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## A MULTILEVEL MODEL OF RESISTANCE TO INFORMATION TECHNOLOGY IMPLEMENTATION<sup>1</sup>

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### Abstract

*To better explain resistance to information technology implementation, we used a multilevel, longitudinal approach. We first assessed extant models of resistance to IT. Using semantic analysis, we identified five basic components of resistance: behaviors, object, subject, threats, and initial conditions. We further examined extant models to (1) carry out a preliminary specification*

*of the nature of the relationships between these components and (2) refine our understanding of the multilevel nature of the phenomenon. Using analytic induction, we examined data from three case studies of clinical information systems implementations in hospital settings, focusing on physicians' resistance behaviors. The resulting mixed-determinants model suggests that group resistance behaviors vary during implementation. When a system is introduced, users in a group will first assess it in terms of the interplay between its features and individual and/or organizational-level initial conditions. They then make projections about the consequences of its use. If expected consequences are threatening, resistance behaviors will result. During implementation, should some trigger occur to either modify or activate an initial condition involving the balance of power between the group and other user groups, it will also modify the object of resistance, from system to system significance. If the relevant initial conditions pertain to the power of the resisting group vis-à-vis the system advocates, the object of resistance will also be modified, from system significance to system advocates. Resistance behaviors will follow if threats are perceived from the interaction between the object of resistance and initial conditions. We also found that the bottom-up process by which group resistance behaviors emerge from individual behaviors is not the same in early versus late implementation. In*

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*early implementation, the emergence process is one of compilation, described as a combination of independent, individual behaviors. In later stages of implementation, if group level initial conditions have become active, the emergence process is one of composition, described as the convergence of individual behaviors.*

**Keywords:** User resistance, information technology implementation, information system implementation, longitudinal perspective, multilevel approach, resistance behaviors, semantic analysis, case study

## Introduction

Early researchers who studied information technology implementation recognized resistance as a critical variable (Keen 1981). While some saw resistance as a barrier to be removed (Kossek et al. 1994), others saw it as a means by which users communicate their discomfort with a system that might be flawed (Marakas and Hornik 1996). A review of 20 IT and IT-related journals over the past 25 years found 43 articles that treated resistance as a key implementation issue. While they acknowledge the importance of resistance, most treat it as a black box. Only 9 of the 43 articles explicitly defined the concept of resistance. Moreover, only four opened the black box and proposed theoretical explanations of how and why resistance occurs (Joshi 1991; Marakas and Hornik 1996; Markus 1983; Martinko et al. 1996). Adopting the premise that "better theories of resistance will lead to better implementation strategies and, hopefully, to better outcomes" (Markus 1983, p. 430), our study follows in the steps of these earlier efforts. Using case study research, we propose a process model of resistance to IT implementation that explains how resistance surfaces, progresses, and culminates.

Our model of resistance both resembles and differs from earlier models. Like earlier models, it conceptualizes resistance as a result of the interaction among several antecedents. It also adopts a neutral stance toward resistance to IT,

regarding it as neither good nor bad. It departs from earlier models by using a case study strategy of theory building (Eisenhardt 1989), suggesting that time plays an important role in explaining the nature of resistance behaviors, and adopting a multilevel rather than a single-level approach to studying resistance. Considering the relatively scarce prior research and theorizing with respect to resistance in the IT literature, the contribution of our model will be to shed light on the multilevel and evolutionary nature of the resistance phenomenon.

We began our theory-building effort by assessing the four extant models of resistance to IT. Then, using semantic analysis, we identified five basic components of resistance to IT: behaviors, object, subject, threats, and initial conditions. We further examined the extant models to carry out a preliminary specification of the nature of the relationships between these components and to refine our understanding of the multilevel nature of the phenomenon. We pursued our theory building effort by analyzing data from three case studies on the implementation of electronic medical records. We verified the presence of the basic components and their relationships. We also used analytic induction to uncover new constructs, relationships, and boundaries that could enrich our understanding of the phenomenon and assist our theory-building process (Patton 2002). Finally, we revisited prior research on resistance to IT in light of our findings.

## Assessing Extant Models of Resistance to IT

Adopting the political variant of interaction theory, Markus (1983) explains resistance in terms of interaction between the system being implemented and the context of use. She posits that a group of actors will be inclined to use a system if they believe it will support their position of power. If they think it might cause them to lose power, they will resist.

Joshi (1991) uses equity theory to propose a model wherein individuals evaluate a given change on three levels. They first assess the variation in their equity status brought about by the system. They then compare it to that of their organization. Finally, they compare it to that of other members of their reference group. They will resist if they perceive inequity. Marakas and Hornik (1996) adapted a model of passive resistance misuse to explain resistance behavior as passive-aggressive responses to threats or stresses that an individual will, rightly or wrongly, associate with a new system. Martinko et al. (1996) propose an attributional model of individual reactions to IT that posits that a new technology, internal and external variables, and an individual's experience with success and failure at tasks involving similar technologies evoke causal attributions. In turn, these attributions influence the individual's expectations regarding future performance outcomes, which then drive his or her affective and behavioral reactions toward the technology and its use. The behavioral reactions result in outcomes, the nature of which influences the nature of future attributions.

All four models share the underlying assumption about the desirability, or lack thereof, of resistance. Contrary to commonly held assumptions about resistance that regard it as a critical obstacle preventing organizations from reaping the potential benefits of an IT implementation, the models consider resistance to be neither good nor bad. For instance, rather than seeing resistance as an undesirable result to be avoided or overcome, Markus posits that it can have negative or positive effects. When it generates conflict and consumes time and attention, resistance is dysfunctional and can even be destructive. It can nevertheless be functional for organizations if it prevents the implementation of systems that, by increasing stress or turnover or by eroding performance levels, would have negative impacts. While Joshi does not explicitly enunciate the assumption about the desirable or undesirable nature of resistance underlying his model, it is clearly implicit in the argument. Indeed, Joshi posits that extreme inequities should be avoided, because highly inequitable treatment of some users is likely to influence the equity perception of others, hence

causing disruptions. Therefore, when resistance prevents the use of a system that has inequitable consequences, it plays a useful role. For Marakas and Hornik, resistance is a means by which users communicate their discomfort with a system that might be flawed. While they suggest intervention techniques aimed at overcoming resistance, Martinko et al. do not consider resistance intrinsically bad; rather, their techniques aim at alleviating those situations where dysfunctional attributions can have debilitating effects.

A second common assumption pertains to the nature of the relationship between resistance and its antecedents. While only Markus explicitly uses the term interaction theory, all four models indeed assume that resistance results from the mutual adjustment of several antecedents. Markus's model portrays resistance as resulting from the interaction of system features with the intra-organizational distribution of power. "When [the interests and intentions of both users and designers] are very similar, resistance rarely occurs" (p. 433); conversely, if users perceive that the system represents a loss of power, they are likely to resist. More precisely, the model stipulates that the strength of resistance would be related to the size of the loss and its perceived importance. Similarly, Joshi's model posits that "in any exchange relationship, individuals are constantly concerned about their inputs, outcomes, and the fairness of the exchange" (p. 231). They also constantly compare themselves with others. When a system is implemented, individuals assess the importance of variations in inputs and outcomes. If they perceive the variations as detrimental, they will experience inequity. The stronger the perceived inequity, the more likely they are to resist. Focusing on passive resistance misuse, Marakas and Hornik argue that it is situational. It results from the interaction between the uncertain conditions provoked by a new system and individual traits (e.g., rigidity and resentment). When this interaction leads to perceived threats or stresses, the individual may respond with passive resistance misuse behaviors. Finally, Martinko et al. suggest that the intensity and nature of resistance to IT depend on the interaction of a number of factors: internal and external influences as well as the individual's prior experience with the technology.

Notwithstanding the contributions of these models, we identified a number of areas to be expanded upon. The first is that each model adopts a single-level perspective in explaining resistance. Three explain resistance at the individual level (Joshi, Marakas and Hornik, and Martinko et al.). The fourth focuses on resistance at the group level (Markus). By adopting a single-level approach, each model helps better understand some aspects of resistance, but dismisses others. It has been argued that a multilevel perspective, which aims at providing a more integrated understanding of phenomena that unfold across levels in an organization, provides a richer portrait of organizational life and makes explicit the relationships between constructs that were previously unlinked (Klein and Kozlowski 2000). Second, while they have strong theoretical groundings, three of the models are wanting in terms of empirical evidence. Indeed, while Joshi and Marakas and Hornik illustrate their models with examples, either fictitious or from previous studies, Martinko et al. keep the discussion at a conceptual level. Only Markus uses data from a case study. Finally, while the IT implementation process is not instantaneous and resistance may evolve over time, the models do not explicitly take into account the role of time in the unfolding of resistance.

## Defining Resistance

The next step of our theory building effort was to define the theoretical phenomenon under study and its underlying constructs (Eisenhardt 1989). Because the semantic structure of words is said to reflect their meaning (Pitt 1999), we used semantic analysis in our effort to define the phenomenon of resistance. In compositional semantics, the meaning of the whole is made up of the meaning of the parts. According to the principle of decompositionality, "When an expression admits analysis as morphologically or syntactically complex, assume as an operating hypothesis that the sense of the expression arises from the composition of the senses of its constituent parts" (Wasow et al. 1983, p. 104). Thus, although various definitions of a concept might exist,

semantic decomposition can be used to reveal common ground among them by separating a concept into smaller concepts, down to semantic primitives. While the term primitive refers to the most-basic concepts, no correct set of primitives exists for a given domain. A set of primitives is deemed adequate when knowledge about them can be presented in a simple, meaningful way (Wilks 1992).

We conducted semantic decomposition using the guidelines set forth by Akmajian et al. (1984). First, we identified syntactically unstructured expressions of the language referring to the concept of resistance, taking them from several sources. The primary source was the set of nine definitions of resistance previously identified in the IT literature. Because these definitions had been either borrowed or adapted from various reference disciplines, these disciplines (psychology, political science, sociology, and change management) were also searched for additional expressions referring to resistance. Second, we searched for commonalities among the definitions proposed for these expressions. Third, to establish correspondence among definitions, a small number of repeatable semantic primitives were identified for each definition. While not all definitions have all primitives, the pool of definitions taken from a given discipline invariably reveals five basic, common primitives: resistance behaviors, object of resistance, perceived threats, initial conditions, and subject of resistance (Table 1).

