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Communications of the Association for Information Systems

Volume 24 Article 35

6-1-2009

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Yoonhyuk Jung
*Louisiana State University*, yjung1@lsu.edu

Suzanne D. Pawlowski
*Louisiana State University*

Sonja Wiley-Patton
*Louisiana State University*

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Recommended Citation
Jung, Yoonhyuk; Pawlowski, Suzanne D.; and Wiley-Patton, Sonja (2009) "Conducting Social Cognition Research in IS: A Methodology for Eliciting and Analyzing Social Representations," *Communications of the Association for Information Systems*: Vol. 24 , Article 35.
DOI: 10.17705/1CAIS.02435
Available at: https://aisel.aisnet.org/cais/vol24/iss1/35

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Communications of the Association for Information Systems

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# Conducting Social Cognition Research in IS: A Methodology for Eliciting and Analyzing Social Representations

Yoonhyuk Jung
*Louisiana State University*
*yjung1@lsu.edu*

Suzanne D. Pawlowski
*Louisiana State University*

Sonja Wiley-Patton
*Louisiana State University*

Abstract:

This paper presents a methodology for socio-cognitive research based on the theory of social representations. Elements of the methodology include:1) data elicitation through free word association; 2) content analysis/coding to identify key concepts in the social representation; 3) analysis of the structure of the representation using analysis of similarity and core/periphery analysis; 4) correspondence analysis to place the concepts on a perceptual space; and 5) interpretation of the social representation. The methodology is demonstrated in use through a study examining early sense-making about electronic health records (EHRs). Analysis of qualitative survey data from 190 students identified 22 concepts forming the social representation. Merits of the methodology are discussed, including its potential value for investigations based on technology frames of reference (TFR), the social construction of technology (SCOT) and organizing visions for IT innovations.

**Keywords:** community-wide systems, exploratory, psychological theory, survey, privacy, community

Volume 24, Article 35, pp. 597-614, June 2009

The manuscript was received 07/26/2008 and was with the authors 5-1/2 months for 2 revisions.

## I. INTRODUCTION

*Reality for the individual is, to a high degree, determined by what is socially accepted as reality.*
*Resolving Social Conflict* [Lewin 1948]

Social cognition theory is based on the premise that the content of cognition originates in social life, in human interaction and communication [Augoustinos and Walker 1995]. The use of socio-cognitive approaches to understand the collective sense-making surrounding information technologies and the implications of those interpretations has a long history in IS research. One example of IS research concerned with socio-cognitive processes is the work that examines how system requirements are socially constructed through the interactions of participants in IS development [e.g., Malhotra et al. 1980; Newman and Nobel 1990]. A key concept emerging from this research is the notion of technology frames of reference [TFR; Orlikowski and Gash 1994], defined as "that subset of members' organizational frames that concern the assumptions, expectations and knowledge they use to understand technology in organizations" (p. 178). By addressing social, learning, and negotiation processes, the stream of research based on TFR has complemented and extended technology-based methodological approaches [Griffith1999]. Another example of a social cognition framework used to highlight different aspects and outcomes of sense-making processes is the social construction of technology [SCOT; Pinch and Bijker 1987]. SCOT sets out to explain how society shapes the nature of technology. With its emphasis on technologies as socially mediated relations, it incorporates social, economic, political, and cultural forces into the analysis, and the conflict and negotiations among diverse groups as they try to make sense of technology [Bijker 1995]. A third example in which social cognition is an important element (in this case, within an institutional view) is found in the idea of organizing visions by Swanson and Ramiller [1997]. Defined as "a focal community idea for the application of information technology in organizations" (Swanson and Ramiller 1997, p. 460), these shared understandings are established, maintained, and transformed through discourse within the community of interest for the innovation. Organizing visions facilitate the diffusion of IT innovations through the functions of interpretation, legitimation and mobilization. These examples highlight just a few of the ways that socio-cognitive approaches are being used to make important contributions to IS research.

The current study aims at introducing a methodological alternative for socio-cognitive research based on the theory of social representations. Prior IS studies based on social-cognitive approaches have relied primarily on qualitative research strategies (e.g., in-depth case studies and grounded theory) and qualitative methods (e.g., participant observation, open interviews, content analysis, cognitive mapping). While these approaches can be used to generate rich understandings of collective sense-making about information technology, exclusive reliance on these kinds of labor-intensive and time-consuming methods can also severely inhibit the pace of progress at certain stages of theoretical development. Sole reliance on quantitative research methods for social cognition research can also be problematic. One of the major risks is operationalization, where a concept comes to be defined by its methodology rather than reflecting the understandings of the relevant social group [Gigerenzer 1991]. Using a mixed methods research strategy that combines qualitative and quantitative methods in a complementary way can leverage the strengths and mitigate the weaknesses of each approach when used standalone.

Mixed methods can be particularly useful as a next step for theoretical development following exploratory work. Issues of content can be approached effectively through more qualitative methods followed by the use of quantitative methods for a structured approach to analysis. In their review of technological frames research, for example, Davidson and Pai [2004] argue for the use of a mixed methods approach, including quantitative methods to measure and compare frames at the individual and group levels and to more precisely measure frame incongruence. In order to realize the potential of a technological frames approach, they recommend mixed qualitative/quantitative methodologies such as multidimensional scaling (MDS) and repertory grid to identify and analyze technology frames. The purpose of this paper is to present and demonstrate an alternative qualitative/quantitative research strategy that can be used for these and other types of investigations. The methodology, which is in alignment with the theory of *social representations* [Moscovici 1961/1976, 1981; Farr and Moscovici 1984], can be a valuable addition to the toolkit of social cognition researchers in IS.

Social representations are the stock of common knowledge and information which people share in the form of commonsense theories about the social world [Augoustinos and Walker 1995]. Social representations provide "a framework of references that facilitates our interpretations of reality and guides our relations to the world around us" [Philogene and Deaux 2001, p. 5]. Social representations theory has been used to study collective sense-making on

a wide range of topics, e.g., health and illness [Herzlich 1973], human rights [Doise 2001], entrepreneurs [Radu and Redien-Collot 2008], and "African American" [Philogene 1999]. The use of social representations theory in the IS field, however, is a relatively new development [e.g., Vaast and Walsham 2005; Vaast 2007; Pawlowski et al. 2007]. As IS researchers are gaining more familiarity with the theory, its potential to illuminate central questions in other areas of investigation such as knowledge management is beginning to be recognized [see Vaast et al. 2006].

One of the advantages of using a social representations approach is the diversity of methodological approaches that have been developed for these studies, including multi-methodological approaches. Multi-methodological approaches are particularly useful in these investigations because of: 1) the multifold nature of the construct of social representations, involving ideas, beliefs, values, practices, feelings, images, attitudes, knowledge, understandings and explanations; 2) the additional complexity that needs to be taken into account because social representations acquire meaning, structure and image through verbal expression and communication; and 3) the different questions that can be pursued by studying social representations (how they function, how they are created, etc.) [Sotirakopoulou and Breakwell 1992]. For many of these investigations, no single tool is adequate, and social psychologists have given special priority to the development of mixed method approaches.

The particular qualitative/quantitative methodology described in this paper can be used to study the shared representations of a social collective and includes the following elements: 1) data elicitation through *free word association*; 2) *content analysis/coding* to identify key concepts in the social representation; 3) analysis of the structure of the representation using *analysis of similarity* [Flament, 1986] and *core/periphery analysis* [Borgatti and Everett, 1999];, 4) *correspondence analysis* to place the concepts on a perceptual space; and 5) *interpretation of the social representation*. We demonstrate in use each part of the methodology through an example case of sense-making about an IT innovation in healthcare and electronic health records (EHRs). For demonstration of the methodology, we conducted a Web-based survey of undergraduate students to elicit the emergent social representations of EHRs. Electronic health records are longitudinal electronic records of personal healthcare information, including relevant administrative information as well as medical information such as diagnoses, treatments, test results, and medications [Gunter and Terry 2005]. Application of the methodology provided the opportunity to study sense-making by this segment of the public about a technology that has potential for major societal impacts, both positive (e.g., quick access to records, reduction of medical errors) and negative (e.g., threats to patients' privacy). Our analysis of the social representation of EHRs illustrates how this methodology can be used to produce a detailed view of the semantic field and cognitive organization of "everyday knowledge" about a concept. In this case, we found evidence of multi-faceted, high-level sense-making at this early stage of understanding, including potential benefits, potential risks, and characteristics of the technology artifact. The understandings of EHRs by these subjects at this point appear to be largely anchored in, and limited by, shared understandings of more familiar information technologies. While these understandings did not reflect a high level of knowledgeability; neither did they represent a state of blind naiveté.

