of research in other disciplines, and projection allowed for

Volume 22

examining the similarity of empathy research in the IS field to these clusters of research. The advantages of using cluster analysis and projection were clearly identified, and we demonstrated how other IS researchers could incorporate cluster analysis and/or projection into their own literature reviews.

REFERENCES

Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.

2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.

- 3. The author(s) of the Web pages, not AIS, is (are) responsible for the accuracy of their content.
- 4. The author(s) of this article, not AIS, is (are) responsible for the accuracy of the URL and version information.
- Avgerou, C. (2005). "Doing Critical Research in Information Systems: Some Further Thoughts,", Information Systems Journal (15)2, pp. 103-109.
- Beckman, H. et al. (1994). "The Doctor Patient Relationship and Malpractice: Lessons from Plaintiff Depositions," Archives of Internal Medicine (154)12, pp. 1365-1370.
- Belew, R. (2000). *Finding Out About: A Cognitive Perspective on Search Engine Technology and the WWW*, Cambridge, England: Cambridge University Press.
- Bennett, J. (1995). "Methodological Notes on Empathy: Further Considerations," Advances in Nursing Science (18)1, pp. 36-50.
- Blake, C. (1998). "Historical Empathy: A Response to Foster and Yeager," *International Journal of Social Education* (13)1, pp. 25-31.
- Berry, M., and M. Browne. (2005). Understanding Search Engines: Mathematical Modeling and Text Retrieval, Philadelphia, PA: SIAM.
- Boley, D. et al. (1999). "Partitioning-Based Clustering for Web Document Categorization," *Decision Support Systems*, (27)3, pp. 329-341.
- Britt, A. et al. (2004). "Using Intelligent Feedback to Improve Sourcing and Integration in Students' Essays," International Journal of Artificial Intelligence in Education (14)3-4, pp. 359-374.
- Corcoran, K. (1989). "Interpersonal Stress and Burnout: Unraveling the Role Of Empathy," *Journal of Social Behavior and Personality* (4)1, pp. 141-144.

Darling-Hammond, L. (2000). "How Teacher Education Matters," Journal of Teacher Education (51)3, pp. 166-173.

- Davis, M. (1996). Empathy: A Social Psychological Approach, Boulder, CO: Westview Press.
- Dempster, A., N. Laird, and D. Rubin. (1977). "Maximum Likelihood from Incomplete Data via the EM Algorithm," *Journal of the Royal Statistical Society* (39)1, pp. 1-38.
- Dong, A. (2005). "The Latent Semantic Approach to Studying Design Team Communication," *Design Studies* (26)5, pp. 445-461.
- Dubé, M., A. Pellerin, and G. Dubois. (1987). "The Training of Empathy and Values," *Canadian Journal of Behavioural Sciences* (19)1, pp. 16-24.
- Eisenberg, N., and J. Strayer. (1987). *Empathy and Its Development*, Cambridge, England: Cambridge University Press.
- Eisenberg-Berg, N., and P. Mussen. (1978). "Empathy and Moral Development in Adolescence," *Developmental Psychology* (14)2, pp. 185-186.
- Engram, B. E., and D. Vandergoot. (1978). "Correlation between the Traux and Carkhuff Scales for Measurement Of Empathy," *Journal of Counseling Psychology* (25)4, pp. 349-351.
- Fiorentine, R., and M. Hillhouse. (1999). "Drug Treatment Effectiveness and Client-Counselor Empathy: Exploring the Effects of Gender and Ethnic Congruency," *Journal of Drug Issues*, (29)1, pp. 59-74.
- Foster, S. J., and E. A. Yeager. (1998). "The Role of Empathy in the Development of Historical Understanding," International Journal of Social Education (13)1, pp. 1-7.