*Resistance behaviors.* Behavior is the primary dimension of resistance, inasmuch as words like reaction (Ang and Pavri 1994), behavior (Markus 1983), and conduct (Zaltman and Duncan 1977) are found in almost all definitions. Resistance behaviors exist across a spectrum, from being passively uncooperative to engaging in physically destructive behavior (Marakas and Hornik 1996), or from lack of cooperation to sabotage (Carnall 1986). The taxonomy proposed by Coetsee (1993, 1999) is useful in this regard, allowing the classification of the resistance behaviors according to four levels of resistance: apathy, passive resistance, active resistance, and aggressive resistance. Apathy includes behaviors such as inac-

**Table 1. Results of Semantic Analysis of Resistance to IT**

	Author	Keen (1981, p. 27)	Markus (1983, p. 433)	DeSanctis & Courtney (1983, p. 737)
	Expression	Resistance to change	Resistance	Resistance to MIS
	Definition	The tactical approach to implementation sees resistance as a <b>signal from a system in equilibrium</b> that the <i>costs of change are perceived as greater than the likely benefits</i>	<b>Behaviors</b> intended to prevent the implementation or use of a system or to prevent system designers from achieving their objectives	Resistance to <u>the MIS</u> sometimes occurs when PEOPLE experience <i>changes in the content of their jobs and their relative power vis-à-vis others</i>
Primitives	Initial conditions	from a system in equilibrium		in the content of their jobs and their relative power vis-à-vis others
	Perceived threats	<i>costs of change are perceived as greater than the likely benefits</i>		<i>changes</i>
	Object	<u>change</u>	implementation or use of a system or to prevent system designers from achieving their objectives	<u>the MIS</u>
	Resistance behaviors	<b>signal</b>	<b>behaviors</b>	
	SUBJECT			PEOPLE
	Author	Joshi (1991, p. 231)	Ang and Pavri (1994, p. 130)	Martinko et al. (1996, p. 322)
	Expression	Resistance to inequity	Resistance to change	Resistance to the implementation of an IT
	Definition	Equity theory suggests that the greater the <i>inequity or decline in the net gain</i> , the greater the resulting distress would be, <b>INDIVIDUALS</b> who experience the <u>distress of inequity or loss of equity</u> are likely to resist it <b>by attempting to minimize their inputs and others' outcomes as well as attempting to increase others' inputs</b>	Resistance to <u>change</u> is a normal <b>psychological reaction</b> when the <i>perceived consequences (e.g., loss of power) are negative</i>	USER resistance [ <u>to the implementation of IT</u> ] can take on a wide variety of <b>behavioral forms</b>
Primitives	Initial conditions			
	Perceived threats	<i>suggests the greater the inequity or decline in the net gain, the greater the resulting distress</i>	<i>perceived consequences (e.g., loss of power) are negative</i>	
	Object	<u>distress of inequity or loss of equity</u>	<u>change</u>	<u>to the implementation of IT</u>
	Resistance behaviors	<b>by attempting to minimize their inputs and others' outcomes as well as attempting to increase others' inputs</b>	<b>psychological reaction</b>	<b>behavioral forms</b>
	SUBJECT	INDIVIDUALS		USER

Table 1. Results of Semantic Analysis of Resistance to IT (Continued)				
	Author	Marakas and Hornik (1996, p. 209)	Lee and Clark (1996-1997, p. 121)	Enns et al. (2003, p. 162)
	Expression	Passive resistance misuse	Resistance to reengineering	Resistance
	Definition	A <b>recalcitrant, covert behavior</b> resulting from both <i>fear and stress</i> stemming from the <u>intrusion of the technology</u> into the <b>previously stable world of THE USER</b>	The resistance may be nothing more than <b>inertia</b> , but it also stems from a <i>healthy suspicion of new and unproved market systems</i> . Furthermore, PARTIES AFFECTED ADVERSELY by the <u>change</u> are expected to <b>fight</b> <u>reengineering efforts</u>	Resistance is displayed when THE TARGET <b>avoids performing</b> the requested action <i>by arguing, delaying, etc.</i>
Primitives	Initial conditions	previously stable world of the user		
	Perceived threats	<i>fear and stress</i>	<i>a healthy suspicion of new and unproved market systems</i>	
	Object	<u>intrusion of the technology</u>	<u>Change; reengineering efforts</u>	<u>the requested action</u>
	Resistance behaviors	<b>recalcitrant, covert behavior</b>	<b>inertia, fight</b>	<b>avoids performing [the requested action] by arguing, delaying, etc.</b>
	SUBJECT	THE USER	PARTIES AFFECTED ADVERSELY	THE TARGET

tion, distance, and lack of interest. Manifestations of passive resistance are rather mild; they include delay tactics, excuses, persistence of former behavior, and withdrawal. Active manifestations are typified by strong but not destructive behaviors, such as voicing opposite points of view, asking others to intervene or forming coalitions. Finally, aggressive resistance behaviors such as infighting, making threats, strikes, boycotts, or sabotage seek to be disruptive and may even be destructive.

*Object of resistance.* The verb *resist* is transitive, which means that it takes a direct object. Identifying and understanding this object is critical, because resistance is shaped in part by the “content of what is being resisted” (Jermier et al. 1994). Psychotherapy clients resist the counseling process (Cowan and Presbury 2000), employees resist management’s efforts to institute change (Dent and Goldberg 1999), and users resist the implementation of an information technology (Joshi 1991).

*Perceived threats.* All fields of inquiry share the idea that for resistance to occur, some threat has to be perceived. Dent and Goldberg (1999) argue that people do not resist change *per se*. Rather, they react to the threats that they perceive will be brought by that change. Perceived threats are identified by expressions such as “overwhelming emotional pain” (Freud 1919) or “the perception of a dangerous situation” (Marakas and Hornik 1996). Employees resist changes that they believe will cause either loss of status, loss of revenue, or loss of power (Dent and Goldberg 1999). Individuals resist the implementation of a system when they perceive inequity (Joshi 1991); groups resist it when they fear a potential loss of power (Markus 1983).

*Initial conditions.* Some authors emphasize the role of subjectivity in resistance (Jermier et al. 1994). They argue that understanding resistance demands attention to subjectivities (Collinson 1994). Some individuals or groups may accept a change, but others may resist it. Apart from the ability, or lack thereof, to perceive a threat, some initial conditions such as distribution of power

(Markus 1983) or established routines (Marakas and Hornik 1996) may influence how threatening an object is perceived to be.

*Subject of resistance.* The subject of resistance is the entity that adopts resistance behaviors. When resistance is studied from a psychological perspective, the subject is the individual (Cowan and Presbury 2000). When it is studied from a political perspective, the subject is generally a group of actors (Jermier et al. 1994). In IT research, sometimes the subject is an individual (Marakas and Hornik 1996). At other times, it can be a group (Markus 1983) or an organization (Ang and Pavri 1994).

## Toward a Multilevel View of Resistance to IT

In light of this set of primitives, we further examined the four extant models and derived a preliminary model of resistance to IT. Table 2 synthesizes the four models in terms of the five primitives. Although their instantiations differ from one model to another, all five are included in each model. In terms of relationships between the primitives, all four models posit that perceived threats result from the interaction between a given set of initial conditions and an object. In turn, the presence of perceived threats is a necessary condition for resistance behaviors to occur. While such a preliminary specification allows the analysis of the interplay among initial conditions, an object, perceived threats, and resistance behaviors adopted by a subject, it fails to capture the multilevel and dynamic nature of resistance.

Table 2 hints at the usefulness of adopting a multilevel perspective to the study of resistance to IT. First, multilevel theory posits that a phenomenon can be studied at two levels: the individual and the unit (dyad, group, function, or organization) (Klein and Kozlowski 2000). As shown in Table 2, resistance to IT can be conceptualized at either level. Joshi (1991), Marakas and Hornik (1996), and Martinko et al. (1996) adopted an



**Table 2. The Extant Models of Resistance to IT Implementation**

Article	Object	Initial Conditions	Interaction	Perceived Threat	Resistance Behaviors	Subject
Markus 1983	Patterns of interaction prescribed by the system	Patterns that already exist in the setting into which the system is introduced (here the political setting)	Mismatches [may] create resistance-generating conditions	Power loss for a group, power gain for another	Speaking resentfully of the system  Continuing to follow former procedures	Group
Joshi 1991	Inputs and outcomes prescribed by the system (self, group of reference, employer)	Inputs and outcomes that already exist (self, group of reference, employer)	Mismatches [may] create a perceived threat	Distress of inequity or loss of equity	Attempting to minimize their inputs and others' outcomes as well as attempting to increase others' inputs	Individual
Marakas and Hornik 1996	New routines and modes of work brought about by a new IT	Established routines and modes of work  Individual's rigidity and resentment	Interaction between difference in demands of the IT, established modes of work, and the individual's rigidity and resentment	Stress and fear	Passive resistance misuse	Individual
Martinko et al. 1996	Characteristics of the IT	Attribution schemata of the individual External influences Internal influences	Attributional processes	Efficacy expectations Outcome expectations	Low levels of use Lack of use Harmful use	Individual

individual-level conceptualization, and Markus (1983) adopted a unit-level conceptualization. Second, multilevel research categorizes models as either single-level or cross-level. Single-level models specify the relationships among constructs conceptualized at the same level. Cross-level models link constructs from different levels. From Table 2, Markus's and Marakas and Hornik's models are clearly single level. Table 2 suggests that the other two models incorporate antecedents from different levels. Joshi's model refers to the self, the group of reference, and the employer. Martinko et al.'s model posits that external influences help explain individual resistance behaviors.

Adopting a multilevel perspective, we conceptualize resistance to IT as a unit-level phenomenon. We chose to focus on group resistance because, in most circumstances, resistance from a single user would not be sufficient to severely affect the overall implementation process or lead to system abandonment (Dickson et al. 1974; Markus 1983). By adopting a multilevel perspective, we also acknowledge the possibility that our resulting model will be cross-level, recognizing that individual or unit-level constructs may influence group resistance.

In multilevel research, studying a phenomenon at the unit level calls for examining the process by which lower-level properties manifest at a higher level (Klein and Kozlowski 2000). In line with this precept, we seek to understand the bottom-up process by which group resistance behaviors emerge from individual behaviors. Finally, we take a longitudinal perspective, because the multilevel approach calls for a consideration of the role played by time because "the temporal scope... affects the apparent origin and direction of many phenomena" (Klein and Kozlowski 2000 p., 23).

