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A Triple Take on Information System Implementation

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While researchers have used a variety of models to explain information system (IS) implementation outcomes, few have analyzed the same project or set of projects with different models looking for complementary explanations. Recognizing the multilevel nature of IS implementation, our study rises to this challenge by conducting an alternate template analysis of three cases of IS implementation in hospitals. First, we explain individual use, group resistance, and organizational adoption with models situated at the same level of analysis as each outcome. At the individual level, we use a model of cognitive absorption to explain individual system usage. At the group level, the political variant of interaction theory is used to explain group resistance to IS implementation. At the organizational level, we use organizational configurations to explain IS adoption in terms of emergence and routinization. We identify each model's limits and prediction failures, and we show that using alternate models helps to remedy a model's prediction failures and overcome its limits. Finally, we propose an alternate-template theory of IS implementation outcomes that takes into account all three levels of analysis, their respective outcomes, and the time dimension. This multilevel, longitudinal theory provides a better understanding of IS implementation and further elucidates what may initially have seemed to be contradictory results.

Key words: information systems implementation; implementation outcomes; cognitive absorption; perceived usefulness; perceived ease of use; interaction theory; organizational configurations; individual use; group resistance; organizational adoption

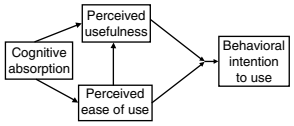
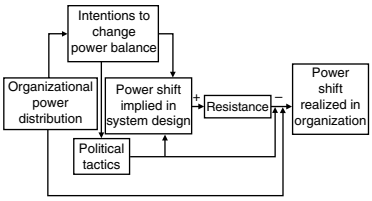
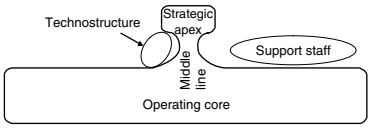
> Conceptual models not only fix the mesh of the nets that the analyst drags through the material in order to explain a particular action; they also direct him to cast his nets in select ponds, at certain depths, in order to catch the fish he is after. (Allison 1971, p. 4)

In his renowned analysis of the Cuban missile crisis, Allison masterfully demonstrated how closely the explanation for a given phenomenon depends on the conceptual model, i.e., the fishing net, one uses. By alternately analyzing the crisis with three models—rational actor, organizational behavior, and governmental politics—he showed how different "conceptual lenses lead one to see, emphasize, and worry about quite different aspects of an event" (Allison 1971, p. 5), and illustrated how any single model "limits one's grasp of other dimensions of the phenomena [being analyzed]" (Allison and Zelikow 1999, p. 8). He also demonstrated that using alternate yet complementary models offers a richer explanation by providing insights into dimensions that would otherwise remain neglected.

Although researchers have used a variety of models to explain IS implementation outcomes, few have analyzed the same project or set of projects with different models. Moreover, the few researchers who did so were not looking for complementary explanations; rather, they sought either to determine which, among a number of models, best explained a given outcome (Keil 1995, Markus 1983), or to propose a unified model to explain a single outcome (Venkatesh et al. 2003).

Our motivation is different. We believe that IS implementation projects have several outcomes of interest (Sambamurthy and Kirsch 2000) that, given the nature of an IS, occur at different levels. Indeed the multilevel nature of an IS implementation is embedded in Mason and Mitroff's (1973) classic definition of an IS, which "consists of, at least, a person of a certain psychological type who faces a problem within some organizational context for which he needs evidence to arrive at a solution, where evidence is made available through some mode of presentation" (p. 475). From this, three levels of analysis—and a corresponding outcome for each—are deemed appropriate for studying IS implementation: the individual and IS usage, the group and group resistance to IS implementation, and the organization and organizational adoption of an IS. Espousing Allison and Zelikow's view that "at one level [alternative] models produce different explanations of the same happening, at another level the models produce different explanations of quite different outcomes" (1999, p. 387), we aim to take advantage of the complementarity of several models, rather than comparing their explanatory power. By alternating between models and levels, we endeavor to uncover "how factors from different levels of analysis combine to shape and constrain social phenomena

Table 1 The Alternate Templates

Model	CA	PVIT	OC
Depiction			
Theory	Cognitive absorption is a determinant of perceived usefulness and perceived ease of use, which influence behavioral intentions.	When a system implies a loss of power from a group of actors, this group will resist implementation.	Design parameters, which characterize an organizational configuration, will influence organizational IS adoption.
Unit of analysis	Individual	Group	Organization
Key concepts	Cognitive absorption, ease of use, usefulness, intention	Power, interests, tactics	Design parameters
Dependent variable	Intention to use as a proxy for use	Group-level resistance to implementation	Adoption of innovations in terms of emergence and routinization
Questions	Why do individuals use an information system?	Why do groups of actors engage in resistance behaviors toward a system?	What explains the propensity of an organization to experience emergence and routinization with respect to an information system?
General propositions	Ease of use and usefulness will influence individual use.	When the actors in power resist, the system will not be adopted.	Most design parameters of a professional bureaucracy favor the emergence of innovations but hinder their routinization.

in ways that we otherwise might not discern" (Hackman 2003, p. 921).

Using data from three cases of IS implementation in hospitals, we adopt an alternate template strategy (Langley 1999) to first explain individual use, group resistance, and organizational adoption with models situated at the same level of analysis as each outcome. We also identify each model's limits and prediction failures. Then, we show that using these alternate models helps to remedy a given model's prediction failures and overcome its limits. Finally, we propose an alternate-template theory of IS implementation outcomes that takes into account all three levels of analysis, their respective outcomes, and the time dimension. Our theory posits that while a given outcome becomes salient during a particular implementation phase, it also remains peripheral during the other phases. A salient outcome is explained by a prominent model situated at the same level; however, this model has limits, and at times its predictions fail. The models situated at the other levels then play complementary roles either by informing the prominent model and expanding its limits or by elucidating its prediction failures. This multilevel, longitudinal theory provides insight into IS project successes or failures that might otherwise appear paradoxical.

1. Alternate Templates

Our choice of templates was guided by the following criteria: the clarity of the level of analysis of the model's focal outcome, the recognition of the model's ability to explain the focal outcome, and the parsimonious nature of the model. Table 1 synthesizes the three models that we selected.

1.1. The Individual Level

At this level, use is a key outcome (Wixom and Todd 2005) and the following question is often raised: Why do individuals use an information system? Several attempts to answer this question have converged on the role of two user beliefs, perceived ease of use and perceived usefulness of an IS, as having a significant influence on usage behavior (Agarwal and Karahanna 2000, Wixom and Todd 2005). These beliefs were first proposed in the technology acceptance model (Davis et al. 1989) adapted from Ajzen and Fishbein's (1980) theory of reasoned action (TRA), which is widely recognized for its ability to explain individual behavior (Benbasat and Barki forthcoming). Conceptualizing computer usage as a holistic experience, Agarwal and Karahanna (2000) propose a cognitive absorption (CA) model that posits that ease of use and usefulness are influenced by the user's state of cognitive absorption (see Table 1). Cognitive absorption is defined as a state of deep involvement with software that is exhibited through five dimensions: temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity. Because CA is strongly grounded in TRA, we adopted it as the template to explain individual use.

1.2. The Group Level

At this level, the question: Why do groups of actors engage in resistance behaviors toward a system? is often asked. Resistance to IS is recognized as a critical issue that often prevents organizations from reaping the benefits of its implementation. Because resistance from a single user would generally not be sufficient to severely affect an IS implementation or lead to project termination, resistance is studied here at the group level. To this end we adopted Markus's political variant of interaction theory (PVIT) (Markus 1983), which is considered a classic in the study of IS in organizations (Lee et al. 2000).

As shown in Table 1, PVIT explains group resistance in terms of the interaction between an IS and the context of its use. The model's primary assumption is that an IS often embodies the distribution of power among the actors that it affects. When a target group believes that an IS implies a power shift that undermines its power position, it will engage in resistance behaviors. Organizational power distribution influences the intentions of actors to change the power balance. In turn, intentions influence both the power shift embodied in the system and the political tactics that actors will adopt to effect the power shift. The resulting power shift will come from the resistance behaviors of the target group, the political tactics of the actors who want to see a power shift occur, and the original distribution of power in the organization.

1.3. The Organizational Level

At this level, a relevant question is: What explains the propensity of an organization to adopt an IS or not? The selected template differs from the other two in that its theoretical predictions are not fully developed. Yet it is strongly grounded in theory because it is derived from Mintzberg's model of organizational configurations (OC) (1979, 1980), which has been extensively used since its publication (Doty et al. 1993). OC comprises five configurations: the simple structure (e.g., a retail store), the machine bureaucracy (e.g., a steel company), the professional bureaucracy (e.g., a hospital), the divisionalized form (which includes most Fortune 500 firms), and the adhocracy (e.g., NASA). We conducted our case studies in hospitals, often referred to as the archetype of professional bureaucracies (PBs) (Downey-Ennis and Harrington 2002). Although major transformations have occurred in hospital management in the past decades, studies have shown that their organizational characteristics have experienced little fundamental change (Scott et al. 2000).