- Giancola, P. (2003). "The Moderating Effects of Dispositional Empathy on Alcohol-Related Aggression in Men and Women," *Journal of Abnormal Psychology* (112)2, pp. 275-281.
- Hardgrave, B. C., and K. A. Walstrom. (1997). "Forums for MIS Scholars," *Communications of the ACM* (40)11, pp. 119-124.
- Hogan, R. (1969). "Development of an Empathy Scale," *Journal of Consulting and Clinical Psychology* (33)3, pp. 307-316.
- Hojat, M. et al. (2002). "Empathy in Medical Students As Related to Academic Performance, Clinical Competence and Gender," *Medical Education* (36)6, pp. 522-527.
- Holm, U. (1996). "The Affect Reading Scale: A Method of Measuring Prerequisites for Empathy," *Scandinavian Journal of Educational Research* (40)3, pp. 239-253.
- Homayouni, R. et al. (2005). "Gene Clustering by Latent Semantic Indexing of MEDLINE Abstracts," *Bioinformatics* (21)1, pp. 104-115.
- Illiopoulos, I., A. Engright, and C. Ouzonisc. (2001). "TEXTQUEST: Document Clustering of MEDLINE Abstracts For Concept Discovery in Molecular Biology," *Pac. Symp. Biocomp.* (6), pp. 384-395.
- Jain, A., M. Murty, and P. Flynn. (1999). "Data Clustering: A Review," ACM Computing Surveys (31)3, pp. 265-323.
- Katerattanakul, P., B. Han, and S. Hong. (2003). "Objective Quality Ranking of Computing Journals," *Communications of the ACM* (46)10, pp. 111-114.
- Karniol, R. et al. (1998). "Is Gender or Gender-Role Orientation a Better Predictor of Empathy in Adolescence?" Sex Roles: A Journal of Research (39)1-2, pp. 45-59.
- Kozar, K. (1989). *Humanized Information Systems Analysis and Design: People Building Systems for People*, New York: McGraw-Hill Publishing.
- Landauer, T., and S. Dumais. (1997). "A Solution to Plato's Problem: The Latent Semantic Analysis Theory of Acquisition, Induction, and Representation of Knowledge," *Psychological Review* (104)2, pp. 211-240.
- LeSure-Lester, G. (2000). "Relation between Empathy and Aggression and Behavior Compliance among Abused Group Home Youth," *Child Psychiatry and Human Development* (31)2, pp. 153-161.
- Lieberman, H. et al. (2004). "Beating Common Sense into Interactive Applications," AI Magazine, (25)4, pp. 63-76.
- Lowry, P. B., D. Romans, and A. Curtis. (2004). "Global Journal Prestige and Supporting Disciplines: A Scientometric Study of Information Systems Journals," *Journal of the Association for Information Systems* (5)2, pp. 29-75.
- Magliano, J. et al. (2002). "Using Latent Semantic Analysis to Assess Reader Strategies," *Behavior Research Methods, Instruments & Computers* (34)2, pp. 181-188.
- Maletic, J. I., and A. Markus. (2000). "Using Latent Semantic Analysis to Identify Similarities in Source Code to Support Program Understanding," *IEEE International Conference on Tools with Artificial Intelligence* (12), pp. 46-53.
- Mangione, S. et al. (2002). "Assessment of Empathy in Different Years of Internal Medicine Training," *Medical Teacher* (24)4, pp. 370-373.
- Marshall, W., and A. Maric. (1996). "Cognitive and Emotional Components of Generalized Empathy Deficits in Child Molesters," *Journal of Child Sexual Abuse* (5)2, pp. 101-110.,
- Mathews, K., L. Canon, and K. Alexander. (1974). "The Influence of Level of Empathy and Ambient Noise on Body Buffer Zone," *Personality and Social Psychology Bulletin* (1)1, pp. 367-369.
- Moss, J., K. Kotovsky, and J. Cagan. (2006). "The Role of Functionality in the Mental Representations of Engineering Students: Some Differences in the Early Stages of Expertise," *Cognitive Science* (30)1, pp. 65-93.
- Mylonopoulos, N. A., and V. Theoharakis. (2001). "On-Site: Global Perceptions of IS Journals," *Communications of the ACM* (44)9, pp. 29-33.
- Norman, D. (2004). "Ad-Hoc Personas and Empathetic Focus," *Jnd.org*, http://www.jnd.org/dn.mss/personas_empath.html (current Feb. 20, 2007).
- Olson, J. (1995). "Relationships between Nurse-Expressed Empathy, Patient-Perceived Empathy and Patient Distress," *Journal of Nursing Scholarship* (27)4, pp. 317-322.

Volume 22

131

Article 7

Parasuraman, A., L. Berry, and V. Zeithaml. (1988). "SERVQUAL: A Multiple-Item Scale for Measuring Customer Perceptions of Service Quality," *Journal of Retailing* (64)1, pp. 12-40.

Patterson, J., and L. Zderad. (1976). *Humanistic Nursing*, New York: John Wiley.

- Pecukonis, E. (1990). "A Cognitive/Affective Empathy Training Program As a Function of Ego Development in Aggressive Adolescent Females," *Adolescence* (25)97, pp. 59-76.
- Peffers, K., and Y. Tang. (2003). "Identifying and Evaluating the Universe of Outlets for Information Systems Research: Ranking the Journals," *The Journal of Information Technology Theory and Application* (5)1, pp. 63-84.
- Pitt, L.F., R.T. Watson, and C.B. Kavan. (1997). "Measuring Information Systems Service Quality: Concerns for a Complete Canvas," *MIS Quarterly* (21)2, pp. 209-222.
- Popescul A., and L. Ungar. (2000). "Automatic Labeling of Document Clusters," *Unpublished manuscript*, http://citeseer.nj.nec.com/popescul00automatic.html (current June 20, 2006).

Preece, J. (2004). "Etiquette Online: From Nice to Necessary," Communications of the ACM (47)4, pp. 56-61.

Rainer, R. K., and M. Miller. (2005). "Examining Differences across Journal Rankings," *Communications of the ACM* (48)2, pp. 91-94.

Raines, J. (1990). "Empathy in Clinical Social Work," Clinical Social Work Journal (18)1, pp. 57-72.