## Research Method

Studying resistance to IT with a multilevel approach requires a rich, longitudinal data set. Data from three case studies of implementation of

electronic medical records (EMRs) in hospital settings were analyzed. EMRs are systems that allow access to patients' records at all times from different locations, either to retrieve data, observe treatment regimens, or obtain test results. We selected hospital settings because of the presence of clearly identified groups of actors. Our study focused on one of these groups, the physicians. Each case describes the implementation process from software selection to installation and use or nonuse by the hospital's physicians. This time frame sets the model's temporal boundaries, thus framing the set of antecedents that will lead to physicians' resistance behaviors. Consequently, the model does not seek to explain events that occurred before software selection. Rather, the results of such events are taken as initial conditions.

Research sites were selected to maximize variation and allow comparison (Guba and Lincoln 1989). As shown in Table 3, similarities and variations pertain to three characteristics of the cases: hospital type, software package, and outcome. In terms of similarities, two sites were university hospitals, two had selected the same EMR software, and two implementations had failed. In terms of variations, two hospital types are present, two different EMR packages were implemented, and two different outcomes were observed.

To reach an appropriate degree of internal validity, three sources of evidence were used: direct observation, documentation, and interviews (Dubé and Paré 2003). One of us spent several days at each site observing how each EMR was used in units providing representative or revealing situations. System and project documentation, minutes from committee meetings, as well as memorandums and letters were analyzed. Data gathered from these sources was used to corroborate, validate, and complement the interview data.

Interviewees represented the major stakeholders: physicians, nurses, and administrators. Initial respondents were the project manager, the nursing director, and the medical director from

**Table 3. Selected Cases**

	Hospital Type	Software Package	Result of the Implementation Process	People Interviewed
Case 1	Community hospital	Alpha	Failure	Physicians: 7 Nurses: 4 Managers: 5
Case 2	University hospital	Alpha	Success	Physicians: 4 Nurses: 4 Managers: 5
Case 3	University hospital	Delta	Failure	Physicians: 4 Nurses: 6 Managers: 4

each site. A snowball sampling strategy was used to identify subsequent respondents. Each initial interviewee was asked to suggest other respondents who were knowledgeable about the project, represented a subset of the hospital population, and/or had exhibited extreme behavior during implementation (Crabtree and Miller 1992; Patton 2002). The average interview lasted one hour. Respondents were asked to provide a narrative of the implementation, from the decision to implement an EMR to project termination. Interviews typically began with a generic question that allowed the respondents to express how they experienced the implementation process. More specific questions were asked as required to ensure that the data from each case covered similar material and would allow cross-case comparisons (Miles and Huberman 1994). Data collection ended at the point of redundancy, "when efforts to get additional members cannot be justified in terms of the additional outlay of energy and resources" (Lincoln and Guba 1985, p. 233). One of us produced and coded complete transcripts using NUD\*IST. To ensure validity of the coding process, three additional researchers coded 45 excerpts from the cases. The inter-coder reliability was 0.77. The initial coding allowed for the identification of behaviors, precursors, threats, subjects, and objects of resistance and was an integral part of the analysis.

Meaning was attributed to the data, and efforts were made to ensure that the coding process preserved existing relationships in the data (Miles and Huberman 1994). Because qualitative data analysis is an open and iterative process, room was made for modifications dictated by the data itself. When elements were not represented adequately by the selected codes, new categories were allowed.

Data was analyzed in two stages (Eisenhardt 1989). Within-case analysis was performed first to allow the unique patterns of each case to emerge and to provide researchers with a rich understanding of each case, hence accelerating cross-case comparisons. Second, a cross-case analysis using analytic induction was conducted in search of common patterns and unique features. Analytic induction is an alternative to purer forms of phenomenological inquiry and grounded theory (Patton 2002). More precisely, in analytic induction

researchers develop hypotheses, sometimes rough and general approximations, prior to entry into the field or, in cases where data already are collected, prior to data analysis. These hypotheses can be based on hunches, assumptions, careful examination of research and theory, or

combinations. Hypotheses are revised to fit emerging interpretations of the data over the course of data collection and analysis. (Gilgun 1995, pp. 268-269).

For the within-case analysis, data reduction and presentation techniques were used (Miles and Huberman 1994). First, separate tables were created to distinguish between different episodes of resistance. Segments of the transcripts that reported specific resistance behaviors were then identified. The segments were examined to identify the objects of these behaviors and their associated threats and initial conditions. They were then organized in conceptually clustered matrices so as to build a logical chain of evidence. The resulting chains of evidence, presented in the appendices permitted an explanation-building analytic strategy (Yin 1994).

Cross-case analysis was conducted using two tactics said to enhance the probability of capturing novel findings among the data (Eisenhardt 1989). First, categories were selected for identifying patterns in each dimension of the framework. Second, cases were compared in pairs to identify the subtle similarities and differences between them. In addition, the chains of evidence developed in the within-case analyses helped build a general explanation that could be applied to each individual case, while simultaneously taking into account differences between cases.

## Within-Case Analysis: Episodes of Resistance

In each case, we identified several episodes of physicians' resistance. This section presents a detailed narrative of the events so that the dynamics of each episode can be understood. Not only does it allow the identification of diverse resistance behaviors, but the threats, initial conditions, subjects, and objects of resistance can also be distinguished. What results is an in-depth understanding of the surfacing, progression, and culmination of physicians' resistance throughout the implementation process.

### Case 1

Case 1 is an acute care hospital where physicians are remunerated on a fee-for-service basis. This new hospital was to serve as a model "paperless hospital." As they were recruited, nurses and physicians were informed that they would be using an EMR. However, when the hospital opened, the system had not yet been installed. Implementation of Alpha began two years later. Five years after system introduction, only the first module (Phase I, test requisitions/test results) was still in use. The second module (Phase II, nursing care) had been withdrawn after major conflicts, first between the nurses and the physicians, then between the physicians and the administration. Workstations installed at bedside, which had almost never been used, had been removed. The system was running at 25 percent of capacity, and there were no plans for expanding its use. As suggested by Figure 1 and in Appendix A, while resistance behaviors initially consisted mostly of apathy and lack of interest, they later became more aggressive. The project was ultimately abandoned and the Department of Health put the hospital under trusteeship.

**Prologue.** A multidisciplinary committee of physicians, nurses, and other professionals was formed to evaluate systems on the market and identify the one best suited to meeting the hospital's needs. After an exhaustive review, the committee selected Alpha. Management invited department heads (physicians) and some nurses and technicians to travel to Alpha headquarters in California to try the system. Upon returning, all participants approved the decision to purchase the system.

*Employees and physicians selected the system in a positive group process. People went to a center in California that already had the system, they saw it in operation, and they gave their approval. The hospital wasn't quite open.... Everyone was in agreement.... Several physicians took part in the process.*  
(Administrator 7)