As discussed in the concluding section of the paper, the demonstrated approach can provide distinct advantages for socio-cognitive investigations. Most importantly, the integrated qualitative/quantitative methodology enables surfacing of the elements (concepts) that comprise shared understandings, their relative importance, and the relationships among them, thus making it possible for systematic comparison of social representations (e.g., to identify differentiated knowledge structures shared by subgroups within a social collective, shifts in understandings over time). Moreover, because the method is in alignment with social representations theory, aspects of the theory concerning the generation, structure and dynamic nature of social representations can be applied to enrich investigations from a conceptual perspective [Augoustinos and Walker 1995; Moscovici 1984]. The use of a Web-based word-association technique as a method of elicitation can enable the inclusion of subjects who might be unable or unwilling to take part in a study if their participation required a greater time commitment. Finally, as noted earlier, the mixed-method approach offers a "middle ground" research strategy that can be particularly useful as a follow-on step to earlier phases of research on a topic using qualitative methodologies for in-depth exploratory investigations and as a prelude to later phases of the research that rely predominantly on quantitative approaches.

In the next section, we begin the paper with an overview of social representations theory and a review of prior IS investigations based on this theoretical lens.

## II. SOCIAL REPRESENTATIONS THEORY

One of the aims of this paper is to introduce readers to social representations theory and methods as an alternative or complementary framework for eliciting and analyzing shared social knowledge. This particular social cognition approach provides a rich theoretical lens and associated methods to investigate collective sense-making about IT innovations. Moreover, it can be used in conjunction with other frameworks involving social construction processes such as TFR, SCOT and organizing visions for IT innovations.

The theory has roots in Durkheim's [1898] notion of "collective representations." Social representations can be defined as commonsense knowledge about general topics that are the focus of everyday conversation [Lorenzi-Cioldi and Clemence 2001]. Social representations theory is an approach that links macro-level social discourse with individual social behavior, cognition, affect, and symbolic understanding [Wagner et al. 1996]. Formed through discursive practices, social representations are the consensual universes shared by subgroups in our society, the shared images and concepts through which we organize our world [Augoustinos and Walker 1995; Parker 1987; Wagner et al. 1996]. Social representations are dynamic structures, and once created "…they lead a life of their own, circulate, merge, attract and repel each other, and give birth to new representations, while old ones die out…" [Moscovici 1984, p. 19].

The demonstration study illustrates two basic elements of the theory that can be used to analyze elicited representations: the structural (core-periphery) approach to social representations and the concept of anchoring.

## Structural Approach to Social Representations: Core and Periphery

A basic tenet of social representations theory relates to the structure of representations, which are seen as consisting of a *central core* and *peripheral elements* [Abric 1976]. The central core, or attitudinal component, provides a "generating function" through which the other elements acquire meaning and value [Abric 2001]. For example, a "company" must make a profit [Flament 1994a], and equality and friendship are seen as essential elements of an "ideal group" [Flament 1984]. Central core theory posits that the core is non-negotiable and stable, unaffected by variations in context: "It constitutes the most stable element of the representation, the one that ensures the perennial nature of the representation in moving and evolving contexts" [Abric 2001, p. 44]. Peripheral elements, organized around the central core, are the area of adaptation based on new information or transformation of the environment. One of the functions of peripheral elements is to act as a defense system, or "shock absorber," because they may change without disturbing the nucleus or central core [Flament 1994b]. Peripheral elements are more malleable and integrate inter-individual variations such as personal experiences into the representation and adapt it to the reality of the moment [Guimelli 1998; Moliner 1995]. One example of how the structural view can be applied in research studies is the comparison of core elements of the social representations of different social collectives (e.g., senior executives, IT developers, and end users) to identify commonalities and differences. Another approach is to examine the content and structure of social representations over time and identify changes in response to significant events. (See, for example, the study of social representations of organ transplants by Maloney and colleagues [2005]. Content analysis of newspaper reports over a 25-year period and identification of significant events in transplantation, such as the introduction of the artificial heart, revealed shifting central themes including the change from a "spare part surgery" perspective of organ donation to a "gift of life" perspective.) We use core-periphery analysis in the demonstration study to provide a preliminary view of the emergent core-periphery structure of the social representation of EHRs during a period when sense-making by the public is still in an early stage of maturity.

## Anchoring

Anchoring is considered a key process that generates representations. Social representations arise through the efforts of groups to 'cope' symbolically with unfamiliar ideas and practices [Wagner et al. 2002]. It is during the anchoring process that unfamiliar objects (in this case, EHRs) are classified and named by comparing them with familiar categories [Moscovici 1984].

In classifying, we compare with a prototype or model. When we compare, we either decide that something is similar to a prototype, that is, we generalize certain salient features of the prototype to the unfamiliar stimulus, or we decide that something is different, that is, we particularize and differentiate between the object and the prototype. If we decide in favor of the similarity, the unfamiliar acquires the characteristics of the model. In some cases when discrepancy exists, the object is readjusted so as to fit the defining features of the prototype. [Augostinos and Walker 1995, p. 138].

It is during the process of anchoring that new information is placed into a network of significance, molding it in a way that appears consistent with existing ideas [Moscovici 1984]. Anchoring is thus prescriptive in nature, since supporting and conflicting information is anchored and re-presented in a way that is compatible with a group's consensual universe [Augustinos and Walker 1995]. When analyzing the elicited social representations of EHRs in the demonstration study, for example, we found evidence of anchoring of EHRs with more familiar categories (e.g., familiar information technologies, paper-based medical records).

## Investigating Social Representations: Ontological and Epistemological Considerations

It is important to note that research relying on social representations theory is based on an interpretivist stance and the belief that reality is socially constructed [Berger and Luckman 1989]. The research strategies and suite of

methods employed by researchers relying on social representations theory, however, extends beyond those typically associated with social constructionist research. Although studies adopting a social representations approach stand on an interpretive epistemology, they use diverse approaches to collect and analyze data [Philogène and Deaux 2001; Vaast 2007; see also Breakwell and Canter [1993] and Doise et al. [1993] for examples], including the use of quantitative methods more characteristically employed in positivist research. Different types of data-analysis methods including quantitative approaches can be used in order to capture social representations from a vast range of raw materials consisting of individual opinions, attitudes, or prejudices [Doise et al. 1993]. This is consistent with the view of Denzin and Lincoln [2005], namely that interpretive research may adopt diverse statistical techniques for supporting their interpretations. To grasp the multidimensional quality of social representations, researchers have borrowed innovative methods which have combined various empirical approaches. It is the rich methodological heritage of social representations studies that has made the theory so effective in tracing a social reality [Philogène and Deaux 2001]. The qualitative/quantitative methodology illustrated in this paper is just one of many that may be utilized for eliciting and analyzing the content, formation and maintenance of social representations.

## III. PRIOR IS RESEARCH BUILDING ON THE THEORY OF SOCIAL REPRESENTATIONS

Despite its relative unfamiliarity in the IS field, there have been a few recent studies using social representations theory in various contexts. The concept of social representations was first introduced to the IS field by Vaast and Walsham [2005]. In this study, social representations was used as a conceptual lens to understand how work practices change with IT use. More specifically, the perspective adopted for this work was to relate what agents do to the way they represent their actions and context. Analysis of data from a longitudinal field study of an intranet implementation found that existing practices are reproduced with new IT use when end-users experience a sustained consonance between induced actions and representations of a new IT; their experience of dissonance caused users to adapt their existing practices and representations to reestablish consonance. A valuable contribution of Vaast and Walsham's paper is their delineation of the notion of representations with other concepts that may be more familiar to IS researchers such as attitudes, beliefs, and technological frames. As such, it provides a good starting point for researchers to begin their exploration of social representations theory. In terms of methodology for the study, there were three main qualitative data sources: participant observation; individual semi-structured interviews; and focus groups. Data analysis followed a grounded theory approach.