- Redfern, S., C. Dancey, and W. Dryden. (1993). "Empathy: Its Effect on How Counselors Are Perceived," British Journal of Guidance & Counseling (21)3, pp. 300-309.
- Sahan, S. (2004). "Beyond Utopian and Nostalgic Views of Information Technology and Education: Implications for Research and Practice," *Journal of the Association for Information Systems* (5)7, pp. 282-313.
- Saunders, C. (2005). "MIS Journal Rankings," *IS World*, http://isworld.org/csaunders/rankings.htm (current Jan. 10, 2007).
- Shamay-Tsoory, S. et al. (2005). "The Neural Correlates of Understanding the Other's Distress: A Positron Emission Tomography Investigation of Accurate Empathy", *NeuroImage*, (27)2, pp. 468-472.
- Shechtman, Z. (2002) "Cognitive and Affective Empathy in Aggressive Boys: Implications for Counseling," International Journal for the Advancement of Counseling (24)4, 211-222
- Smeaton, A. F. et al. (2003). "Analysis of Papers from 25 Years Of SIGIR Conferences: What Have We Been Doing for the Last Quarter of a Century," ACM SIGIR Forum (37)1, pp. 49-53.
- Tan, P., M. Steinbach, and V. Kumar. (2006). Introduction to Data Mining, Boston: Pearson.
- Van Dyke, T., V. Prybutok, and L. Kappelman. (1999). "Cautions on the Use of the SERVQUAL Measure to Assess the Quality of Information Systems Services," *Decision Sciences* (30)3, pp. 877-892.
- Vinton, L., and P. Harrington. (1994). "An Evaluation of the Use of Videotape in Teaching Empathy," *Journal of Teaching in Social Work* (9)1-2, pp. 71-84.
- Walstrom, K.A., B.C. Hardgrave, and R.L. Wilson. (1995) "Forums for Management Information Systems Scholars," Communications of the ACM, (38)3, pp. 93-102.
- Whitman, M. E., A. R. Hendrickson, and A. M. Townsend. (1999). "Academic Rewards for Teaching, Research and Service: Data and Discourse," Information Systems Research (10) 2, pp. 99-109.
- Wispé, L. (1986). "The Distinction between Sympathy and Empathy: To Call Forth a Concept, a Word Is Needed," Journal of Personality and Social Psychology (50)2, pp. 314-321.
- Wolfe, M. et al. (1998). "Learning from Text: Matching Readers and Texts by Latent Semantic Analysis," *Discourse Processes* (25)2, pp. 309-336.
- Yates, P. et al. (1998). "Exploring Empathy As a Variable in the Evaluation of Professional Development Programs for Palliative Care Nurses," *Cancer Nursing* (21)6, pp. 402-410.

APPENDIX I: YEARS OF FULL-TEXT ACCESS TO IS JOURNALS AND CONFERENCES Journal/Conference Name Years of Full-Text Access Ranking MIS Quarterly (MISQ) 1977 to March 2006 1 2 Information Systems Research (ISR) 1990 to March 2006 3 Communications of the ACM (CACM) 1958 to March 2006 4 Management Science* (MS) 1954 to March 2006 5 Journal of Management Information Systems (JMIS) 1984 to March 2006 6 Artificial Intelligence (AI) 1995 to March 2006 Decision Sciences (DS) 7 1988 to 2005 8 Harvard Business Review* (HBR) 1922 to March 2006 9 IEEE Transactions (various)* 1963 to March 2006 range ** 10 AI Magazine (AiMag) 1997 to March 2006 11 European Journal of Information Systems 1999 to 2005 12 Decision Support Systems (DSS) 1997 to March 2006 13 **IEEE Software** 1988 to March 2006 14 1996 to March 2006 Information & Management (I&M) 15 ACM Transactions on Database Systems 1976 to March 2006 16 Journal of Computer and Systems Sciences 1993 to March 2006 17 Sloan Management Review* 1970 to 2000 18 Communications of the AIS (CAIS) 1999 to March 2006 19 IEEE Transactions on Systems, Man, and Cybernetics 1988 to 1995 20 ACM Computing Surveys 1971 to March 2006 21 Journal of Computing 2000 to March 2006 22 Academy of Management Journal* (AMJ) 1963 to March 2006 23 International Journal of Electronic Commerce 2000 to 2005 24 Journal of the AIS (JAIS) 2000 to March, 2006 25 **IEEE Transactions on Computers** 1988 to March, 2006 1999 to March 2006 26 Information Systems Frontiers Journal of Management Systems 27 None **Organization Science*** 1990 to 2005 28 29 **IEEE** Computer 1988 to March 2006 30 Information Systems Journal (ISJ) 1996 to March 2006 31 Administrative Science Quarterly* 1956 to March 2006 32 Journal of Global Information Management 1999 to March 2006 33 The DATABASE for Advances in Information Systems 1969 to March 2006 34 Journal of Database Management 1993 to 1994, 2000 to 2006 Information Systems 1997 to March 2006 35 MISQ Discovery*** 36 1996 to 1998 37 Academy of Management Review* (AMR) 1976 to March 2006 38 Journal of the ACM 1991 to March 2006 39 **Computers and Operations Research** 1997 to March 2006 40 Human Computer Interaction (HCI) 1985 to 2005 AMCIS**** N/A 1995 to 2005 N/A ICIS**** 1980 to 2005

* - The journals contained empathy research from other disciplines such as Marketing and Management. The researchers manually selected the IS-specific articles.

