

When Passion and Compassion Lead to a Technological Innovation: Telehealth Systems

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With the emergence of COVID-19, Telehealth became one of the subjects most discussed around the world as a solution to provide health service. Nowadays more than ever, we are facing a limitation of resources available, especially human and technological. As a consequence of these limitations, having in person appointment became almost impossible. Our aim in this article is to propose a better understand of the Telehealth and how it can be a good solution in this new context which we are living. We start discussing the specificities of the health environment and how the management literature applied to achieve success consider the passion and we make a review on the theories linked with the subject; then we propose some conjecture which can help the assimilation and implementation of a new system to provide. This paper concludes with a proposal of a multilevel modeling approach that enables stakeholders to gain a better understanding of the assimilation of information systems, based on their nature and the issues associated with their development.

Keywords: organizational behavior, information and communications technology systems, institutional theory, structuration theory, social cognition theory, assimilation, telehealth deployment

INTRODUCTION

The professional management literature is replete with success stories in which the passion of an individual leads to the creation, rescue or exceptional growth of an organization. Thus, the concept of *passion* is familiar to the field of management. However, the concept of *compassion* may seem unusual, because the images of management, and even more so the different perspectives of theories of organization, seem to leave little room for this emotion. The silence of the literature on organizational behavior in this regard is quite eloquent. So we can legitimately ask whether the content of the management literature reflects the totality of organizational practices. Fortunately, we think it does not, because compassion has always been at the heart of some organizations, particularly in the field of healthcare. Compassion shaped the different faces of these organizations both in peacetime and in war. Moreover, the very existence and activities of these organizations can be hardly understood apart from passion and compassion, regardless of whether the approach taken is more institutional or cognitive.

Telehealth as Active Compassion

Ensuring equal access to healthcare on their territory is one of the challenges currently facing Western countries (OMS, 2006). This issue is even more acute for countries like Canada that have vast territories. For example, the province of Quebec alone has an area equivalent to three times the size of France. Only 20% of Quebec's population lives in rural areas, which account for 80% of the inhabited territory. Indeed, many studies (Gravelle and Sutton, 2001; Politzer et al., 1991) have shown geographic variations in the provision of health services in Western countries despite the existence of universal healthcare systems. These geographic variations result from numerous factors including staff shortages, local policy, terms of physician practice, transportation, etc. (Field and Briggs, 2001). It is therefore possible that, in the long term, this inadequate provision of healthcare services is translated into inequalities affecting the population. Indeed, several studies have shown that the doctor/patient ratios in cities and rural areas are associated with poorer health conditions in the latter (Gulliford, 2002; Vogel, 1998).

Compassion has led to the search for new means to mitigate the consequences of such geographic variation in healthcare services. Some western countries, including Canada, have adopted a number of public measures including measures related to initial physician training and limitations or constraints promoting establishment and recruitment or retention in deficit areas. These measures have not all proven to be effective. Regarding measures related to initial training, increasing the number of doctors has failed to solve the problems of geographic distribution. In fact, physicians continue to settle in areas with high population density in spite of increased competition (Barer and Stoddart, 1999). Similarly, financial assistance in the form of scholarships or loans on preferential terms that require compulsory residence for a determined period in deficit areas were effective only in the short term, mainly because of the principle of repayment of the grant or loan, which allows doctors to evade the obligation of service before the actual end of their term (Bourgueil et al., 2006).

Telehealth is one of the most recent initiatives to which healthcare organizations' compassion for communities has given rise. In principle and in practice, telehealth belongs to the many strategies aimed at improving the geographic distribution of health professionals. It is among the more recent measures cited above in that it aims not only to break the isolation of health professionals in areas remote from major centers but also to promote accessibility to healthcare services for patients in remote areas and finally to stabilize the practice of the professionals involved. The term telehealth is presently used to describe all possible variations of healthcare services that rely on information and communications technology (ICT) such as tele-education, teleconsultation, and teletraining, among others. It is expected to provide many other benefits such as shortening the timeframe for decision-making related to diagnosis and treatment, cutting emergency transfer costs, reducing expenses for patient travel from remote regions to healthcare service points, reducing delays in providing healthcare, promoting continuous healthcare, and attracting and retaining clinicians in remote regions.

Given the importance of the problems that telehealth is addressing on one hand and the collective performance of such programs in terms of clinical value and technical feasibility on the other, governments are trying to integrate telehealth into the mainstream clinical care system. The need to sustain this initiative has led to both managerial and technological concerns. Questions related to each of these types of concerns have opened the door to different research areas, at the very least to propose a framework for understanding both the structure and function of the phenomenon associated with the transformation sparked by telehealth as a new permanent healthcare service.

The centrality of information technology in telehealth projects requires one to take into account not only managerial concerns but also those of a technological nature. Indeed, incorporating telehealth into the health system involves inserting telehealth systems into an organization's clinical and administrative routines, and in so doing, causing these systems to become part of the organization's technological and informational architecture. Technological considerations relate the issue to an understudied phenomenon in the literature in information systems: assimilation. This means, first, inserting the system into the organization's processes in such a way that it ceases to be perceived as a novelty (Saga and Zmud, 1994; Zucker, 1977) and secondly, its integration into the work architecture, including the existing information systems (Cooper and Zmud, 1990), which usually involves making changes to existing systems and

processes (Chatterjee and Segars, 2001). We presume that the process of assimilation comprises two sub-processes: routinization and infusion (Saga and Zmud, 1994).

Currently, very little is known about the structure and factors that influence the assimilation of telehealth systems because few studies address this issue. Publications that we have identified with respect to telehealth projects belong to two research streams: the literature on program evaluation and the literature on information systems.

The first stream combines two trends. The first trend is oriented toward project management; considerations include the conditions for the success of these projects. In the second trend, considerations pertain to assessment itself, in that authors attempt to determine to what extent the promises of telehealth are materializing in terms of cost reduction and patient satisfaction. For example, many studies have focused on the conditions for sustainability of telehealth projects.

Surprisingly, in this extensive and useful literature on the evaluation of telehealth *programs*, little consideration has been given to telehealth *systems*. When they are invoked, the focus is on technical aspects such as the bandwidth of a specific technology or similar considerations. The report of the Lewin Group (2000), however, considered the acceptance and suitability of the technology to be essential elements. Despite this, explicit relationships are rarely posited between the deployment of telehealth systems and the performance of telehealth projects. This finding is particularly surprising given that these technological systems play a central role in telehealth and consume the largest amount of the budget allocated to such projects.