Configurations differ according to the key part of the organization, the key coordination mechanism, design parameters, and contingency factors. As shown in Table 1, the key part of the PB is its operating core, which consists of highly trained and indoctrinated professionals. The strategic apex, middle management and the technostructure are minimal, and the support staff assumes more routine tasks to back up the professionals of the operating core. Table 2 describes the design parameters of PBs. These organizations are highly decentralized, both horizontally and vertically, which gives much decision-making power and autonomy to the operating core. Job specialization is high across the horizontal dimension such that specialists have extensive control over their work. Specialization is low in the vertical dimension, which results in little administrative control over professionals' work. The need for formal planning and control is limited, and liaison devices are not commonly found in the operating core. The basis for establishing groups is bi-dimensional. First, professionals are grouped by means (work processes, knowledge, and skills) into specialties such as pneumology or neurosurgery. Second, they are grouped by ends, that is, according to the characteristics of the ultimate market (e.g., patient type) served. In terms of unit size, a PB is usually wide at the bottom with few hierarchical levels. Formalization of behavior emphasizes the power of expertise with standards originating "largely outside its own structure, in the self-governing association its operators join with their colleagues from other professional bureaucracies" (Mintzberg 1979, p. 351).

Although Mintzberg does not explicitly hypothesize relationships between design parameters and the propensity to adopt innovations, he contends that hospitals are environments where changes and innovations are difficult to implement (Mintzberg 1979). This is supported by recent studies of IS implementation in hospitals (Ash and Bates 2005). We used meta-analyses of organization acceptance of innovations (Damanpour 1992, 1991, 1987; Gopalakrishnan and Damanpour 1997; Damanpour and Gopalakrishnan 1998) to add theoretical predictions to Mintzberg's model (synthesized in Table 2). Two outcomes of interest were revealed by these meta-analyses: emergence and routinization of an innovation.

2. Research Method

We adopted a case study approach with embedded units of analysis—the individual, the group, and the organization (Yin 2003)—and conducted three case studies of clinical IS (CIS) implementation in hospitals. Here implementation refers to the four-phase enterprise system (ES) experience cycle described by Markus and Tanis (2000). This conceptualization of IS implementation was deemed appropriate because all three CISs were integrated packages. The first phase, project chartering, involves making decisions on whether, why, and how to implement an ES. It includes software selection and roll out planning. The second phase, configuration and roll out, aims at getting the ES and users "up and running." The third phase is shakedown, and its objective is to

Table 2 Elements of the Professional Bureaucracy and Their Relationships with the Emergence and Adoption of Innovations

Design parameters	Definition	Professional bureaucracy	Inferred relationship with emergence and/or adoption
Specialization of jobs	Horizontal: division of labor Vertical: degree of separation between performing work and managing it	High horizontal specialization Low vertical specialization	Facilitates emergence (Kimberly and Evanisko 1981, Moch 1976, Aiken and Hage 1971); hinders adoption (Damanpour 1991)
Training and indoctrination	Means of knowledge and skill standardization; usually takes place outside the organization, prior to entering the organization	High training and indoctrination	Facilitates emergence (Pierce and Delbecq 1977); hinders adoption (Damanpour 1991)
Formalization of behavior; bureaucratic/organic	Standardization of work processes through rules, procedures, etc.	Little formalization; bureaucratic	Facilitates emergence (Aiken and Hage 1971, Pierce and Delbecq 1977); hinders adoption (Zaltman et al. 1973)
Grouping	Base by which direct supervision is most affected	Functional grouping by means and by ends	Facilitates emergence and hinders adoption (Baldrige and Burnham 1975)
Unit size	Number of positions or sub-units that are grouped into a single unit	Wide at bottom, narrow elsewhere	No prior study
Planning and control systems	System by which outputs are standardized in the organization	Little planning or control	Hinders adoption (Daft and Becker 1978, Damanpour 1987)
Liaison devices	Means used to encourage mutual adjustment across units	Some liaison devices in administration	Hinders adoption (Aiken and Hage 1971, Ross 1974)
Decentralization	The extent to which power over decision making is dispersed among organizational members	Horizontal and vertical decentralization	Facilitates adoption (Thompson 1965)

eliminate bugs and stabilize operations. Finally, there is the onward and upward phase, which is designed to maintain and upgrade the system, and to support users.

Hospitals were selected as research sites because their levels of analysis are well delineated. Indeed, in hospitals, several clearly identified groups of actors—physicians, nurses, other health professionals, and administrators—are in continuous interaction. Also, the configuration type of hospitals is unambiguous, often portrayed as the epitome of a PB (Downey-Ennis and Harrington 2002).

Apart from being selected on the basis of aspects related to theoretical relevance, sites were chosen to ensure an adequate foundation for comparison and to maximize variation (Guba and Lincoln 1989). All three cases involved a software package that had been configured to fit the functionalities and requirements of each hospital. All three CISs allowed access to patient records at all times from different locations. They were intended to enhance the care process, support clinicians' workflow, and provide the information infrastructure needed to coordinate care. The electronic medical record component kept track of patient demographics, progress notes, medications, vital signs, medical history, etc. Other modules included admission, transfer, discharge (ATD), scheduling, test prescription (laboratory and radiology), care plans, clinical notes, pharmacy services, and decision support tools. Three modules are of interest here: test prescription, care plans, and pharmacy. As shown in Table 3, Cases 1 and 2 involved the same CIS, thus inviting comparison. The two cases ensured variation because their missions differed (Case 1 was a community hospital; Case 2 was a university hospital), as did the project's final result (abandonment in Case 1 and success in Case 2). Case 3 was selected for variation and comparison. It differs from Cases 1 and 2 in that a different CIS was implemented. It resembles Case 2 because it involved a university hospital; however it resembles Case 1 and differs from Case 2 in the ultimate project result: abandonment.

Table 3 The Three Cases

Case	Hospital type	Software package	Result of the implementation process	Respondents
Case 1	Community hospital	Alpha	Failure	Physicians: 7 Nurses: 4 Administrators: 5
Case 2	University hospital	Alpha	Success	Physicians: 4 Nurses: 4 Administrators: 5
Case 3	University hospital	Delta	Failure	Physicians: 4 Nurses: 6 Administrators: 4

To obtain detailed, rich, and real-life data, we conducted semistructured, face-to-face, in-depth interviews. The first respondents on each site were the project manager, the nursing director, and the medical director. Subsequent respondents were recruited using snowball sampling under which interviewees provide the names of other respondents, who in turn name other respondents, and so forth (Patton 2002). Respondents were asked to use the following criteria: The person had to be knowledgeable about the implementation process, representative of a subset of the hospital population, and/or have exhibited extreme behavior during implementation (Crabtree and Miller 1992). As shown in Table 3, the final sample included 43 physicians, nurses, project managers, and hospital administrators. The total number of participants for each case was not determined at the outset. Instead, it was based on the concept of redundancy of information (Lincoln and Guba 1985), which is the point at which the researcher determines that no new information is forthcoming or that the same information is being reported again and again by the participants. At this point, also known as saturation of data, data collection was terminated.

An interview guide was developed and refined through training and mock interviews. The respondents were first invited to describe the complete implementation. They were asked to report on the events from the time of the decision to acquire a CIS to either the time of data collection—if the CIS was still in use—or of project abandonment. As needed, specific questions were asked to ensure completeness of data and comparability of cases (Miles and Huberman 1994). The interviews lasted one hour on average and yielded several hundred pages of audiotape transcriptions. Data collection was supplemented by document review, which informed the research process (Creswell 2003). Documents included technical documentation, consultant reports, memoranda, and minutes from committee meetings. System use was observed at all three sites on an ad hoc basis to better understand the dynamics between professionals. The information from these sources was used to complement and validate the interview data.

We devised a list of codes to reflect each model's constructs. We reviewed the data in light of each model (Auerbach and Silverstein 2003) and coded meaningful excerpts of the interview transcripts. After several iterations, all the transcripts were coded and data were organized in matrices to facilitate their analysis (Miles and Huberman 1994). The researcher in charge of the interviews analyzed the data following a pattern matching strategy (Yin 2003). This analysis resulted in observed patterns of outcomes, which are presented in Tables 4 and 5 and Figures 1, 2, and 3. The other researcher validated the analysis and played the role of devil's advocate (Eisenhardt 1989) to establish evidence that patterns in the cases indeed matched the theoretical predictions of each model and were not the result of spurious associations.