** - Exact years for the IEEE Transactions journals depend on a specific IEEE Transaction journal. The 1963 to March 2006 range represents the broadest range.

*** - No search feature was available for MISQ Discovery.

**** - The articles in the AMCIS and ICIS conferences could only be searched by title.

APPENDIX B: IS EMPATHY ARTICLES USED IN ANALYSIS

#	Article Title	Year	Author(s)	Journal	Volume & Issue	# of ¶s	Abstract?
1	Ethical decision making in software piracy: Initial development and test of a four component model	2006	Moores, T. T., and Chang, J. C.	MISQ	(30)1	2	No
2	Zones of tolerance: Alternative scales for measuring information systems service quality	2005	Kettinger, W. J., and Lee, C. C.	MISQ	(29)4	2	No
3	A field study of the effect of interpersonal trust on virtual collaborative relationship performance	2004	Paul, D. L., and McDaniel, R. R.	MISQ	(28)2	8	No
4	Cross-cultural software production and use: A structurational analysis	2002	Walsham, G.	MISQ	(26)4	1	No
5	Measuring information system service quality: SERVQUAL from the other side	2002	Jiang, J. J., Klein, G., and Carr, C. L	MISQ	(26)2	1	No
6	Measuring information systems service quality: Lessons from two longitudinal case studies	1998	Watson, R. T., Pitt, L. F., and Kavan, C. B.	MISQ	(22)1	1	No
7	Gender differences in the perception and use of e- mail: An extension to the technology acceptance model	1997	Gefen, D., and Straub, D. W.	MISQ	(21)4	1	No
8	An historical method for MIS research: steps and assumptions	1997	Mason, R. O., McKenney, J. L., and Copeland, D. G.	MISQ	(21)3	4	No
9	Measuring information systems service quality: Concerns on the use of the SERVQUAL questionnaire	1997	Van Dyke, T. P., Kappelman, L. A., and Prybutok, V. R.	MISQ	(21)2	1	No
10	Measuring information systems service quality: concerns for a complete canvas	1997	Pitt, L.F., Watson, R.T., and Kavan, C.B.	MISQ	(21)2	4	No
11	Pragmatic perspectives on the measurement of information systems service quality	1997	Kittinger, W. J., and Lee, C. C	MISQ	(21)2	4	No
12	Service quality: A measure of information systems	1995	Pitt, L. F., and Watson, R. T.	MISQ	(19)2	1	Yes

Volume 22

Article 7

#	Article Title	Year	Author(s)	Journal	Volume & Issue	# of ¶s	Abstract?
	effectiveness						
13	Controlling prototype development through risk analysis	1996	Baskerville, R. L., and Stage, J.	MISQ	(20)4	1	No
14	Executive or functional manager? The nature of the CIO's job	1992	Stephens, C. S., Ledbetter, W. N., Mitra, A., and Ford, F. N	MISQ	(16)4	1	No
15	Establishing telemarketing leadership through information management: Creative concepts at AT&T American Transtech	1989	Cobbin, W. F., Kozar, K. A., and Michaele, S. J.	MISQ	(13)3	1	No
16	Perceived importance of systems analysts' job skills, roles, and non-salary incentives	1989	Green, G. I.	MISQ	(13)2	1	No
17	Deploying common systems globally: The dynamics of control	2004	Kirsch, L. J.	ISR	(15)4	1	No
18	Potential research space in MIS: A framework for envisioning and evaluating research replication, extension, and generation	2002	Berthon, P, Pitt, L., Ewing, M., and Carr, C. L.	ISR	(13)4	2	No
19	Antecedents of B2C channel satisfaction and preference: Validating e- commerce metrics	2002	Devaraj, S., Fan, M., and Kohli, R.	ISR	(13)3	6	No
20	Closing the user and provider service quality gap	2003	Jiang, J. J., Klein, G., Tesch, D., and Chen, H.	CACM	(46)2	8	No
21	Responsive virtual environments	1997	Zeltzer, D., and Addison, R. K.	CACM	(40)8	3	No
22	A web of fuzzy problems: confronting the ethical issues	1993	Wagner, I.	CACM	(36)6	2	No
23	Etiquette online: From nice to necessary	2004	Preece, J.	CACM	(47)4	3	No
24	An empirical study of computer capacity planning in Japan	1988	Lam, S. F.	CACM	(31)8	1	No
25	Global applications of collaborative technology: Global virtual teams	2001	Dubé, L. and Paré, G.	CACM	(44)2	2	No
26	Human-computer etiquette: Managing expectations with intentional agents	2004	Miller, C. A.	CACM	(47)4	2	No
27	Building customer trust in mobile commerce	2003	Siau, K. and Shen, Z.	CACM	(46)4	1	No
28	Issues and challenges in ubiquitous computing: Group dynamics and ubiquitous computing	2002	Grudin, J.	CACM	(45)12	1	No
29	Supporting community and building social capital:	2002	Preece, J.	CACM	(45)4	1	No