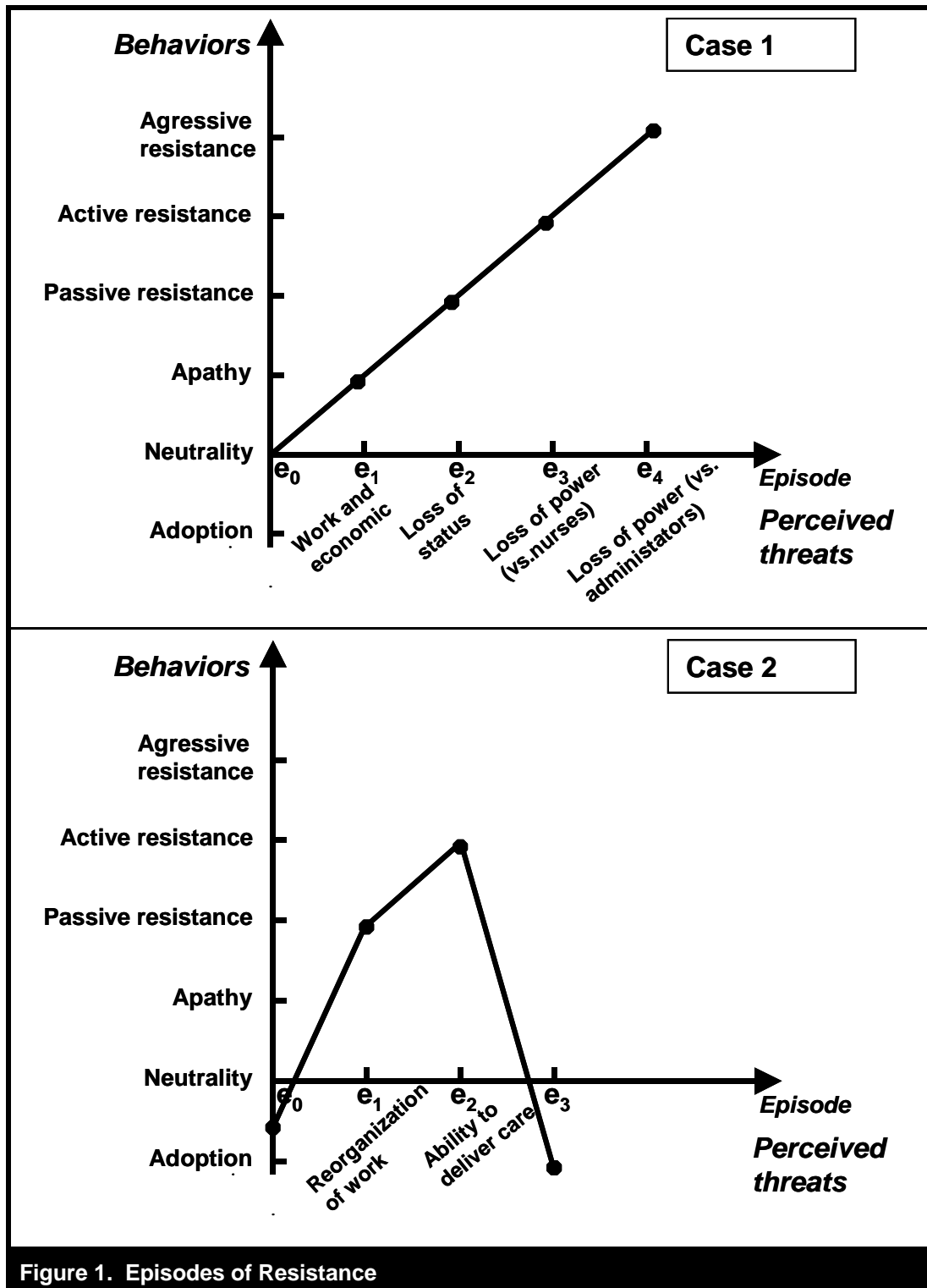


Figure 1. Episodes of Resistance

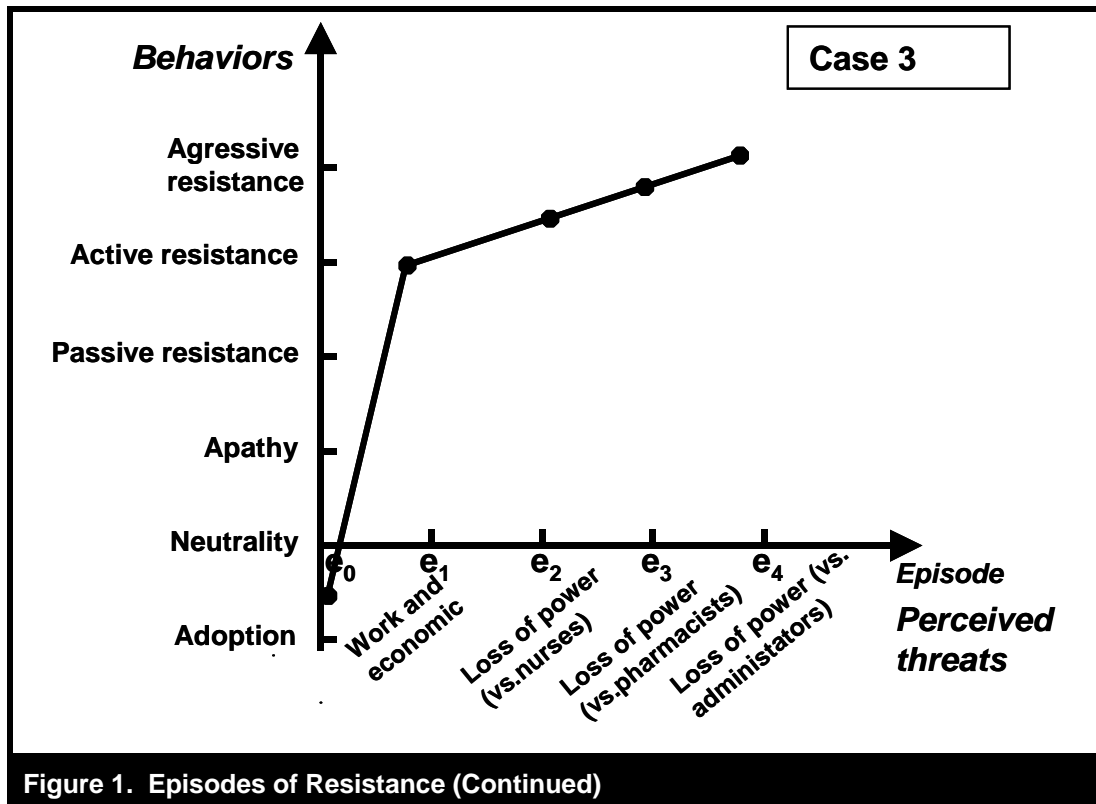


Figure 1. Episodes of Resistance (Continued)

**Episode 1: Apathy.** At the time Phase I was installed, resistance behaviors mostly took the form of inaction and lack of interest, as physicians did not participate in the training sessions and put little effort into learning to use the system. With the system's introduction, the principal tool in medical practice, the paper file, was replaced with a computer monitor. Hospital paper files are organized in a standard manner, and most physicians had received their medical training with this type of record. They know how to quickly locate the information they need, whether it is the patient's vital signs, laboratory tests, or notes from earlier consultations. As suggested by the quotes in Appendix A, the new system represented a significant change in the interface between the physician and the patient file. Rather than being able to locate different parts of the record through color-coded tabs and documents, they had to navigate from one window to another according to an unfamiliar logic. The system not only had an impact on work methods, it also required that

physicians spend more time managing records. It was estimated that using the system added between 1½ and 2 hours of work every day. Given that doctors in this hospital were paid by procedure, slowing down the process of carrying out medical procedures threatened their economic well-being. One doctor describes the impact of her use of the system as follows:

*This means that it cut two office hours out of every day. Plus, since a day only has 24 hours, once I have logged 12 hours of work, I've had it. So this gets to be very frustrating, when we're told that it's all the same, when over time we're talking about a lot of money. (Physician 3)*

In this instance, the interaction between the system's features and the initial conditions of work habits and compensation system led doctors to perceive a threat to the organization of their work and their economic well-being. Resistance behav-

iors of inaction and lack of interest followed; their object was the system itself and its features.

**Episode 2: Passive Resistance.** Phase II, which was introduced 18 months after Phase I, brought about new issues. Under traditional medical practice, and even with Phase I, doctors would generally prescribe care and treatment by giving verbal instructions to nurses. With Phase II, this was no longer feasible. From this point on, prescriptions had to be entered in the system, and only doctors were allowed to do so. Each user had a personal key that gave access to particular modules. Only doctors' keys gave access to the prescription modules. The system, therefore, introduced considerable changes to methods for prescribing treatments and care.

Several physicians refused to accept these new responsibilities, a manifestation of passive resistance. Some refused to enter their prescriptions, arguing that they were not secretaries, and that caring for the patients was more important than entering data. A physician reports the following:

*[Dr. X told me that] one day he had to prescribe the removal of a catheter. Given the large number of steps required to enter the request into the system, he felt that it was faster to just remove the catheter himself rather than entering the prescription. (Physician 3).*

Physicians felt that the system required them to perform clerical tasks that were inappropriate for a doctor and this represented a threat to their professional status. At this point, in addition to threatening the physicians' organization of work and economic well-being, the system threatened their very status as health professionals. Several doctors argued that administrators—people who did not understand the impact of the new system on work methods—were imposing the changes. Once again, the object of resistance was the system itself and its features.

**Episode 3: Active resistance.** While physicians reacted negatively to Phase II, nurses in general appreciated it.

*Phase II was the computerized plan of care. For nurses, it was an excellent tool, it was great, and it made it possible to produce so many reports, control quality, there were lots of things we could do with it. (Administrator 7)*

Eventually physicians started to feel that, in addition to the other impacts, the system was undermining their power vis-à-vis the nurses. A physician reported that when doctors refused to enter prescriptions for various treatments in the system and verbally asked the nurses to perform the treatments, some would respond: "No, I won't remove [an IV or a catheter] unless you prescribe it. No, I won't [take a blood sample or check vital signs] unless you prescribe it" (Physician 6). Appendix A provides additional evidence of some nurses no longer accepting verbal orders from doctors, telling them that they should enter prescriptions into the system.

In terms of initial conditions, the distribution of power between physicians and nurses now played a critical role. While physicians had traditionally held more power than nurses, the use of the system challenged this distribution of power. The nurses' behavior had diverged from what was typical for a power structure in this type of organization. Active resistance behaviors from physicians followed. They initially reacted to this threat by individually voicing their indignation. They quickly joined forces and informed the hospital's CEO that they could not accept such a situation. The object of resistance no longer was the system itself but its very significance.

**Episode 4: Aggressive resistance.** The CEO and the Board responded to the coalition's demands by telling physicians to keep on using the system while attempts were made to modify some features. At the same time, the Board decreed that six physicians, identified as champions of the resistance, should be denied the right to admit patients. In this health care system, physicians act as entrepreneurs, and hospital administrators do not have formal power over them. The physicians felt that the Board was trying to usurp their rights. At this point, the power balance between physi-

cians and hospital administrators came into play as an initial condition, as did their mode of association with the hospital. The physicians' power vis-à-vis the hospital's administration was threatened. The coalition reacted with aggressive behaviors by rebelling and menacing to terminate their association with the hospital. At this point, the system itself and its meaning were irrelevant; the system's advocates—the hospital administrators—became the object of resistance.

**Epilogue.** Some doctors resigned. Those who remained asked their professional association for assistance. As a result of the resignations, the Emergency Room could no longer function, and concerns arose that the hospital might have to close. The Department of Health intervened, dismissed the CEO, and put the hospital under trusteeship. The system was dramatically downsized with a mere 25 percent of its functionality remaining in operation.

## Case 2

Case 2 is a university hospital where physicians are partly salaried and partly remunerated on a fee-for-service basis. Implementing an ERM was a way to prepare for the 21<sup>st</sup> century. As in Case 1, Alpha was the selected software. Initially the system was well-received by physicians, who liked the idea of using IT in their work. However, a crisis occurred after a few months when the pharmacy module was installed and the residents formed a coalition. In response, the administration had the system modified. Four years after implementation, the project was considered a success, with 65 percent of system's functionality operational and plans to have 75 percent of them in function within a few months. Case 2 had agreed to collaborate with two other hospitals that were considering implementing the same software.

**Prologue.** The hospital hoped to computerize patient records and eliminate paper. A multidisciplinary committee was formed and reviewed the systems available on the market while giving consideration to the hospital's specific objectives. After detailed analysis of three systems, the

committee selected Alpha. Sensing that physicians' cooperation would be essential to the project's success, the committee consulted with them, both individually and through departments. To the committee's delight, the physicians were enthusiastic about the project.

*The real reason my colleagues...bought into the idea was that they said, "It'll be great. In the hospital, we do a lot of research and teaching in addition to tertiary care, and we often have to do retrospective and prospective analyses and manage spreadsheets on a daily basis—it is endless....Once we have the system, everything will be on it; we'll just press a button, and it'll be incredible." They saw its advantages in terms of better care, teaching, and research. They bought the system enthusiastically.*  
(Physician 10)

**Episode 1: Passive resistance.** The first module implemented handled admissions, transfers, and discharges. It was followed by a test requisitions and test results module. Most physicians initially adopted the system without any major incidents. However, with time, the system features led them to perceive a threat to how their work was organized, mainly because they had to enter prescriptions themselves rather than give the information to a nurse as they had in the past. This approach was not only an important change to how their work was organized, it also slowed them down, particularly because the system had an unduly long response time. In this case, the relevant initial condition was their existing work habits, which they considered efficient and effective.