3. Case Study Findings

3.1. Case 1

This new community hospital had been envisioned as a paperless environment. A multidisciplinary committee selected the Alpha software to support both clinical and administrative processes. Although the intention was to have the CIS up and running when the hospital opened, unexpected delays forced the staff to resort to paper record-keeping for two years before the actual roll out. The first module to be rolled out was test requisition/results, which materially changed the interface between physician and patient files. It was followed, 18 months later, by the roll out of the computerized care plan module, which caused a dramatic shift in the treatment-recording process from one in which physicians gave verbal instructions to nurses to one in which physicians had to key in the prescriptions themselves. This resulted in serious conflicts between physicians, nurses, and the hospital administration. While nurses appreciated the CIS, physicians complained that it was inadequate; they wanted it removed. To reach this goal, they resorted to drastic actions. At the time of this study, the module had been withdrawn and the hospital CEO had been dismissed. The system was only running at 25% of capacity and the new administration had no plans to implement further modules.

3.1.1. Take 1—Explaining Use with CA. Cognitive absorption, usefulness, and ease of use explain CIS intention to use for most of the nurses and physicians in Case 1. Table 4 summarizes the coding of transcripts per CA constructs, including focused immersion, heightened enjoyment, control, and/or curiosity. The pattern of outcomes suggests that all the nurses interviewed had reported cognitive absorption when using the CIS, felt that it was useful and, after an initial period of adaptation for some, found it easy to use. The following excerpts from Nurse 5's interview reflect her assessment of CA and her beliefs about the CIS's ease of use and usefulness:

> Cognitive absorption: it's . . . new, so we are facing a lot of challenges . . . . I thought it was a great idea. I said it may be a good thing, or it may not; let's give it a month, we'll work with it and put our energy into it, and then we'll be able to give our comments. (Nurse 5, Case 1)

> Perceived ease of use: You only have to enter the information on the patient. It takes a fraction of a second, and then the result pops out on the computer. (Nurse 5, Case 1)

> Perceived usefulness: The big advantage was that it had a lot to offer; it cut back a lot on . . . everything that was paperwork, a huge reduction in paperwork and phone

Table 4 Individual Use/Nonuse of CIS

	Cognitive absorption	Perceived usefulness	Perceived ease of use	Intention	Actual use/nonuse at T2
			Case 1		
Nurse 5	+	+	+	+	Use
Nurse 9	+	+	+	+	Use
Nurse 11	+	+	− at T1 + at T2	+	Use
Nurse 15	+	+	− at T1 + at T2	+	Use
Physician 1	+	+	+	+	Use
Physician 3	+	−	−	−	Nonuse
Physician 4	+	−	−	−	Nonuse
Physician 6	+	+	+/−	+	Nonuse
Physician 10	+	−	−	−	Nonuse
Physician 12	+	−	−	−	Nonuse
Physician 14	+	−	−	−	Nonuse
			Case 2		
Nurse 2	+	+	− at T1 + at T2	+	Use
Nurse 4	+	+/− at T1 + at T2	− at T1 + at T2	+	Use
Nurse 5	+	+	− at T1 + at T2	+	Use
Nurse 6	+	+	− at T1 + at T2	+	Use
Physician 7	−	+	− at T1 + at T2	+	Use
Physician 8	+	+/−	− at T1 + at T2	+	Use
Physician 9	+	+/−	− at T1 + at T2	+	Use
Physician 11	−	−	−	+	Use
			Case 3		
Nurse 1	+	+	− at T1 + at T2	+	Use
Nurse 4	+	+	+	+	Use
Nurse 5	+	+	+	+	Use
Nurse 6	+	+	− at T1 + at T2	+	Use
Nurse 9	+	+	− at T1 + at T2	+	Use
Nurse 10	+	+	+	+	Use
Physician 7	+/−	−	−	−	Nonuse
Physician 8	+	−	−	−	Nonuse
Physician 13	+	+	− at T1 + at T2	+	Nonuse
Physician 14	+	+	− at T1 + at T2	+	Use

Table 5 Organizational Adoption of CISs Multicase Pattern Analysis

	Case 1			Case 2			Case 3		
Design parameters	Value	Impact on E*	Impact on R**	Value	Impact on E*	Impact on R**	Value	Impact on E*	Impact on R**
Specialization of jobs	◙	+	−	◙	+	None	◙	+	−
Training and indoctrination	◙	+	−	◙	+	None	◙	+	−
Formalization of behavior;	□	+	−	□	+	+	□	+	−
bureaucratic/organic	●	n/d	+	●	n/d	+	●	n/d	+
Grouping: functional and according to market	◙	+	−	◙	+	−	◙	+	−
Planning and control systems	□	n/d	−	□	n/d	+	□	n/d	−
	●	n/d	+	●	n/d	+	●	n/d	+
Liaison devices	□	n/d	−	□	n/d	+	□	n/d	−
	●	n/d	+	●	n/d	+	●	n/d	+
Decentralization	⊡	+	−	◙	+	+	⊡	+	−

*E = Emergence; **R = Routinization.
Many, strong, or high: ● Nurses; ■ Physicians; ◙ All.
Few, weak, or little: ○ Nurses; □ Physicians; ⊡ All.

> calls. Among the nurses, this was a big thing. It was the big advantage to [using] the system. The other advantage was being able to do the plans of care more quickly. (Nurse 5, Case 1)

Similarly, Physician 1, who also reported being cognitively absorbed when using the system, found it easy to use and useful. On the other hand, five others, although they mentioned being cognitively absorbed, felt that the system was neither easy to use nor useful, and they refused to use it. For example, as expressed by Physician 10:

> Cognitive absorption: I'm comfortable with it . . . I don't have a problem with it. As you can see, we have protocols, I have followed protocols, postoperative protocols postoperative upper limbs, clinical . . . . (Physician 10, Case 1)

> Perceived ease of use: In reality, it's the keyboard that's the problem. None of us type. I type 10 words a minute, 7 words a minute. At my age, I won't be taking a secretarial course, with the little time I have left. You won't see me sitting down and typing 120 words a minute. (Physician 10, Case 1)

> Perceived usefulness: It's a fancy toy, that's all. For all that we get out of it, it turned out to be extremely expensive, because the value just isn't there. (Physician 10, Case 1)

3.1.2. Take 2—Explaining Group Resistance with PVIT. Figure 1 shows that the features of the CIS implied a shift in the organizational distribution of power via considerable changes in the work model. Indeed, prior to system implementation, although physicians were, by law, required to write prescriptions in the patient file themselves, they would traditionally dictate the prescriptions to nurses who actually entered the data. In the new system, only physicians could enter prescriptions.

> Of course it changed the distribution of tasks. Given the way we entered prescriptions, we ended up creating their [the nurses'] care plans. They no longer had to prepare any care plans. It just came out of the machine. By working this way, we were doing it for them. (Physician 8, Case 1)

Several physicians continued to ask nurses to enter prescriptions. Many nurses, however, were quite pleased with these system features, and several complained and refused to comply with the physicians' demands. They took the introduction of the system as an opportunity to improve their position of power.

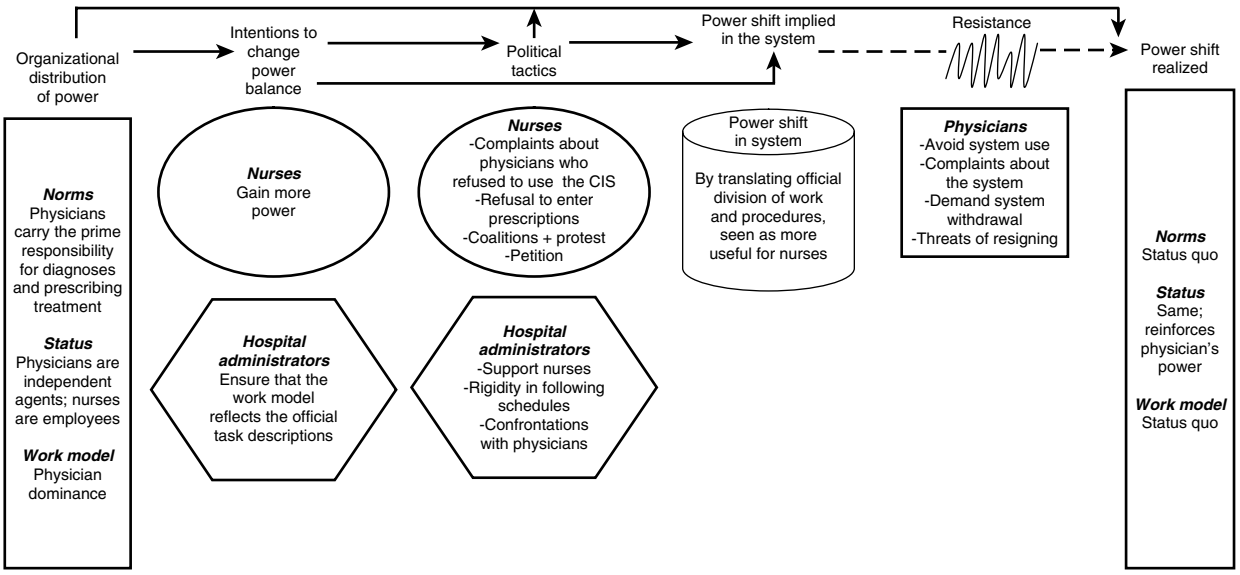
> When they introduced Phase 2 [computerized care plan], when things really got out of hand, you couldn't tell a nurse, "Take off his band-aid" without her telling you to enter it in the system. Hey, are you trying to make fun of me? (Physician 4, Case 1)

The nurses' political tactics escalated when they all signed a petition to oppose physicians' demands for a halt to system roll out. The hospital administration supported the nurses.