#	Article Title	Year	Author(s)	Journal	Volume & Issue	# of ¶s	Abstract?
	Introduction						
30	Electronic empire	2001	Townsend, A. M. and Bennett, J. T.	CACM	(44)3	1	No
31	Effects of chargeout on user/manager attitudes	1977	Nolan, R. L.	CACM	(20)3	1	No
32	Managing the computer resource: A stage hypothesis	1973	Nolan, R. L.	CACM	(16)7	1	No
33	The Japanese approach: A better way to manage programmers?	1983	Licker, P. S.	CACM	(26)9	1	No
34	Animation control for real- time virtual humans	1999	Badler, N. I., Palmer, M. S., Bindiganavale, R.	CACM	(42)8	1	No
35	VR and health care	1997	Strickland, D.	CACM	(40)8	1	No
36	Systems analysis: Asystemic analysis of a conceptual model	1987	Shemer, I.	CACM	(30)6	1	No
37	Electronic social fields in bureaucracies	1991	Perin, C.	CACM	(34)12	1	No
38	Wanted: Project teams with a blend of IS professional orientations	2002	Klein, G., Jiang, J. J., and Tesch, D. B.	CACM	(45)6	1	No
39	On management myth- information systems	1974	Mitroff, I. I., Nelson, J., and Mason, R. O.	MS	(21)4	1	No
40	Customer satisfaction in virtual environments: A study of online investing	2003	Balasubramania n, S., Konana, P., and Menon, N. M.	MS	(49)7	1	Yes
41	An introduction to structured modeling	1987	Geoffrion, A. M.	MS	(33)5	1	No
42	Antecedents of information and system quality: An empirical examination within the context of data warehousing	2005	Nelson, R. R. and Todd, P. A.	JMIS	(21)4	1	No
43	The DeLone and McLean model of information systems success: A ten- year update	2003	DeLone, W. D. and McLean, E. R.	JMIS	(19)4	2	No
44	Individual trust in online firms: Scale development and initial test	2002	Bhattacherjee, A.	JMIS	(19)1	3	No
45	Leadership effectiveness in global virtual teams	2002	Kayworth, T. R. and Leidner, D. E.	JMIS	(18)3	1	No
46	Is anybody out there? Antecedents of trust in global virtual teams	1998	Jarvenpaa, S. L., Knoll, K., and Leidner, D. E.	JMIS	(14)4	1	No
47	Managing information about processes	1995	Davenport, T. H. and Beers, M. C.	JMIS	(12)1	2	No
48	Design, implementation, and evaluation of trust-	2005	Leimeister, J. M., Ebner, W.,	JMIS	(21)4	3	No

Volume 22

Article 7

#	Article Title	Year	Author(s)	Journal	Volume & Issue	# of ¶s	Abstract?
	supporting components in virtual communities for patients		and Krcmar, H.				
49	Response to my critics	1996	Dreyfus, H. L.	AI	(80)1	1	No
50	The economic payout model for service guarantees	2005	Baker, T. and Collier, D. A.	DS	(36)2	2	No
51	Adaptive versus proactive behavior in service recovery: The role of self- managing teams	2004	De Long, A., and De Ruyter, K.	DS	(35)3	1	No
52	A mathematical model of service failure and recovery strategies	2004	Zhu, Z., Sivakumar, K., and Parasuraman, A.	DS	(35)3	1	No
53	The role of clinical and process quality in achieving patient satisfaction in hospitals	2004	Marley, K. A., Collier, D. A., and Goldstein, S. M.	DS	(35)3	3	No
54	Modeling the effects of a service guarantee on perceived service quality using alternating conditional expectations (ACE)	2002	Sum, C., Lee, Y, Hays, J. M., and Hill, A. V.	DS	(33)3	1	No
55	A psychometric evaluation of the expectations, perceptions, and difference-scores generated by the IS- adapted SERVQUAL instrument	2002	Carr, C. L.	DS	(33)2	3	No
56	A note on SERVQUAL reliability and validity in information system service quality measurement	2000	Jiang, J. J., Klein, G., and Crampton, S. M.	DS	(31)3	5	No
57	Cautions on the use of the SERVQUAL measure to assess the quality of information systems services	1999	Van Dyke, T. P., Prybutok, V. R., and Kappelman, L. A.	DS	(30)3	1	No
58	Global measures of information service quality: A cross-national study	1995	Kettinger, W. J., Lee, C. C., and Lee, S.	DS	(26)5	4	No
59	Perceived service quality and user satisfaction with the information services function	1994	Kettinger, W. J., and Lee, C. C.	DS	(25)5	1	Yes
60	Supply-side hurdles in Internet B2C e-commerce: an empirical investigation	2003	Cheung, M. T. and Liao, Z.	IEEE Trans on Eng Mgmt	(50)4	5	No
61	A consumer perspective of e-service quality	2005	Zhang, X., and Prybutok, V. R.	IEEE Trans on Eng Mgmt	(52)4	2	No
62	Transition and change during the implementation of a computer-based manufacturing process	1999	Joshi, K. and Lauer, T. W.	IEEE Trans on Eng Mgmt	(46)4	1	No