A second empirical study conducted by Vaast [2007] examined the social representations of IS security of different occupational communities working in a healthcare organization (e.g., physicians, nurses, IS professionals). Differences and similarities in those representations have implications for security and awareness programs. The methodology for this study included semi-structured interviews followed by content analysis of interview transcripts. As an exploratory study, the coding process was based on Strauss and Corbin's [1998] guidelines for developing grounded theory. An additional step was to calculate the mean frequency by community of the occurrence of topics defining security, topics presenting the context of IS security, and topics related to external and internal threats to IS security.

The third example of an IS study using social representations theory is an investigation by Pawlowski et al. [2007] to understand how IT professionals make sense of and assign meaning to 'burnout' in the context of their work. Transcripts from semi-structured interviews were content analyzed to identify key concepts in that social representation. Quantitative methods, analysis of similarity [Flament 1986] and core/periphery analysis [Borgatti and Everett 1999], were then used to identify and "map" the relationships structure of the social representation. Results were interpreted to develop an occupation-specific research agenda on burnout in the IT profession focused on highly salient issues and specific work contexts warranting priority in future investigations, as reflected in the representation.

In addition to these three studies, researchers in the field are also beginning to identify IS research domains in which a social representations approach may be of particular benefit. A paper by Vaast et al. [2006] elaborates on a panel discussion and presentations at ICIS 2005 on the topic of how social representations theory could illuminate central questions related to the research and practice of knowledge management. A paper by Gal and Berente [2008] proposes social representations theory as an alternative to the technological frames for IS research, arguing that it provides a more comprehensive framework.

## IV. THE DEMONSTRATION CASE: ELECTRONIC HEALTH RECORDS

As the topic of the demonstration study, we chose electronic health records, an IT innovation that is in the early stages of sense-making by the public. To date, communication on the subject of EHRs has taken place primarily within specialized communities of interest (e.g., healthcare professionals, the medical informatics community, public policymakers), and broader public discourse has been much more limited. Another reason for the selection of this topic is the high potential for major societal impacts, and we were interested in the general level of public awareness

of these issues. Beliefs about EHRs can affect public policy, diffusion of the technology and the choices individuals may make in the future concerning their personal health information. This is a critical issue for an information society. Public scrutiny to assess the acceptability of a new information technology depends upon the perceptions and 'commonsense' understandings that emerge from the sense-making process. The introduction of new technology can be met with unawareness and disinterest by the public, or it may be met with high expectations of likely benefits, accompanied by fears and concerns about risks. Sense-making outcomes can range from naiveté to high knowledgeability concerning the innovation and its potential consequences, and reactions that range from passive acceptance to active resistance by members of a society.

### Background

In 2004, President George W. Bush stated his goal for "widespread deployment" of electronic health records within a decade [The White House Press 2004]. For proponents of EHRs, the long-term vision includes the ability for a patient's health records to be accessed by a health professional from anywhere in the country, significant reduction of deaths due to medical errors, and substantial improvements in patient care and cost savings [Charette 2006]. The importance of EHRs is also reflected in the American Recovery & Reinvestment Act of 2009, or the economic stimulus bill. According to the act, $19 billion will be invested by the federal government in health information technology systems, primarily to accomplish widespread adoption of EHRs (http://www.cnsnews.com/public/content/article.aspx?RsrcID=43463, February 12, 2009. In spite of the claimed potential benefits, the implementation of EHRs has encountered major barriers, such as the lack of national standards, physician resistance and financial obstacles. Another serious concern is privacy. The pronounced accessibility of personal health information raises potential threats to patients' privacy [Whiddett et al. 2006]. President Bush has stated, "One of the things I've insisted upon is that it's got to be secure and private. There's nothing more private than our own health records." A report by the General Accountability Office (GAO), however, found that the Bush administration had only a jumble of studies and vague policy statements, but no clear overall strategy to protect the privacy of patients as it promotes the use of electronic medical records [Pear 2007]. Clearly, electronic health records present important issues for our society, from public health implications and changes to medical practice to protection of sensitive, personal information. Given the limited engagement of the public in discourse on the topic to date, one question that arises is the level of awareness of the technology and those issues by the general public. Through the demonstration study in this paper, we show how analysis of the emergent social representations of EHRs can provide insights into that type of question. While we focused on EHRs and sense-making by one segment of the public—university undergraduate students—the same steps could be followed to broaden the investigation to other segments of the U.S. public or to investigate sense-making surrounding other information technologies by any other social group.

## V. METHOD AND FINDINGS

Despite the variety of empirical designs used in social representation research, these methodologies mainly consist of two parts: 1) *eliciting social representations* from respondents; and 2) *analysis of social representations*, which primarily aims at finding the central core [Abric 1994]. Elicitation techniques include the use of secondary sources such as newspapers, magazines, meeting transcripts or direct interaction with respondents, requiring them to reveal their cognition and emotion toward the object through free word association, interviews, or questionnaires [Breakwell and Canter 1993]. Because of the innately complex nature of social representations, elicited representations have been analyzed by diverse analytic techniques. Researchers have not only employed various multivariate techniques (e.g., cluster analysis, multidimensional scaling, correspondence analysis), but also developed methods specifically to explore the structure of social representations such as the analysis of similarity method designed by Flament [1986].

This study focused on the structural nature of social representations, that is, a core-periphery analysis of social representations [Abric 2001]. Use of the structural approach enables the identification of the set of concepts in the representation that are more stable and "taken for granted" by members of a social group (core) and the concepts in the representation that are more malleable and adaptable to different contexts (periphery). For this purpose, social representations were elicited through *free word association* and then answers were coded to identify concepts. Next, the data was analyzed to identify the structure of the representation, based on Abric's [2001] theory of core and periphery elements. The analytic techniques used include Flament's [1986] *analysis of similarity* and Borgatti and Everett's [1999] *core/periphery model* to clarify the core and periphery structure; and *correspondence analysis* to place the elements on a perceptual space, showing the distances between them in the semantic field.

### Step 1. Eliciting Social Representations: Free-Word Association

The respondents for our Web-based survey were first- and second-year undergraduate students who were taking introductory courses in statistics or MIS at a university in the Southeastern region of the United States. Participation was voluntary, and some students received course credit points. One-hundred-ninety students responded to the

survey. 95.8 percent were business students, with about half in the first year of study and half in their second year. Gender demographics were 54.7 percent male, 44.2 percent female (1.1 percent unknown).

A free-word association technique was employed to elicit the students' social representations of electronic health records. In a free word association test, the respondent is required to reply immediately with the first word(s) that come to mind upon being given the stimulus word. Words which illustrate an object can provide useful information in order to define the semantic universe of social representations of the object [Doise et al. 1993]. The free-word association technique has been popularly adopted in exploring this semantic space [Di Giacomo 1980; Lorenzi-Cioldi 1996; Wagner et al. 1996]. In social representations research, the exposure of a cue for the object (e.g., definitions, scenarios) has been used as a way to support the elicitation of representations [Di Giacomo 1980; Staerkle et al. 1998; Wagner et al. 1996]. In the survey for this study, after reading a short, general definition of an EHR[1] to facilitate the extraction of its image, respondents were instructed to write down three words or phrases which came to mind when hearing the term "electronic health record." It should be noted that while we chose to provide a short, general definition of EHR, generally subjects are presented with a single cue-word/phrase (e.g., "enterprise resource planning system," "Agile methods," "Web 2.0") to stimulate associations to other concepts, as additional information has the potential to bias responses. Our presentation of the brief definition in the EHR study was the result of the small pilot study we conducted prior to the full study. We found that some undergraduate students had such minimal exposure to the concept of electronic health records that they were unable to associate the term with other concepts. Because this was a demonstration study, we decided to provide the basic definition to subjects in order to generate a large enough data set to demonstrate the analytical techniques in the methodology. This experience illustrates that the methodology is most appropriate to use when the majority of subjects have enough understanding of a concept to draw associations on the basis of a single-word/phrase stimulus.