> When they [the physicians] all wanted to resign, we signed a petition and called a meeting within 24 hours. I think that there must have been 160 or 200 of us there. Then the CEO called a huge meeting, and everyone gave their opinion. There were a lot of doctors there and a lot of nurses, and everyone had a chance to speak. It was getting to be a bit like the Hatfields and the McCoys: "All you care about is money." Many nurses were saying, "What are you complaining about, we're the ones doing all the work." People were raising their voices. (Nurse 5, Case 1)

In reaction the physicians resisted the system, and many threatened to resign. The hospital administration reacted by stating that the project had to continue as scheduled and by telling the physicians to continue using

Figure 1 Analyzing Case 1 Using PVIT



the system while attempts were made to modify some features. The Board decreed that six physicians, identified as champions of resistance, should be denied patient admission rights. Physicians reacted aggressively. Some resigned and others asked their professional association for assistance, which resulted in the system's withdrawal and the dismissal of the hospital CEO. The end result was status quo in the organizational distribution of power.

3.1.3. Take 3—Explaining Emergence and Routinization with OC. As Table 5 shows, several of the design parameters of a PB that encourage the emergence of innovation were present in Case 1 including high horizontal specialization, high training and indoctrination, little formalization, and functional grouping by means and ends. This explains why the idea of implementing a CIS was well received by the physicians, sometimes with enthusiasm.

> Generally speaking, physicians are people who buy technology. We are keen on technology. If you tell us that we'll find the computer system useful, no doctor will say no, because we're keen on technology. We always want the most advanced technology possible. We don't mind putting the hospital in the red by buying the most advanced equipment possible. Whether it's cutting-edge ultrasound, or lab equipment. (Physician 14, Case 1)

However, as shown in Table 2, the same design parameters tend to hinder routinization. In Case 1, it soon became obvious that each group of professionals and each specialty within these groups required and demanded different features and functionalities.

> [One] major problem faced by a hospital that is computerizing its data is the wide range of professionals who will be using the system, and the fact that there will be as wide a range of expectations concerning user-friendliness. The needs of the physiotherapist, the respiratory therapist or the nurse, or the needs of the physician, psychologist or radiology technician, are vastly different. (Administrator 8, Case 1)

In a PB, decentralization is the only design parameter that is positively associated with routinization. Our data suggest that although decision making was rather decentralized at the time of system selection, it was not so during the following implementation phases. Indeed, many physicians complained that clinicians were not sufficiently consulted and did not have enough control over the implementation process.

> There were very few physicians on that committee. There was only one physician, a pathologist, and by definition pathology is not close to clinical practice. So this physician participated actively in system configuration, participated as a member of the committee, but had a perspective that was perhaps different from clinical practitioners. (Physician 14, Case 1)

3.1.4. Limitations, Paradoxes, and Alternate Explanations. In Case 1, although all users reported being cognitively absorbed, the CIS was perceived as useful by some physicians and not by others. These differences in how the system was perceived are not explained by CA. However, through the explanations provided by three PB design parameters (training/indoctrination, high horizontal specialization, and grouping by ends and means), OC sheds light on this ambiguity. The first parameter shows that interaction between activities, confidence, and desire to change the status quo encourages cognitive absorption. The other two show how needs differ when there is a wide variety of specialists and high diversity in terms of structural units, thus hindering actual perceptions of perceived usefulness.

Also, CA predictions failed when, as shown in Table 4, some of the physicians who had been using the CIS suddenly stopped using it and even adopted resistance behaviors. Although these physicians reported cognitive absorption, perceived usefulness, and perceived ease of use, they were still refusing to use the CIS. By highlighting how the perception that a power shift is embedded in a system can lead users to resist, PVIT provides information that contributes to explaining this paradox, and insight into why these physicians felt that refusing to use the system would be to their benefit.

3.2. Case 2

Case 2 was a university hospital that integrated patient care with teaching. Implementing a CIS was seen as vital to meeting the challenges in this rapidly changing environment. A multidisciplinary committee was formed to select a package. Alpha, the same system as in Case 1, was chosen. The admission, transfer, and discharge module was rolled out first, followed by the test requisition/results module. These modules led to relatively little initial resistance. Real opposition emerged only after the pharmacy module roll out. This module was deemed inefficient for prescribing medication. It was also perceived as threatening patient safety and physicians' ability to deliver quality care. The hospital administration withdrew, reviewed, and fixed this module. At the time of our study, 75% of the functionalities were in operation and stakeholders viewed the project as a success. The remaining features were slated for introduction in the near future.

3.2.1. Take 1—Explaining Use with CA. As shown in Table 4, the four nurses we interviewed stated that they were cognitively absorbed when using the system and that they found the CIS useful. While they initially did not find the system easy to use, they all used it nonetheless. For example:

> Cognitive absorption: ...those who, like me, got on board, who weren't afraid of it, who wished and hoped... and who saw the advantages.... Now I am getting into all the techniques. I like working with it. (Nurse 5, Case 2)

> Perceived ease of use: It took more of our time. When you change methods, it just takes more of your time. It was a question of time. ...I'd say that it wasn't up to scratch yet, either. There were a lot of problems because the system hadn't been perfected. Months and months went by in which changes had to be made, and it always felt like we had taken on a system that wasn't perfectly suited to our needs. On the other hand, for those people who liked it, like me, the problems didn't get in the way. (Nurse 5, Case 2)

> Perceived usefulness: When the laboratories came online, when we had results in the system, that made a big change in how we looked at it. I felt like we had a good one, because now it was better than what we had before. (Nurse 5, Case 2)

The results of previous studies help explain the seemingly mixed influence of perceived ease of use on usage. While some studies found that perceived ease of use had a direct effect on use (Igbaria et al. 1997), its role was not found to be as strong as that of perceived usefulness. Some studies have found that perceived ease of use is related to behavioral intentions only in the early phases of implementation (Adams et al. 1992), suggesting that as users become familiar with a system their concerns about ease of use tend to disappear.

As Table 4 shows, two of the four physicians interviewed reported cognitive absorption said that they found the CIS relatively useful, easy to use, and actually used it. Physician 9 reported cognitive absorption, expressed positive behavioral intentions, and had been using the CIS. His comments reflect assessment of his level of cognitive absorption as well as his evaluation of the system's ease of use and usefulness:

> Cognitive absorption: I like computers... Some people have computer phobia, not me. Personally, I use it and I like it. I already had a positive leaning toward use before actually using the system.

> Perceived ease of use: There have been improvements, mainly with response time. I must admit that now, except when everybody is online, it is not bad.

> Perceived usefulness: It is useful mainly because you can access patient files wherever you are in the hospital. This is convenient. Sometimes, when things are a bit quiet, I can sit anywhere in the hospital and review the lab results and do work without having to actually going to the ward where the patient is.

3.2.2. Take 2—Explaining Group Resistance with PVIT. In Case 2, the CIS did not imply a power shift between physicians and nurses. Also, as shown in Figure 2, the actual work model favored collaboration, not only between nurses and physicians, but also among all the staff, including the hospital administrators. Moreover, in Case 2, the hospital administration recognized that the physicians hold considerable power:

> We also have a CEO who is very sensitive to medical issues, without necessarily always taking their side. But he recognizes that, in a hospital, physicians represent the group of people that you have to deal with, the people who can play a decisive role in a project's success. We also have a DNS [director of nursing services] who is very comfortable working with medical colleagues. He isn't a corporate DNS; he defends his values well, but he also has a strategic orientation... A moment ago, I was talking about the unique nature of [Case 2]. This includes the unions, the employees, the physicians, a management committee that works well together, and positions that are coherent.... If it wasn't this way, things would be much more complicated. (Physician-Administrator 10, Case 2)

This suggests that the hospital administrators did not intend to change the balance of power, which might

have influenced the tactics they used when they introduced the system. Well aware of the power held by physicians in their organization, they carefully took measures that would disturb the existing balance of power as little as possible and made sure that, for physicians, the advantages would be worth the efforts being made. In other words, "There would always be a fair balance of sugar and vinegar in what we provided" (Physician-Administrator 10, Case 2).