The second family of studies, the information system (IS) literature on telehealth, covers several topics, of which the most salient are:

- (1) user acceptance/adoption of telehealth systems (Hu et al., 2000; Cohn and Goodenough, 2002; Croteau and Vieru, 2002);
- (2) the characteristics of these systems (LeRouge et al., 2002; Naegele-Jackson et al., 2002);
- (3) the effectiveness of telehealth systems compared to conventional face-to-face delivery in different medical specialties (Nordal et al., 2001; Bishop et al., 2002; Scheideman-Miller et al., 2002);
- (4) factors affecting the diffusion of telemedicine (Mitchell, 1998; Hu, 2003);
- (5) physicians' knowledge and perception of telehealth (Demartines et al., 2000; Gagnon et al., 2004).

In conclusion, the literature on telehealth, no matter whether it is oriented to assessment or information systems, does not address the issue of the assimilation of telehealth systems, except for a few contributions, including Lehoux et al. (2002) and Hu, Wei and Cheng (2002). Lehoux et al. studied the use of theories underlying teleconsultation. They were particularly concerned with the extent to which this theory can facilitate the insertion of teleconsultation into the clinical routines of six medical specialties. Hu et al. analyzed how the development of several telemedicine projects highlighted a number of management problems raised by the passage of telemedicine from project to real-world healthcare service.

These studies do not answer the questions we are interested in. However, they reinforce their relevance in showing that, ultimately, telehealth will be a success if it becomes part of the current healthcare system. It is therefore necessary to undertake studies that focus specifically on understanding and identifying the factors that influence the assimilation of telehealth systems, that is, their integration into clinical and administrative routines on one hand and into organizations' technological infrastructure on the other.

Consequently, the objective of this article is to contribute to this project by proposing a theoretical framework to explain the mechanisms that underlie the process of assimilation, along with the factors that influence it. Such an undertaking is important for at least two reasons. Firstly, from a theoretical standpoint, telehealth constitutes a new field for experimentation involving information technologies. It also provides a new context of study, given the specificities of the healthcare milieu in terms of organization, culture and professional practices. Due to their highly complex nature, healthcare organizations allow us to extend, propose and test theories that go beyond our current understanding of information technology assimilation. Secondly, from a practical standpoint, knowledge of these factors is likely to lead to a more successful implementation of sustainable telehealth infrastructure.

To move toward this goal, we begin by examining the nature of telehealth systems in order to better conceptualize them. Then, building on three influential theories, namely institutional, social cognition and structuration theory, we offer a conceptual framework for understanding IS assimilation. Our model expands the analysis of the assimilation process to include a broader range of concepts than is normally found in the assimilation literature. In short, we believe that a single-level analysis of this phenomenon is too restrictive and is likely to ignore alternative explanations.

THEORETICAL FRAMEWORK

As indicated above, this study proposes to develop a model of the assimilation of telehealth systems. Such an undertaking can only have value if the model is anchored in theory and if the theories applied make it possible to take account of the issues associated with the assimilation of these systems and analyze them appropriately. This entails at least two things. First of all, particular attention should be paid to the conceptualization of telehealth systems in order to clarify their characteristics. As well, it is necessary to take into consideration, on one hand, these systems' cultural and computational aspects and, on the other, the effect of the social, historical and institutional contexts, and how the systems are understood and used (Orlikowski and Iacono, 2001). By articulating the nature and role of these systems within their organizational and institutional contexts, we were able to identify the issues related to their assimilation and the theories likely to inform these issues, and thus ultimately to formulate, in a robust and logical way, a network of factors likely to influence assimilation.

The starting point of the approach consists of telehealth systems and their assimilation as the object and phenomenon of interest, respectively. The confrontation of these two entities has successively led to an understanding of problems associated with the phenomenon and the theoretical framework. In this regard, emphasis is first placed on the conceptualization of telehealth systems via consideration of their characteristics. Then, the impact thereof on assimilation is analyzed. Given the embedded nature of these systems, it is possible and necessary to analyze their assimilation in terms of their interactions the both the internal environment and the institutional environment of the organizations in which they are deployed. The result is a multilevel model in which the assimilation of telehealth systems is influenced by individual-, group- and organizational-level factors.

The Object of Interest: Telehealth Systems

Telehealth systems are ISs that use a bundle of technologies designed to remotely deliver healthcare services (disease management, home healthcare, long-term care, emergency medicine) and other health-related social services such as tele-education. They are therefore extended systems that connect two or more organizations and several categories of actors from each one. Consideration of the social context is essential to ensure the successful deployment of such systems. An understanding of social relations, the division of labor, cultural factors and the history of technologies in these organizations also appears to be essential. In the case of ISs like those used in telehealth, numerous decisions must be made and the technologies are too vast and complex to be grasped by any one person's cognitive capacity. As well, the decisions to acquire and deploy such systems are not generally at the discretion of a single member of the organization (Eveland and Tornatzky, 1990, p. 124). When the deployment of an information system requires complex organizational arrangements instead of individual decisions, as is the case with telehealth, the deployment is often the result of numerous decisions dictated by economic and social considerations that extend beyond simple managerial logic. In addition to the organization's context, actors and history, an analysis of information systems and technologies should take account of the nature of the technologies underlying these systems. Telehealth systems are made up of a variety of technologies depending on the specialty in question. As such, they include at least two of the three classes of information technology that can be found in healthcare organizations (Grémy and Bonnin, 1995).

In class 1 technologies, the computer performs numerical or logical calculations without interacting with the user and without causing the user to lose any autonomy (Grémy and Bonnin, 1995). Class 2 technologies are designed to support clinical activities, reasoning and evaluation, and medical education.

This class of technologies presupposes a high level of interaction with professionals since it represents an intrusion into their area of activity. Class 3 technologies operate at a more collective level. These systems have no separate existence; they are an integral part of the bureaucratic organization (Grémy and Bonnin, 1995).

Telehealth systems can combine technologies from all three classes, as needed. They are therefore composed of an assembly of heterogeneous equipment made up of intrinsically complex and independent components (Paré and Sicotte, 2004). For this reason, it appears more appropriate to use web models to attempt to grasp these ISs and capture the complex social consequences associated with their deployment. Unlike discrete-entity models, web models allow one to make explicit the connections between a technological system and its political and social contexts (Kling and Scacchi, 1982). The web concept makes it clear that, even though the artifact is a central element of a technological system, it is just one element of an assembly that also includes the components needed to apply the technical artifact to a given socioeconomic activity. These components include commitment, additional resources such as training, qualified personnel, organizational arrangements, the compensation policy and system, in short everything that is necessary to foster the effective management and use of the system (Kling and Scacchi, 1982).