As shown in Appendix B, some physicians reacted to this threat with passive resistance expressed through humor. For example, a resident, faced with rounds that took all day to complete instead of several hours, decided to make a practical joke by prescribing a complete blood count every hour on the hour for five years. This overloaded the system and resulted in a shut-down. Another example involved x-ray requests. Traditionally, x-



rays were requested by completing a form that listed possible justifications that were ordered so as to present the most frequent reasons first. In this system, the window for x-ray requests also listed justifications on which to check off the appropriate item. The first item on the list was "bullet wound." The hospital served a small community where such a case might occur once a year, so some physicians responded to what they saw as the ridiculous prominence of "bullet wound" by checking it off as the reason for every x-ray request. Here, the system and its features were the object of physicians' resistance.

**Episode 2: Active resistance.** The implementation of the pharmacy module led to major problems. The module was not only perceived as an inefficient way for prescribing medication, it also lengthened a response time that was already drawing criticism. The physicians now considered the system a threat to patients' safety and their ability to deliver quality care. In terms of initial conditions, the system conflicted with the physicians' social values, under which the quality of care played a critical, nonnegotiable role. For this reason, they actively manifested their resistance, organizing a formal protest. The residents sent a letter to the management in which they demanded a resolution to the response time issue and a withdrawal of the pharmacy module. They also threatened to return their keys. This action would have meant a return to paper files. Here again, the object of resistance was the system's features.

**Epilogue.** In response to the residents' demands, the administration took requests for changes into consideration and responded wherever possible. As a result, the schedule of system implementation was relaxed and the pharmacy module withdrawn so that the necessary improvements could be made. Four years after the implementation process began, all parties were using the system and the hospital considered the project a success.

### Case 3

Case 3 is a university hospital where physicians are paid on a fee-for-service basis. When the time came to change its laboratory, admissions, radio-

logy, and pharmacy systems, the hospital opted for an EMR. The Delta software was chosen and the surgery units acted as a pilot site. As implementation began, the surgeons had a positive attitude toward the EMR; indeed, they showed exceptional enthusiasm. This quickly changed as they developed reservations about how well the system met their needs. Soon they demanded, to the great disappointment of nurses, that the system be withdrawn. They agreed to use the system again only when the hospital appointed a nurse to enter data for them. Even with this support, the surgeons felt that the system was inadequate and demanded a return to the paper file.

**Prologue.** Once the decision had been made to acquire an EMR, a selection committee including a representative for physicians and another for nurses was formed. The committee assessed several systems and chose Delta, an EMR that had already been implemented elsewhere in North America.

*We went to New York [and elsewhere in North America] and saw the system in operation....In an intensive care unit in New York, I saw the system, I saw residents prescribing with it, I saw them receive information through it. I was thrilled. I saw the interface between laboratory, radiology, and pharmacy, enabling physicians to have access to results anywhere in the hospital; you could even have them at your office and monitor important metabolic data. The nursing care plan was computerized, you could have data on vital signs, or on a certain number of statistics with which services could be optimized, and of course we saw the computerization of the medical record. (Physician-Administrator 3)*

To facilitate implementation, management formed a new committee joined with considerable enthusiasm by several physicians. Some physicians visited other hospitals where the system was operational. Once the system purchase was finalized, committee members were responsible for identifying needs in their sector, a task they took seriously.

**Episode 1: Active resistance.** Physicians in the surgery units had a positive attitude towards the system and participated enthusiastically in training sessions. They wanted to participate in the pilot project and invested time and energy preparing for it.

*There were people in surgery who were very open to the idea of implementing the system, there was willingness, even if some individuals [grumbled about it], people were still willing to say yes, let's try it out, it will be a pilot project and it'll be fun, it'll shake things up a bit, etc.*  
(Nurse 4)

However, a month after the system was introduced, several surgeons noted that they were spending considerable time prescribing tests. Because laboratory results did not come back in electronic form, however, they were not deriving any benefit. The surgeons and the residents complained forcefully about the system's complexity and the fact that it had prompted abrupt changes in their work habits. The system was a threat because it led to the reorganization of work and disrupted the initial conditions: the physicians' work habits. Moreover, entering prescriptions was tedious and took time. The system required that they spend more time managing records, which threatened physicians' economic well-being, because they were paid by procedure. The system's features became the object of their complaints.

**Episode 2: Active resistance.** Two months later, some surgeons mentioned that they were considering not using the system anymore. As a result, nurses felt cheated. The physicians' dissatisfaction stirred up preexisting conflicts with the nurses and resulted in new confrontations between the two groups. On the one hand, the physicians felt like they were doing nurses' work. Once the prescription data was entered, it was used to create nursing care plans. On the other hand, the nurses refused to enter the data when asked by the physicians.

Nurses were upset by the physicians' refusal to use the system. In the cafeteria, some were even heard making disparaging comments about the surgeons, questioning their ability to learn how to use the new system, eliciting rather caustic responses from physicians. Heated discussions occasionally led to an exchange of insults. In terms of initial conditions, hospital standards, the administrative structure, and the traditional distribution of power all supported the physicians' power position. The system presented a threat to this position because it could upset the existing balance of power between physicians and nurses. It was, therefore, the significance of the system, and not the system itself, that was the object of the surgeons' resistance.

Trying to find a peaceful solution and satisfy physicians, the administration asked nurses to enter data for the surgeons and even appointed a full-time nurse to do it.

*Their damned machine. We hated it... with the problems we had, and the residents were complaining. So at one point we said that we wanted nothing more to do with it, that we wouldn't enter anything more in it. They said they would give us what they called "officers" to do the data entry. So there were some people upstairs entering prescriptions.* (Physician 7)

**Episode 3: Active/aggressive resistance.** A clear split quickly emerged between the two groups. The nurses maintained that the system worked, while the surgeons believed that it represented a danger to patients. After an incident where a patient did not receive his medication, some even suggested that significant flaws in the system had put some patients' lives at risk (see Appendix C, Episode 3). The surgeons met and chose a representative to discuss it with the hospital's CEO. Eight months after the introduction of the system, the representative delivered an ultimatum, demanding that the system be withdrawn.

*The residents still had problems...so we went into the General Manager's office with the Director of Professional Services...and gave him an ultimatum: get it out of there, because if you don't, there's gonna be trouble. The problem was that the machine couldn't keep up with us. (Physician 7)*

Here the threat appears to be associated with the quality of patient care. The relevant initial condition seems to be group values, under which quality of care is paramount. The object of resistance appears to be the system. However, as a hospital administrator suggested (see Appendix C), it is possible that this was only a pretext. Indeed, the nurses and physicians other than the surgeons considered the system adequate. According to a pediatrician,

*Some errors did occur. Perhaps that was the point where the system was blamed, but errors can also be made when writing. There can in fact be even more errors of interpretation when you read someone else's writing. (Physician 14)*

The real object of resistance was, therefore, the system's significance rather than the system itself. In turn, the real threat was physicians' loss of control over their jobs because, using the pretext of the EMR, pharmacists were attempting to force surgeons to change their prescribing behaviors. Here, the relevant initial condition was the distribution of power between physicians and pharmacists rather than the professional values held by physicians.

*People in the pharmacy said to themselves: Doctors are supposed to prescribe narcotics every three days and you're not doing it. We're going to make you do it. (Physician 7)*

**Episode 4: Aggressive resistance.** The administration responded to the surgeons' ultimatum with a threat: if the surgeons refused to use the system, beds that had been allocated to them would be given to physicians who were more positive

toward the system. The surgeons perceived this as a threat to their power and status. They rebelled, explicitly asking their colleagues in other care units not to hospitalize patients in any beds that became available this way. By threatening physicians with the closure of hospital beds in the surgery units, management was challenging the physicians' traditional right to manage admissions. The object of the physicians' resistance was no longer the system itself nor its significance, but its advocates.

**Epilogue.** The other physicians supported the surgeons by refusing to admit patients into surgery units. With beds sitting idle, causing significant financial shortfalls, the administration decided, less than a year after its implementation, to withdraw the system from these units.

## Cross-Case Analysis: Theoretical Synthesis

The within-case analysis showed how perceived threats result from the interaction between relevant initial conditions and an object of resistance, leading to physicians' resistance behaviors. Using a cross-case analysis, we now examine how resistance behaviors unfold over time and explain their bottom-up process of emergence.

### How Resistance Unfolds

Our analysis reveals that, in the presence of mixed determinants, resistance behaviors vary in nature and intensity as implementation evolves. It also suggests the existence of triggers that influence initial conditions and the object of resistance.

**Mixed determinants of resistance behaviors.** In all three cases, resistance behaviors initially included indifference, lack of interest, and complaints, which are instances of apathy, passive resistance, and mild active resistance behaviors. In later episodes, we observed an active resistance behavior, the formation of coalitions. In the

final episodes of Cases 1 and 3, physicians threatened to resign, created trouble, and rebelled, which all correspond to aggressive resistance behaviors. Along with an increase in the intensity of resistance behaviors, we observed a change in the level of the perceived threats. Initially, perceived threats manifested themselves at the individual level and were reported independently by various physicians (for example, reorganization of work or economic well-being). In later episodes of Cases 1 and 3, the perceived threats characterized entire groups (for example, the balance of power between doctors and nurses). Similarly, in the final episodes of these two cases, the perceived threats stemmed from the administration's attempt to take away the physicians' privileges. In a multilevel perspective, when they characterize an entire group of people, perceived threats can then be said to be at the unit level.