The administration also ensured that they had the collaboration of the department heads whose influence over their peers was well known. Hence, when some physicians initially expressed a reluctance to use the system, the department heads could use their medical status to reiterate the importance of the hospital's commitment to the project:

> When talking to doctors, you have to do it in a way that will make them receptive to your message. When I need to speak to one of my colleagues, I am basically speaking to him in a medical way, how things are done in the field of medicine, in the jargon . . . with a doctor . . . you can't use an authoritarian management style, because they are not employees. They have a certain freedom to act. In this sense, you have to bring them to a point where they recognize that a project can be of collective interest, or they can even have a personal interest in it. (Physician-Administrator 1, Case 2)

In general, the nurses' tactics were to help physicians learn how to use the system and to collaborate with them as much as possible.

> Because the doctors didn't always attend the training sessions, when a module was introduced, the doctors weren't ready. . . . And it was always the nurses, our support staff, who were saying to the doctors, "Look, this is how it works." The strategy taken by the nurses was, "We'll show you once, but after that it's up to you." Our strategy was polite but firm: We understand, you didn't have the time, but we'll show you, we'll explain how it works. (Administrator 13, Case 2)

When problems arose because of some of the pharmacy module's technical features, such as response time when prescribing medications, residents decided to stop using it and wrote a letter to the administration threatening to stop using the CIS altogether if the pharmacy module was not removed. These demands were taken very seriously:

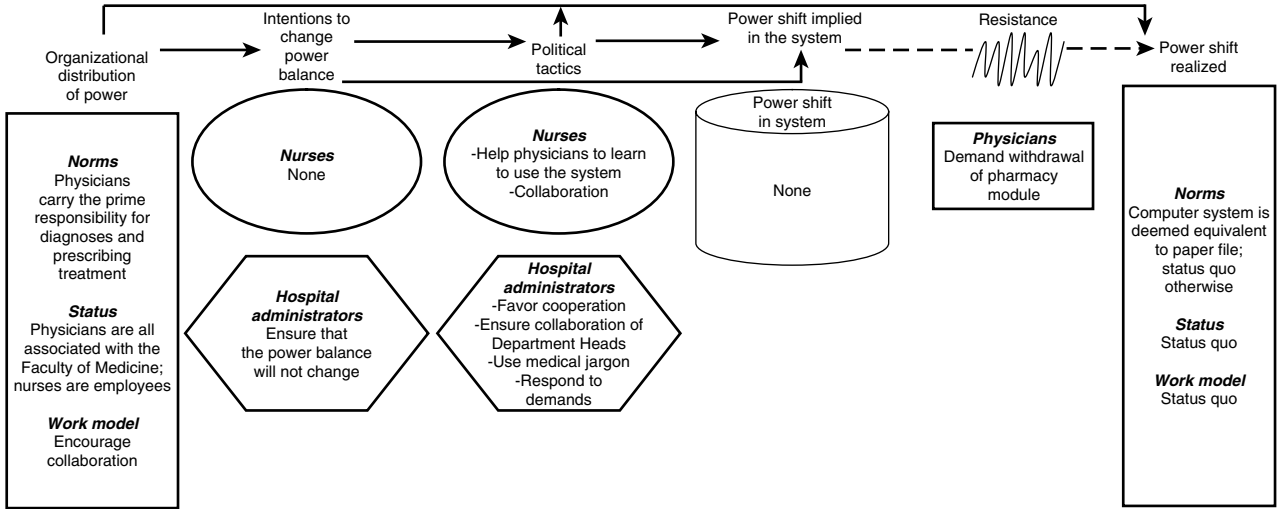
> We responded to the [residents'] letter very quickly. We formed an ad hoc committee to oversee planning, organizational, and installation issues with respect to the upgrade. And we included them, meaning we included the residents, in the form of the president of the union. And it worked so well that the one-month deadline was ignored, and they accepted what we proposed. So we completely avoided having them give back their keys and carry out their threats. (Physician-Administrator 1, Case 2)

Ultimately, the hospital decided to withdraw the pharmacy module and asked the software supplier to improve its features. All parties agreed to continue rolling out the other modules. Nurses and physicians continued to use the system; no change was observed in the organizational distribution of power.

3.2.3. Take 3—Explaining Emergence and Routinization with OC. As shown in Table 5, all five of the design parameters that are conducive to the emergence of innovations were present to the same degree in Case 2 as they were in other PBs. This explains why the project was welcomed at the outset:

> My colleagues . . . bought into it with enthusiasm . . . Here we are in a very active teaching hospital, with lots of research and tertiary care; we often have to draft reports and are stuck with preparing budgets and managing

Figure 2 Analyzing Case 2 Using PVIT



> spreadsheets on a daily basis; it never ends. When we get the system, everything will be online; we will just press a button, and it'll be amazing. That is what they bought into, seeing the advantages in terms of improving the quality of care, teaching, and research. (Physician 11, Case 2)

As shown in Table 2, prior research suggests that the only design parameter positively associated with routinization is decentralization. As indicated in Table 5, decentralization was a hallmark of Case 2 throughout the entire implementation. In this hospital, the physician who championed the project made sure that all physicians became actively involved in the decisions that drove the implementation process. Moreover, the actual implementation was driven by the department heads:

> We simply proceeded by group and the attraction of the group. [We addressed] the department heads, [and] we tried to convince them that the project was a good idea. Until they get on board, there's not much you can do . . . Once we had the department head on our side, with the influence he has over other people; although there are always some members of the staff who will tell their department to get lost, and so in general they could still do it, but in general they respect [the department head] because they elected him. (Physician-Administrator 10, Case 2)

3.2.4. Limitations, Paradoxes, and Alternate Explanations. CA predictions held for all but one of the physicians interviewed. As shown in Table 4, Physician 11 was using the CIS even though she reported not having experienced cognitive absorption and did not perceive the system as useful or easy to use:

> If they took the system out, I don't think that our lives would be made any more difficult. As far as I'm concerned, it gets in the way. It may be that we can review a file faster, but in most of the other hospitals that operate without it, they do things quite well on paper. (Physician 11, Case 2)

Applying PVIT helps us understand this apparent paradox because it reveals that the distribution of power in this hospital favored collaboration. Hence, using the system was, for this physician, a way to collaborate.

Using PVIT also reveals that the new system did not imply any shift in the organizational distribution of power. Therefore, based on the model's predictions, no resistance should have been observed in this case. Although this prediction held for the test requisition/results module, the implementation of the pharmacy module led to resistance from physicians. Indeed, we observed a form of resistance—refusal to use—that could not be explained by a power shift embodied in the system. According to PVIT, that power shift is a necessary condition for resistance. However, by using CA as an alternate template, we can explain the physicians' intentions and actual decision not to use the system in terms of a perceived lack of usefulness. Indeed, in this case, physicians felt that the pharmacy module was not useful; they saw it as an inefficient prescribing method that lengthened the response time and threatened patients' safety.

Finally, while the design parameters of Case 2 were typical of a PB, they did not hinder routinization, contrary to OC prediction. In fact, using the CIS had become routine:

> It just became how we did things. It stopped being a subject for teasing or a topic of conversation. I'm sure that if we could go back to the cafeteria in the early days we would hear people talking about the system at almost all the tables, but I would be surprised if anyone is talking about it in the cafeteria today. It's just taken for granted. (Administrator 1, Case 2)

While OC fails to predict this result, analyzing this case with PVIT reveals that the administrators used tactics designed to ensure the quality of the liaison devices and of planning and control mechanisms while preserving the hospital's power structure. For instance, efforts were made to create additional liaison devices and to ensure that department heads played significant roles in the implementation process. This suggests that it is possible to circumvent some of the barriers created by the very nature of design parameters by implementing mechanisms that draw on the strengths of a given configuration type.

3.3. Case 3

Case 3 was a university hospital. The administration chose to implement a CIS to replace obsolete systems in admissions, radiology, pharmacy, and laboratory. A selection committee composed of physicians and nurses selected the Delta system. The surgery unit volunteered to host a pilot project. Although the CIS was initially received by surgeons and surgery residents with much enthusiasm, the interest was short-lived. At the roll out of the requisition/results module, the surgery residents' and surgeons' enthusiasm radically shifted to reservations about how effectively the system met their needs. These concerns were compounded when the computerized care plan was introduced. Several weeks after its implementation, conflicts arose between physicians and nurses. The administration intervened to resolve the issue. Several months later, the introduction of the pharmacy module created additional conflict between physicians and pharmacists, resulting in surgeons demanding the withdrawal of the system. At the time of our study, the CIS had been withdrawn from most care units, and there were no plans to reintroduce it in the near future.

