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THCI

Original Research

Representation in Systems Development and Implementation: A Healthcare Enterprise System Implementation

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Abstract

Today's information systems are often large and complex, affecting many people within and beyond the organization. Participation in this context is increasingly challenging because of the complexity of involving all who might be affected by a new information system. As a result, systems of representation, in which individuals are chosen to represent others, are often put in place to manage the participation process.

Research has considered particular challenges of "representative participation" (Mumford, 1983); however, there is little empirical research comprehensively examining these systems of representation. Who participates in these systems, how are they structured and how is this representative work undertaken? Most importantly, what are the impacts of these decisions on the representation systems that are built and on the participation that flows from them?

The purpose of our research is to explore the structuring of systems of representation in IS development and implementation. Building on the work of Land and Hirschheim (1983) and Mumford (1983), and drawing on Habermas' deliberative democracy (1998), this research explores the system of representation employed in a large Electronic Health Record implementation as empirical evidence. Healthcare is a critical context for studying information systems implementation because of its uniqueness and complexity (Chiasson and Davidson, 2004; LeRouge et al., 2007), and therefore serves as an important environment for this research.

Our contributions, drawn from this Electronic Health Record project, include an understanding of three fundamental tasks for developing systems of representation: defining the constituency, selecting representatives, and determining how the representation relationship will be carried out. We demonstrate that systems of representation can be classified by different meanings of "represent." These types – "represent as spokesperson," "represent as example" and "represent as symbol" – differ in the purpose of representation, in who is involved and in how representation is undertaken. Most importantly, these types of systems differ in their participatory potential. The findings highlight the opportunities and challenges inherent in the construction and implementation of systems of representation.

The paper concludes by exploring the implications of these findings for practitioners and researchers, suggesting that representation should be more than simply appointing representatives, and offering mechanisms for participation and influence. We call on researchers to view these systems of representation in more fine-grained ways to better understand what their complexities mean for contemporary system development and implementation.

Keywords: Representation, healthcare, participation, enterprise systems, Habermas, information system implementation

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INTRODUCTION

Participation is a well-studied area in information systems development and implementation. It has attracted significant attention because it is considered important in producing user commitment to a new system, in creating high-quality systems, and in providing users the opportunity to contribute to the systems which affect their working lives (Barki and Hartwick, 1994; Hirschheim and Newman, 1991; Lawrence and Low, 1993; Markus and Mao, 2004; Mumford, 1983; Olson and Ives, 1981). Today, information systems are often large and complex, affecting many people within and beyond the organization. Participation in this modern context is challenging because of the difficulty of involving everyone who may be affected by an information system. To overcome this challenge, the participation process often relies on systems of representation in which select individuals represent others. Despite their importance to successful system development and implementation outcomes (Lawrence and Low, 1993), there is little empirical research examining systems of representation (Markus and Mao, 2004). The general participation literature helps us to understand some elements of participation in a system of representation such as the extent, degree, content and formality of participation (Cavaye, 1995; Mumford, 1983). However, a system of representation poses additional questions that must be considered in their own right.

Some issues surrounding systems of representation have received research interest. Most of this attention has been placed on representatives and how they come to be selected (Damodoran, 1996; Markus and Mao, 2004). Others have considered the ability of representatives to carry out their roles while facing time or knowledge constraints (Davidson, 1999). Others still have considered the contradictory interests of the representative, who is aligned with, yet separated from, both the analyst and the user (Symon, 1998). Damodoran (1996) provides a practical guide to building systems of representation, which gives insight into other important issues such as the roles of representatives and end-users. However, what is missing in this literature is empirical research exploring both the different choices that can be made in structuring representation and the impacts of these choices on creating the conditions necessary for participation to bring about strong user influence and involvement, what we call participatory potential.

The purpose of this paper, therefore, is to explore the structuring of systems of representation in IS development and implementation. In doing so, our research builds on the work of Land and Hirschheim (1983) and Mumford (1983), and draws on theoretical contributions from deliberative democracy (Habermas, 1998; Held, 2006). We explored and assessed the system of representation employed in a large Electronic Health Record implementation in which participation and representation emerged as key issues. Through close examination of this system of representation, we found that "representation" can take different forms - as spokesperson, as example, or as symbol, and that each of these forms is associated with different participatory potential.

The remainder of the paper is structured as follows. First, we review the general literature on participation and then focus on the current understanding of systems of representation. Drawing on the work of Habermas (1998) and the information systems literature, we develop ideal standards to assess a system of representation across three important questions: who should be represented, how representatives should be selected, and how representation should be carried out. We then present our research methods and case, focusing on the choices that structured the system of representation (intentionally or otherwise). We offer our analysis in the Results section, organized according to the three forms of systems of representation that emerged. We conclude by exploring the implications of these results for information systems generally but also within the health care context. Our results suggest that representation should be more than simply putting representatives in place; we discuss mechanisms for user participation and influence through representative democracy.

BACKGROUND

User participation in the information systems development and implementation process has been an important area of study for many years. Participation is defined as the activities and behaviors undertaken by users and/or their representatives during system development and implementation (Barki and Hartwick, 1994). Researchers have posited a link between the involvement of users in the development process and successful outcomes. Specifically, participation is thought to build user commitment to the new system, termed user involvement by Barki and Hartwick (1994), enable stronger information gathering about user needs and wants, and lead to better user-developer relationships (Markus and Mao, 2004). Some have also argued that user participation is a right for those whose work lives are affected by a new information system (Hirschheim and Newman, 1991). Yet, the link between participation and system outcomes is unclear (Howcroft and Wilson, 2003) despite significant research attention (c.f., Allingham and O'Connor, 1992, Barki and Huff, 1990; Choe, 1998; Franz and Robey, 1986; Hartwick and Barki, 1994; He and King, 2008). Markus and Mao (2004) conclude that, while participation is neither a necessary nor sufficient condition for system development success, it supports positive development and implementation outcomes.

Other research has focused on understanding participation in greater depth. As shown in Table 1, participation can be described by its structure, processes and content (Mumford, 1983). Each of these elements has been further explored by researchers, as summarized by Cavaye's (1995) and Markus and Mao's (2004) frameworks of participation.

Table 1: Elements of Participation

Mumford, 1983	Cavaye, 1995	Markus and Mao, 2004
Structure (consultative, representative and consensus)	Type (Proportion of users involved)	
	Degree (Level of responsibility)	
Process (the sets of processes involved – i.e., how learning is supported, goal setting, equalizing power imbalances)	Extent (Phases included in participation)	
	Formality (Formal, informal)	
		Type (Different activities involved – i.e., solution design, change management, project management)
		Methods (Mechanisms through which participants are included – e.g. data flow diagrams, business process mapping, cognitive elaboration techniques)
		Facilitating conditions (Specific conditions which facilitate or constrain participation effectiveness – e.g., location, time and resources)
Content (the nature of the issues included in participation)	Content (Aspects of design included in participation – technical or sociotechnical)	
	Influence (Effect of participation on process - input ignored, contribution considered, input taken seriously)	Richness (extent to which participants experience participation as personally meaningful and consequential)

Critical to an understanding of participation are richness (Markus and Mao, 2004) and influence (Cavaye, 1995), as shown in the last row of Table 1. Both reflect a similar idea – that participation can be more or less meaningful and influential. In this vein, Kirsch and Beath (1996) identify three types of participation: token, shared and compliant. In token participation, participants play only small roles in the overall project; in shared participation, analysts and participants work together; and in compliant participation, participants trust the IS analyst to represent their interests. Researching from the perspective of the analyst rather than the participant, Symon (1998) finds that participation fulfills political and symbolic functions in addition to its role in trying to determine accurate requirements. Together, these works demonstrate that there are different types of participation, which are affected by both the participant and analyst and reflect many decisions about the nature and purpose of participation, such as the relative contribution of knowledge and decision making, coordination mechanisms, and conflict management.