•

Article 7

#	Article Title	Year	Author(s)	Journal	Volume & Issue	# of ¶s	Abstract?
63	planning system Examining the relationship between electronic marketplace strategy and structure	2006	Standing, C., Love, P. E., Stockdale, R., and Gengatharen, D.	IEEE Trans on Eng Mgmt	(53)2	1	No
64	Beating common sense into interactive applications	2004	Lieberman, H., Liu, H. and Singh P	AIMag	(25)4	2	No
65	Pedagogical agent research at CARTE	2001	Johnson, W. L.	AIMag	(22)4	2	No
66	It's more than just use: An exploration of telemedicine use quality	2007	LeRounge, C., Hervner, A. R., and Collins, R. W.	DSS	(43)4	1	No
67	Investigating the effect of Web site quality on e- business success: An analytic hierarchy process (AHP) approach	2006	Lee, Y. and Kozar, K. A.	DSS	(42)3	3	No
68	Incorporating an ethical perspective into problem formulation: Implications for decision support systems design	2005	Chae, B., Paradice, D., Courtney, J. F., and Cagle, C. J.	DSS	(40)2	2	No
69	Web-based intervention support system for health promotion	2006	Liang, H., Xue, Y., and Berger, B. A.	DSS	(42)1	1	No
70	The Greta system: organizational politics introduced to the garbage can	2001	McGrath, G. M., More, E.	DSS	(31)2	1	No
71	Pruning your programs' unused functions	1990	Potosnak, K.	IEEE Software	(7)1	1	No
72	Back to the user	2004	Messerschmitt, D. G.	IEEE Software	(21)1	1	No
73	An exploratory study into factors of service quality for application service providers	2005	Ma, Q., Pearson, J. M., and Tadisina, S.	I&M	(42)8	1	No
74	Literature derived reference models for the adoption of online shopping	2005	Chang, M. K., Cheung, W., and Lai, V. S.	I&M	(42)4	1	No
75	Perceptions about the quality of Web sites: a survey amongst students at Northeastern University and Erasmus University	2004	Van Iwaarden, J., Vad der Wiele, T., Ball, L., and Millien, R.	I&M	(41)8	2	No
76	Dimensional hierarchy of retail Web site quality	2004	Kim, S. and Stoel, L.	I&M	(41)5	1	No
77	Social support and leaving intention among computer professionals	2004	Lee, P. C.	I&M	(41)3	1	No
78	An empirical study on predicting user acceptance of e-shopping on the Web	2004	Shih, H.	I&M	(41)3	1	No

Volume 22

Article 7

#	Article Title	Year	Author(s)	Journal	Volume & Issue	# of ¶s	Abstract?
79	Quality and effectiveness in Web-based customer support systems	2003	Negash, S., Ryan, T., and Igbaria, M.	I&M	(40)8	1	No
80	Developing and validating an instrument for measuring user-perceived Web quality	2002	Aladwani, A. M., and Palvia, P. C.	I&M	(39)6	1	No
81	Opportunities to enhance a commercial Web site	2000	Wan, H. A.	I&M	(38)1	1	No
82	Exploring the factors associated with Web site success in the context of electronic commerce	2000	Liu, C. and Arnett, K. P.	I&M	(38)1	1	No
83	A framework for evaluating economics of knowledge management systems	2004	Shin, M.	I&M	(42)1	1	No
84	DSS implementation in the UK retail organizations: a GIS perspective	2003	Nasirin, S. and Birks, D. F.	I&M	(40)4	1	No
85	Effect of store design on consumer purchases: an empirical study of on-line bookstores	2002	Liang, T. and Lai, H.	I&M	(39)6	1	No
86	IS service performance: self-perceptions and user perceptions	2001	Jiang, J. J., Klein, G., Roan, J., and Lin, J. T.	I&M	(38)8	1	No
87	The evolution of the design-inspired enterprise	2004	Lojacono, G., and Zaccai, G.	Sloan Mgmt Review	(45)3	1	No
88	How to manage an IT outsourcing alliance	1995	McFarlan, F. W., and Nolan, R. L.	Sloan Mgmt Review	(36)2	1	No
89	Investigating information systems with ethnographic research	1999	Myers, M. D.	CAIS	(2)4	2	No
90	IS research relevance revisited: Subtle accomplishment, unfulfilled promise, or serial hypocrisy?	2002	Kock, N., Gray, P., Hoving, R., Klein, H., Myers, M., and Rockart, J.	CAIS	(8)	1	No
91	Communication in the IS community: A call for research and design	2004	Te'eni, D., and Schwarz	CAIS	(8)	1	No
92	Experiential learning in a management information systems course: Simulating it consulting and CRM system procurement	2005	Heim, G. R., Meile, L, Tease, J., Glass, J., Laher, S., Rowan, J., and Comerford, K.	CAIS	(15)	1	No
93	Systems engineering and information technology: Catalysts for total quality in industry and education	2000	Deshayes, P. J., and Thissen, W. A.	IEEE Trans Systems, Man, and Cybernetics	(30)2	1	No
94	Supporting mobile professionals in global banking: The role of global ICT-support call-centers	2004	Al-Taitoon, A., and Sørensen, C.	Journal of Computing	(12)4	2	No
95	Measuring e-commerce success: Applying the	2004	DeLone, W. H., and McLean, E.	International Journal of e-	(9)1	1	No