Borrowing from institutional, structuration and social cognition theories, we shall develop a conceptual model of the assimilation of telehealth systems, along with the factors that are likely to influence this process. These three influential theories tap different levels of analysis in such a way that they allow us to adopt a multilevel perspective.

Institutional Theory

Traditionally, computerization projects in the healthcare environment are analyzed at the organizational level, and concerns generally relate to the individual preferences of the professionals who influence the phenomenon in question. Nevertheless, given the organizational arrangements that the implementation of telehealth projects requires, the analysis of telehealth system deployment needs to focus on several levels of analysis, including the healthcare system, for two reasons. First of all, the integration of telehealth into the healthcare system has the mission of mitigating the inadequacies of the conventional healthcare system, which it expands and complements. This conceptualization of the usefulness and potential of ISs did not come out of nowhere and is not maintained by its own internal logic; rather, it is developed and supported by certain allegiances emerging from the social and economic maneuvers of society that it appeals to (Klecun-Dabrowska and Cornford, 2002). Secondly, the implementation of telehealth projects, and consequently of the ISs that support them, requires complex institutional arrangements that involve different organizations and different units within a single organization. This complexity is increased by the fact that each of these organizations possesses specific clinical and organizational routines. For example, the telemedicine component of the National Infrastructure Initiative in Taipei brings together hospital centers that provide third-line care as well as university hospitals and regional hospitals providing second- and third-line care. For all these reasons, the conventional analysis of individual factors must be taken to a higher level so that institutional influences can also be considered.

Structuration Theory

Telehealth projects in fact constitute a new way of providing healthcare services. Because of the institutional arrangements that these projects involve, these ISs are likely to substantially change habits, rules and practices in the participating organizations, and thus in turn to influence the institutional environment into which they are inserted. For example, when interacting with a patient in a virtual context, a physician must learn new ways of feeling and seeing, which represents a real challenge from the point of view of learning (Hu et al., 2002).

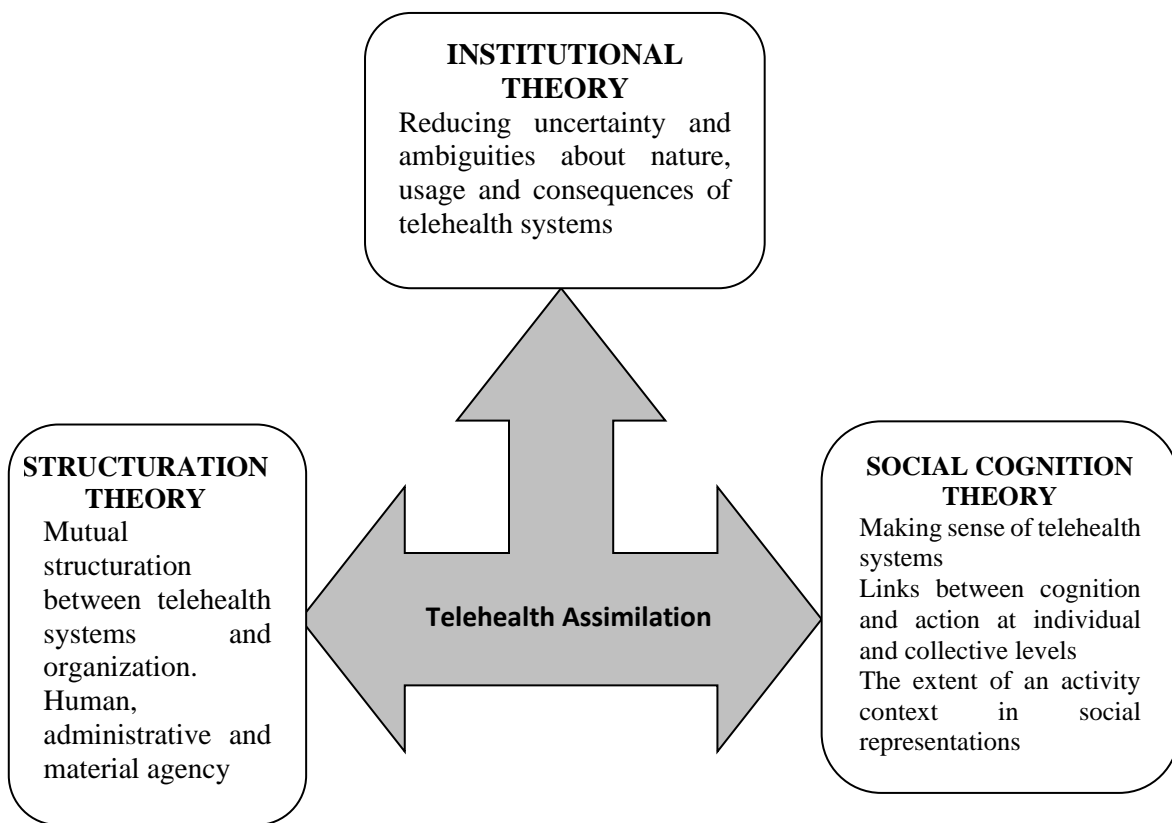
Conditions that may potentially favor or disfavor the deployment of telehealth systems are some of the issues raised by the encounter of the healthcare system as an institution and telehealth projects as the expression of a new process of institutionalization. It is important to recognize that the healthcare system has sufficient weight to foster or constrain the implementation of telehealth projects and that the importance attributed to telehealth projects results from negotiations of meaning among social groups with divergent

material interests. Moreover, telehealth systems are not neutral. They are able to influence the institutional environment as much as they are influenced by it. It should also be remembered that institutional weight does not preclude human agency, particularly the role of the preferences and power of social groups and individuals in isolation.

Social Cognition Theory

When members of a telehealth project gather to make a difficult decision, each individual engages in the debate based on his or her own representations of what the problem is. Group activity by interaction and polarization can produce not only common knowledge but also an individual understanding of telehealth systems, which can be significantly different from the understanding that the individual would have developed in a similar activity in another context.

**FIGURE 1
THEORETICAL FRAMEWORK**



MODEL DEVELOPMENT

Our conceptual model in figure 1 shows the different forms of assimilation at the individual, group and organizational levels and the factors related to these three levels that may influence the process. In the following sections, we describe the construction of the model and discuss its various elements.