This research comes together into an increasingly complete understanding of participation. Yet, the context in which participation takes place brings new challenges. Today, the information systems that organizations implement are large enterprise systems with effects that are felt within and beyond the organization. When organizations need to engage a broad cross-section of those affected by these large systems, a typical approach to structuring this participation is to employ a system of representation, what Mumford (1983) calls “representative participation.” Representative participation differs from other forms of participation in that it is considered indirect (Mumford, 1983); that is, individuals do not represent their own interests in the participation process but rather rely on others to represent them. Using this structure allows organizations to build participation into a project while avoiding the difficult if not impossible task of involving every person in the design process (Iivari and Iivari, 2011).

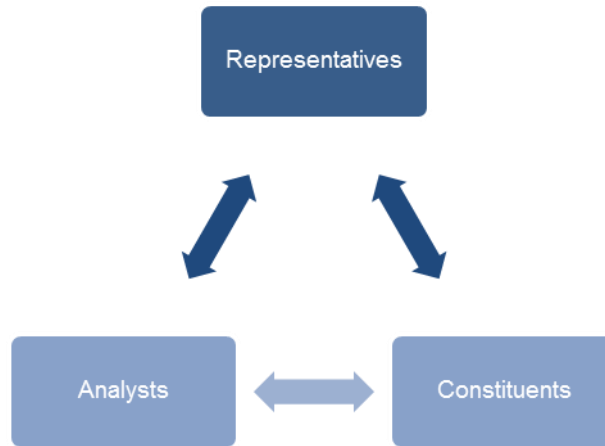


Figure 1: Roles in Representative Participation

This figure demonstrates that, in terms of structure, representative participation differs from direct participation in the addition of the representative role and the relationships between the representatives and the analysts, and the representatives and the constituents.

This structure suggests three main questions about the system of representation. In representative participation, participants are split into constituents and representatives; the first two questions, therefore, relate to who assumes these roles. That is, who should be represented? How should representatives be selected? The third question relates to the relationships among the groups. That is, how should representation be carried out?

Habermas' (1998) deliberative democracy provides a useful theoretical perspective to draw upon in answering these questions. In his work, he offers a strong perspective on the structures and processes necessary for representation to engage all citizens in democracy. These structures and processes can provide guidance to us in understanding how to develop representation within the information systems participation process.

We next consider the literature addressing our questions about representation. In particular, we seek to understand how representation might best be structured by considering principles from Habermas' deliberative democracy (1998) and the existing information systems literature.

Who should be Represented?

An important question in developing a system of representation is the constituencies for the system (Land, 1982; Mumford, 1983). In many ways, this question is similar to the questions asked about participation more broadly – who should be included in participation? Past research has focused on “the user” as the constituent for participation (Beath and Orlikowski, 1994; Markus and Mao, 2004). However, identifying the “user” is problematic. Symon and Clegg (2005) have challenged this simple categorization showing that, in the project they examined, the term “user” was constructed and reconstructed throughout the system development process for political purposes. This in itself makes it difficult to identify who the constituents are for participation. In addition, there is increasing recognition that there are many people affected by systems, in addition to just users (Markus and Mao, 2004; Puri et al., 2009). A system of representation, therefore, needs to make room for this broader set of stakeholders.

In this vein, Mumford (1983) argues that all interests should be represented. However, an important question is whether interests can be known at the start of a system development process. Habermas (1998) challenges the possibility of knowing the interests of others in advance of discussion, a challenge we believe is fundamental to thinking about participation. This challenge is also important in deliberative democracy, a form of democracy which seeks to deepen participation in the political process.

The major contention of deliberative democrats is to bid farewell to any notion of fixed preferences and to replace them with a learning process in and through which people come to terms with the range of issues they need to in order to hold a sound and reasonable political judgement. (Held, 2006, p. 233)

The argument here is that interests are formed through, not in advance of, participation. Participation allows participants to develop understandings of the new system in their specific contexts (Wastell, 1999). It is through this learning process that interests and groups of interests develop. Therefore, identifying interests prior to participation is both impossible and undemocratic in many important ways.

Because participation precedes the identification of interests, representatives cannot be chosen based on a fixed set of interests. Instead, the literature suggests that throughout the systems development process, the focus must be on ensuring the broadest participation of those who might be affected. This raises specific questions and poses challenges for determining how representatives are to be chosen to represent various constituents.

How should Representatives be Chosen?

A second set of questions about systems of representation concerns the representatives themselves. In particular, what characteristics or skills should representatives have (Mumford and Henshall, 1979)? How should they be selected (Land and Hirschheim, 1983; Mumford, 1983)? These questions are inextricably linked with the system of representation that is created. Without due care and consideration to the methods of selection, representatives may be inappropriate and perceived as illegitimate, casting doubt on the entire system of representation and increasing the chances of procedural and system development failure.

Mumford and Henshall (1979) argue that representatives must be viewed as being able to represent their constituency. This sheds light on important characteristics of representatives. First, they must have legitimacy with those they represent. Therefore, the mechanism of selection must confer this legitimacy. Second, they must have characteristics and skills that allow them to be good representatives. Some practitioner-oriented research provides advice on how to select representatives for participation (Nah, Lau and Kuang, 2001): include the best people, make the implementation team cross-functional, mix internal staff with consultants, and include both technical and functional knowledge. Other work has identified the need to choose individuals based upon attributes of their job roles (location, position in hierarchy, specialism) (Damodaran, 1996). These characteristics speak to the knowledge that participants might have but do not cover the skills required to carry out the communication functions that may form representation work.

For choosing representatives, Land (1982) offers several possibilities, including selection:

“by a higher authority such as management; selection by an independent body; the democratic election of representatives from different interest groups; the involvement of all members of interest groups through some kind of voting or other democratic opinion gathering procedure; the hiring of outside experts to represent interest groups in the decision making forum.” (Mumford, 1983).

Each of these selection methods, however, has different implications for the system of representation. For example, Howcroft and Wilson (2003) point out that the process of selecting representatives may be seen as a mechanism for silencing dissent by choosing individuals who agree with the project. Habermas (1998) argues, for systems of representation more broadly, that the selection of representatives should be done by free, equal, and secret elections. This method of selection avoids the problem identified by Howcroft and Wilson by minimizing the influence of power relations in the selection of representatives, thereby affording representatives a greater capability to represent their constituents.

How should Representation be Carried Out?

With representatives in place, what does it mean to represent a constituency in the participation process? What is necessary and required for representing others? In other words, how does an organization construct a system of representation that allows those who do not “sit at the table” to influence the overall project? In the systems of representation they studied, Lawrence and Low (1993) found overall low levels of perceived influence by users who were not directly involved in the project, but also found a correlation between perceived influence and user satisfaction with the new systems. Therefore, it appears that even when participation is representative, ensuring that people perceive their influence in a project remains an important and difficult goal.

In considering the challenges, Land and Hirschheim (1983) point to problems encountered in trying to develop one system of representation. First, people could not identify who their representatives were and were unable to distinguish them from the project team. Second, geographic distribution made communication and coordination difficult. Finally, representatives were unclear about their constituency and didn't feel a sense of responsibility to represent them. These challenges point to the mechanisms needed for developing an effective system of representation – clearly identifying representatives and constituencies so that each is aware of the other and ensuring on-going communication between them.