Article 7

Volume 22

#	Article Title	Year	Author(s)	Journal	Volume & Issue	# of ¶s	Abstract?
	Delone & McLean information systems success model		R.	Commerce			
96	Customer loyalty in e- commerce	2002	Gefen, G.	JAIS	(3)2	1	Yes
97	Understanding virtual team development: An interpretive study	2003	Sarker, S., and Sahay, S.	JAIS	(4)1	1	No
98	Determinants of satisfaction at different adoption stages of Internet-based services	2003	Khalifa, M., and Liu, V.	JAIS	(4)5	1	No
99	Crisis in the IS field? A Critical reflection on the state of the discipline	2003	Hirschheim, R. A., and Klein, H. K.	JAIS	(4)5	1	No
100	Beyond utopian and nostalgic views of information technology, and education: Implications for research and practice	2004	Sahay, S.	JAIS	(5)7	3	No
101	A comparison of online trust building factors between potential customers and repeat customers	2004	Kim, H., Xu, Y. and Koh, J.	JAIS	(5)10	8	Νο
102	Inhibitors and enablers as dual factor concepts in technology usage	2004	Cenfetelli, R. T.	JAIS	(5)11	1	No
103	An integrated framework for service quality, customer value, satisfaction: Evidence from china's telecommunication	2004	Wang, Y., Lo, H., and Yang, Y.	Frontiers	(6)4	7	No
104	Service quality and perceived value's impact on satisfaction, intention and usage of short message service (SMS)	2004	Lai Lai, T.	Frontiers	(6)4	1	Yes
105	Ensuring IT consulting SERVQUAL and user satisfaction: A modified measurement tool	2004	Yoon, S. and Suh, H.	Frontiers	(6)4	1	Yes
106	Oracles, bards, and village gossips, or social roles and meta knowledge management	2000	Masterson, S. and Watt, S.	Frontiers	(2)3-4	1	No
107	Believing is seeing: cultivating radical media innovations	2006	Stapelson, C., and Hughes, C. E.	IEEE Computer Graphics	(26)1	3	No
108	Special education and rehabilitation: Teaching and healing with interactive graphics	2005	Takacs, B.	IEEE Computer Graphics	(25)5	2	No
109	Detour: brain deconstruction ahead	1995	Addison, R.	IEEE Computer Graphics	(15)2	1	No
110	The virtual human	2003	Takács, B. and	IEEE	(23)5	1	No

140

Volume 22

#	Article Title	Year	Author(s)	Journal	Volume & Issue	# of ¶s	Abstract?
	interface: A photorealistic digital human		Kiss, B.	Computer Graphics			
111	Interactive imagination: Tapping the emotions through interactive story for compelling simulations	2003	Stapelson, C., and Hughes, C. E.	IEEE Computer Graphics	(23)5	2	No
112	Doing critical research in information systems: some further thoughts	2005	Avgerou, C.	ISJ	(15)2	1	No
113	A new framework for managing IT-enabled business change	1999	Ward, J. and Elvin, R.	ISJ	(9)3	1	No
114	Trust, power and interorganizational information systems: the case of the electronic trading community Transl ease	2000	Allen, D. K., Colligan, D., and Finnie, A., and Kern, T.	ISJ	(10)1	1	No
115	IT outsourcing: frameworks for conceptualizing practice and perception	2000	Hancox, M. and Hackney, R.	ISJ	(10)3	1	No
116	An evaluation system for IT outsourcing customer satisfaction using the analytic hierarchy process	2005	Yoon, Y. and Im, K.S.	Journal of Global Information Mgmt	(13)4	1	No
117	Contracts, control and `presentation' in IT outsourcing: Research in 13 UK organizations	2000	Kern, T. and Willcocks, L.	Journal of Global Information Mamt	(8)4	1	No
118	Assessing information technology personnel: Toward a behavioral rating scale	2004	Chilton, M. A., and Hardgrave, B. C.	DATABASE	(35)3	1	No
119	Consumer acceptance of virtual stores: A theoretical model and critical success factors for virtual stores	2004	Chen, L., Gillenson, M. L., and Sherrell, D. L.	DATABASE	(35)2	2	No
120	If you spoke as she does, sir, instead of the way you do: A sociolinguistics perspective of gender differences in virtual communities	2005	Gefen, D. and Ridings, C. M.	DATABASE	(36)2	1	Yes
121	A language-oriented data modeling approach	1996	Steinberg, G. and Lin, J.	DATABASE	(27)1	1	No
122	IT acceptance: Managing user – IT group boundaries	2003	Gefen, D. and Ridings, C. M.	DATABASE	(34)3	1	No
123	Using an adapted grounded theory approach for inductive theory building about virtual team development	2001	Sarker, S., Lau, F., and Sahay, S.	DATABASE	(32)1	1	No
124	A comparative investigation of ethical decision making: Information systems professionals versus students	1998	Cappel, J. J. and Windsor, J. C.	DATABASE	(29)2	1	No