The reasoning underlying the model development is as follows. First, we consider that organizations are essentially multilevel in nature, and so are organizational phenomena (Rousseau, 1985). To guide the multilevel modeling, we were mainly inspired by the work of Rousseau (1985), Klein et al. (1994), Chan (1998), Morgesson and Hofmann (1999) and Kozlowski and Klein (2000). Three major concerns became evident. The first was the necessity of properly laying the theoretical foundations for the model; the second concerns the necessity of adequately clarifying the levels of analysis to avoid flaws in reasoning; and the

third refers to the necessity of specifying the sources of variability. These concerns have been taken into account in our modeling approach.

The Phenomenon of Interest: Assimilation

A theorization exercise must start by designating and defining the phenomenon of interest and the theoretical constructs used to conceptualize it, because they determine the levels and the connection processes that the theory or model must address (Kozlowski and Klein, 2000).

Information systems assimilation is defined in different ways in the literature, as shown in table 1:

**TABLE 1
DEFINITIONS OF ASSIMILATION**

Meyer and Goes (1988)	An organizational process that (1) is set in motion when individual organization members first hear of an innovation’s development, (2) can lead to the acquisition of the innovation and (3) sometimes to fruition in the innovation’s full acceptance, utilization, and institutionalization (p. 897).
Fichman and Kemerer (1997)	Assimilation is defined as the process spanning from an organization’s first awareness of an innovation to, potentially, acquisition and widespread deployment (p. 1346)... and is best conceptualized as process of organizational learning wherein individuals and the organization as a whole acquire the knowledge and the skills necessary to effectively apply the technology (Attewell, 1992) (p. 1345).
Purvis et al. (2001) Chatterjee et al. (2002)	Assimilation is defined as the extent to which the use of a technology diffuses across organization work processes and becomes routinized in the activities associated with those processes (Cooper and Zmud, 1990; Tornatzky and Klein, 1982).

Inspired by these definitions, and especially the last, we define organizational assimilation as a post-implementation phenomenon. In other words, it can only occur after a technological innovation is implemented. It has two dimensions: routinization (or institutionalization) and infusion. Routinization expresses the idea that an information system is inserted into the organization’s practices in such a way that, over time, it ceases to be perceived as a novelty and starts to be taken for granted (Saga and Zmud, 1994). The term infusion is used when the system becomes so deeply embedded in the organizational routines that it configures the workplace architecture by contributing to linking different organizational elements such as roles, formal procedures and emergent routines (Cooper and Zmud, 1990). Thus, routinization and infusion refer to the two organizational manifestations of assimilation. It is also imperative to specify the hierarchical levels of interest that are relevant in the development of the theory or model. The focal or reference level of our study – that is, the level at which generalizations will be made – is the organization. Since we are studying a multilevel phenomenon, its manifestations at the individual and group levels are also presented. By doing this, we are striving to show the structure and function of the collective constructs of assimilation at each level, and reveal the processes of composition or compilation whereby the lower-level constructs contribute to organizational assimilation, defined in terms of routinization and infusion.

Individual Assimilation or Interpretation

At the individual level, we conceive of assimilation as resulting from an individual’s engagement in a process of making sense when he or she is faced with the potential use of a technological innovation. In the

course of this interpretative effort, individuals are engaged at three levels – emotional, behavioral and cognitive (Drazin et al., 1999) – since interpretation requires individuals to explain by words or actions their understanding, no matter how embryonic, of the object, both to themselves and to other people (Crossan et al., 1999).

In the case that concerns us, the need for interpretation – for making sense of telehealth systems – is the result of two conjoined events, namely the nature of these systems and the fact that telehealth constitutes a new way of providing health services. Telehealth systems are complex information systems, not only because of the institutional arrangements necessitated by their deployment but also because of their constituent technologies. For example, the wound care tele-assistance project set up by the Réseau universitaire intégré de santé (RUIS) de Sherbrooke (Sherbrooke integrated university health network) is deploying 73 tele-assistance technologies in 65 points of service. Because of the combination of technologies, the presence of such systems in the healthcare environment can cause unaccustomed problems of interpretation and sense-making for both managers and healthcare professionals (Weick, 1990). Since these technological innovations are exogenous to the organizational context, their introduction is likely to create a certain mismatch between the existing systems of meaning, legitimation and domination and the new requirements for day-to-day activities in the organizational context (Barley, 1986). These new technologies therefore affect the ability of members of the organizational context to reason about the structures making up telehealth systems, because technologies in general and new information technologies in particular lend themselves to interpretive flexibility (Weick, 1990) in the sense that they allow different possible and plausible interpretations by various social groups and may therefore be misunderstood, uncertain and complex (Pinch and Bijker, 1987; Weick, 1990; Orlikowski and Gash, 1994).

In addition, the meaning attributed to the technology may depend on a given actor's ability to access the system's schemas and artifacts, that is, the ability to reinterpret the schemas of the set of artifacts other than by means of the schemas already incorporated into these artifacts (Chae, 2002). This interpretive flexibility is based on the fact that any information system comprises both information technology artifacts and schemas (Chae, 2002). Artifacts include tangible resources such as equipment and applications (Kling, 1987), intangible resources such as networking capacities and programming languages (Chae, 2002) and structural elements incorporated in the technologies (De Sanctis and Poole, 1994). Schemas refer to generalizable procedures that emerge from the context or from pre-existing institutions (Chae, 2002). In the context of implementation and use, they can refer to the installed base of the social organization of computerization (Kling and Iacono, 1989). Unlike resources, which are objective, schemas are essentially virtual (Chae, 2002). The ambiguity introduced by telehealth systems is even stronger because in some cases the systems involved are extremely large: not only are numerous resources deployed on a large scale but many different entities are involved. For example, the wound care tele-assistance project includes 13 health and social services centers in three geographic regions of Quebec and anticipates mobilizing 90 resource nurses. Consequently, there are numerous and complex schemas, which, moreover, are embedded in multiple structures.

All of the above arguments highlight both the ambiguous nature of telehealth systems for actors and the need for these actors to make sense of the technologies underlying these systems so that they can use them and integrate them into their practices.