There are a number of different methods in addition to free-word association that can be used to elicit social representations (e.g., interviews, focus groups, content analysis of documents). Criteria for choosing a data collection strategy will depend upon the purposes of the research as well as practical considerations such as time, cost, access to participants, sensitivity of the topic, and so on. One of the primary advantages of the method used for the demonstration study is the ease of data collection in terms of effort by researchers and subjects. Participation in a study may also be broader in terms of number of participants/social groups because of the minimal time required by subjects as well as the ability to collect the data online. Elapsed time for data collection can also be shorter in contrast to other methods. Interviews, for example, are much more time consuming and costly [Heppner et al., 1992]. The interview method requires the interviewer to invest time and effort to develop a relationship with the interviewee before conducting an actual interview, as well as the time to schedule and conduct interview. Interviews must be transcribed prior to content coding, whereas free-word association responses captured online do not require this extra step.

For some social representations studies, free-word association would not be the optimal data elicitation strategy. The major drawback is the lack of elaboration that free-association responses (typically single words and short phrases) provide. In cases where the researchers are unfamiliar with relevant elements of the context or specialized terminology used within the social group, there is a risk that the researchers will miss or misinterpret meanings underlying the responses of the subjects. In these situations, other elicitation techniques such as in-depth interviews or focus groups may be necessary. Approaches can also be combined to address this issue, for example, conducting a pilot study involving a limited number of interviews or a period of observation/immersion in a context, followed by a survey with broader participation using free-word association to gather data.

### Step 2. Content Analysis/Coding to Identify Key Concepts in the Social Representation

The first part of the data analysis is detailed coding of each word/phrase elicited from the participants and identification of key topics (concepts). For this study, one of the researchers coded the data using an open coding procedure in which codes were not predetermined but rather emerged from the data. This resulted in 59 detail codes, or subjects, present in the data (C3 Big Brother, C25 Life-saving, C53 Unreliable, etc.). For example, "You won't have to have your health history," "medical history" and "past health" were assigned to code C18 Health History. In cases where the data contained more than one subject, multiple codes were assigned. For example, "fast communication" was assigned two codes: C31 Quick/saves time and C55 Communication. A second coder, another researcher, independently re-coded the data using the set of codes identified during the initial coding. The two raters were in agreement on 498 of the 554 codes assigned (Cohen's Kappa = 0.89), indicating a high level of inter-rater reliability [Fleiss, 1981]. Inter-rater disagreements were then reconciled through discussion and

[1] The definition given (based on a definition drawn from an ISO Technical Report [2004]) was the following: *An Electronic Health Record (EHR) is a longitudinal electronic repository of an individual's health information accessible by multiple authorized users (e.g., health professionals, administrators, policymakers, researchers, pharmacies, insurance companies, etc.).*

consensus. Finally, related codes were grouped into 22 topics, as shown in Table 1. For example, Topic 16 Health/Saves Lives is a grouping of three detail codes: C16 Health (general), C17 Health conditions/illness, and C25 Life-saving.

| Table 1. Topics: Concepts in the Social Representation | | | |
|---|---|---|---|
| Topic 1 | Privacy | Topic 12 | Technology |
| Topic 2 | Unauthorized access/identity theft/ misuse | Topic 13 | Future/progress |
| Topic 3 | Security/hackers | Topic 14 | Information/history |
| Topic 4 | Failure/crash | Topic 15 | Records/files |
| Topic 5 | Reliability | Topic 16 | Health/saves lives |
| Topic 6 | Risky/dangerous | Topic 17 | Doctors/hospitals/treatments |
| Topic 7 | Accessible/available | Topic 18 | Helpful/valuable |
| Topic 8 | Easy/convenient | Topic 19 | Important/smart |
| Topic 9 | Quick/saves time | Topic 20 | Cost |
| Topic 10 | Efficient/organized | Topic 21 | Universal/widespread |
| Topic 11 | Accuracy/currency | Topic 22 | Insurers/employers |

## Step 3. Analysis of the Structure of the Representation: Analysis of Similarity and Core/Periphery Analysis

The next stage of the analysis involves identification of the emergent core and periphery structure of the social representation. The three criteria for the core elements of a social representation identified by Abric [2001] are: symbolic value, expressive value, and associative value. *Symbolic value* is based on the generating function of the core and the concept that central elements cannot be questioned without affecting the signification, or meaning, of the entire representation. *Expressive value* springs from the assumption that central elements will be more frequently present in the discourse concerning the object than the peripheral elements. Finally, *associative value* is established on the tenet that central elements must be associated with a larger number of elements than the periphery ones. Within the scope of the current study, we were able to assess expressive and associative value of the elicited concepts, but not symbolic value. It should be noted that these two criteria are considered "soft"conditions: necessary, but not sufficient for coreness. (Symbolic value is the only criterion that is both necessary and sufficient.) Because the study dealt with an emerging concept which is not yet fully incorporated in everyday social discourse, it is premature to assess symbolic value. Our analysis, then, indicates the preliminary structure of the emergent EHR representation.

Expressive value was assessed by the parameter *salience*, which was measured by computing frequencies of appearance of elements (topics) in the responses [Abric 2001; Nicolini 1999]. We used weighted frequencies instead of simple frequencies in order to exclude bias resulting from differences in the number of codes per subject. For example, when one subject's responses corresponded to four codes, the frequency of each code was weighted one fourth. Associative value was assessed via two indexes, *sum of similarity* and *coreness*. Sum of similarity is produced by *analysis of similarity* which was introduced by Flament [1986] and has been widely used to clarify relationships among the elements of social representations (see, e.g., Nicolini 1999; Pawlowski et al. 2007). The fundamental component of the analysis is an inter-attribute similarity (IAS) matrix in which each cell contains a Jaccard's similarity coefficient, indicating the degree of co-occurrence (proximity) for a given pair of attributes [Hammond, 1993]. Sum of similarity is calculated as a sum of the similarities of each element (topic) to all others in the IAS matrix shown in Table 2. In analysis of similarity, the higher sum of similarity that the element (topic) has, the closer association the element has with the others.

In order to clarify the associative value of elements in the representation the last parameter, *coreness*, was determined using Borgatti and Everett's [1999] core/periphery model. This procedure was developed to detect a core and periphery structure in network data consisting of values representing strengths of relationships among items. Coreness is considered a function of the closeness (either correlation or Euclidean distance) of an element to the center, and in this way is similar to factor analysis where the correlations among a set of variables are assumed to be a function of the correlation of each variable to the latent factor, that is, the strength of the relationship between any two elements depends completely on the extent to which each is associated with the center [Borgatti and Everett 1999]. Borgatti and his colleagues developed an algorithm for detecting a core and periphery structure and developed the computer package UCINET, which estimates the coreness value of each element and classifies

elements into the core or the periphery.[2] We used the co-occurrence matrix as the data matrix for this part of the analysis.