In the relationship between representative and represented, responsibilities exist for both sides. Representatives must bring expertise to the participation table; they must also keep their constituencies informed of project happenings and solicit feedback and input on decisions. In order to have influence, constituents must remain actively involved in these communications.

Ensuring that indirect participants can participate effectively (that is, provide input to their representative) also means allowing time and space for opinion and will formation (Habermas, 1998). In explaining this Habermasian requirement in the political arena, Rehag (1998) wrote:

As a formation of opinion and will, public discourse is not merely a cognitive exercise but mobilizes reasons and arguments that draw on citizens' interests, values, and identities. Political discourse thus brings in the citizens' actual sources of motivation and volition. It thereby generates a "communicative power" that has a real impact on the formal decision making and action that represent the final institutional expression of political "will." (p. xxviii)

In creating participation in the information systems development process, a public forum to allow the time and space for opinion and will formation would ensure that the various needs, interests and opinions that exist among all interested parties are brought into the open. This would enable interested individuals to challenge others' perspectives and have others challenge their own.

Representation built on this premise most resembles Habermas' requirement of "participation by all affected" by ensuring that participation extends as fully as possible to those not at the table. Without these mechanisms, a system of representation is unlikely to meet this requirement, leaving low levels of perceived participation and influence (Lawrence and Low, 1993), reduced user satisfaction, and, more importantly, users having little influence over the systems that affect their working lives.

Hence, this background literature suggests several ideal standards for building a system of representation, as summarized in Table 2.

Table 2: "Ideal" Standards for Assessing a System of Representation Summary

Question	Standard
Who should be represented (constituents)?	<ul style="list-style-type: none"> • Make room for broad set of stakeholders • Involve all who might be affected • Identify throughout the systems development process
How should representatives be selected?	<ul style="list-style-type: none"> • Ensure representatives' skills and characteristics convey legitimacy to constituents • Ensure method of selection confers legitimacy • Selection through free, equal and perhaps secret elections if possible
How should representation be carried out?	<ul style="list-style-type: none"> • Representatives know their constituents • Constituents know their representatives • Representatives keep constituencies informed and seek out feedback and input • Constituents have methods of communication to remain actively involved • Creation of public forum to allow opinion and will formation

RESEARCH METHOD

We empirically explored the structuring of a system of representation in IS development and implementation. To do this, we used a critical ethnographic method to follow the process of implementing a large enterprise system from post-selection to "go-live" in a healthcare setting. The healthcare environment has been shown to be an important setting for information systems research because of its complexity and uniqueness (Chiasson and Davidson, 2004; LeRouge et al., 2007). It is a particularly relevant context for research related to participation because of the strong focus in healthcare implementations on clinician and physician engagement (Bernstein et al., 2007; Cohn et al., 2009; Hopkins, 2005).

Myers and Young (1997) have established the importance of critical ethnography in information systems research. Typical of ethnographic research, the main source of data for this research was participant observation. The lead author observed and participated in project meetings for approximately thirteen months, and conducted nineteen interviews with requirements process participants and one interview with a non-participant end user. Data collection also included observation of the project team in its work environment, observation of clinical processes and document collection through the organization's intranet and Internet sites.

All observation and interview data were transcribed and entered into NVivo, a qualitative research software package, by the lead author or a research assistant. A summary of the data collected in this research can be found in Table 3 and illustrates the data labeling technique to be used for the remainder of this report.

Table 3: Data Collection Summary

Data Type	Number of Data Items	Report Reference
Journal	124 Observation Events, representing approximate 220 hours of observation from November 2003 to February 2005	Journal YYYYMMDD Mtg X; ¹ <paragraph reference>
Interviews	20	Interview X
Documents	169	Document <name of document>
E-mails	367	Document <name of document>

Data analysis in qualitative research is the process of “bringing order, structure, and meaning to the mass of collected data” (Marshall and Rossman, 1995, p. 111). In our analysis of the data, which included three full passes through the notes and transcripts, we focused on the system of representation and considered the questions described in the Background Section – who were the representatives (and how were they chosen), who was the broader population being represented, and how was representation carried out. We considered what constrained or supported the systems of representation in this case.

RESEARCH CASE

The case involved the Regional Health Authority² (RHA) as it went through the process of implementing the Integrated Patient Information System (IPIS). The IPIS project, part of a larger Electronic Health Record (EHR) project, followed an implementation method suggested by the vendor, which included system configuration, testing, and a pilot implementation within a single unit, followed by rollout to a single hospital, before a rollout throughout the health authority. A high-level project timeline is provided in Figure 2.

In describing the case, we first provide a brief description of the organization and then the project objectives. We explain in detail the system of representation that was put in place in order to gather input from clinicians and non-clinicians during the configuration process of the enterprise system. We end the description of the case by summarizing the project outcomes.

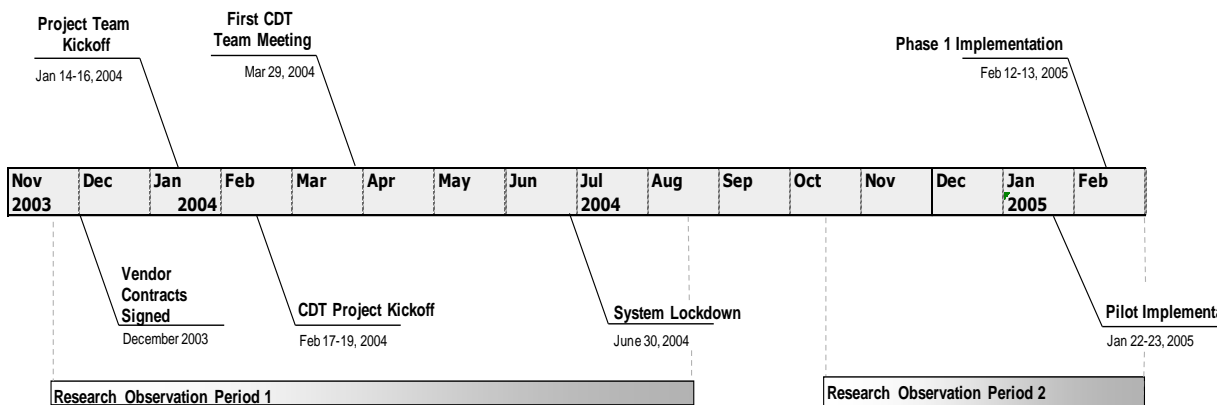


Figure 2: High-Level Project Timeline

Regional Health Authority (RHA)

The RHA provided hospital and healthcare services in a city located in a Canadian province, which we will call “The City.” In 1994, the provincial government undertook a program of widespread healthcare system reform. One major initiative was to replace over 200 separate boards of hospitals, health units and other health service institutions with just 17 health regions and 2 province-wide authorities (Casebeer and Hannah, 1998). In The City, this led to the formation of the Regional Health Authority, amalgamating a Board of Health with various hospital boards (Document Organization Archives). While the Region was responsible for numerous health centers and hospitals in and around

The City, the focus of this project was on the acute care centers within The City proper, including University Hospital, North Hospital, South Hospital and Children's Hospital.

Project Objectives

The objective of the EHR project was to support the provision of healthcare across the Region through the use of integrated information systems. The EHR sought "to support a critical 'pivot point' in healthcare by contributing to fundamental changes in areas such as chronic disease management, distributed healthcare delivery (primary care, telerriage, diagnostic and treatment centers, self-care, etc.), and improvements in quality of care and service" (Document EHR Strategy 2003, p. 3).