Based on their interpretations, actors develop a certain number of hypotheses and expectations that form their understanding of what the telehealth systems are and what they can be used for (Orlikowski and Gash, 1994). During the course of interpretation, individuals develop a kind of cognitive map, schema or frame in which language plays a central role by allowing the individual to start naming and explaining what had formerly been a matter of sensation or feeling (Crossan et al., 1999). This new meaning of technology concerns not only the very nature of the telehealth systems but also its applications and the consequences associated with their use in a given context (Orlikowski and Gash, 1994).

Group Assimilation

Given that multilevel models essentially aim to describe the phenomena that take place at one level and are generalizable to several levels, it is imperative to specify the formation of collective constructs by

clarifying their structures and functions (Morgesson and Hofmann, 1999); this amounts to clarifying how the phenomena are interrelated at different levels (Klein and Kozlowski, 2000) while identifying the cycle of events that structure the collective phenomenon and specifying the processes involved in the emergence of the collective constructs (Morgesson and Hofmann, 1999).

At the group level, we conceive of assimilation as an integration process during the course of which shared understandings are formed and mutual adjustments are made between individual interpretations. Social interaction in the form of dialogue and joint actions is indispensable to this integration (Morgesson and Hofmann, 1999; Crossan et al., 1999; Lauriol, 1998), which continues the process of interpretation by giving it the status of a social activity that contributes to clarifying images and eventually creating shared understandings and meanings. By allowing the group to arrive at a common discourse and decide on a principle for action (Lauriol, 1998), integration helps to reduce the ambiguity surrounding telehealth systems as innovations. Our conceptualization is similar to that of Hall and Loucks (1977). In the view of these authors, individuals first collect information about the technology so that they can make sense of it and prepare to use it. Later, they tend to move up to an increased level of use of the technology. To do this, they refine their understanding of both the technology and its various possible applications by interacting with it more, discussing their experiences with other people and, finally, coordinating their activities with those of other users. In fact, when users of a system must carry out interdependent activities using it, they need to confront their understandings of the system's nature and what it is meant to do. A shared understanding is indispensable to the coherence of collective action and may differ from one social group to another. The social cognition theory of knowledge creation teaches us that every social group, like every individual, is likely to develop common understandings – cultural and cognitive frames (Scott, 2001), also called technological frames (Orlikowski and Gash, 1994) – which are specific to itself. These frames develop due to the close relationships between group members resulting from the coordination of their activities (Schein, 1985) and also due to the group's influence on its members through its specific system of meaning and norms (Gregory, 1983). In short, the integration of individual interpretations into shared understandings of what telehealth systems are and what they should be used for establishes a consensus on the meaning of these systems within the reference group.

Organizational Assimilation

At the organizational level, we claim that assimilation has two aspects: first a process of institutionalization or routinization, then a process of infusion. Routinization ensures that actions are specified, tasks are defined and the organizational mechanisms necessary for their achievement are set up (Crossan et al., 1999). Shared understandings lead to collective actions. Over time, the repetition and persistence of these collective actions define patterns of interaction and communication, which routinization tends to formalize. By coordinating their actions with those of others, users or groups of users construct new cognitive coordinations, memorize them and repeat them, transposing them to new situations until their use is perceived as normal, and using them more frequently, which means inserting them into the organization's routines. As well, coordination requires one to take into consideration the organizing principles for interaction, such as norms and rules, as well as the organizing principles for individuals, such as scripts and previous representations. Taking these principles into consideration contributes to institutionalizing (or routinizing) the use of the system, by reproducing or enacting structures, since these organizing principles may conflict with the group's sociocognitive orientations. When conflict occurs, it generates new cognitive configurations and thus is likely to lead to a renewed social representation of the system as a function of the social marking that characterizes it (Lauriol, 1998). Thus, as the organization advances in its understanding of the technology and its possibilities, it is likely to modify its work architecture, following a cumulative learning curve (Saga and Zmud, 1994). This in-depth understanding and the change in work architecture that it induces cause users to (1) use more and more of the system's functionalities to execute a larger set of tasks; (2) use the system in a more integrated way to build links between sets of activities; (3) use the technology to perform activities that were not identifiable or feasible before the system was introduced. These three ways of using the system help to infuse it in the organization (Cooper and Zmud, 1987).

To sum up, we consider that assimilation occurs first by means of an individual interpretation process in which individuals succeed in making sense of the new technology, then developing new categories and new schemas and scripts that shape their representation of the system. Then, through a process of integration, the individuals interact and integrate their understandings in order to coordinate their activities. By doing this, they develop shared understandings or frames specific to their group. Over time, these frames are incorporated into routines, then infused into practices and beliefs until they endure within the organization even after the individuals who originated them have left.

The Emergence of Collective Assimilation Constructs

Collective processes can develop via contextual top-down processes or emergent bottom-up processes (Kozlowski and Klein, 2000). In the case of emergence, it is necessary to clarify whether composition or compilation is involved (Kozlowski and Klein, 2000; Chan, 1998).

From the Individual to the Group

In the previous section, assimilation was viewed as a phenomenon that can be seen at different hierarchical levels of the organization: individual, group and organizational, with the individual as the level of origin. We can deduce at least two things from this: first, at these three levels, assimilation is defined as qualitatively distinct constructs; second, assimilation is manifested as an emergent phenomenon. In this regard, it is important to specify the nature of this emergence from the individual to the group and then on to the organization. Individuals interpret technological innovation within the framework of the organizational context. Individual cognitive frames, namely the expectations and hypotheses they develop regarding the technological innovation, are marked by social interactions with their colleagues who are also engaged in the interpretation effort. It is legitimate to consider that, through this interaction, individual scripts, schemas and semantic labels are pooled to develop shared understandings and a principle for action. In fact, when individuals face ambiguous situations, they start to seek the interpretations of other people who are experiencing the same thing (Swanson and Ramiller, 1997). Through these interactions, schemas and individual categorizations are diffused throughout the reference group (Poole and DeSanctis, 1990). Interaction is undoubtedly the vehicle of this pooling, but common frames result primarily from the frequency of these interactions, which make up a cycle of events (Morgesson and Hoffman, 1999). A high level of interdependence among group members' activities increases the presence of such cycles and consequently the emergence of group assimilation. The collective construct may result from the composition or compilation of individual interpretations (Kozlowski and Klein, 2000). We opt for the first possibility, since assimilation at the individual and group levels involves cognitive processes that result in the generation of reference and categorization frames, etc. In other words, the constructs of individual and group assimilation are similar in function but different in structure. We also hypothesize that individuals act homogeneously within the group when they pool their individual reference frames (Klein et al., 1994), since it is difficult to distinguish between individual and group contributions in the creation of common frames (Drazin et al., 1999). Likewise, the group reflects the steps of individual assimilation in its approach, namely the development of images, categories, a language, expectations and hypotheses, etc. In short, group assimilation and individual assimilation are functionally isomorphic, in that both constructs have the same meaning and share the same content and the same nomological network (Kozlowski and Klein, 2000). This leads to the following hypothesis:

Conjecture 1

Group assimilation results from intragroup consensus around individuals' assimilation.