#	Article Title	Year	Author(s)	Journal	Volume & Issue	# of ¶s	Abstract?
125	A model of organizational communications	1987	Lind, M. R.	DATABASE	(18)3	1	No
126	Desituating action: Digital representation of context	2001	Grudin, J.	HCI	(16)2-4	1	No
127	Systematic sources of suboptimal interface design in large product development organizations	1991	Grudin, J.	HCI	(6)2	2	No
128	Affect in computer- mediated communication: An experiment in synchronous terminal-to- terminal discussion	1985	Kielser, S., Zubrow, D., Moses, A. M., and Geller, V.	HCI	(1)1	1	No
129	In search of empathy online: A review of 100 online communities	1998	Preece, J. and Ghozati, K.	AMCIS	NA	1	Yes

ABOUT THE AUTHORS

Tomasz Miaskiewicz is a Ph.D. student in the Systems Division at the University of Colorado at Boulder. His research and teaching interests are primarily in the human computer interaction area. He has also worked in a variety of roles at several technology and design consulting companies.

David E. Monarchi is a Retired Full Professor of Systems at the University of Colorado at Boulder. He has published in various academic journals, such as the Journal of the American Statistical Association, Communications of the ACM, and Decision Support Systems, and presented his work nationally and internationally. Monarchi's primary areas of interest are natural language programming, data and text mining, and knowledge extraction.

Copyright © 2008 by the Association for Information Systems. Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and full citation on the first page. Copyright for components of this work owned by others than the Association for Information Systems must be honored. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers, or to redistribute to lists requires prior specific permission and/or fee. Request permission to publish from: AIS Administrative Office, P.O. Box 2712 Atlanta, GA, 30301-2712 Attn: Reprints or via e-mail from <u>ais@aisnet.org</u>



ISSN: 1529-3181

EDITOR-IN-CHIEF

Joey F. George Florida State University

AIS SENIOR EDITORIAL BOARD

Guy Fitzgerald		Joey F. George			Kalle Lyytinen		
Vice President Publications		Editor, CAIS			Editor, JAIS		
Brunel University		Florida State University			Case Western Reserve University		
Edward A. Stohr	Blake lves			Paul Gray			
Editor-at-Large		Editor, Electronic Publications		olications	Founding Editor, CAIS		
Stevens Inst. of Technology		University of Hous	ston		Claremon	t Graduate University	
CAIS ADVISORY BOA	RD						
Gordon Davis	Ken	Kraemer		M. Lynne Markus		Richard Mason	
University of Minnesota	Univ.	of Calif. at Irvine		Bentley College		Southern Methodist Univ.	
Jay Nunamaker	Henk	Sol		Ralph Spragu	е	Hugh J. Watson	
University of Arizona	Delft	University		University of H	lawaii	University of Georgia	
CAIS SENIOR EDITOR	RS						
Steve Alter	Jane	Fedorowicz		Chris Holland		Jerry Luftman	
U. of San Francisco	Bentl	ey College		Manchester Bus. School		Stevens Inst. of Tech.	
CAIS EDITORIAL BOARD							
Michel Avital	hel Avital Dinesh Batra		Erran Carmel			Fred Davis	
Univ of Amsterdam	Florid	a International U.	Ar	American University		Uof Arkansas, Fayetteville	
Gurpreet Dhillon	Evan	Duggan	Al	Ali Farhoomand		Robert L. Glass	
Virginia Commonwealth U	Univ of the West Indies		Ur	niversity of Hong	g Kong	Computing Trends	
Sy Goodman	Ake Gronlund		Rι	uth Guthrie		Juhani livari	
Ga. Inst. of Technology	Unive	University of Umea		California State Univ.		Univ. of Oulu	
K.D. Joshi	Chuc	Chuck Kacmar		Michel Kalika		Claudia Loebbecke	
Washington St Univ.	Unive	ersity of Alabama	U. of Paris Dauphine		line	University of Cologne	
Paul Benjamin Lowry	Sal N	larch	Don McCubbrey			Michael Myers	
Brigham Young Univ.	Vand	erbilt University	University of Denver		ver	University of Auckland	
Fred Niederman	Shan	Ling Pan	Kelley Rainer			Paul Tallon	
St. Louis University	Natl. U. of Singapore			Auburn University		Boston College	
Thompson Teo	Craig	aig Tyran		Chelley Vician		Rolf Wigand	
Natl. U. of Singapore	W Wa	ashington Univ.	on Univ. Michigan Tech		niv.	U. Arkansas, Little Rock	
Vance Wilson	Peter	Wolcott	Pi	ng Zhang			
University of Toledo U. of Nebraska-Omaha			Sy	racuse Univers	ity		
DEPARTMENTS							
Global Diffusion of the Internet.				Information Technology and Systems.			
Editors, Dotor Walcott and S	lmon	Editors: Sal March and Dinach Patra					

Global Diffusion of the Internet.	Information Technology and Systems.
Editors: Peter Wolcott and Sy Goodman	Editors: Sal March and Dinesh Batra
Papers in French	Information Systems and Healthcare
Editor: Michel Kalika	Editor: Vance Wilson

ADMINISTRATIVE PERSONNEL

James P. Tinsley AIS Executive Director	Robert Hooker CAIS Managing Editor Florida State Univ.	Copyediting by Carlisle Publishing Services
--	--	--

Volume 22

Article 7