3.3.1. Take 1—Explaining Use with CA. All six nurses and one of the four physicians interviewed reported cognitive absorption and found the system useful and easy to use (see Table 4). Although a few initially had some difficulties, after a while they were able to use the system easily:

> Cognitive absorption: I like it. I like a challenge, and I was happy to be working with this system . . . At the last meeting, I asked, "When are you going to put more in it, I want something new." (Nurse 9, Case 3)

> Perceived ease of use: You could say that even I came close to throwing one out a window a couple of times, because you go to do something, you're in a hurry, and you don't know how. But now I've mastered it. (Nurse 9, Case 3)

> Perceived usefulness: But as a work tool, for placing all our orders or for developing care plans, all the forms appear; you can't go wrong. Everything is there; you don't have to deal with a Cardex where everything is written up all wrong. I find it great. (Nurse 9, Case 3)

3.3.2. Take 2—Explaining Group Resistance with PVIT. As indicated in Figure 3, the organizational distribution of power reflected the prominent status held by physicians, especially surgeons. The CIS implied a power shift, inasmuch as one of the test requisition/results module's features required that prescriptions be entered by physicians. Despite the fact that prior to system implementation physicians would officially be required to write down prescriptions, in practice, they would give verbal orders to nurses. With the new system, when physicians asked the nurses to enter prescriptions, the nurses' tactic was to refuse, because they were benefiting from this shift in power: "First, we wanted to put some pressure on them by saying that we wouldn't enter any prescriptions" (Nurse 9, Case 3).

Surgeons resisted by refusing to enter prescriptions. Hospital management's response was to ask the nurses to comply. At first, some of the nurses complained, and the union was not very receptive to the idea. However, after many negotiating sessions between the union and the hospital, the nurses decided to accept:

> Happily, the nurses were able to agree to enter prescriptions for some of the doctors instead of making them do it. If the nurses had really put their feet down and said, "We will not enter prescriptions . . . for doctors," there would have been some big problems, but it didn't come to that. (Physician 14, Case 3)

Although this issue was resolved, problems arose between the surgeons and the pharmacists when the implementation of the pharmacy module brought attention to another practice that did not meet regulatory requirements. In principle, a pharmacist must review and approve a prescription before medication can be given to a patient. In practice, however, once a prescription had been written and sent to the pharmacy, nurses would often simply take the medication from a cabinet in the care unit and administer it to the patient. The medication sent from the pharmacy was used to restock the cabinet. System use revealed this unorthodox procedure to the pharmacists, who reacted by insisting that the rules be followed. Introducing the system therefore raised the issue of the entire process of exercising professional responsibility, and brought about the pharmacists' desire to take control of prescribing and distributing medication.

> The pharmacists said, "Listen, we are responsible for prescriptions; we have to review them; there is no way the nurses are going to continue doing this like it was done in the past." (Administrator 3, Case 3)

This situation led to much physician resistance: "It caused some incredible arguments" (Administrator 3, Case 3). The pharmacists' tactics reinforced the power shift embodied by the system, feeding the mounting resistance among the surgeons. The physicians confronted the hospital CEO, demanding that the system be withdrawn. The final salvo came in the form of an ultimatum delivered by a surgeons' representative to the administration that insisted that the system be shut down. The administration responded aggressively, threatening to reallocate beds to physicians with a more positive attitude toward the system. The surgeons rebelled, explicitly asking colleagues in other care units not to hospitalize patients in any beds that became available in this way:

> We gave them an ultimatum . . . "You better get it out of here, because if you don't, there'll be trouble . . . ." Then management literally didn't believe us. They said, "They won't do it. Fine, we won't back down." And we had given our colleagues a very clear message: you guys better not take those beds, or there's going to be one helluva fight. (Physician 8, Case 3)

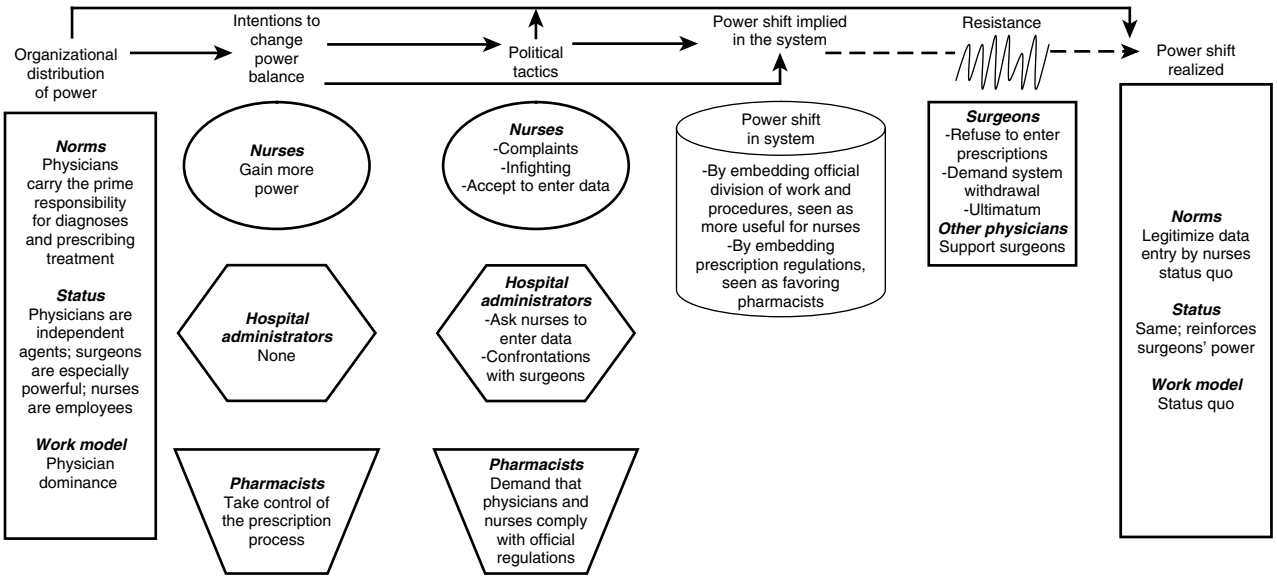
With many beds empty and mounting financial problems, the CEO, who could not afford to have a department go empty, decided to withdraw the system from surgery. All the staff went back to working with paper and the original distribution of power was reinforced.

3.3.3. Take 3—Explaining Emergence and Routinization with OC. As shown in Table 5, the design parameters of Case 3 are typical for a PB. As predicted by OC, the idea of a CIS was well received by the physicians, sometimes with enthusiasm.

> People thought, "Alright, this is the future, it's a normal development," and at [Case 3 hospital] we have always wanted our institution to be a bit ahead of the pack in all fields, and we saw this as another opportunity to be a bit cutting edge, so we got on board. (Physician 14, Case 3)

However, the same design parameters tend to hinder routinization. For instance, the absence of formal rules that often accompany low formalization makes it difficult for an innovation to become part of the routine. Also, although the diversity associated with grouping by means and ends encourages new ideas to emerge, it often generates conflicts over goals and resources. This explains several of the difficulties experienced in Case 3, where it soon became obvious that groups of professionals and specialties had different needs and expectations:

Figure 3 Analyzing Case 3 Using PVIT



> After two days, the surgeons said they would never [work] with it. The system was too slow and not at all adapted to their needs . . . they gave up. As for myself, I continue to work with it, because in geriatrics it isn't at all the same type of practice. In surgery, they have to review their opinion or change prescriptions every two or three hours. In geriatrics, we usually make changes for our patients once or twice a week. So I didn't have to use the computer all that often. For me, having the computer in geriatrics was a good thing. (Physician 13, Case 3)

The combination of these elements—conflict over goals and resources, the relative scarcity of planning and control systems, the relative absence of mechanisms to encourage mutual adjustment—hindered the routinization of system use.

3.3.4. Limitations, Paradoxes, and Alternate Explanations. One limitation of CA, observed in Case 3, is that it does not explain why (as shown in Table 4) the CIS was perceived as useful by some physicians and not by others, even though they all reported being cognitively absorbed when using the system. For instance, Physician 8 expressed some level of cognitive absorption by saying that he "found it intriguing" and "spent an enormous amount of time on that." Nevertheless, as illustrated by the following excerpts, this physician found the CIS neither useful nor easy to use:

> Perceived ease of use: Prescribing a blood count took six clicks on the panorama, whereas you can take a piece of paper and write "complete blood count" and everyone understands what you mean. (Physician 8, Case 3)

> Perceived usefulness: We quickly realized that there were some important limitations because . . . it was impossible to write conditional prescriptions. (Physician 8, Case 3)

Through the design parameters of training/indoctrination, horizontal specialization, and grouping, OC expands the limits of CA. Indeed, while training/indoctrination favors cognitive absorption, in a context of high horizontal specialization where grouping is by means and ends, an integrated system implemented across all care units has to satisfy a great variety of needs. In reality, such a system may well meet the needs of a geriatrician in a long-term care unit but not those of a surgeon in the intensive care unit.