From the Group to the Organization

Routinization and infusion, the two manifestations of assimilation, are two essentially organizational phenomena and have no individual counterparts. Consequently, assimilation at the organizational level cannot occur on the basis of group assimilation. It is true that routinization results from the repetition of behavior patterns as a result of group consensus. Nevertheless, when one moves from the group level to

that of the organization, the assimilation process becomes less fluid and incremental and more punctuated and disconnected (Crossan et al., 1999). Indeed, organizational assimilation usually entails modifications being made to existing systems and processes (Chatterjee and Segars, 2001). Such modifications raise issues that extend beyond the field of social cognition. In particular, one might mention the inertia characterizing existing institutions, which results in the more punctuated nature of organizational assimilation mechanisms compared to the greater fluidity of the phenomenon at the individual and group levels (Crossan et al., 1999). Moreover, through routinization, the modified structures, systems and procedures provide a new context for interaction such that the representations of groups, and still more so of individuals, have less weight because they are embedded in the organization (Crossan et al., 1999).

Moreover, there are theoretical reasons for believing that the emergence of organizational assimilation, which involves hundreds of people, may be substantially different from assimilation at the group level, which may involve no more than five or six people. In a large organization, individuals only interact regularly with a subset of other employees, whereas they will end up interacting with most, if not all, of the other members in a group (Dawson et al., 2008). Thus, organizational assimilation is probably a slower and more risky process and therefore is more sensitive to contextual factors. In fact, each social group within the organization (physicians, nurses, administrators, technicians) may well develop its own technological frames regarding telehealth systems for reasons as diverse as their specialty, occupation, ideology, etc. (Orlikowski and Gash, 1994). We can therefore imagine that, at the organizational level, assimilation results from a process of negotiation among the different frames specific to each group involved, with their divergent belief systems and interests (Drazin et al., 1999). Cognitive frames of any kind guide how individuals or groups understand and act toward an organizational phenomenon. Frames give meaning to events, which then determine courses of action (Goffman, 1974). Thus, the frames specific to each group determine how that group inserts the use of the new technology into its practices. When the different frames are mutually coherent, in the sense that they share a certain number of categories and contents (Orlikowski and Gash, 1994), one can imagine that these specific practices may combine to configure the insertion of the technological innovation into the organizational routines of which it will become an integral part. It is also possible to imagine that, as this use is institutionalized, it will become more widespread and more integrated and modifications may be made to the technological architecture to take into consideration the way in which various organizational elements such as roles, formal procedures and emergent routines will henceforth be connected (Cooper and Zmud, 1990).

On the basis of the above discussion, we consider that organizational assimilation emerges from the compilation of the various frames specific to each social group. In other words, assimilation at the organizational level results not from the convergence of the technological frames of the various groups involved but instead from a combination of these frames in a particular configuration. Consequently, at the group and organization levels, the two constructs are qualitatively different even though they are functionally equivalent (Kozlowski and Klein, 2000). While group-level assimilation results in a consensus concerning the role and use of the technological innovation, organizational assimilation is reflected in the insertion of the innovation into organizational routines and subsequent changes to the administrative and technological infrastructure (Zmud and Apple, 1992). Thus, both constructs concern the same domain, but they are manifested in different ways at the two levels of analysis. This development leads us to formulate the following conjecture:

Conjecture 2

Organizational assimilation results from a configuration of each group's specific assimilation.

ANTECEDENTS OF ASSIMILATION

Individual Factors

Psychological Ownership for the Organization and Felt Responsibility

Psychological ownership defines a state in which individuals feel that an object belongs to them, in whole or in part (Pierce et al., 1991). This feeling may develop for either tangible or intangible objects

(Pierce et al., 2001). Empirical studies have shown that individuals may experience feelings of possession toward their work, their organization (Dirks et al., 1996), the practices of the organization, and particular problems facing their organization (Pratt and Dutton, 2000). Thus, psychological ownership is an attitude that includes both affective and cognitive components (Pierce et al., 2001). Three main mechanisms participate in the emergence of psychological ownership: control of the target or object for which ownership is felt; intimate knowledge of this target; and finally, self-investment in the target (Pierce et al., 2001).

Healthcare organizations provide their members with many opportunities to control, to varying degrees, different factors that then constitute potential targets of psychological ownership (Pierce et al., 2001; Hackman and Oldham, 1980). In healthcare organizations, professionals enjoy a very high degree of autonomy in their areas of expertise because of the complex tasks they have to perform. The low level of bureaucratic formalization and the decentralized decision-making power that characterize healthcare organizations are factors that favor high autonomy for healthcare professionals and, consequently, the likelihood that they will develop feelings of ownership for their work or for specific organizational problems related to it (Pierce et al., 2001).

Healthcare organizations also offer their members opportunities to become more familiar with certain targets of psychological ownership. The collegial nature of healthcare organizations means that professionals are constantly being informed and consulted about their institution's problems and objectives and often about those of other establishments in the same administrative region. All of these factors contribute to the fact that healthcare professionals know their organizations very well and thus increase the probability that they will develop feelings of ownership toward some of its targets. Finally, organizations offer their members opportunities to invest themselves in different aspects of organizational life. This investment may relate to the individual's ideas, time, or physical and psychological energy (Pierce et al., 2001). The greater the investment, the greater the psychological ownership of the target (Pierce et al., 2001). Indeed, executing their tasks requires healthcare professionals to acquire information and knowledge through the social processes of discussion, reading and education, then to apply this knowledge to solving their patients' problems. It is therefore legitimate to think that such a working environment promotes the development of psychological ownership of targets such as certain organizational challenges, protocols or practices, etc.

The above discussion helps us to understand that healthcare organizations combine conditions that favor the development of psychological ownership of certain targets by their members. One of these targets could be telehealth, given the fervor it has stirred up because of expectations that it will solve certain limitations hampering the current healthcare system. We also believe that the feeling of responsibility that results from psychological ownership is one of the factors that explains why individuals in these organizations engage themselves in three ways – emotionally, behaviorally and cognitively (Drazin et al., 1999) – in the effort to understand what telehealth systems are and what they should be used for.