**Table 2A. Inter-Attribute Similarity (IAS) Matrix (Part 1)**

| | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 | T11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **T1** | 1.000 | 0.155 | 0.145 | 0.022 | 0.042 | 0.078 | 0.203 | 0.117 | 0.016 | 0.016 | 0.019 |
| **T2** | 0.155 | 1.000 | 0.106 | 0.000 | 0.000 | 0.125 | 0.085 | 0.063 | 0.023 | 0.022 | 0.000 |
| **T3** | 0.145 | 0.106 | 1.000 | 0.032 | 0.061 | 0.125 | 0.097 | 0.109 | 0.065 | 0.087 | 0.056 |
| **T4** | 0.022 | 0.000 | 0.032 | 1.000 | 0.000 | 0.067 | 0.048 | 0.044 | 0.000 | 0.040 | 0.000 |
| **T5** | 0.042 | 0.000 | 0.061 | 0.000 | 1.000 | 0.056 | 0.044 | 0.042 | 0.037 | 0.036 | 0.063 |
| **T6** | 0.078 | 0.125 | 0.125 | 0.067 | 0.056 | 1.000 | 0.040 | 0.038 | 0.031 | 0.000 | 0.000 |
| **T7** | 0.203 | 0.085 | 0.097 | 0.048 | 0.044 | 0.040 | 1.000 | 0.383 | 0.109 | 0.033 | 0.064 |
| **T8** | 0.117 | 0.063 | 0.109 | 0.044 | 0.042 | 0.038 | 0.383 | 1.000 | 0.164 | 0.102 | 0.128 |
| **T9** | 0.016 | 0.023 | 0.065 | 0.000 | 0.037 | 0.031 | 0.109 | 0.164 | 1.000 | 0.075 | 0.000 |
| **T10** | 0.016 | 0.022 | 0.087 | 0.040 | 0.036 | 0.000 | 0.033 | 0.102 | 0.075 | 1.000 | 0.185 |
| **T11** | 0.019 | 0.000 | 0.056 | 0.000 | 0.063 | 0.000 | 0.064 | 0.128 | 0.000 | 0.185 | 1.000 |
| **T12** | 0.050 | 0.066 | 0.078 | 0.047 | 0.021 | 0.082 | 0.125 | 0.091 | 0.088 | 0.050 | 0.020 |
| **T13** | 0.053 | 0.000 | 0.023 | 0.000 | 0.000 | 0.036 | 0.056 | 0.017 | 0.118 | 0.054 | 0.000 |
| **T14** | 0.103 | 0.125 | 0.089 | 0.000 | 0.077 | 0.100 | 0.109 | 0.085 | 0.105 | 0.024 | 0.033 |
| **T15** | 0.028 | 0.102 | 0.074 | 0.000 | 0.057 | 0.050 | 0.167 | 0.090 | 0.041 | 0.061 | 0.000 |
| **T16** | 0.035 | 0.000 | 0.023 | 0.000 | 0.045 | 0.037 | 0.000 | 0.017 | 0.057 | 0.027 | 0.000 |
| **T17** | 0.062 | 0.020 | 0.059 | 0.071 | 0.000 | 0.000 | 0.031 | 0.015 | 0.000 | 0.091 | 0.000 |
| **T18** | 0.111 | 0.000 | 0.071 | 0.000 | 0.091 | 0.000 | 0.018 | 0.132 | 0.086 | 0.054 | 0.038 |
| **T19** | 0.042 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.022 | 0.087 | 0.037 | 0.036 | 0.063 |
| **T20** | 0.022 | 0.037 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.042 | 0.083 | 0.000 |
| **T21** | 0.063 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.091 | 0.063 | 0.000 | 0.071 | 0.000 |
| **T22** | 0.065 | 0.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.022 | 0.021 | 0.000 | 0.000 | 0.000 |

**Table 2B. Inter-Attribute Similarity (IAS) Matrix (Part 2)**

| | T12 | T13 | T14 | T15 | T16 | T17 | T18 | T19 | T20 | T21 | T22 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **T1** | 0.050 | 0.053 | 0.103 | 0.028 | 0.035 | 0.062 | 0.111 | 0.042 | 0.022 | 0.063 | 0.065 |
| **T2** | 0.066 | 0.000 | 0.125 | 0.102 | 0.000 | 0.020 | 0.000 | 0.000 | 0.037 | 0.000 | 0.200 |
| **T3** | 0.078 | 0.023 | 0.089 | 0.074 | 0.023 | 0.059 | 0.071 | 0.000 | 0.000 | 0.000 | 0.000 |
| **T4** | 0.047 | 0.000 | 0.000 | 0.000 | 0.000 | 0.071 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **T5** | 0.021 | 0.000 | 0.077 | 0.057 | 0.045 | 0.000 | 0.091 | 0.000 | 0.000 | 0.000 | 0.000 |
| **T6** | 0.082 | 0.036 | 0.100 | 0.050 | 0.037 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **T7** | 0.125 | 0.056 | 0.109 | 0.167 | 0.000 | 0.031 | 0.018 | 0.022 | 0.000 | 0.091 | 0.022 |
| **T8** | 0.091 | 0.017 | 0.085 | 0.090 | 0.017 | 0.015 | 0.132 | 0.087 | 0.000 | 0.063 | 0.021 |
| **T9** | 0.088 | 0.118 | 0.105 | 0.041 | 0.057 | 0.000 | 0.086 | 0.037 | 0.042 | 0.000 | 0.000 |
| **T10** | 0.050 | 0.054 | 0.024 | 0.061 | 0.027 | 0.091 | 0.054 | 0.036 | 0.083 | 0.071 | 0.000 |
| **T11** | 0.020 | 0.000 | 0.033 | 0.000 | 0.000 | 0.000 | 0.038 | 0.063 | 0.000 | 0.000 | 0.000 |
| **T12** | 1.000 | 0.137 | 0.107 | 0.224 | 0.188 | 0.175 | 0.036 | 0.021 | 0.023 | 0.000 | 0.022 |
| **T13** | 0.137 | 1.000 | 0.027 | 0.068 | 0.065 | 0.075 | 0.030 | 0.000 | 0.000 | 0.042 | 0.000 |
| **T14** | 0.107 | 0.027 | 1.000 | 0.085 | 0.057 | 0.093 | 0.027 | 0.000 | 0.000 | 0.000 | 0.080 |
| **T15** | 0.224 | 0.068 | 0.085 | 1.000 | 0.095 | 0.143 | 0.044 | 0.000 | 0.030 | 0.118 | 0.059 |
| **T16** | 0.188 | 0.065 | 0.057 | 0.095 | 1.000 | 0.167 | 0.065 | 0.000 | 0.000 | 0.000 | 0.000 |
| **T17** | 0.175 | 0.075 | 0.093 | 0.143 | 0.167 | 1.000 | 0.024 | 0.000 | 0.000 | 0.030 | 0.032 |
| **T18** | 0.036 | 0.030 | 0.027 | 0.044 | 0.065 | 0.024 | 1.000 | 0.143 | 0.000 | 0.042 | 0.000 |
| **T19** | 0.021 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.143 | 1.000 | 0.000 | 0.000 | 0.000 |
| **T20** | 0.023 | 0.000 | 0.000 | 0.030 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.111 |
| **T21** | 0.000 | 0.042 | 0.000 | 0.118 | 0.000 | 0.030 | 0.042 | 0.000 | 0.000 | 1.000 | 0.000 |
| **T22** | 0.022 | 0.000 | 0.080 | 0.059 | 0.000 | 0.032 | 0.000 | 0.000 | 0.111 | 0.000 | 1.000 |

[2] We used statistical software UCINET 6.0 in order to generate coreness and the membership of elements (i.e., core or periphery). In the core-periphery analysis of UCINET 6.0, the program creates the pattern matrix which is defined as $\delta_{ij} = c_i c_j$, where $c$ is a vector specifying the degree of coreness of each node. The program finds a set of $c$ values so that the matrix correlation between the pattern matrix and the data matrix is maximized, and classifies elements into core or periphery based on the pattern matrix chosen. The following website can be consulted for details of UCINET 6.0: http://www.analytictech.com/ucinet/ucinet.htm (current February 1, 2009).



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Sum of similarity, salience and coreness of each topic are shown in Table 3. UCINET 6.0 was used to assess the membership of topics based on coreness. On the basis of the coreness measure, 5 topics were classified into the core of the social representation and the remaining 17 into the periphery. In order to simultaneously consider all three parameters (i.e., salience, sum of similarity and coreness), we conducted a hierarchical cluster analysis using the parameter values of the topics. Using the standardized parameter values of topics, the results were exactly same as the membership results generated by UCINET 6.0.

### Step 4. Correspondence Analysis: Placing Elements on a Perceptual Space

For the final step in the analysis, we used correspondence analysis to place topics on a perceptual space. Correspondence analysis is a "compositional approach to perceptual mapping that is based on categories of a contingency table" [Hair et al. 2006, p. 630]. The purpose of this step is to aid in the interpretation of the social representation [Hammond 1993]. Because this technique visually elucidates the perceptual positions of the elements of a social representation, it is frequently used in studies of social representations [Doise et al. 1993], especially in conjunction with the word association technique [Mannetti and Tanucci 1993; Lorenzi-Cioldi 1996]. The closer two elements are in a perceptual space, the more they are associated in the representation of an object. In determining the number of dimensions of a perceptual space, researchers need to consider both the increased explanation and the augmented complexity of adding additional dimensions [Hair et al. 2006]. Because there was a large difference in the increased explanation between the second dimension and the third dimension (see Table 4) and we placed emphasis on a clear explanation of the perceptual map, the two dimensional solution was accepted. The two-dimensional perceptual map accounts for 32.4 percent of the variance. This is a high value compared to prior social representation research studies using a similar methodology (e.g., 15.1 percent in Lorenzi-Cioldi [1996]).