A fundamental part of the EHR project was the Integrated Patient Information System (IPIS) project. This system was composed of two sub-systems: an Admission, Discharge and Transfer (ADT) system and a Clinical Information System (CIS). The ADT system was designed to track patient admissions and discharges from the acute care centers, and to track patient location within and across the centers. The CIS was intended to integrate order entry (entry of requests for laboratory testing, diagnostic imaging, etc.) and patient results into a single information system.

An important objective of the IPIS project was to deal with the lack of integration across functional areas both within and across the hospitals. Typical of many organizations, the Region had grown through mergers, which had produced disjointed and non-integrated systems. There were three different ADT systems across the four acute care centers. The two centers which used the same software had different system instances which could not share information with each other. The existence of several other systems (e.g., diagnostic imaging, laboratory, cardiac care, emergency and operating rooms) made the information system architecture even more complex. Because these systems were largely non-integrated, access to the entire patient record was impossible. The paper chart was the most complete record of the patient, but it suffered from the traditional problems of decreased information timeliness and limited access.

Another major objective of the project was to provide greater information system support to clinical processes. Only two of the centers had any support in this area. Augmenting the existing support in these two centers and bringing it into the other centers was an important goal of the project, supported by clinical research showing that this type of support can reduce medical errors and increase the quality of care provided by physicians (Ash et al., 2003).

Building a System of Representation

Incorporating clinician input into the system was considered critical in order to assure other clinicians that their needs had been identified and addressed. Participation in a preceding project had been widely unsuccessful; almost 15 years after the previous project's implementation, clinicians were still telling stories about the problems that they encountered. The IPIS project initiators identified clinician engagement as a critical success factor after conducting significant research to determine how the new project should be carried out to avoid similar issues.

Physician input was seen as particularly important because of the need to ensure high physician adoption of the system. The success of the system was thought to be critically dependent upon physician adoption because "the physician order drives the business" (Journal 20040324 Mtg 1, Paragraph 24). This meant that assuring physicians that their needs had been built into the system was a key driver of project decisions.

However, the ability to include all participants in this healthcare system implementation process was limited. Including all 22,000 (or more) organizational workers in the project was considered to be impossible because of the time, cost, and complexity involved. At one point early in the project, there was talk of trying to engage the wider RHA community; however, this idea was dismissed because it risked sidestepping the hierarchical structures through which decisions were normally taken (Journal 20040115 Mtg 1). As a result, the Region recognized that they needed a system of representation to obtain input.

This system of representation was built around a group called the Clinical Design Team (CDT). The CDT was envisioned as a multidisciplinary committee at the heart of the requirements process. The team's role was to provide input into design decisions and provide project oversight and approval on behalf of clinicians. Most of the decisions about whom to involve in the Clinical Information System project were made by a group of three individuals on the unofficial Clinician Engagement Team (CET). Dr. John Smith, a physician and head of the Clinical Informatics group, assumed the lead role within this group and was responsible for the selection of physicians to participate in the project. Dorothy Robertson, previously a practicing nurse but now part of the Clinical Informatics group, was responsible for the selection process related to nursing and allied health (Journal 20040115). A third individual, Jane Roderick, was a consultant hired by the Clinical Informatics group to provide expertise in the Clinical Information System implementation. These three individuals were largely responsible for the decisions about who was to be on the CDT.

The CET considered their challenge to be putting together a CDT that balanced team representation with team size. In trying to achieve this balance, the CET developed criteria that drove their selection of individuals to form the CDT. According to the "Terms of Reference Document version 0.3"³ (p. 2), the team was to ensure representation from the Region's Chief Operating Officer (COO), Chief Medical Officer (CMO), Chief Nursing Officer (CNO) and the Chief Information Officer (CIO) portfolios." Further considerations were:

- "Interdisciplinary – crosses the different disciplinary boundaries to achieve diversity and representation of the various roles in patient care delivery"
- "Across sites – serves the four acute care hospital sites"
- "Across Organizational Hierarchy – representative of the different levels of healthcare providers within the [Regional Health Authority]"
- "Continuity from Current Systems – this team will continue the work of [team name removed] (the committee who advised the maintenance and on-going development of the [previous system]) to ensure continuity of current expertise"
- "Organizational Champions – members have earned credibility in their own positions and are influential and sought opinion leaders"
- "Across major clinical programs – although not possible to incorporate representation from all of the clinical programs, membership is reflective of the clinical programs with the greatest impact, while at the same time obtaining feedback from the other programmes not represented in a peer review capacity"
- "Committed – although membership is voluntary, the expectations of an effective team functioning is collaboration and completion of deliverables through an investment of the members' intellectual capital"⁴

In addition to these documented criteria, other considerations came into play – namely, whether or not someone was known to the CET and whether or not they had participated on the product selection team for the CIS software. In some cases, a specific individual meeting these criteria was directly selected by the CET. In other cases, or if the requested person was unavailable, a request would be made to the person's group to supply another individual. In post-requirements interviews, interviewees reported on how they were approached to participate in the project; about the same number of participants reported that they had been directly approached by the project team as those who reported having been approached by their supervisor or department (7 to 6 respectively). Only two individuals reported that they had approached the project team themselves.

When a departmental manager was approached to provide a staff member for the team, the method they used to select an individual from their group varied. Jane Roderick, citing one of the clinicians from the project team, said that Patient Care Managers (nurse managers for particular hospital units) assign someone to a committee for one of three reasons— for punishment, because it is their turn, or because they are the best person for the job (Journal 20040115). While this was said at least partially tongue-in-cheek, it appears that the individuals comprising the CDT had been assigned to the team for a variety of reasons.

Working Groups

Another important part of structuring participation in this project was the working group. When the project team felt that there would be too many issues within a particular area to resolve through the CDT, a working group was established. Working groups, therefore, had an important role in defining system requirements. The project team would generally begin the selection process for these groups by choosing a clinician leader and a project team lead. For the lab working group, for example, a physician was chosen by the project team as a working group leader because "it was important for physicians to be on board" (Journal 20040412 Mtg 2). Although there were, of course, medical reasons for the inclusion of physicians in leadership roles in the project, it was also hoped that this strategy would make it more likely that other physicians who were not involved in the project would later embrace the system. For all working groups, a project team leader was also assigned. The project team lead was the overall leader of all project team members (generally analysts) who were assigned to support the working group. The project team lead also provided administrative support to the clinician leader and acted as the liaison between the working group and the remainder of the project team.

After a leader was in place, the remainder of the working group was recruited. For some working groups, individuals were asked to volunteer, as was the case for the lab working group (Journal 20040412 Mtg 2). In one CDT meeting, the project team lead for the lab working group demonstrated the software to show the kinds of decisions that the lab working group would need to make. She then asked for volunteers. Individuals volunteered to join the project team, and the project team then decided which of the volunteers to include in the working group.

Sometimes the project team felt that particular knowledge was required for a specific working group. If the project team knew someone with the necessary knowledge base, the team would personally invite that individual; if they didn't know of a specific person, they would approach a department that was likely to employ someone with that knowledge and ask for a representative. CDT members were also asked to solicit volunteers who might be particularly suited for one of the working groups. Although we do not have data that show how many working group members were selected in which way, our impression from the post-requirements interviews and from speaking with the project team was that these selection methods were evenly used.

Project Outcomes

Phase 1 of the system implementation took place approximately 51 days behind schedule; part of this delay was the result of a system upgrade that was unexpectedly added to the project. About one year after the go-live date, the implementation at South Hospital was widely considered to be successful. Both project executives and key informants confirmed this view. There were several reasons given for this perceived success: the system had proven useful to clinical providers because patient information was available across units and at any time; the implementation had gone well technically; the system was being used by many people; there had been minimal resistance to the system; and South Hospital workers, who lacked information technology support in the past, appeared happy to finally have IT support.