Conjecture 3a

Psychological ownership of the organization should have a positive impact on the individual's assimilation of telehealth systems.

Conjecture 3b

Felt responsibility will mediate the influence of psychological ownership of the organization on the individual's assimilation of telehealth systems.

Group Factors

Interdependence

One of the fundamental characteristics of organizations is the need for coordination. In addition to administrative prescriptions, coordination is the result of structural factors such as interdependence (Van De Ven et al., 1976). Interdependence expresses the extent to which the behavior of one member of a group affects that of the other members. A distinction must be established between task interdependence and goal interdependence (Mitchell and Silver, 1990).

Definitions of task interdependence (TI) are quite varied (Pearce and Gregersen, 1991). In this research, we consider that TI expresses the extent to which group members must exchange resources (information, advice and expertise) and coordinate their efforts to perform their tasks (Mitchell and Silver, 1990). Goal interdependence (GO) expresses the extent to which members perceive their respective goals as being related to those of the group and acknowledge one another as contributors to a common project (Deutsch, 1973).

The fact that healthcare organizations are usually considered to be professional bureaucracies, in which professionals are given a great deal of autonomy, does not preclude the need for coordination, and therefore the interdependence. On the contrary, the structural changes that have occurred in these organizations in recent years tend to reinforce this need. In Quebec, for example, structural problems related to the accessibility, coordination and continuity of healthcare and services have led to the emergence of several solutions, including the integration of services through the creation of integrated health and social services networks. The goal, of course, is the complementary use of resources and expertise, with the aim of facilitating the ongoing provision of healthcare and services.

Despite their relative autonomy, then, professionals in healthcare organizations are not totally independent from one another. This is especially true in the case of telehealth, where information technologies play a pivotal role. On this basis, it is reasonable to make the following conjectures:

Conjecture 4a

Task interdependence should have a positive impact on consensus building within different groups regarding what telehealth systems are and what they should be used for.

Conjecture 4b

Goal interdependence should have a positive impact on consensus building within different groups regarding what telehealth systems are and what they should be used for.

Organizational Factors

At the organizational level, in view of how assimilation is manifested, it may be influenced by specific organizational capacities and by the interaction between ISs and the organization. In the context of this study, the organizational capacities that appear most relevant to us are those associated with the technological and sociocognitive environments. The former refers primarily to the technological infrastructure's IT capacities and the latter to the organizational climate. The interaction between the system and the organization essentially refers to compatibility between the technological innovation and the institutional system, on one hand, and the organization's existing technological systems, on the other.

IT Capacities

As indicated above, organizational assimilation implies that changes must potentially be made to the technological architecture to take account of how various organizational elements such as roles, formal procedures and emergent routines will henceforth be connected (Cooper and Zmud, 1990). To support the emergence and implementation of such changes, the organization must possess IT capacities that cover both technological and organizational dimensions (Bharadwaj, 1999). In particular, the organization needs the capacity to maintain a close, ongoing partnership between the heads of business and IT processes. It also needs the capacity to mutually adjust operating and technological processes to maintain their efficiency and effectiveness and exploit the capacities of emerging IT (Bharadwaj, 1999). In order to possess these capacities, the organization must have a sufficiently flexible, integrated IT infrastructure; this is critically important, since it makes it possible to ensure continuous compatibility and interoperability between telehealth systems and the systems already in place in the organization (Kayworth et al., 2001). In fact, this integrated IT infrastructure must constitute a platform on which the organization's shared IT capacities are articulated (Weill et al., 2002). By IT infrastructure, we mean a shared organizational resource comprising physical elements such as technological artifacts and intellectual elements such as knowledge and know-how, all of which are kept in step by standards (Kayworth et al., 2001).

Conjecture 5

The presence of a flexible infrastructure that can integrate existing and emerging operating and technological processes should have a positive impact on the organizational assimilation of telehealth systems.

Organizational Climate

For the same reasons mentioned in the previous section, we believe that the work environment, and in particular the organizational climate, may constrain or promote the organizational assimilation of telehealth systems.

Organizational climate, unlike psychological climate, corresponds to patterns of meaning shared by the individual members of the organization with regard to certain characteristics of the organizational context (Tracey et al., 1995). An overall conceptualization of organizational climate could prove somewhat irrelevant for studying a specific phenomenon (Kozlowski and Hults, 1987). Rather, the concept of organizational climate should be considered as a broad, multidimensional perceptual domain for which construct definition depends on the variable of interest. Bearing this in mind, we shall consider only the dimensions of climate that appear to us to be most relevant to the routinization (or institutionalization) and infusion of telehealth systems.

The assimilation of telehealth systems derives its meaning from a long-term vision that views telehealth as a new way of organizing healthcare services that complements and extends existing systems. This perspective highlights at least two points: first, information and communication technologies are constantly changing. Consequently, one must plan for continual updates of both the telehealth systems as such and the other information systems in order to benefit from technological advances to improve the quality of patient care and cope with emerging needs. Secondly, this means that medical, administrative and IT staff members must constantly upgrade their skills since the institutionalization of a technological innovation entails that staff competencies must be developed and updated (Kozlowski and Hults, 1987). Furthermore, the structure of healthcare organizations is such that individuals may belong to one or more groups dedicated to specific activities, but they have to work with members of other groups to provide patient care (Dawson et al., 2008). When this reality is reinforced by well-thought-out integration strategies, as was the case with Quebec's health and social services networks, it can look like a climate of integration that fosters professional interdisciplinarity and cohesion among case managers, teams and departments, which then become institutionalized (Kozlowski and Hults, 1987). In our view, such a climate is favorable both to the routinization of telehealth systems and to their use in more extended and integrated ways, which leads to infusion (Zmud and Apple, 1992). It is therefore reasonable to think that if healthcare organizations implement strategies that reinforce learning, continuous upgrading and integration of their staff members' competencies, they could induce normative responses by their members that promote continuous upgrading of their skill level. An organizational climate that unites these three dimensions (learning, upgrading and integration of skills) could prove favorable to the assimilation of telehealth systems. This leads to the following conjecture:

Conjecture 6

A proactive organizational climate that focuses on upgrading skills should have a positive impact on the organizational assimilation of telehealth systems.