**Table 3. Core and Periphery Membership (Emergent): EHR Social Representation Elements**

| Topic # | Topic | Sum of Similarity | Salience (Weighted frequency) | Coreness | **Membership** |
|---|---|---|---|---|---|
| **8** | **Easy/convenient** | **2.81** | **13.08** | **0.449** | |
| **7** | **Accessible/available** | **2.75** | **11.43** | **0.481** | |
| **12** | **Technology** | **2.65** | **12.67** | **0.320** | **CORE** |
| **15** | **Records/files** | **2.54** | **12.13** | **0.274** | |
| **1** | **Privacy** | **2.45** | **17.51** | **0.319** | |
| 14 | Information/history | 2.33 | 4.78 | 0.206 | |
| 3 | Security/hackers | 2.30 | 9.59 | 0.234 | |
| 10 | Efficient/organized | 2.15 | 7.10 | 0.134 | |
| 2 | Unauthorized access/identity theft/misuse | 2.13 | 9.94 | 0.184 | |
| 17 | Doctors/hospitals/treatments | 2.09 | 7.84 | 0.159 | |
| 9 | Quick/saves time | 2.09 | 7.58 | 0.180 | |
| 18 | Helpful/valuable | 2.01 | 5.86 | 0.130 | |
| 16 | Health/saves lives | 1.88 | 5.73 | 0.107 | |
| 6 | Risky/dangerous | 1.86 | 2.80 | 0.107 | PERIPHERY |
| 13 | Future/progress | 1.80 | 5.06 | 0.115 | |
| 11 | Accuracy/currency | 1.67 | 3.47 | 0.087 | |
| 5 | Reliability | 1.67 | 2.86 | 0.070 | |
| 22 | Insurers/employers | 1.61 | 1.19 | 0.058 | |
| 21 | Universal/widespread | 1.52 | 2.28 | 0.082 | |
| 19 | Important/smart | 1.45 | 1.65 | 0.055 | |
| 4 | Failure/crash | 1.37 | 1.00 | 0.049 | |
| 20 | Cost | 1.35 | 0.79 | 0.022 | |

The visual results of our correspondence analysis shown in Figure 1 are analogous to the findings of the similarity analysis. The correspondence map, however, can provide additional insights via examination of the dimensions shown in the map. In the demonstration study, for example, interpreting the map in terms of the extracted dimensions, it appears that the Dimension I opposes *the negative aspects of EHRs*, composed of T22 (Insurers/employers), T2 (Unauthorized access/identity theft/misuse), T20 (Cost) and T6 (Risky/dangerous) to *the positive aspects of EHRs*, composed of T16 (Health/saves lives), T13 (Future/progress), T19 (Important/smart) and T10 (Efficient/organized); and the Dimension II represents *the value of EHRs*, consisting of T19 (Important/smart), T11 (Accuracy/currency), T18 (Helpful/valuable) and T8 (Easy/convenient) opposite to *the operating components of*

*EHRs*, consisting of T17 (Doctors/hospitals/treatments), T12 (Technology), T15 (Records/files) and T22 (Insurers/employers).[3]

**Table 4. Correspondence Analysis Results**

| Dimension | Singular Value | Principal Inertia | Percentage Explained | Cumulative Percentage |
|---|---|---|---|---|
| 1 | 0.54 | 0.29 | 17.14 | 17.14 |
| 2 | 0.51 | 0.26 | 15.29 | 32.43 |
| 3 | 0.39 | 0.15 | 9.11 | 41.55 |
| 4 | 0.38 | 0.14 | 8.46 | 50.00 |
| 5 | 0.37 | 0.14 | 8.08 | 58.09 |
| 6 | 0.33 | 0.11 | 6.55 | 64.64 |
| 7 | 0.31 | 0.10 | 5.90 | 70.54 |
| 8 | 0.28 | 0.08 | 4.72 | 75.26 |
| 9 | 0.27 | 0.07 | 4.45 | 79.71 |
| 10 | 0.26 | 0.07 | 3.94 | 83.65 |
| 11 | 0.23 | 0.05 | 3.21 | 86.86 |
| 12 | 0.23 | 0.05 | 3.14 | 90.01 |
| 13 | 0.19 | 0.04 | 2.11 | 92.12 |
| 14 | 0.18 | 0.03 | 1.93 | 94.05 |
| 15 | 0.17 | 0.03 | 1.67 | 95.72 |
| 16 | 0.15 | 0.02 | 1.36 | 97.09 |
| 17 | 0.15 | 0.02 | 1.27 | 98.35 |
| 18 | 0.14 | 0.02 | 1.13 | 99.48 |
| 19 | 0.09 | 0.01 | 0.52 | 100.00 |

Note that Figure 1 is generated to show visually the linkages between various concepts and the degree to which each element is close to the others in a perceptual space. In the figure, the membership of elements (i.e., core and periphery) is derived from core-periphery analysis of the prior stage. Each of these steps in the analysis provides an alternate and complementary focus for interpretation of the social representation. Core/periphery analysis aids in identifying those elements that are more stable in the representation and those that are more malleable; correspondence analysis can highlight how all elements are perceptually organized in a visual context.

Methods other than the one illustrated can also be used to general a visual displays of the core/periphery membership and linkages among concepts in a social representation. One alternative is the method used by Nicolini [1999] and Pawlowski et al. [2007] to construct a different style of social representations "map.". Using this method, concepts are shown as nodes on the map, with size of the node based on the frequency of occurrence of the concept in the set of data sources (larger nodes for higher frequency). Links between nodes show the relationships between elements, with different line styles used to indicate the strength of the similarity or co-occurrence. Significant relationships among the elements of the representation are identified by constructing the 'maximum tree' of the system based on pair-wise similarity indexes [Flament 1986]. Flament's maximum tree seeks to single out those relationships among the elements that maximize the overall similarity within the representation. One of the advantages of this style of map compared to a correspondence map is that the frequency and relationship information are displayed in a way that may be more intuitive for subjects to understand. This can be helpful in soliciting feedback on the results from subjects or presenting the findings to practitioners. One disadvantage is that the final construction of the map is not automated but must be "hand drawn.". Also, the map does not contain the dimensionality view of correspondence maps that may be valuable in interpretation.

[3] Although T16 (Health/saves lives) and T13 (Future/progress) can represent the value of an EHR, the both topics are located in the area of the operating components. A plausible explanation is that both are bound to T12 (Technology).



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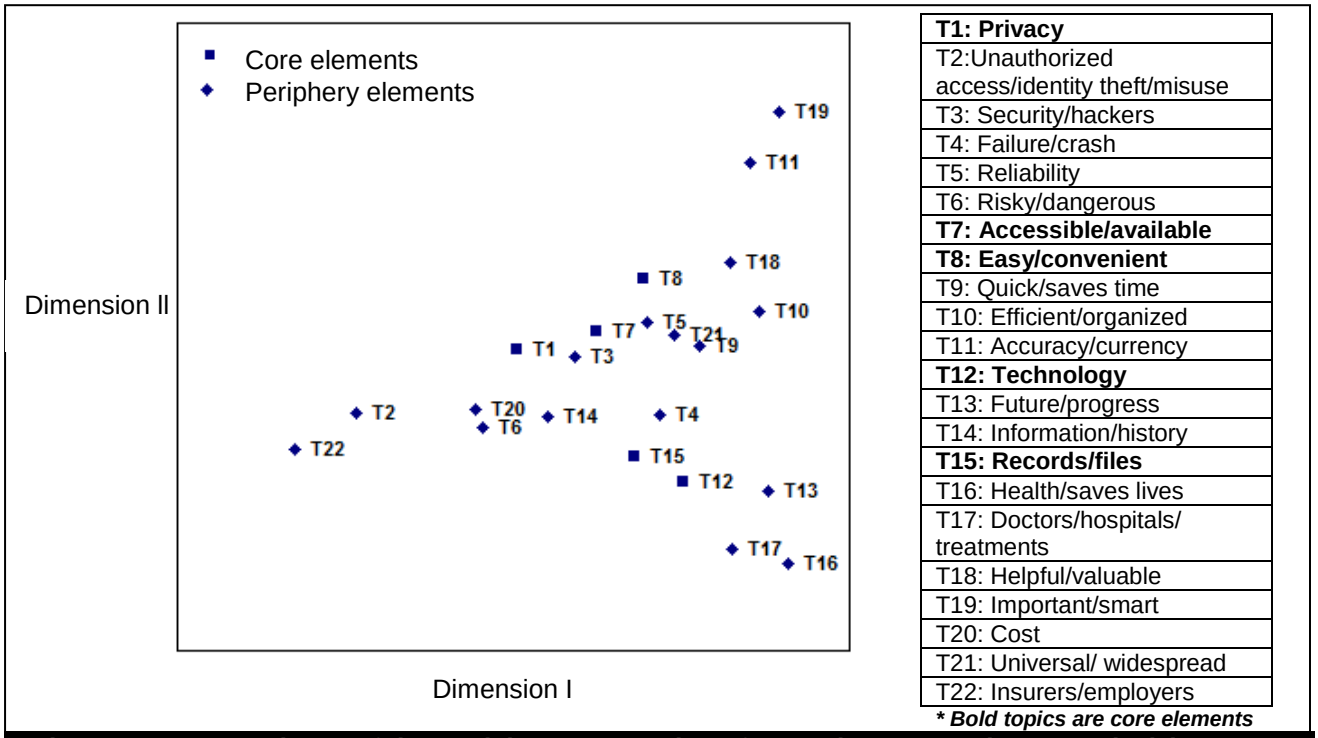