Post-implementation interviews, however, revealed that while physicians were using the system to obtain information, they were not entering patient information to any great extent. Allied Health professionals (roughly 25% of clinicians) were using the system only sparingly. These groups had not been expected to be heavy users of Phase 1, but post-implementation informants thought that the groups were using the system even less than expected.

Furthermore, the specific needs of some groups who were required to use the system – like nurses (approximately 50% of clinicians) – appeared to have been neglected during the implementation process. As a result, post-implementation interviews suggest that the processes for information entry by nurses were ill-defined. In response, nurses developed their own local methods for using the system in each unit, contravening the design principle of standardization across the units. This had not yet become problematic for nurses⁵, although some issues had begun to arise when patients were transferred across units and previous patient information had been entered differently than expected by the receiving unit. Both post-implementation interviewees independently expressed concern about this lack of information standardization. Different standards for use were considered a patient safety issue because, in a critical situation, the ability to access information quickly and accurately is essential, so standardization of electronic documentation is necessary⁶. Therefore, despite the perceived successes of the project, serious deficits in mutual understanding and coordination of action were evident in system use and coordinated clinical care.

RESULTS

We analyzed the data using the three guiding questions and the ideal standards developed in the Background Literature section (Table 2). As we will demonstrate, it became clear that the observed “representation” did not reflect the ideal standard in which representatives act as full spokespeople for their constituents. This led us to question what “representation” meant in this context if it did not mean “spokesperson.” In summary, three meanings of “representation” emerged: representation as spokesperson, representation as example, and representation as symbol. Each meaning is associated with an archetype for a system of representation, characterized by different relationships among the parties. More importantly, each offers different participatory potential. In this section, we identify and describe each of these meanings and the extent to which they were present in this case.

Represent as Spokesperson

At the outset of the paper, a system of representation consistent with deliberative democratic principles was presented that relied on several structural elements: representatives elected by constituencies which represent all of those affected by the system; structured and frequent communication between representatives and constituencies; and public forums to create the time and space for opinion and will formation amongst all those affected. These elements comprise a system of representation which we call “representation as spokesperson.” Our analysis demonstrates that the requirements for this view of representation were only partially fulfilled, as discussed next.

Who was Represented?

Representatives from various groups were selected to represent constituencies. However, the system of representation that was developed by the CDT was not designed to represent everyone within the healthcare organization (or even all of those who would be affected by the system). The intent was to recruit those who were the

greatest users or would affect many others, even at the risk of further marginalizing those who were already largely excluded (e.g., psychiatry) (Journal 20040115 Mtg 1) . As the requirements process proceeded, it became apparent that several groups had been missed, such as bed control coordinators, hospital chaplains and the dietary department. One nurse commented, "I think the limitation for that [gaining input from stakeholders] is that they handpicked that stakeholder feedback." (Interviewee 10, Paragraph 385). This comment says much about the process and, in particular, that there were important groups and individuals who were not able to influence the CDT because of incomplete and selective representation.

The system of representation was intended to be representative across several predefined characteristics: discipline, site, organizational hierarchy and clinical program. However, there were challenges to representation across each of these, making it clear that the "participation by all who are affected" principle was not met in this case. As examples of these challenges, we discuss representativeness by discipline and organizational hierarchy next.

By discipline: In trying to bring in a variety of representatives from across disciplinary boundaries, defining these boundaries was clearly important. In an early CET meeting, the user groups that were identified as desirable for inclusion were "physicians, nursing and allied health" (Journal 20040115 Mtg 1, Paragraph 7). These dimensions were broadly based on existing views of the organization. In a meeting of the CET early in Phase 1, the three healthcare groups were identified without a discussion of why these were the appropriate groups (Journal 20040115 Mtg 1) ⁷. Because this was early in our observation of the project, it is possible that discussions had taken place before we became involved. However, it is more likely that the three-group categorization was used because it was the default view of clinicians in the organization. If there had been a discussion about appropriate categorizations, we would have expected there to be recognition that the group "Allied Health" was too large and diverse to be considered a single group. There were over 20 distinct professions considered to be part of Allied Health, each with different concerns (Interview 9, paragraph 53). Condensing all of these groups within one "Allied Health" group masked important differences and marginalized sub-group and individual views.

Representation along healthcare disciplinary lines was also subject to other concerns. In post-project interviews, interviewees were mixed on the question of how representative the team was of even these predefined disciplines. One physician said:

Allied Health, I thought, was underrepresented and ... certainly you heard almost nothing from Allied Health. This despite the fact that they have a consultant that's supposed to be helping them in developing their presence. (Interview 1, Paragraph 131)

This concern was also shared by Jane Roderick, the consultant member of the CET. She identified a concern early on that the CET was not bringing Allied Health "into the fold well enough" (Journal 20040115 Mtg 1).

After we referred to this physician's comments and asked for an opinion on the representation of Allied Health, one of the Allied Health interviewees commented:

...if you had asked me two weeks ago, I would have said no, we are very well represented but having said that I went over to [North Hospital] to do a demo last week and some of the staff there had not heard much about the program so various parts in our communication chain are breaking down. (Interview 7, Paragraph 205)

The distribution of Clinical Design Team representatives by discipline and site is shown in Table 4.

**Table 4: Distribution of Clinical Design Team Members across Sites
(Adapted from Draft Slides for the March 29/04 CDT meeting)**

Hospital	No. of Physicians	No. of Nurses	No. of Allied Health	Other	Total
University	1	7	1	0	9
North	1	1	1	0	3
South	0	2	1	0	3
Children's	2	1	0	0	3
Multiple sites	8	0	0	1	9
Total	12	11	3	1	27

These figures confirm that representativeness was not achieved across disciplines. If this had been the case, there would have been approximately 3-4 times as many nurse representatives as physician representatives and as many allied health representatives as physicians. This is a strong signal that pre-existing organizational relations of power present in the healthcare context affected representation.

By Organizational Hierarchy: Representation was also sought across the organizational hierarchy. In the clinical world, there are hierarchical structures within and across professional groups. For physicians, an important hierarchical structure is the separation between residents and physicians. Residents and physicians were expected to differ in their opinions and needs for the new system. For example, it was pointed out that, in teaching hospitals (such as University Hospital), residents do a lot of the order entry (Journal 20040115 Mtg 1) so residents would be substantially affected by the implementation of the system. Nevertheless, residents were represented by only a single individual on the CDT.

There were also physicians who acted as directors in their particular specialties. Regarding the representation of this hierarchy, one Patient Care Manager said:

I guess I would invite more of the really big players and who knows, maybe they were invited...but I think that probably I don't see enough higher ups there like the directors, the leaders of physician groups, there's physician representatives but I don't know that they represent a leadership role outside, like I don't know that they are a director of this or a medical director of that or whatever, they just seem like Joe Physician. (Interview 2, Paragraph 271)

For physicians then, representation was mainly from practicing physicians with little representation from either physician directors or residents.