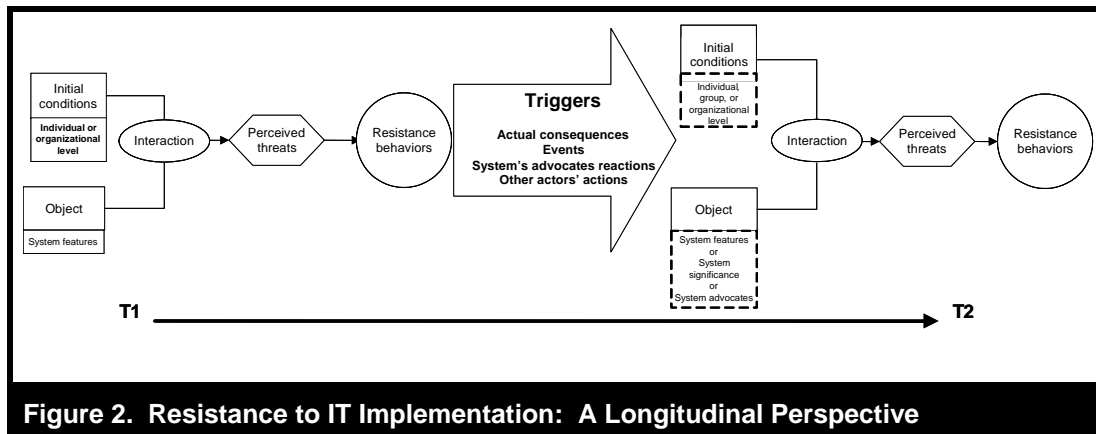
From a multilevel perspective, this reveals the presence of mixed determinants of resistance behaviors. Indeed, antecedents from both individual and unit levels influenced physicians' resistance behaviors. Furthermore, it appears that the level of perceived threats influenced the degree of severity of these behaviors, because perceived threats at the individual level were associated with more benign forms of resistance behaviors than those at the group level.

**Triggers.** Why did perceived threats change from the individual to the group level? A potential explanation is found in the dynamics of resistance across episodes. Because the interaction between initial conditions and the object of resistance is at the origin of perceived threats, these antecedents have to be different for the perceived threats to change levels. We observed that both antecedents may change during implementation. While the preliminary specification of the relationship between the components of our model is useful for explaining each episode of resistance, it fails to explain the changes that occurred from one episode to another. Figure 2 proposes a process model, taken in a longitudinal perspective, which is helpful in capturing the essential elements of the process under study (Applegate 1994; Langley 1999).

In a given episode of resistance, perceived threats are expected consequences. A longitudinal perspective makes it possible to consider actual consequences of system use and highlights "triggers" that can modify either the set of initial conditions or the object of resistance. Triggers include consequences of system use, other actors' actions, system advocates' reactions to resistance behaviors, and events related to the implementation process.

**Effects of triggers on initial conditions.** While initial conditions are always present, they can be either active or inactive. They are active when they play a role in the interaction with the object of resistance; they are inactive when they do not. For instance, the initial condition "distribution of power between the hospital's administration and physicians" remained inactive through Case 2 and only became active in the latest episodes of Cases 1 and 3. The nature of initial conditions may also change during a project. This occurred in Case 3, where the nature of the physicians' association with the hospital was modified when the administration offered beds reserved for surgery patients to other specialties.

Triggers affect the upcoming episode by either transforming one or several initial conditions or activating one that was latent. At the end of Episode 1 of Case 1, the perceived threat "reorganization of work" materialized as an actual consequence of system use, which modified an initial condition, work habits. In Case 2, an event, the introduction of the pharmacy module, activated the initial condition of group social values. At the end of Episode 3 of Case 1, the administration threatened to terminate some physicians' association with the hospital. The system advocates' response modified the rules that govern a physician's association with the hospital, thus changing the initial conditions of Episode 4. Following Episode 2 of Case 1 and Episode 1 of Case 3, nurses were reluctant to enter prescriptions for physicians. Some even refused to perform medical acts if they had not been entered in the EMR by a physician. These actions by other actors (nurses) not only activated the initial condition "distribution of power between nurses and physicians," they also modified it.



**Figure 2. Resistance to IT Implementation: A Longitudinal Perspective**

**Changes in the object of resistance.** As depicted in the cases, the object of resistance may also change during implementation. We observed three such object types: the system itself, its significance, and its advocates. In the early episodes, numerous physicians in all three hospitals complained about specific aspects of the system's interface. Later, in Cases 1 and 3, the object of resistance became the system's significance and then the system advocates. We observed that such a change occurs simultaneously with activation of the initial condition, "distribution of power." Recall that the nurses' actions, following Episode 2 of Case 1 and Episode 1 of Case 3, modified the distribution of power between nurses and doctors. In the next episode, the object of resistance was the significance of the systems rather than their features. Also, again in Cases 1 and 3, the object of resistance changed from system significance to system advocates when the hospital administration responded to resistance behaviors by trying to undermine the power of physicians. Why was no such change in the object of resistance observed in Case 2? Again, the answer lies in the distribution of power, because in this case no trigger activated or modified the balance of power in this hospital.

**Dynamics of resistance.** We propose a dynamic explanation of resistance to IT implementation. At time  $T_1$ , when a system is introduced, resistance behaviors will result if a subject (here the group)

perceives threats from the interaction between the system's features and individual and/or organizational-level initial conditions. Consequences of system use/nonuse, whether or not they had been foreseen, will occur. These consequences, in turn, may change the nature of, or activate, one or several initial conditions. Other triggers (events, other actors' actions, or system advocates' responses to resistance behaviors) may also modify the set of initial conditions. The new set will become the initial conditions at time  $T_2$ . If a trigger affects an initial condition involving the balance of power between the group and other user groups, it also changes the object of resistance from the system to system significance. If the relevant initial conditions pertain to the power of the resisting group vis-à-vis the system advocates, the object of resistance is also modified from system significance to system advocates. Again, at time  $T_2$ , resistance behaviors will follow if threats are perceived from the interaction between the object of resistance and initial conditions.

### ***The Emergence Process of Group Resistance Behaviors***

Because group resistance behaviors as a unit-level phenomenon are the aggregate of individual behaviors, adopting a multilevel approach calls for an examination of the bottom-up process by which individual resistance behaviors emerge into group

resistance. This process can be one of either composition or compilation. It is a composition process when the unit-level phenomenon “emerges from individual members’ shared perceptions, affect, and responses” (Klein and Kozlowski 2000, p. 33). Group norms are an example of this type of phenomenon. The process is one of compilation when the unit-level phenomenon emerges from different, independent individual contributions that do not converge. Team members’ personality characteristics are an example. As group resistance to IT has never been studied in a multilevel perspective, no *a priori* assumptions about the nature of the emergence process can be made.

We proceeded with our cross-case analysis to uncover the process from which the resistance behaviors of physicians, as a group, emerge from individual resistance behaviors. The most salient result is that the nature of the process differs from early to late implementation. Early in the implementation, we observed in each case that while several resistance behaviors were similar, they were relatively independent. In Case 1, for instance, there was no indication that the decision of several physicians not to attend training sessions was concerted. Similarly, the two residents in Case 2 who used humor to show their disapproval of some system features did so independently of each other. In all three cases, we observed that resistance behaviors were not identical early in the implementation. Some physicians appreciated the system, some were indifferent, and some adopted passive or active resistance behaviors. In Episode 1 of Case 1, for instance, indifference was the most frequent resistance behavior observed, yet all physicians were not neutral toward the EMR. Some actually liked it: “*Sitting down in front of a keyboard isn’t something that disgusted me, I didn’t hate it. I liked it. I saw it as something positive*” (Case 1, Physician 6), while others had a negative reaction: “*The screen froze....The delays were a big problem....If I have to deal with a computer system that can’t respond, it just isn’t going to work. I’ll get distracted and then I’ll be angry at the system*” (Case 1, Physician 14).

When individual contributions to the higher-level

phenomenon vary, the dynamics show dispersion and exhibit nonuniform patterns, and individual contributions are independent of each other, the bottom-up emergence process is described as compilation (Klein and Kozlowski 2000). This type of process took place in all three cases early in the implementation. Physicians appeared to “take stock” of the system’s features and their relationship to their work time, workload, or economic well-being.

In the later stages, we observed convergence of behaviors. In all three cases, physicians formed coalitions. In Cases 1 and 3, they threatened either to resign or cause trouble, and they then rebelled against the administration. Even physicians who initially appreciated the system or were indifferent to it displayed such behaviors. In Case 1, a physician who initially was indifferent toward the system later led a coalition that requested its withdrawal: “*On the first day we didn’t say ‘It’s worthless’, We tried it.... When you try, and it doesn’t work and people start to leave, someone has to act, so we acted*” (Case 1, Physician 4). In Case 3, a physician who initially found the system useful, later joined forces with his peers out of solidarity: “*I abandoned the project largely in solidarity with my colleagues*” (Case 3, Physician 13). The vocabulary used by physicians in reporting on these stages further reveals convergence of individual behaviors, with expressions such as *collectively*, *blockade*, *petition*, *vote*, and *got together as a block*. In multilevel research, when individual contributions to the higher-level phenomenon are similar and the dynamics exhibit low dispersion, the bottom-up process of emergence is one of composition. One comment vividly illustrates the change in the nature of the emergence process, from early to late implementation:

*By the end, the physicians were acting as a monolithic group... they had forged a coalition with the CMDP [council of physicians, dentists, and pharmacists]. They had become a monolithic group, but at the beginning their behaviors varied. During the three or four months that followed the end of the first deployments, you had every sort of attitude. Some*

*physicians were trying to find a solution, some were trying to get around it, and some refused to use it at all. Some played along. In other words, they duly filled out requests for improvements and changes....Others, who were a bit more "experienced" with computers...found tricks to get what they wanted....Others' behavior was that of a typical doctor: when they don't like something, they can always find a way around it....They continued to prescribe on paper and had nurses enter the information instead of entering it themselves...there were others who had an approach that was a bit more radical. From the start, they said that they wouldn't use the system until the problems had been ironed out.* (Case 1, Physician-Administrator 8)

The physicians' discourse provides further support for this conjecture. Referring to early stages, they used expressions such as "*I couldn't care less*," "*I wanted the results*," *this has happened to me*," and "*I really lost my temper*," reflecting the importance of the individual. Later, they used expressions such as "*we voted*," "*everyone agreed*," "*we all thought*," and even referred to themselves as a group, saying, for example, "*we physicians*" or "*the doctors*."