Compatibility

Telehealth systems are not deployed in a vacuum, but in organizational contexts with well-established social structures such as practices, professional culture, technologies and other sociotechnical elements (Gosain, 2004). It is essential to consider the impact of these structural elements on the assimilation of telehealth ISs, because studies have shown that they can either constitute barriers to IS implementation or facilitate it by providing the necessary infrastructure or strengthening the organization's absorptive capacity (Kling and Iacono, 1989). Similarly, because of the organizational arrangements they require, telehealth ISs have the capacity to structure the behaviors of the organizations involved. Thus, the deployment of a

new system, especially a complex system like the ones supporting telehealth, not only triggers a process of mutual structuring among the host organizations and the system but may also raise the possibility of a mismatch (institutional misalignment) between the institutional regime of the organizations involved and the institutional logics conveyed by the technology (Gosain, 2004). It is therefore possible that conflicting structural components may come into contact.

The above discussion helps us to understand why the encounter between telehealth systems and the organization raises the problem of compatibility between the systems and the organization's operating infrastructure, on one hand, and the organization's technological infrastructure in the sense of software, hardware and IT management procedures, on the other. In the first case, we refer to operational compatibility, whereas the second corresponds to technological compatibility (Jones and Beatty, 1998).

Conjecture 7

Telehealth systems' compatibility with the organization's operating infrastructure will have a positive impact on their assimilation.

Conjecture 8

Telehealth systems' compatibility with the organization's existing technological infrastructure will have a positive impact on their assimilation.

Organizing Vision

In the case of innovations like telehealth systems, institutional processes play a role from the outset of the diffusion of such systems and help to reduce the ambiguity surrounding them by proposing an organizing vision (Swanson and Ramiller, 1997). Since telehealth systems are essentially interorganizational in their application, their origin and rationale can be sought at the level of the organizational field, which is made up of the various entities comprising the healthcare system. The organizing vision (OV) is created and developed at this level.

This makes it clear that, when the actors involved in telehealth projects must make sense of the system, they are not acting in a vacuum but also making use of the representations of other actors to develop their own, since the organization of which they are members is not isolated. In other words, an essential part of actors' effort to interpret telehealth systems consists of inquiring about and evaluating the interpretations conveyed at the level of the organizational field. Indeed, telehealth projects can be very different from one another, which means that the systems use quite different technologies that have often not stabilized yet and are sometimes still in the prototyping phase (Klecun-Dabrowska and Cornford, 2002). The technologies used and users' understanding of them are incomplete and unstable. In short, the components of these systems are not always well articulated and their implications may not be well understood (Swanson and Ramiller, 1997). In this context, the OV acts to formulate the spirit of the system in the sense of the philosophy underlying the artifact and the motives that led to its development (Chae, 2002). The OV is a meaning structure that actors make use of to understand the nature of telehealth systems and their roles in the social, technical and economic context (Klecun-Dabrowska and Cornford, 2002). In this way, the telehealth OV may remove, or at least reduce, the ambiguity characterizing telehealth systems and their possible applications. By formulating expectations, hypotheses and knowledge regarding the key aspects of telehealth systems, the OV contributes to ensuring the congruence of the different groups of actors' technological frames (as discussed above) and may also align the institutional logics incorporated in the configuration of these systems with the organization's institutional regime (values, practices, norms, culture and technologies). When this happens, organizations experience less conflict in the implementation and use of new systems (Orlikowski and Gash, 1994). Thus, we believe that the following conjecture applies:

Conjecture 9a

A preeminent organizing vision should have a positive impact on the assimilation of telehealth systems.

The OV also provides a legitimation structure, which complements the meaning structure by considering in its discourse the aspects that justify the innovation. The discourse on the system's legitimacy

uses technical and functional arguments, as well as political, organizational and business arguments (Klecun-Dabrowska and Cornford, 2002). For example, by presenting telehealth as a solution to the health problems experienced by people in remote regions and by underserved groups, and to the problem of recruiting and keeping physicians in these regions, etc., the OV not only clarifies the benefits of telehealth but also ties in with society's concern for equity. By doing this, it emphasizes the importance of telehealth systems and strengthens the social norms and values that encourage and value their use (Orlikowski and Gash, 1994), and ensures that users take ownership of them. In turn, legitimacy favors the mobilization of the resources needed to move telehealth from the status of project to the status of current service, which involves changing practices and operating infrastructure so the telehealth system can be integrated.

Conjecture 9b

An OV that formulates the rationale for telehealth systems in terms of existing values and social norms in the healthcare sector should have a positive impact on the assimilation of telehealth systems.

CONTRIBUTIONS

This paper has undertaken a multilevel modeling approach that enables us to gain a better understanding of the assimilation of information systems, based on their nature and the issues associated with their development. Earlier work on the organizational assimilation of information technologies (Zmud and Apple, 1992; Saga and Zmud, 1994; Fichman and Kemerer, 1997; Meyer and Goes, 1998; Purvis et al., 2001; Gallivan, 2001; Chatterjee et al., 2002) has certainly enriched our knowledge of this phenomenon. Nevertheless, the fact that these studies considered assimilation as an exclusively organizational phenomenon has undoubtedly overshadowed more micro or meso explanations that could enrich our understanding still more. In particular, these studies are silent about the structure and functions of assimilation constructs. Unlike those prior studies, our model proposes a detailed account of the assimilation process by clarifying both the structure (Kozlowski and Klein, 2000) and the functional relationships of the phenomenon (Morgesson and Hofmann, 1999). Put simply, the model accounts for how individual, group and organization characteristics interact to structure assimilation. Briefly, the adoption of a multilevel perspective resulted in a more comprehensive understanding of how assimilation unfolds across levels in organizations.

Our study also has implications for practice. In particular, it points to the importance of examining assimilation within the continuum of IS phenomena surrounding the deployment of telehealth systems. As such, it helps understand why managerial actions intended to facilitate the assimilation process should be employed as early as the adoption phase. For instance, issues related to the systems' compatibility with the organization's work infrastructure should be managed during the development phase. Even though routinization and infusion are post-implementation behaviors, factors that are likely to influence them should be taken into consideration before systems are acquired. Moreover, by making explicit the functional relationships at the individual, group and organizational levels, this work highlights the range of managerial interventions required to ensure IS assimilation and consequently the telehealth systems' effectiveness. In addition, beyond the policy level, the model provides a better understanding of the locus of authority for each specific managerial intervention. In so doing, it will help to enhance the effectiveness of managerial actions and smooth the IS governance aspects of telehealth systems.

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