For nursing, the important hierarchy was the Patient Care Manager (PCM) (head nurse) and the Assistant Patient Care Manager (APCM) on each nursing unit. Front-line nurses reported to their unit's PCM and APCM. One physician commenting on the representation of these nursing groups said:

I didn't feel like front line nurses were well represented. They had a lot of nursing managers and – most of whom I know well and respect and work well with and don't have any problems with – but it was to a large degree ...[ed: code blue announcement... hard to hear] managers from the point of view of the nursing staff. (Interview 1, Paragraph 135)

This physician echoed a common theme among interviewees: that front-line staff was underrepresented on the CDT. There were perhaps some practical reasons for this. It is difficult to take individuals with front-line responsibilities away from their jobs unless there is enough organizational slack. There was also an early discussion about constraints on participation due to collective agreements (Journal 20040115 Mtg 1). Further, there was concern that perhaps front-line healthcare staff would not be able to represent a broader group, and keeping a manageable number of people on the team required choosing those who could represent a larger group. The same physician who commented on the paucity of front-line nurses summarized the issue in the following way:

Admitting and health records and so on sent their most senior manager so that's probably good because there is a fair amount of background work to be done and you couldn't give that to somebody who had a lot of other front line responsibilities but at the same time I sometimes wondered how realistic their perspective or their view was... (Interview 1, Paragraph 135)

The problem as seen by this physician was that no one knows the front-line business process better than those actually carrying it out on a daily basis. The exclusion of these individuals meant a reduced ability to understand opportunities to shape the system around the day-to-day work processes of front-line staff.

How Representatives were Selected

The representatives were selected almost entirely through the organizational and project managers rather than through an election or selection by constituents. Further, representatives were selected for reasons that were sometimes unrelated to whether they were the "ideal" candidate for the job. As previously discussed, this selection mechanism is unlikely to ensure that those selected will be seen as legitimate by their constituents; however, perhaps authorization (or legitimacy) could be conferred in some other way. In this case, one of the selection criteria was stated as "organizational champions" – that is, "members [who] have earned credibility in their own positions and are influential and sought opinion leaders" (Terms of Reference Document version 0.3). Perhaps being opinion leaders in the organization could serve as a proxy for authorization. We did not interview people from outside the project, so we cannot provide evidence on this question; however, one nurse's comments about feedback being "handpicked" suggests there was some question about the legitimacy of these representatives for constituents. Further, the constituencies were defined only in the broadest sense (based on a representative's medical profession, discipline,

and possibly location) and often implied rather than explicitly articulated to representatives or constituents. As a result, many individuals in the organization would have been unable to identify and discuss their concerns with a representative at the CDT table.

How Representation was Carried Out

Another key to meeting the “represent as spokesperson” archetype is that representatives and constituents share information and feedback. In this healthcare organization, this communication was affected by the unclear relationships between representatives and specific constituents. Some people in the organization knew who was participating on the CDT and sought out CDT team members to pass on their feedback. This allowed a certain degree of indirect participation. However, the link was not formalized, and the lack of formalization made it difficult for constituents to know whom to approach in order to provide input.

Representatives on the CDT were encouraged to consult with colleagues and peers about various decisions that were being made at CDT meetings; this was included in the Clinical Design Team Terms of Reference as a role of individual members (Document CDT Terms of Reference). However, interviews with CDT members suggest that this was not done uniformly:

Admitting and health records and so on sent their most senior manager ... There is a big difference between asking somebody in administration who doesn't actually do the job their opinion, so I guess I will just have to trust that they have good internal processes – disseminating information and collecting feedback – but I don't know any of the details of those processes. (Interview 1, Paragraph 135)

Interviewee 1 was someone who often reported that he had discussed project issues with his colleagues; it is clear, however, that he did not entirely trust that representatives had the necessary and appropriate internal processes required for this communication (“I guess I will just have to trust” is not a strong vote of confidence). His comment also suggests that these processes were left to the discretion of the individual. This comment – typical of several interviews – shows that work-related time pressures combined with a busy workload on the project made it difficult to get feedback from constituents:

*Interviewee 15: I think when I met with [my predecessor on the team] we discussed that [obtaining feedback from colleagues]. If I am representing [person's area] I should probably get some feedback on some of these things, which is hard to do I mean it's hard to touch base with people prior to the meeting, but we try.
Interviewer: And does there seem to be enough time at this point between when you get that meeting information or the decision request forms...?
Interviewee 15: No, but that's more my schedule, there's always more pressing unit business that I get called away doing.” (Interviewee 15, Paragraph 173-175)*

Other individuals said that decisions were at such a high level of abstraction that they were difficult to share with others, and a lack of resources (either the system itself or documentation) explaining or illustrating the issues made it difficult to communicate with other health professionals. Further, as previously mentioned, the link between representative and constituent was not formalized; representatives may have surmised who they should represent (as Interviewee 15 did based on her/his area) but this lack of clarity created significant space for people to be left out of any communication that did occur. So while there was an understanding that two-way communication was necessary, numerous barriers kept it from being comprehensive or occurring at all.

A final requirement for a “represent as spokesperson” system of representation is to create the time and space for opinion and will formation among the broader organization. This requires outward communication from the project team to the rest of the organization. The IPIS project team talked about needing to “come out of the cave” – that is, needing to provide more communication from the project team to the rest of the organization. However, their concern (one often shared in projects) is that providing information too early, or showing the system before it is completely working, will induce fear and anxiety. The problem is that this restricts participation until much later in the process, effectively cutting off opinion and will formation for the majority of the project and organizational constituents.

As a result of these problems, it is difficult to see this system of representation as one in which the representative could act in the capacity as spokesperson. Representation was certainly less comprehensive than possible (i.e., not everyone had representation on the committee) and the communication processes between representatives and constituents were limited and informal.

Represent as Example

Given that representation in this healthcare case did not fully meet the requirements of “representation as spokesperson,” we considered other ways in which the system could be considered “representative.” The next likely

meaning was “represent as example.” A system of representation built on this meaning of “represent” is no longer about engaging broad-based input into the system development and implementation process. Instead, representatives are examples of the people who will be affected by the system implementation; the project team uses the input and feedback of its members as an example of the feedback they would get if everyone participated.

We see strong elements of this type of representation in this case. The individuals chosen to sit on the CDT were “to stand for” all other individuals “like” them – that is, the input from these individuals could “stand for” the input of all other like-individuals. By carefully defining the dimensions (discipline, location, hierarchy and specialty) along which CDT team members were selected, the project team attempted to design a group that was “representative” of the broader population. However, while these individuals were like the other individuals in the organization in certain ways, they were different in many other ways. The CET chose professional designation, medical specialty, acute care location and hierarchy as the dimensions along which the team should be representative. At face value, these seem to be reasonable dimensions along which work processes might vary. Yet, we saw that there were significant problems in developing a CDT that was fully representative across these dimensions; several groups were either underrepresented or unrepresented (e.g., front line nurses, residents, administrative personnel, and allied health groups). Further, these individuals were also different from others along important dimensions. These were organizational champions – people whom others looked up to – suggesting that they were different from others in the organization. Also, representatives were primarily people who were comfortable with existing RHA technology. In one of the CDT meetings, while discussing an issue of nursing assignments, one of the physicians pointed out that a problem in the participation process was that many in the organization found computers to be a challenge, while most people on the CDT were comfortable using and understanding technology:

One of the weaknesses of this is we're all sitting here with knowledge and interest and we're designing for the maroon⁸ who doesn't know computers. (Journal 20040719 Mtg 2, paragraph 108)

The degree of “likeness” between the representatives and the broader worker population is also unclear because there were many demographic dimensions that were not included in the CDT selection criteria, such as age, gender, and years of experience in their professions. Therefore, it is also difficult to conclude that the system of representation was fully about “represent as example.”

Represent as Symbol

A final definition of “represent” that is applicable to this case is “represent as symbol.” Here, what we mean is that the system of representation is not built to gather input and feedback per se, but to suggest and demonstrate to others that feedback was gathered. This symbolic act is designed to create a sense of trust and “buy-in” toward the system by others in the organization.