| |
|---|
| **T1: Privacy** |
| T2:Unauthorized access/identity theft/misuse |
| T3: Security/hackers |
| T4: Failure/crash |
| T5: Reliability |
| T6: Risky/dangerous |
| **T7: Accessible/available** |
| **T8: Easy/convenient** |
| T9: Quick/saves time |
| T10: Efficient/organized |
| T11: Accuracy/currency |
| **T12: Technology** |
| T13: Future/progress |
| T14: Information/history |
| **T15: Records/files** |
| T16: Health/saves lives |
| T17: Doctors/hospitals/ treatments |
| T18: Helpful/valuable |
| T19: Important/smart |
| T20: Cost |
| T21: Universal/ widespread |
| T22: Insurers/employers |

**** Bold topics are core elements***

**Figure 1. Perceptual Map of the Social Representation of EHRs (Correspondence Analysis)**

## Step 5. Interpretation of the Social Representation

In this section, we show how the results of the analyses described above can be interpreted using the framework of social representations theory. To recap, 22 concepts formed the social representation of EHRs, and we found preliminary evidence of five elements currently in the core. Correspondence analysis identified two dimensions in the organization of the elements (value/operating components; positive/negative aspects). In addition to identifying important elements of the socially shared cognitive structure related specifically to electronic health records, the results also suggest certain patterns concerning the interpretation of new technologies in cases where public discourse and exposure to the technology has been limited. For this level of interpretation, we draw upon different aspects of social representations theory as described in the remainder of this section.

A first observation is the large number and diversity of the concepts that form the emergent representation. As a conceptual space, the 22 concepts can be characterized more as a collection of varied topics rather than an integrated set of ideas. This may be due to the early stage of sense-making. A type of "brainstorming" effect may be occurring as people attempt to connect, or anchor, the new object to any relevant elements in their existing social world where they see a possible linkage. There is also wide assortment in the types of elements, including descriptive (T15 Records/files), normative (e.g., T19 Helpful/valuable), risks (T4 Failure/crash) and benefits (T8 Easy/convenient). Prior studies have also found the co-existence of normative and functional beliefs in the same representational space [Moloney et al. 2005], and the current study demonstrates that both may be present in the early formation of the representation.

One of the things we found most striking about the social representation of EHRs was the generic quality of a majority of the concepts. With the exception of two elements (T16 Health/saves lives and T17 Doctors/hospitals/ treatments), neither of which are located in the core, this could be a representation of any number of information technologies involving the storage/access of personal information. Consistent with social representations theory, it appears that the participants in the study are coping with an unfamiliar technology by anchoring it in the characteristics, benefits and risks of familiar technologies (e.g., the Internet, other database applications that contain personal information). At this early stage, understandings of EHRs appear to be strongly rooted in beliefs associated with known technologies. Studying this initial stage of anchoring can show which representational elements are seen to be most relevant to the newer technology and can also be a seed for follow-on research which attempts to trace change of the social representations of EHRs by this social group [Wagner and Hayes 2005].

While anchoring sets things in a familiar context, as Moscovici [1984] cautions, a social representation also "fosters ready-made opinions and usually leads to over-hasty decisions" (p. 33). By grounding the social representation of EHRs in beliefs concerning other technologies, important aspects of EHRs may be missed or minimized. For

example, the concept of unauthorized access and identity theft (T2) was mentioned four times as often by the subjects than comments concerning possible misuse by insurers/employers (T22). The problems of identity theft are well known by the public; however, the greater risk of EHRs may be discrimination in hiring, firing, and promotion by employers or inappropriate denial of benefits by insurers. Anchoring has the potential to focus the public on the most salient issues (benefits as well as risks) related to familiar technologies and not the current technology, at least in the early stages of sense-making. More informed decisions, at a societal and individual level, related to complex information technologies, requires a deeper, more informed level of sense-making by the public. The way that social representations become "particularized and uprooted" from the initial categories they are associated with is dependent upon social discourse [Billig 1988], reinforcing the importance of public dialog on new information technologies.

Electronic health records is a "behind the scenes" technology, not readily observable by the public. Similarly, much of the discourse on EHRs is also taking place behind the scenes, in conversations among experts, not in public forums. The "generic" representation of EHRs in this study stands in stark contrast to the topics raised in the discourse on EHRs taking place within other communities of interest. For example, in a set of short articles on EHRs in *Medical Student JAMA* (available at http://jama.ama-assn.org/cgi/content/full/285/13/1764 (current February 1, 2009)) topics stressed include the legal, ethical and technical challenges; the importance of being able to access medical charts electronically in emergency situations; the benefits of error checking functionality along with the question of whether physicians will rely too heavily on the safety nets of automatic warning systems; and the need for debate concerning the use of patient data for research and public health management and the right of the individual to control personal privacy of the medical record. Clearly, a very different type of discourse is presently shaping the social representation of EHRs within this and other "expert" communities, and we would expect that discourse to generate a very different social representation than the one surfaced in the current study. In this case, public exposure to elements of that discourse is necessary for people to make informed, not hasty, decisions concerning EHRs.

The study findings have provided insights into early sense-making by one segment of the public of EHRs and highlighted the importance of public dialog on emerging and new technologies. In the vein of Kurt Lewin's [1948] observation that began this paper, reality for members of an information society is determined by what is socially accepted about information technologies. Public discourse is critical in shaping that reality. One is struck by a sense of ambivalence towards EHRs in the social representation captured in this study. Core elements include appreciation for accessibility and convenience, coupled with concerns about security and privacy. It appears that the public jury, at least from the perspective of undergraduate university students, may still be out on the question of electronic health records. Given the potential social impacts of the technology in terms of the healthcare system and protection of personal information, broader public policy discourse on EHRs is vital.

## VI. CONCLUDING COMMENTS

We have presented a detailed example of a methodology that can be used to elicit and analyze social representations using free word association, similarity, core/periphery and correspondence analysis. We have also shown how the output from this approach yields a structural view of a social representation that depicts the knowledge structures shared by a social collectivity about objects in their social world. In this section we conclude the paper with some observations about factors that are important to keep in mind when considering the use of this methodology.