How can we explain this change in the bottom-up process of emergence? As illustrated in Figure 3, in all three cases the turning point appears to be the activation of one or several group-level initial conditions. In Episode 2 of Case 2, when the pharmacy module was introduced, the group cultural values of physicians became active as initial conditions because the module was felt to "*put patients' health at risk*." At this time, "*all hell broke loose*." The residents formed a coalition and asked the administration to withdraw the module "*until the system was better structured*." In Episode 3 of Case 1, the distribution of power between nurses and physicians became relevant as an initial condition because it had been modified by the nurses' actions. Doctors initially reacted to the threat to their power by individually voicing their indignation. They then "*came to an*

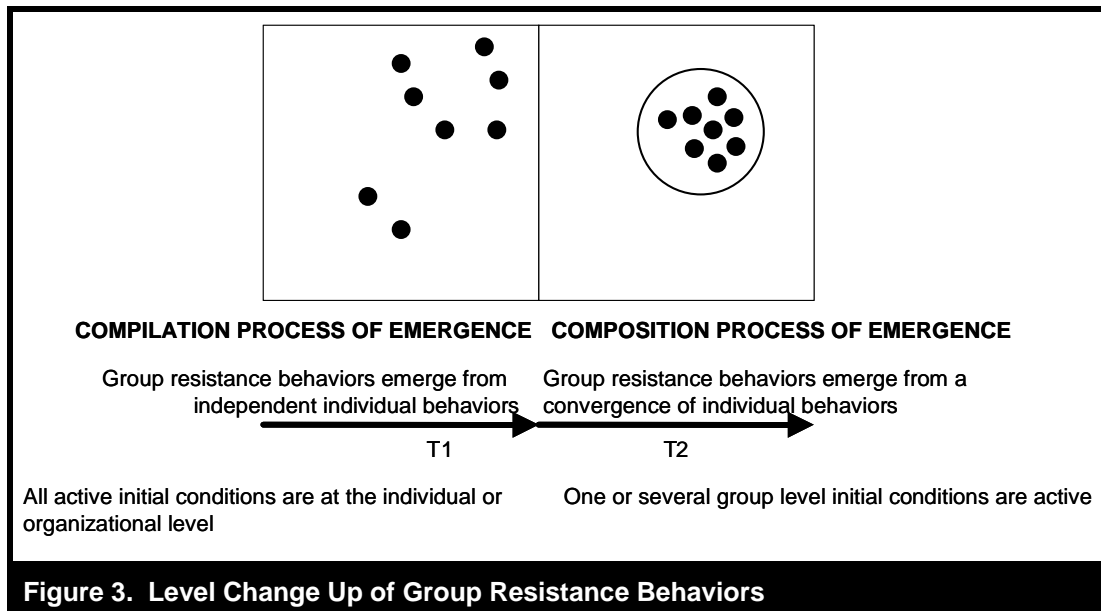
*agreement and quickly notified the General Manager that [they] couldn't work that way*" (Case 1, Physician 4). A physician describes this episode as *pandemonium*. In Case 3, the turning point was when the distribution of power between nurses and doctors, and then between physicians and pharmacists, became the relevant initial conditions. Infighting was quickly followed by the formation of a coalition.

In the terminology of multilevel research, such a change from time  $T_1$  to time  $T_2$  is termed "level change up." It represents situations where, with the passage of time, individuals in a group change from being independent of each other to being interdependent in a homogeneous group (Dansereau et al. 1999).

## Revisiting Prior Models of Resistance to IT Implementation

We propose a model of resistance to IT implementation where, as suggested by prior models, resistance behaviors occur following perceived threats that result from the interaction between initial conditions and a given object. These models refer to several resistance behaviors such as passive resistance, active sabotage, oral defamations (Martinko et al. 1996), covert procrastination, protesting, criticism (Marakas and Hornik 1996), and not using the system or sabotage (Markus 1983). By adopting Coetsee's (1993, 1999) taxonomy and populating it with instances of resistance behaviors to IT implementation, we add to the extant knowledge by organizing these behaviors according to their intensity.

In terms of antecedents, each of the prior models acknowledges a single instantiation of these components. For instance, Markus (1983) sees the object as the patterns of interaction prescribed by the system, the initial conditions as the political setting, and the perceived threat as the power loss for a group. In Martinko et al.'s (1996) model, the object is the system's features, the initial conditions are the attribution schemata of the individual



influences, and the perceived threats are the efficacy and outcome expectations. By contrast, our model recognizes the potential presence of multiple instantiations for each antecedent. The initial conditions are identified at the individual, group, and organizational levels, the objects can be either a system's features, a system's significance or a system's advocates. The perceived threats can be at the individual or group level. By recognizing the existence of mixed determinants of resistance behaviors, our model includes a wider array of antecedents, thus providing a richer portrait of the phenomenon.

In a multilevel perspective, our model posits that, when perceived threats are at the individual or organizational level, the ensuing resistance behaviors will be more benign than when they are at the group level. Adopting a single-level approach, two of the previous models offer an explanation for the increased intensity of resistance behaviors. Joshi's (1991) equity model posits that the stronger the perceived threat (inequity), the more likely an individual is to adopt resistance behaviors. Because we were studying resistance at the group level, we did not try to verify this contention. Nevertheless, we recognize the explanatory potential of Joshi's argument. Markus posits that if one loses power to a party

who holds a higher position of authority, the strength of resistance will be milder than if one loses power to a peer group. At first glance, our explanation appears contradictory because physicians' resistance behaviors were stronger when they felt threatened with loss of power vis-à-vis the administration than when the nurses represented the other party. However, recall that the physicians were not hospital employees. Instead, they were independent entrepreneurs. As such, they were not under the administration's authority. Notwithstanding this explanation, we believe that the relationships between perceived threats at a given level and the intensity of ensuing resistance behaviors needs to be specified.

Other models acknowledge the importance of some of the elements we identified as triggers. Marakas and Hornik (1996) state that the consequences of individuals' actions will influence their future actions. Martinko et al. imply that outcomes impact the factors that influence future behaviors and that other actors, coworkers, and supervisors influence individuals' resistance behaviors. Through the notion of political tactics, Markus also hints at the importance of other actors' actions. Our model not only identifies a wider set of triggers, it also shows how resistance behaviors change over time under the influence of triggers.



Because the prior models studied resistance at the individual level, the process by which group resistance emerges from individual resistance was not relevant in three of them. While Markus's model studies resistance at the group level, it does not attempt to explain this emergence process. Our analysis explains this process and shows how it differs from early to late implementation. By revealing that early in the implementation individual behaviors are independent and that they later converge, the model provides a finer-grained understanding of group resistance to IT implementation.

## Implications for Research and Practice

Our study is based on cases set in hospitals and has physicians as its focal group. As a result, caution is required in generalizing our findings. Because of the power physicians hold in hospitals, they are freer to choose whether they use a given system than many other types of users. To validate the model, it would be instructive to see how, in similar settings, the resistance of other groups, like nurses, evolves. Also, the model's external validity would be improved by studying the implementation of systems in different settings.

Notwithstanding these limitations, by taking a multilevel, longitudinal perspective, our model not only explains the dynamics of group-level resistance but also shows how group resistance behaviors emerge from individual behaviors. When studying group resistance to IT in the early stages of implementation, independent, individual behaviors need to be analyzed rather than considering the group as a unified entity. In later stages, it then becomes important to understand how and why individual resistance behaviors converge.

Some researchers have recently called for a shift from the monolithic mental model of resistance (Dent and Goldberg 1999; Piderit 2000). The results from our study show that within the implementation of a given system, resistance has a wide variety of antecedents and manifestations

that can evolve and change in nature. By treating resistance as a black box, researchers and managers limit their ability to deal with it. By opening the black box of resistance, this study not only helps explain how resistance develops, it also confirms the contention of other investigators that there may, at times, be legitimate reasons for resistance.

For managers, our study reveals that inappropriate responses to resistance behaviors ultimately provoke resistance escalation. More precisely, our data suggests that early in the implementation, the object of resistance is the system itself and its features. Tyre and Orlikowski (1994) called this initial period following the introduction of a system a "window of opportunity." They posit that this time period is ideal to adapt or improve the system. Our data supports their argument. It also suggests that, in later stages, when the object of resistance is the significance of the system or the system advocates, resistance has become politicized. As a result, managing resistance becomes a more difficult undertaking. Our model provides a tool that managers can use to recognize the first signs and causes of resistance. It should assist them to respond appropriately.

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# Appendix A

## Chain of Evidence, Case 1

	Resistance Behaviors	Perceived Threats	Initial Conditions	Object
E1 Apathy	<b>Inaction/lack of interest</b>	<b>Organization of work Economic well-being</b>	<b>Work habits Compensation system</b>	<b>System features</b>
	Physician 3: <i>Several people said, "The doctors aren't doing their job like they're supposed to. If this system isn't working, it's because they didn't get involved, didn't learn the techniques to use it and still don't know how to use it."</i>	Physician 14: <i>If you count the extra time for prescriptions and going to get the data, among other things, it added about two extra hours to each doctor's rounds. Personally, I had to work an extra hour, hour and a half.</i>	Physician 10: <i>It completely changed the vision of practice, the vision of medicine. I'm not used to working that way.</i> Physician 3: <i>We were the only professionals who weren't being paid for it... When all the others, nurses and physiotherapists, are paid from 8 to 4, at 4 o'clock they just go home, whether their work is finished or not. But the patient must be seen by a doctor, so I could have two more hours added to my day.</i>	Physician 14: <i>I wasn't able to quickly move from one thing to another because the system wouldn't allow it. It was so hard to use, it added so many hours of distraction, hours of being furious at it because, in the end, you knew how to use it, you had everything you needed, but it would just freeze up.</i>
E2 Passive resistance	<b>Refusal to accept responsibility</b>	<b>Status as a professional</b>	<b>Job status</b>	<b>System features</b>
	Nurse 5: <i>The surgeons said, "We have better things to do than to type into that thing."</i>	Physician 10: <i>When I say, "Let's try it this way," and you tell me, "No, no, no, it's going to be like this," it's just unacceptable, because you don't know this field. If you don't know, then don't tell me how to go about my practice.</i>	Physician 14: <i>Well, yes, we can take a typing course and type it ourselves, but the more time we spend on clerical work, the less time we have to see patients and provide the treatment they need. Our work is to make a diagnosis for patient treatment. This is our priority. If the patient bleeds to death while we're waiting for a response from the system, it isn't going to work.</i>	Physician 3: <i>The nurses weren't aware of the difficulties at the start, of all the problems the system could cause doctors.</i>