In the IPIS project, individuals were brought to the table not just for their input into the system requirements and design but also, critically, to show that the software had been designed “for clinicians, by clinicians” (Journal 20040224 Mtg 1, paragraph 121). Several times, physicians indicated that they knew this was their role, perhaps even their most important role. In one CDT meeting, a physician said “we should be called the Clinical Sales Team,” because of the team’s role in “selling” the system to the rest of the Region’s workforce (Journal 20040705 Mtg 1, paragraph 70). Another physician admitted to seeing himself as a figurehead in leading his working group, clarifying that while he co-chaired the group with a project team member, his co-chair was the real “work groupee” and he was there “to bring the image of clinician engagement to help others buy into the project” (Journal 20040512 Mtg 1, Paragraph 110). Therefore, the CDT members were meant to stand as a symbol to show others in the organization that clinician input had played a large part in the design of the overall system.

Looking at the process that occurred, this view of the CDT becomes even more evident. An ongoing concern of team members was that they would become “rubber stampers” (or, as discussed in at least two meetings, “Bobble Head Dogs”⁹). Even though most team members recognized their role in selling the system to the rest of the organization, they still wanted their input to count. By the end of Phase 1 of the project, many representatives recognized that they had, in fact, become what they had feared. CDT members often felt that they didn’t have the knowledge or right to overturn decision recommendations brought to them by working groups which had undertaken sometimes laborious discussions in forming their recommendations. The structure of the CDT meetings – every two weeks for two hours – left little time to really gather significant input from the team across a broad range of issues. This time was often focused more on project updates from the project team to the CDT, further decreasing the time to gather input. Also, given the heavy emphasis on discussing the current state of the project with colleagues during the meetings, it is not difficult to consider these meetings as an opportunity for “staging” clinician representation.

Comparing the above described system of representation to the system of representation that was in place for the Admitting, Discharge and Transfer sub-project underscores the applicability of the meaning of symbolic representation in this case. In the ADT section of the project, which affected mainly administrative personnel, representation was both quieter and less extensive than that in the CIS sub-project, which affected mainly clinicians.

From a functionality perspective, the ADT portion of the project was the largest part of the Phase 1 implementation. Yet, the main requirements definition phase for this part of the project did not involve significant user input until very late in the process. One has to ask why there was such a huge difference between the requirements processes in the two sub-projects. Of course, there are many possible reasons; all of which may explain the outcome. The two sub-projects had different project leaders, possibly espousing different views on participation. However, both project leaders reported to one overall project manager and, had there been an organizational push to gain user input more broadly, this would have occurred in the ADT sub-project. Perhaps the ADT project was thought to be less complex and therefore it was not perceived as requiring the same degree of input. However, the ADT project team did seek input from individuals. The manager of Admitting at the Phase 1 hospital participated in many meetings and the finance department was consulted. Eventually, a working group was formed to gain input from a broader group of people on issues surrounding the ADT subproject. So, it was recognized that input was required. In the end, it seems that the main difference between the two sub-groups' use of representation was the extent to which the project team needed the healthcare groups to "buy in" to the project through the requirements process. Admitting, as a non-professionalized and salaried group, had little choice as to whether or not they would use the system. Clinicians, on the other hand, did have a choice. Therefore, what seemed most important in the Clinical Information System project was the symbolic impression that clinicians had participated in the project in order to sway a reluctant and powerful healthcare group into using the system.

There are, of course, ways in which representation was not just symbolic. Decisions were made as a result of this process, and it did serve a role in incorporating clinician input into the overall system requirements/design. Team members took the responsibility to provide feedback seriously. However, given the identified constraints on the system of representation, the Clinical Design Team itself seemed to be more important in its symbolic role than in its role as an input mechanism.

DISCUSSION

Systems of representation are not all alike. Participation is an emergent process (Markus and Mao, 2004). The decisions taken in constructing the system of representation – its purposes, who to involve, how the process is carried out – have intended and unintended consequences in shaping the type of representation that is created, and its effect on participation, involvement and influence.

Based on our analysis of this case, we have offered one way to view these different types – represent as spokesperson, represent as example and represent as symbol – and demonstrated how each of these was present in the case we studied, as summarized in Table 5. In this section, we explore these types in more detail, considering the fundamental differences among them, the extent to which they may co-exist, and their overall implications for participation.

The first type of system of representation, represent as spokesperson, is about engaging broad-based participation of all who are affected by the system implementation. Representatives speak on behalf of specific constituencies. This meaning of represent is closest to that provided by both Mumford (1983) and Land (1982). Where this type of representation differs most significantly from the other two types is in its full inclusion of constituents and their influence on system projects – that is, those not at the table are given the true opportunity to influence project outcomes.

This difference also leads to significant differences in the construction of this system of representation. To ensure that constituents can be heard, there must be a clear link between representatives and constituents, and a means of communication between the two. As was demonstrated in this case, a lack of formalization makes it difficult for constituents to know who to approach to provide input and fails to ensure that all constituents are adequately represented. Land and Hirschheim (1983) also identified that participation is problematic when representatives do not have the responsibility to speak on behalf of specific constituencies. Therefore, the indirect participation of constituents is strongest in a system of representation when the representative-constituent link is direct and formalized.

The selection of representatives is also important in establishing the representative-constituent link. This link is strongest when the representative is seen as legitimate by the constituents (Habermas, 1998). This is most easily established when the constituents themselves authorize the representative through a free and secret election. The characteristics of free and secret are important; they ensure that relations of power do not sway the selection of representatives as they did in this project. Minimizing the influence of power relations in the selection process is key to ensuring the legitimacy of representatives and supporting the system of representation.

A second requirement of the spokesperson type of representation is the time and space for opinion and will formation (Habermas, 1998). Even with the link between representatives and constituents and communication between the two, constituents' participation and influence will be weak without this opportunity. A public forum supporting opinion and

will formation gives indirect participants the chance to become aware of the issues and decisions facing the project, without which full participation cannot take place. Further, discussion and argumentation around the issues will allow participants – both direct and indirect – to share and challenge positions, and through this, to determine organizational will. As discussed in the Background section, Habermas (1998) argues that communicative power is generated through this process.

Table 5: Types of Systems of Representation

	Representation as:		
	Symbol	Example	Spokesperson
Distinguishing features	Political process more than participatory	Participation by representatives but no indirect participation	Inclusion of indirect participation
Who should be represented (constituency)?	Those who most influence system adoption	Those who are seen to have the greatest impact on the system	All affected
How should representatives be chosen?	Opinion Leaders, selected by management	“Best and Brightest,” “representative” of broader population, probably selected by management	Elected/selected by constituency
How should representation be carried out?	Representatives provide feedback to project team One way communication from project team to organization	Representatives provide feedback to project team Little communication to remainder of organization	Mechanisms for communication between representatives and their constituency Time and space for opinion and will formation
Implications for participation	Pseudo-participation Those at the table still have (limited) opportunity for influence User involvement (commitment to system) may be high despite pseudo-participation	Consultative Participation Analyst/Project Team as decision-maker; broader constituency with limited to no influence Limited participation likely to lead to limited user involvement	Consensus Participation Strongest opportunity for user influence and involvement

In the second type of system, represent as example, representatives are chosen not to speak on behalf of others, but because they serve as an example of a particular group. This is similar to what livari and livari (2011) call “statistical” selection; they are “like” the people they represent. Analysts and designers can then draw on input from these representatives (i.e., examples) and assume that this represents the type of input they would have received if they had sought input from everyone in the group. This differs from the previous type of representation in that indirect participation is not included, but it differs from the next type in that feedback and input from the representative are intended to influence the project direction and outcomes. As a result, this is still a participatory method; however, it moves the decision making and responsibility for the project to the project team, which bases decisions on representative input. In this way, this system of representation most resembles consultative participation (Mumford, 1983).