As always, the primary consideration in choice of research strategy and methodology is the purpose of the research. In the early stages of investigation into a phenomenon using social representations as a theoretical framework, qualitative research strategies and methods such as ethnography, participant observation, in-depth interviews, etc., as seen in the social representation studies by Vaast and Walsham [2005] and Vaast [2007], can be the best means for researchers to gain a rich, nuanced view and understanding of the content of sense-making by the members of a social collective as well as important aspects of the context that provide the background for the sense-making process. Building upon those understandings, methods such as the one demonstrated in this paper and the social representations mapping method used in Pawlowski et al. [2007] can provide a systematic way to surface specific elements of the representation, understand their relative importance and relationships and to compare representations across different groups and/or changes over time.[4]

[4] Our method is in a continuum with Pawlowski et al. [2007] in a sense that both approaches are designed to clarify the core-periphery structure of social representations. However, we have advanced their method by elaborating a way to determine membership of elements and adopted a perceptual map generated by a statistical technique. Pawlowski et al. [2007] depend mainly on associative value (i.e., coreness) of elements to classify them into core and periphery. We used both expressive value

Another advantage of the method illustrated in this paper for social cognition studies is the relative ease and efficiency of the data collection. It is typically much less arduous for researchers and participants to elicit meanings through free-word association compared to other methods commonly used such as in-depth interviews, cognitive mapping and the repertory grid technique. In addition, the ability to solicit participants and collect data through an on-line survey, as we did in the EHR study, can increase the "range and reach" of the study in terms of the participants that can be included. Another advantage is that the subjects' responses are expressions of thought that are immediate and spontaneous, thus reducing self-conscious editing. On the other hand, a concern with this mode of data collection is that free-word association responses may not provide the level of richness and nuanced understandings possible via other methods such as in-depth interviews. For some studies it may be important to conduct a limited number of interviews or focus group sessions as a follow-on step in the research, asking subjects to review, critique and add to critique the researchers' interpretation of the social representation.

Based on our experiences with the EHR study, we also believe there are advantages of the methodology that stem from the active collaboration of the researchers who are involved in the coding/recoding/reconciliation process. In some studies involving content analysis it may only be feasible to recode a sample of the data. In our study, however, it was possible to recode the entire data set of 190 responses. As a result, both of the researchers involved in the coding process became intimately familiar with the data and this facilitated their joint interpretation of the results. In addition, we found that the process led to a high level of inter-coder reliability, which made it feasible to discuss and reconcile all discrepancies, thus contributing to the level of rigor of the study.

For social cognition research in IS, we believe the approach can be particularly useful as a means to expand beyond strictly qualitative approaches. There are three important streams of socio-cognitive research in IS where the use of qualitative/quantitative approaches can facilitate the next step in exploring certain research questions, to increase the pace of theory development or to provide a new perspective: technological frames [Orlikowski and Gash 1994]; social construction of technology [Pinch and Bijker 1987]; and organizing visions for IT innovations [Swanson and Ramiller 1997]. Theoretical work in each of these areas could benefit from social representations theory and methods such as we have detailed in this paper. The chief advantage is that the method enables the *systematic* identification, measurement and comparison of representations across collectives/cultures, or subgroups of a collective, and/or over time. For technology frames research, for example, the methodology presented in this paper can be used to measure and compare frames at the group levels and more precisely measure frame incongruence, as called for by Davidson and Pai [2004]. The identification of central core elements can also aid in the discovery of the values and norms associated with the group espousing the representation [Abric 1994]. Furthermore, the structural view provided by the method can be a valuable tool for longitudinal studies designed to identify changes in the composition and structure of a representation. For example, changes in peripheral elements over time can potentially be associated with specific events or changing contexts, and changes in core elements can provide an indicator of more fundamental shifts in sense-making about an IT innovation. The ability to capture changes in sense-making over time at this level of specificity would be particularly useful in SCOT research and the analysis of technology developmental processes by which a technological system develops over time. In a similar way, these types of comparisons could lead to new insights into organizing visions for IT innovations by uncovering relationships between the actions of institutional entrepreneurs and specific changes in discourse and sense-making among the focal community surrounding an IT innovation.

In addition to aiding the development of socio-cognitive theories in IS, social representations could provide an alternative to current theory, rather than a supplementary theoretical framework. Gal and Berente [2008], for example, have advocated the use of a social representations approach as an alternative to a technological frames framework for the study of socio-cognitive processes in IS implementation. Their proposal addresses concerns voiced by Boland [2001] about the use of concepts such as frames and schemas. Boland argues that these concepts impose a spatial conceptualization of shared sense-making that can cause researchers "to lose sight of the temporal experience of meaning making" (p. 20) and overlook the broader organizational and social processes that influence their formation. "A key question is: can we develop more temporal methods for representing and analyzing organizational phenomena? This suggests the need to design techniques of representation and vocabularies for analysis that, like narratives appreciate experience as it unfolds, that are sensitive to rhythm, tempo and construction in the flow of becoming." [Boland, 2001, p. 20]

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(weighted frequency) and associative value (similarity and coreness) as input data for hierarchical cluster analysis which classifies memberships of elements. In addition, Pawlowski et al. [2007] employ a maximum tree to illustrate visual relationships among elements. A maximum tree does not reflect perceptual positions of elements in a figure, however our map produced by correspondence analysis presents actual perceptual positions of elements. Another advantage is that, correspondence analysis requires less labor in generating a perceptual map than a maximum tree which may need to be built by hand.

Gal and Berente [2008] propose social representations theory and methods as one approach to address this need. They assert that social representations theory provides a more "holistic stance from which to understand processes of meaning making" within a social group (p. 135), and they summarize the main differences between technological frames (TFR) and social representations(SR) as follows: 1) contextual focus: social representation examines the *formation and change* of social knowledge; TFR explains how groups interpret technology; 2) temporality: social representations are an *emergent* property of a system composed of ongoing communication; TFRs may change during an IS project, influencing its trajectory; and 3) level of analysis: social representation focuses on *interpersonal interactions in addition to individual cognition*; TFR focuses on individual cognition by using personal interviews. Gal and Berente [2008] also suggest that social representations theory may be helpful in providing insight into continuing problems with established requirements elicitation practices as well as being useful in understanding how new information systems become meaningful for different group members as they enter an organizational setting.

As a final comment, it is important to point out that the methodology we have presented in this paper is only one of many that are in alignment with social representations theory (see, e.g., Doise et al. 1993). As Philogene and Deaux (2001, p. 4) observe,

> The strength of social representation theory has been its ability to explain sociocultural phenomena by being eminently practical in a Lewinian sense. For this reason the conceptual complexity of the theory has been matched by methodological strategies that often combine a variety of empirical techniques. This rich connection between theory and empirical applications, both quantitative and qualitative, has made social representation theory particularly effective in studying modern society.

We encourage IS researchers to explore social representations theory and the collection of empirical approaches in alignment with the theory as useful additions to their toolkits for socio-cognitive research investigations.

## ACKNOWLEDGMENTS

This work was supported in part by grant NSF Grant Award No. 0426593. We would also thank the anonymous reviewer for their helpful suggestions and comments which were incorporated into the final version of the paper.

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## ABOUT THE AUTHORS

**Yoonhyuk Jung** is a doctoral candidate of Department of Information Systems and Decision Sciences at Louisiana State University. He received a master's degree from Information and Communications University and A bachelor's degree from Sogang University in South Korea. His main research interests are organizational and social meanings of new information technologies in domains of social cyberspaces, mobile technology services, and healthcare. His research appears in *Computers in Human Behavior*, *Proceedings of the Americas Conference on Information Systems (AMCIS)*, and *Proceedings of the Hawaii International Conference on System Sciences (HICSS)*, *Proceedings of the Decision Sciences Institute (DSI) Meeting*.

**Suzanne Pawlowski** is an associate professor at Louisiana State University. She earned her Ph.D. in CIS from Georgia State University and M.B.A. and B.A. degrees from the University of California, Berkeley. Professional experience prior to her academic career includes 20 years in IS as an application developer and manager of application development at Lawrence Livermore National Laboratory. Her primary research interests focus on the relationship between IT and knowledge in organizations, with emphasis on knowledge boundaries, sense-making, and social theories of learning. A second research interest is job-related stress and burnout in IT. Scholarly publications include papers in *MISQ, Information & Management, Database, CAIS, CACM, ACM Computing Surveys* and *IEEE Transactions on Software Engineering*.

**Sonja Wiley-Patton** is an assistant professor at Louisiana State University. Dr. Wiley-Patton is a KPMG Doctoral Fellow and received her Ph.D. in Communications and Information Sciences at the University of Hawaii. Her research interests include the adoption and diffusion of integrated clinical information systems, medical, clinical, and bio-informatics, information technology acceptance and the social impact of information technology diffusion among underrepresented populations and within non-industrialized countries. Dr. Wiley-Patton received the National Science Foundation's 2004 (ITR) Information Technology Resource grant to study the information technology adoption behavior of healthcare professionals.

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