In Case 3, CA fails to predict one outcome. As indicated in Table 4, Physician 13 reported being cognitively absorbed when using the system, perceived the system as useful and easy to use, and had been using it for some time. However, he suddenly stopped using it and sided with his peers. While CA fails to explain this physician's non use of the system, PVIT provides an explanation, i.e., the perceived loss of power associated with the use of the system. Because this physician felt that resistance ultimately served his interests better, he stopped using it, even though he perceived the system as useful and easy to use.

4. An Alternate-Template Theory of IS Implementation

As summarized in Table 6, although each model adds to our understanding of IS implementation in each case, each model is limited in the explanations it can provide, and at times its predictions fail. The use of alternate models helps by compensating for a given model's prediction failures, and by expanding its limits. In this section, we propose an alternate-template theory of IS implementation outcomes which, using the three models in an alternate and complementary manner, contributes

Table 6 Models' Predictions, Prediction Failures, Limits, and Alternate Explanations

Outcomes	Model's predictions	Prediction failures	Alternate templates' explanations	Model's limitations	Alternate templates' explanations
Use (CA)	Cognitive absorption influences perceived usefulness and perceived ease of use, which explain intention to use—as a proxy of individual use.	In Cases 1 and 3, some physicians reported being cognitively absorbed, found the system useful and easy to use but refused to use it. In Case 2, one physician was not cognitively absorbed and found the system neither useful nor easy to use, but actually used it.	PVIT explains why these physicians joined forces with their colleagues and resisted. PVIT explains why this physician collaborated as per the site work model.	Does not explain why some report cognitive absorption but do not find a CIS useful or why, in similar settings, some find it useful while others do not. CA does not explain the failure of an implementation when a majority of users use a given system.	OC explains how training/indoctrination favors cognitive absorption while showing how needs differ due to high horizontal specialization and grouping by ends and by means. PVIT explains physicians' resistance through the exercise of power, while OC explains physicians' dominance.
Resistance (PVIT)	In Cases 1 and 3, physicians resisted. PVIT explains this by their perception that the use of the system was undermining their position of power.	In Case 2, there was resistance (nonuse) not explained by power struggles.	CA explains the nonuse in terms of lack of usefulness of the system.	PVIT does not characterize the a priori distribution of power in an organization.	OC explains PBs distribution of power through several of the design parameters.
Adoption—emergence and routinization (OC)	In Cases 1 and 3, the design parameters of PBs foster emergence of innovations but hinder routinization.	Case 2 shared the same design parameters, yet the CIS was adopted.	PVIT shows how administrators' tactics allowed a temporary modification of the design parameters.	OC does not take into account the IT artifact.	CA takes into account the artifact in terms of usefulness and ease of use.

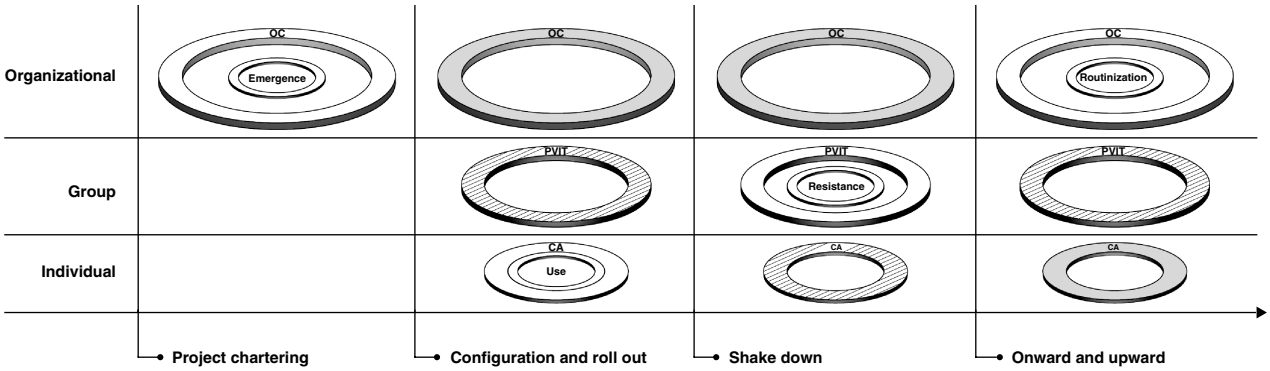
to overcoming the limits of each model and explains results that would otherwise appear paradoxical, hence providing a richer understanding.

In addition to taking into account the individual, group, and organizational levels of analysis, our theory (illustrated in Figure 4) includes a temporal dimension framed within the ES experience cycle. A core concept of the theory is that of outcome, defined as a result realized at any point during implementation (Sambamurthy and Kirsch 2000). The theory comprises four outcomes: emergence, use, resistance, and routinization. Each outcome occurs at a given level—individual, group, or organizational—and becomes salient at a particular phase of the ES experience cycle. This is not to say that the other outcomes are irrelevant; they are simply peripheral. Each focal outcome is explained by a prominent model at the same level of analysis. The models at the other levels of analysis play one of two roles. They either inform the prominent model by expanding its limits or elucidate its prediction failures.

4.1. Within-Phase Analysis

The ES experience cycle begins with project chartering, i.e., when organizational members consider the potential for organizational improvement, learn about an IS, decide to devote resources to its implementation, and make decisions about the upcoming phases of the project. Emergence, which corresponds to a state wherein the organization considers itself a prospective adopter (Swanson and Ramiller 2004), is an organizational-level outcome, and it is salient in this early phase. Our theory posits that OC is the prominent model here because several organizational design parameters explain emergence. First, the presence of a large number of specialists provides a broad knowledge base. Second, a high level of training increases interaction among activities, the level of trust, and the desire to overcome status quo. Third, flexibility, associated with a low degree of formalization and the relatively low importance of rules, creates an environment that facilitates the emergence of new ideas. Finally, grouping by means and by ends, helps promote innovation. Our theory hypothesizes that, conversely, in configurations

Figure 4 An Alternate-Template Theory of IS Implementation



where these design parameters are reversed, their influence on emergence is negative.

During configuration and roll out, the software is parameterized and tested, users are trained, and the system is put into operation. In this phase, user acceptance of the idea of using an IS is no longer sufficient. System use, an individual-level outcome, becomes salient. In our theory, CA becomes the prominent model. It explains intention to use as a proxy of use via cognitive absorption, perceived ease of use, and perceived usefulness. Our theory also suggests that the two other models play complementary roles. First, OC informs CA by expanding its limits. Indeed, one limitation of CA is that it does not explain why a system might not be perceived as useful and easy to use even when users report being cognitively absorbed. Through the design parameter of training/indoctrination, OC shows that interaction between activities, confidence, and desire to change the status quo favors cognitively absorped. CA also does not explain why a given system will be perceived as useful by some users but not by others. Through the design parameters of horizontal specialization and grouping, OC expands this limit. Indeed, in a context of high horizontal specialization where grouping is by function, an integrated system parameterized in the same way across all functions might not satisfy the needs of all users. This observation is supported by Gattinker and Goodhue's (2005) study on the effect of differentiation and interdependence on the benefits obtained from implementing an ES in manufacturing firms. These authors found that an ES can create operational difficulties for those sub units that are different from the others, either in terms of their products or their processes. Second, PVIT helps to explain why CA fails, in some instances, to predict outcomes. By highlighting how resistance can result from the perception that a power shift is embedded in a system, PVIT explains refusal to use a system even when the system is perceived as useful and easy to use and when a user reports being CA. Conversely, PVIT also helps explain why a user may decide to use a system perceived as neither useful nor easy to use when the distribution of power within the organization favors collaboration.