Although this “example” system of representation is clearly limited in the participation and influence it allows, it is reasonable to consider how it is best carried out. This system type draws on input as representative of the broader population, so it can only be most effective when the group is as representative as possible. At the same time, this type of representation justifies the exclusion of broader input by assuming that those who come to the table are those with the greatest knowledge (and are, therefore, not fully representative of those they represent). Future research should consider the question of how organizations can balance these opposing goals.

Another challenge, of course, is determining what constitutes “representativeness.” This is, in effect, a stratified sampling process; survey researchers will understand the complications of achieving this goal. In this particular project, there were significant problems with making the CDT representative of the broader RHA population. Organizational and professional reasons were partly responsible. However, another specific challenge that organizations face is that the population of individuals who may be affected by a project changes through and

throughout the participation process. In the CIS implementation, it was not immediately apparent whose input and feedback was required because the CDT team and the project directions were constantly in flux as new understandings were reached. Organizations need to be vigilant about this possibility and open to revising their representatives in order to achieve substantial and adequate representation.

In the last version of represent, represent as symbol, the system of representation is focused not so much on garnering input, but instead on representing to a larger group that input is being gathered to shape and influence the system. Interestingly, this implies that, despite the pseudo-participation and limited user influence that is characteristic of this archetype and perhaps contrary to expectation, user involvement (or commitment to the new system) may be possible. This archetype differs from the other types of representation in that it is more clearly a political process, designed to engage commitment or buy-in from the broader population. It is well established that participation can be explicitly political (Gärtner and Wagner, 1996; Symon, 1998; Symon and Clegg, 2005). This research, however, shows how representation, when structured as representation as symbol, fulfills this agenda. This type of representation is meant to engage the constituency that is most likely to affect and increase overall system adoption. Therefore, representatives must be selected to signal to this population that consultation has been solicited. It might be argued that this "symbol" system of representation is the least preferable of the three. However, in this research, the organizational reality meant that system success required strong physician adoption and, therefore, it was important to send a clear signal to physicians that the system had been designed with them in mind. Robey and Markus (1984) reached a similar conclusion, suggesting:

However, the naive actor who remains unaware of the differences between symbol and substance, or between ritual and reality, will be a less effective participant in the process. (Robey and Markus, 1984, p. 13)

At the same time, there is a need to recognize that this "symbol" system of representation does not sit comfortably with either of the other system types, or with the ideal outlined earlier. Because representatives in this type of system are not representative of the broader population and participation mechanisms are geared to organizational relations of power, the decision to pursue this system of representation reduces an organization's ability to garner more complete participation and is thus "parasitic" (Habermas, 1984, p. 288) to the other systems of representation, detracting from their participatory potential.

These findings are particularly (but not exclusively) important in the healthcare context, which is marked by an organizational culture that stresses the medical primacy of physicians (Coombs and Ersser, 2004; Rivard et al., 2011). Physician engagement is seen as a critical success factor in healthcare implementations (Bernstein et al., 2007; Cohn et al., 2009; Hopkins, 2005). Our results suggest that organizing representation in order to garner that engagement comes at the expense of more complete participation across many other medical groups. Yet, the stakes in this environment couldn't be higher; for example, Koppel et al. (2005) report that medication errors increase when a Computerized Physician Order Entry (CPOE) system is poorly designed, which is an outcome that participation is intended to avoid. In creating systems of representation, then, there is a significant tension in the healthcare context between the organizational culture of "physician engagement" and the need for strong participation. Organizers may try to create systems of representation that strive for both; however, this research highlights the challenge, if not impossibility, of achieving this synchrony.

CONCLUSION

Systems of representation have become de rigueur in systems development and implementation today because of the complexity and size of contemporary information systems. Therefore, understanding these systems of representation has taken on a new importance, renewing the need to consider how best to construct and execute them. We have made several contributions to this endeavor. First, we have offered an understanding of three fundamental tasks for those developing systems of representation – defining the constituency, selecting representatives, and determining how the representation relationship will be carried out. Second, we have introduced a classification of systems of representation. These archetypes – "represent as spokesperson," "represent as example," and "represent as symbol" – differ in the purpose of representation, in who is involved and in how representation is undertaken. As a result, they differ in their participatory potential. Finally, we have empirically examined a system of representation in a healthcare setting, and highlighted the opportunities and challenges inherent in its construction and implementation.

This is just one case in one specific industry and, although our experience and the literature we draw upon suggests that this case is typical of system implementations both inside and outside of the healthcare setting, caution should be taken in generalizing this case to other situations. The healthcare context is subject to particular and strong organizational constructions of power related to profession and industry. As an industry, healthcare is also a relative newcomer in implementing enterprise systems. These contextual differences affect how those in healthcare approach participation and enterprise system implementations.

Nevertheless, the implications for researchers and practitioners in numerous industry settings are both possible and important. For practitioners, we have demonstrated that simply putting representatives in place will not achieve participation and influence. Careful thought must be given to how the system of representation is constructed. A system of representation based on "represent as spokesperson" requires a formalized communication mechanism between representatives and constituents and, as part of this, representatives and constituents need to be given resources such as time in their daily work in order to communicate with others, and material support in terms of communication tools to help them collect and organize this feedback. Systems of representation built on either "represent as spokesperson" or "represent as example" critically depend on choosing constituencies which reflect the diversity of participants and positions in the organization, and require ongoing vigilance in considering changes to keep participants "representative." "Represent as symbol" can achieve political goals in the organization but does so at the expense of a more complete and ideal form of participation.

For researchers, this work presents a new way to view systems of representation. Mumford (1983) defined three types of participation – consensus, representative and consultative – and this research has shown that representative participation is more varied than this categorization suggests. It may be more like consensus participation, or consultative, depending on how the system of representation is constructed. Exploring these systems requires a more fine-tuned understanding of their differences – differences in intention, execution, and implementation.

Furthermore, this work illuminates new avenues of research. What are the challenges in creating a system of representation that fully aligns with "represent as spokesperson"? How can systems based on "represent as example" balance the need for knowledge with the need for participants who are "representative" of a broader population? Is it possible to combine these different types of systems in ways that don't undermine their participatory potential but still acknowledge the political realities of organizations? These questions and others are key to gaining a better understanding of systems of representation.

Moving beyond the difficulty of involving everyone who is affected by an information system necessitates the creation of systems of representation. However, these systems differ in important ways, as our research shows. Therefore, managing representation within the emergent participation process requires many decisions about the type of representation to be created, decisions that mandate attention throughout the process rather than just at the beginning. We encourage practitioners and researchers to consider the insights offered by our framework, and challenge researchers to pursue further study.

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¹ The "Mtg" suffix is only used if there were multiple observation activities on one day.

² All names of people, systems, locations, hospitals and the organization have been changed.

³ This was the version intended for review by the Clinical Design Team.

⁴ It is perhaps interesting to note that different documents from different times in the project varied considerably in their response to these issues.

⁵ In fact, in some ways, this helped the system adoption because nurses were able to more closely fit the software to their particular needs and interests unencumbered by the standardization of processes.

⁶ The reality is that in the paper charting system previously in place, there was also incomplete standardization across the units.

⁷ Psychiatry and Mental Health were initially excluded from the process but eventually representatives for these areas were added to the Clinical Design Team.

⁸ This was a slang term that, from the context of the complete discussion, meant something close to "uninformed person."

⁹ "Bobble Head Dogs" are toy dogs that are placed in the back of cars, "looking" out the back window. Their heads float on their neck on a spring so that when the car moves the dog's head nods up and down with the movement of the car.

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