	Resistance Behaviors	Perceived Threats	Initial Conditions	Object
E3 Active resistance	<b>Voicing dissatisfaction Formation of coalitions</b>	<b>Loss of power vis-à-vis nurses</b>	<b>Distribution of power (nurses vs. physicians)</b>	<b>System significance</b>
	Physician 4: So there began to be a lot of whining, and the doctors began to resist using the system. We came to an agreement and quickly notified the General Manager that we couldn't work that way.	Physician 4: <i>When they installed Phase 2, it was pandemonium. You couldn't tell a nurse to remove a band-aid without being told to enter it in the machine yourself. "Hey, are you making fun of me? I'm not a secretary, a subordinate, a nobody. If you want my job, do what I did; go through university and shoulder the risks yourself."</i>	Nurse 9: <i>That represented a big advantage for the nurses, but for the doctors it was the opposite, because it's clear that using the system required a lot more of their time....So they had to enter all the prescriptions. I would say that it brought the doctors back to taking care of a certain aspect of their job.</i>	Nurse 5: <i>In the sense that, the way it works is that the nurses have always accommodated the doctors a great deal....But now, well, it wasn't the same.</i>
E4 Aggressive Resistance	<b>Threats, rebellion</b>	<b>Loss of power and status vis-à-vis system administrators</b>	<b>Distribution of power (physicians vs. administration) Physicians' associations with hospital</b>	<b>Advocates</b>
	Physician 14: <i>So we refused their proposal to keep the system, insisting that it be withdrawn. They said, "No, it won't be withdrawn".... So several doctors said, "If that's the way it's going to be, if you spend your time laughing at us, then we'll just leave." That's how it happened.</i>	Physician 8: <i>Up to the point where even the Board of Directors was passing resolutions to fire doctors, something that is almost never done...They had identified six doctors who were resisting a bit and said that they were going to revoke their privileges.</i>	Physician 14: <i>Our association with the hospital is a kind of private "entrepreneurship." I can leave the hospital with a two-month notice; I just have to say that I'm leaving, going somewhere else. For their part, once they have given me hospital privileges, they can't dismiss me unless I make a lot of waves, a lot of medical mistakes and they have me appear before committees that prove that I did indeed make mistakes. It is very difficult to dismiss a doctor from a hospital. The General Manager is not my employer, nor is the hospital. We are associated with a hospital.</i>	Physician 3: <i>There was a huge conflict in which the nurses got behind the General Manager and Board of Directors and said, "The doctors aren't doing their job like they're supposed to. If this system isn't working, it's because they didn't get involved, didn't learn the techniques to use it and still don't know how to use it."</i>

# Appendix B

## Chain of Evidence, Case 2

Episode	Resistance behaviors	Perceived Threats	Initial Conditions	Object
E1 Passive Resistance	<b>Humor</b>	<b>Organization of work</b>	<b>Work habits</b>	<b>System features</b>
	Physician 9: <i>He had written "bullet wound." We aren't in a big city you know, it's a small town, and bullet wounds occur here maybe once a year. One of our doctors indicated that all the time; a bullet wound to the lung. It was a little joke...I even remember a resident who got fed up with rounds that took all day, when he was used to doing very quick rounds at the end of the week. At one point, in the first years when it could still be done that way, he used the computer to prescribe complete blood counts every hour until the year 2000. The computer kicked the bucket.</i>	Physician 10: <i>It takes me 30 seconds to write out a pre-prescription for a complete blood count. With the new methods, I had to get onto the system, enter my password, and go through window after window, page after page. In the end you find some shortcuts, but it's always longer than working with the paper system.</i>	Physician 7: <i>I found it got difficult when the vital signs started arriving by computer. Before that it was easy; you'd arrive at bedside and...I am very visual. I'd arrive at bedside and the vital signs were written at the foot of the bed. I didn't even have to think; while I spoke to the patient, I looked to the foot of the bed. Now it's more difficult, because I have to put my key into the computer and go through at least four specific interactions with the system before I get the patient's vital signs.</i>	Physician 9: <i>It was longer at first. It's better now, but the system was very slow at the beginning. It didn't conform to our timeframes because, although there was a maximum of one or two seconds wait between windows, when I went to look for a specific exam, I could end up going through 10 windows, so it took practically a minute just to have access to exam results. The length of the response time was a big problem.</i>
E2 Active Resistance	<b>Voicing dissatisfaction</b> <b>Formation of coalitions</b>	<b>Ability to deliver care</b>	<b>Group social values</b>	<b>System features</b>
	Physician 7: <i>All the residents got together at one point and said, "It makes no sense at all. We rush to get through our rounds and have what we need." The Chief Resident called a big meeting and we all had a chance to speak. He brought in Doctor X and we all talked it over. Doctor X was taking the crowd's pulse because the Chief Resident had asked him to... People asked, "What are we going to do about it?" Some said, "I think we should pass a petition around." We voted on it and everyone agreed. We all thought that it would make no sense to introduce a pharmacy module until the system was better structured.</i>	Administrator 10: <i>That was the main reason for withdrawing it....The doctors consulted agreed that the system could even put patients' health or lives at risk. There's no reason why we should continue this way. Even if the response time had been good, we would have stopped using the system for that reason alone.</i>	Physician 7: <i>At one point, they tried to put medication services on the system and all hell broke loose among the residents. I think that it ended after about two weeks because the pediatrics resident, in hematology, must have been spending two thirds of her time on the computer and didn't have enough time to examine the babies. The fact is we treat patients, not computers, so it all came to an end. It didn't have to go any further, because they only needed to prove that the thing just didn't work.</i>	Administrator 12: <i>It was because the resistance by residents went as far as sending a petition to the Board of Directors. The residents had taken the position that if the problems with the system had not been resolved by a specific date, they would refuse to use it. That is when we took a position, and it is clear that in this regard they were right. We were able to improve the system and things took a turn for the better.</i>

# Appendix C

## Chain of Evidence, Case 3

	Resistance Behaviors	Perceived Threats	Initial Conditions	Object
E1 Active Resistance	<b>Voicing opposite views</b>	<b>Organization of work Economic well-being</b>	<b>Work habits Compensation system</b>	<b>System features</b>
	Administrator 3: <i>The surgeons said, "It's just ridiculous. This thing hasn't been working for a long time now. There are mistakes, there have been some mistakes. If it continues like this, I can tell you we'll just give up."</i>	Physician 8: <i>Prescribing a complete blood count took six clicks on the panorama, whereas when you take some paper and write "CBC" for complete blood count, everyone understands it, and it just takes a second. Everything just became more complicated with this system.</i>	Nurse 1: <i>The doctors also found it time-consuming because in the past when they came by, like when they came to see a patient, they only had to write something into the record. Now they had to sit down and enter all their prescriptions into the computer; it took a lot more time. Entering prescriptions is time-consuming...It requires a lot of navigation.</i>	Physician 8: <i>The system was slow. It was extremely slow, and we quickly realized that it had significant limitations because of the time consumed filling out prescriptions and because it was impossible to fill out a "conditional prescription."</i>
E2 Active Resistance	<b>Infighting</b>	<b>Loss of power vis-à-vis nurses</b>	<b>Distribution of power (physicians vs. nurses)</b>	<b>System significance</b>
	Physician 7: <i>When it comes to those nurses who called us imbeciles, they're just lucky they're still alive. With comments in the cafeteria like "everybody knows you just aren't bright enough to learn how to use it," the working climate was deteriorating.</i>	Physician 8: <i>Of course it had affected the distribution of responsibilities, because when we entered the prescriptions, we were creating their care plans....The very thing they hated doing, filling out forms and doing paper work, was now our job.</i>	Administrator 2: <i>There were nurses who said, "If you ask me to enter prescriptions, I'll be doing the work of a doctor."</i>	Physician 8: <i>We came to realize that, in the end, those who benefited the most were the nurses. It was only a question of care plans and follow-up on their work.</i>

	Resistance Behaviors	Perceived Threats	Initial Conditions	Object
E3 Active- Aggressive Resistance	<b>Threats</b> <b>Formation of coalitions</b>	<b>Ability to deliver care (overt)</b> <b>Loss of power vis-à-vis pharmacists (covert)</b>	<b>Group social values (overt)</b> <b>Distribution of power (physicians vs. pharmacists) (covert)</b>	<b>System features (overt)</b> <b>System significance (covert)</b>
	Physician 8: <i>We gave the General Manager an ultimatum: "Get it out of here, because if you don't, there'll be trouble."</i>	Physician 8: <i>I really lost my temper that day, because the patient could have died....I had prescribed the steroids, except that the system had not taken the conditional prescription. This means that if I made a prescription for 48 hours and then marked the dose for another 48 hours, etc., the system didn't register it. The prescription was never sent to the pharmacy and the patient went 36 hours without the medication. He was in pretty bad shape when we realized what was going on.</i>	Physician 7: <i>What matters most to us is the treatment received by the patient....The thing that bothered us the most was that there were patients who were suffering, who hadn't received their painkiller, as well as the fact that it wasn't working anymore.</i> Physician 7: <i>People [in the pharmacy] said to themselves: Doctors are supposed to prescribe narcotics every three days and you're not doing it. We're going to make you do it.</i>	Administrator 3: <i>That was another thing; a professional organization like a hospital can't be run as if you were baking bread.... You come in with a system that is black and white without any shades of gray, and already you have a problem.... There are people here who have privileges, real prima donnas, and that doesn't mesh with a computer system. You just can't say to a computer, "Do this and then give him some Demerol." So nothing works anymore.</i>
E4 Aggressive Resistance	<b>Rebellion and subversion</b>	<b>Loss of power and status vis-à-vis system administrators</b>	<b>Distribution of power (physicians vs. administrators)</b> <b>Physicians' association with hospital</b>	<b>Advocates</b>
	Physician 13: <i>During one of our medical meetings, all the members of the board of physicians took this decision. That's when we asked that it not be used.</i> Physician 8: <i>We had given our colleagues a very clear message: you guys better not take those beds, or there's gonna be one helluva fight. Because there's always one idiot who wants more beds and is willing to crucify himself.</i>	Administrator 3: <i>When the surgeons said that they weren't going to use the beds anymore, we said, "OK, we'll open up those beds for doctors who want to use the system."</i>	Physician 7: <i>When we said that we wouldn't be admitting any more patients, management decided to stand up to us.... You have to understand that in a hospital funded on a per diem basis, if you have empty beds, a month later you find yourself with less revenue. So if we stop admitting patients, they've got big problems.</i>	Physician 8: <i>The basic problem was that the system wasn't able to follow us, but not only that, in the beginning the people running it didn't get it at all. So when it didn't work, it was considered our fault. That wasn't it at all; the system wasn't able to do what we wanted it to do. And management literally didn't believe us. For them, for the general manager and for the assistant general manager, it had to work.</i>