Shakedown includes debugging, performance tuning, and retraining. Although the objective in this phase is that users come to grips with the IS and adjust to the new work environment, it can result in project termination (Markus and Tanis 2000). Our analysis suggests that although use is still of interest, group-level resistance becomes the salient outcome. Indeed, we observed instances where individuals who had used the system for some time joined their peers in group resistance. Political models are said to be particularly suitable for explaining behaviors in the latter implementation phases (Jasperson et al. 2005). By taking into account the organizational distribution of power, the actors' intentions and tactics, and the power shift implied by an IS, PVIT explains group-level resistance. CA and OC complement the prominent model. First, there are times when, contrary to PVIT predictions, resistance occurs that cannot be linked to power issues. CA elucidates this paradox by shedding light on the users' perception that the system is not useful. Gattinker and Goodhue's (2005) study supports this contention, suggesting that although some resistance to a new IS is rooted in power dynamics, it may also be founded in the fact that the system, as it has been configured, does not work in a given sub unit because this unit differs from the rest of the organization. Second, although PVIT acknowledges the importance of the existing organizational distribution of power, it does not provide a rationale for this distribution. OC informs PVIT by providing this rationale through several design parameters (high training and indoctrination, high job specialization, little formalization of behavior, and horizontal and vertical decentralization) that indicate that physicians are the most powerful actors in hospitals. Consequently, their resistance or acceptance of an IS is likely to overrule the responses of other actors.

During the onward and upward phase, operations stabilize, on-going support is provided to users, and the system is maintained. The IS is either absorbed into work life, infused and routinized, or it will be curtailed and even rejected (Swanson and Ramiller 2004). Routinization, at the organizational level, becomes the salient outcome. OC is the prominent model because it shows that

the nature of some design parameters either fosters or hinders routinization. As per OC predictions, our analysis suggests that routinization is hindered by high horizontal specialization, low vertical specialization, high training and indoctrination, low formalization, functional grouping, little planning and control, few liaison devices, and low decentralization. Conversely, our theory hypothesizes that in configurations where these design parameters were reversed, the influence on routinization would be positive. Both PVIT and CA play complementary roles in this phase.

First, we observed one case where, although an organization possessed design parameters that, according to OC, should have hindered routinization, the system indeed became part of the organizational routine. By showing how management tactics can allow for a temporary modification of the design parameters, PVIT elucidates this apparent paradox. Second, by excluding the IS artifact, OC is limited in its ability to explain why, although two organizations share the same design parameters, the same IS may become routinized in one but not in the other. By taking into account the IS artifact, CA informs OC and contributes to expanding its limits. Our analysis suggests that when a system has been parameterized according to the needs of users in terms of their grouping, it is understandable that users from most organizational units will find it useful. Such was the case in Case 2, where physicians adopted a system that had been rejected in Case 1. Although parameterization was mostly uniform in Case 1, in Case 2 the system had been adapted to the needs of each specialty and sometimes to each individual; hence it was seen as useful and easy to use.

The within-case analysis is summarized in the following propositions:

Proposition 1. *At a particular phase of an IS implementation, a focal outcome becomes salient. This outcome is then better explained by a prominent model situated at the same level of analysis.*

Proposition 2. *When prominent, a given model may have limitations or fail in its prediction. In such cases, the models situated at other levels of analysis play complementary roles*; *they either inform the prominent model by expanding its limits, or elucidate its prediction failures.*

4.2. Cross-Phase Analysis

By taking into account three levels of analysis (individual, group, and organizational), the timeline, the salient outcome, and the prominent model of each implementation phase, our theory offers a holistic view of the IS implementation process. This provides a richer understanding of the events that shape IS implementation, not only within a given phase, but also across phases. This multilevel longitudinal perspective provides insight into an IS implementation success or failure that might otherwise have appeared paradoxical. We will illustrate this point by revisiting the events of Case 1 and applying our theory.

In Case 1, a focus on the project chartering phase would lead one to expect a successful implementation, because all parties had welcomed the emergence of a CIS in this hospital. Similarly, using CA to analyze the project in the configuration and roll out phase would suggest a successful implementation. Indeed, in Case 1, 450 users were involved—400 nurses and 50 physicians. Given that all the users reported being cognitively absorbed with the system and that the vast majority of the nurses were using it, merely summing up individual behaviors would have led one to conclude that it was a successful implementation. It is only in the shakedown phase that PVIT explains how the power shift embodied in the system design led physicians to resist its implementation even though the nurses favored it. In the onward and upward phase, OC explains why physician resistance overruled acceptance of the system by other users. Indeed, OC explains why, in hospitals, the power lies in physicians' hands. According to Mintzberg, "to have power in the professional bureaucracy, [the actors] must be professionals themselves" (Mintzberg 1980, p. 334). This explains why physicians' support for, or opposition to, a given system will have a critical impact on project success or failure.

This example shows that we can obtain a much more profound understanding of the events in each organization through the concomitant and alternate use of the three models. By using all three models in all four phases of ES, we obtained a more complete and inclusive analysis of the factors and mechanisms behind the various implementation outcomes. No single model, no matter how encompassing, could answer multiple and complementary questions in such a complete fashion. Rather than providing different answers to the same question, each of the three models illuminated another aspect of the subject and, in the process, expanded our understanding of the implementation. By juxtaposing the factors and mechanisms identified under each perspective, explanations were significantly strengthened. Hence the third proposition reads as follows:

Proposition 3. *Taking into account the timeline and using explanatory models alternately provides explanations to outcomes that, at first, appear paradoxical.*

5. Discussion

Before offering practical advice and suggestions for future research, some limitations of the models selected should be noted. First, several models other than CA aim to explain individual use. For instance, the technology acceptance model (Davis et al. 1989) has been most often used to explain IS usage. Social cognitive theory has served to link computer self-efficacy to computer use (Compeau and Higgins 1995), and the social

influence model of technology use has served to explain e-mail usage (Schmitz and Fulk 1991). Yet, even if a model other than CA was used to explain a larger percentage of the variance of individual use, its explanatory power would still be restricted to this outcome at one point in time and at one level of analysis, and it would remain limited in its ability to explain another outcome, at another point in time, at another level of analysis. Second, although PVIT is highly regarded, it has never actually been tested and other models of resistance have recently been proposed (Lapointe and Rivard 2005). However, in our opinion, PVIT remains a single-level model of choice for explaining group-level resistance because it clearly defines the focal construct, and gives significant details on the relationships between the focal construct and its antecedents. Third, OC itself does not offer predictions concerning relationships between design parameters and the emergence and routinization of IS. Yet, OC's widely recognized ability to characterize organizations and the fact that no model exists to explain the impact of organizational-level variables on IS implementation outcomes concur to make OC an appropriate choice.

To overcome these limits, future researchers could select additional outcomes and associated models to expand the coverage of the ES experience cycle. For instance, postadoptive behaviors are said to be wanting in terms of research (Jasperson et al. 2005). Adaptation—efforts made to modify existing conditions, be they related to the self, the work environment, or the technology, so as to reach alignment between such conditions—is a post-adoptive outcome at the group level (Majchrzak et al. 2000) and at the individual level (Beaudry and Pinsonneault 2005). Future researchers could select individual adaptation and group adaptation as additional outcomes, along with models that aim to explain each outcome.

Notwithstanding these limitations, we are confident enough in the soundness of our theoretical foundation and the richness of our findings to offer practical advice. First, our analysis suggests that during project chartering, implementers need to be particularly aware of the design parameters of the organizational configuration where the IS is implemented. Indeed, some of the design parameters may influence how open various actors will be to innovation in their organization and how challenging the process is likely to become in the coming phases.

During configuration and roll out, implementers will want to focus on user cognitive absorption, as well as on the usefulness and ease of use aspects of the system. They will not only want to assess the users' perceptions of ease of use and usefulness at the outset, but also to monitor these perceptions as the implementation process evolves. In addition, in situations of high horizontal specialization, it will be important to determine the extent to which parameterization will have to take into account differentiation so as to provide users with valuable functionalities.

During shakedown, political aspects may become paramount. Thus, implementers must pay heed to the existing distribution of power. They need to acknowledge the main stakeholders and their relative power and adapt implementation strategies accordingly. Implementers must ensure that the most powerful groups perceive benefits as outweighing the challenges they will face. They must also identify the potential modifications to the power structure that are embodied in an IS, and manage the critical changes that may result from it. Implementers should also engage powerful stakeholders in problem resolution. In doing so, implementers are likely to anticipate resistance behaviors and, eventually, avoid them.

Finally, in the onward and upward phase, implementers must consider the influence of design parameters on either routinization or rejection of the system. The very parameters that may have facilitated or hindered the emergence of the idea of IS implementation may now play the opposite role. Thus, managers have to monitor these parameters so as to smooth out IS routinization and avoid its rejection.

In conclusion, this study has strived to advance our understanding of the IS implementation phenomenon. We applied three alternate templates to explain the same phenomenon from multiple positions, preserving separate views and analyzing complementarities of the three models to gain a better understanding of IS implementation and to elucidate what may initially have seemed to be contradictory results. We hope that the alternate-template theory proposed herein will provide implementers with a more holistic understanding of the phenomenon they have to manage and make their project a successful endeavor. We also hope that this new way of studying IS implementation will stimulate other researchers to venture down the numerous avenues that remain to be explored.

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