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RÉSUMÉ

Les organisations sont confrontées à un besoin permanent de mettre à jour et de moderniser leur infrastructure organisationnelle et technologique afin de maintenir un avantage compétitif. Cependant, les objectifs classiques du développement des SI se sont longtemps limités à la satisfaction d'un certain nombre de besoins stables plutôt qu'évolutifs. Cet article répond à ce besoin de développer des systèmes évolutifs dans les organisations en perpétuel changement, en identifiant les principaux facteurs conduisant au développement continu des systèmes – le long d'une ligne d'implémentation en perpétuel mouvement – au sein de l'organisation. Pour ce faire, nous nous appuyons sur l'analyse longitudinale du cas d'une maison de retraite occidentale classique, qui s'est engagée au cours des 12 dernières années dans le développement interne d'un système de gestion en constante évolution. Notre analyse montre que quatre facteurs permettent ce changement simultané: (1) l'appréciation interne du changement, (2) l'appréciation externe du changement, (3) une gestion éclairée, et (4) la présence d'employés émancipés. Les résultats suggèrent qu'en contrôlant ces deux derniers facteurs, les managers peuvent contribuer à la motivation des employés sur le long terme et limiter ainsi les réactions négatives aux technologies de l'information. D'un point de vue théorique, il apparaît qu'éviter intentionnellement de se focaliser sur l'idée de ligne d'implémentation dans l'analyse des données fournit un dispositif de recherche constructif. Alors que cette construction semble plausible dans le cadre de certaines études du changement technologique dans l'organisation, elle semble requise dans les études portant sur l'étude des systèmes d'information évolutifs dans les organisations émergentes.

Mots-clés : maison de retraite, soins de longue durée, changement fondée sur les TI, développement des systèmes, ligne de mise en œuvre, émancipation.

ABSTRACT

Organizations continuously need to both update and upgrade their organizational and technological infrastructure to maintain a competitive edge. However, a traditional goal of information systems development is to satisfy a stable set of requirements rather than evolutionary ones. This article embraces the call to develop evolving systems in continuously emergent organizations and to identify the main factors that can lead to continuous system development—a continuously moving implementation line—from within the organization. In doing so, we draw on a longitudinal analysis of the experience of a typical Western nursing home that, in the past 12 years, has aimed to internally develop a healthcare provision and management system to support its evolving needs. Our analysis shows that four factors enable this concurrent change: (1) the internal appreciation of change, (2) the external appreciation of change, (3) enlightened management, and (4) emancipated employees. By controlling for the latter two factors, managers of long-term care centers can motivate employees to contribute to the development of the system over long periods and limit undesired behaviors with information technology (IT). From a theoretical perspective, this research shows that focusing on the implementation line in data analysis can be a constructive device for research. Although this construction is useful for studies on IT-driven organizational change, it should be mandatory for studies on evolving information systems in emergent organizations.

Keywords: nursing home, long-term care, IT-driven change, systems development, implementation line, emancipation.

INTRODUCTION

Since the 1980s, enormous investments have occurred in information technology (IT) and information systems (IS) in the public sector. Nevertheless, the health service sector has experienced myriad difficulties in keeping up with the IT evolution, and many experiences have produced poor results (Norris & Brittain, 2000; Wickramasinghe & Silvers, 2003; Charney, 2007). In turn, these negative results have partially misled literature on the topic. Indeed, a large body of literature on IT-/IS-driven change processes in the health service sector has focused mainly on the causes of failures (i.e. Iakovidis, 1998; Littlejohns et al., 2003; Malato & Kim, 2004). In contrast with the post-mortem studies of system failures, the research reporting positive results and value-added of IT in healthcare remains mostly theoretical (Adler-Milstein & Bates, 2010). In addition, IS research has largely, and surprisingly, neglected studies of IT use in long-term care (LTC), despite the magnitude and alarming statistics of the aging populations in the Western world and related concerns about providing care to this growing social group[1]. For example, nursing homes in the United States take care of 16 million elderly people on daily basis[2]. Today, the provision of highly complex specialized care services (with Alzheimer's, Parkinson's, diabetes, epilepsy, and cancer being the most frequent chronic conditions) to a population of advanced age in LTC structures[3] requires the integration of a large amount of information, the coordination of multiple roles within and outside the structures, and an accurate monitoring of conditions over long periods. To do so, many nursing homes have turned to IT to support care provision and management, though with limited economic resources and little support from the IS research community.

The problems of healthcare information systems in LTC are in many ways similar to the problems experienced in other contexts, but with an additional layer of complexity in both the specific nature of day-to-day care practices (Østerlund & Boland, 2009) and the perceptions of stakeholders (Jensen & Aanestad, 2007). To account for this complexity, a framework that accounts for and embraces paradoxical results is needed. Arnold (2003) describes IT uses and consequences as paradoxical and ironic because the very existence and implementation of IT in organizations reconfigures the problems addressed by the technology in the first place, thus generating unexpected consequences (Orlikowski, 1996). This problem has been theorized as resulting from the separation between the development of technology and its implementation in organizations (Introna & Hayes, 2011). Such disconnect is re-

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[1] Source: WHO National Health Accounts, 2011.

[2] Source: 2004 National Nursing Home Survey.

[3] Source: ISAT 2010.

ferred to as the "implementation line" (Leonardi, 2009). This divide between development and implementation often occurs in practice and even more often in the literature (Leonardi & Barley, 2008; Leonardi, 2011). This problem has been addressed rarely (see Leonardi, 2007; Orlikowski, 1996 for exceptions) and, if so, mainly from a theoretical standpoint (Leonardi & Barley, 2008; Leonardi, 2009), even though successful information systems must evolve with the organization rather than being developed with a specific, time bounded scope in mind (Truex et al., 1999). This understanding is crucial in long-term care organizations because of the constantly changing and locally emerging nature of care work (Østerlund & Boland, 2009). Thus, this situation calls not only for additional research on the link between the design of technology and that of the organization but also for research that can explain how the implementation line can keep pace over time.

Understanding the characteristics of the co-evolution of technology and organization when both are under constant development is the theoretical challenge of this article. The practical challenge is to understand how to keep LTC employees motivated to continuously contribute to develop systems that adapt to the emerging needs of guests. The question that guides this study therefore is,

What are the factors that keep the implementation line moving in systems development?

We address this question with the analysis of a longitudinal case study (Leonardi & Barley, 2008; Yin, 2009) of the development and use of a health-care provision and management system (HPMS). The HPMS was developed internally in an Italian nursing home that, during the past 12 years, has engaged in a comprehensive IT-driven change process comprising continuous organizational changes and technological developments. We show that this is a process that includes many different actions that help build and maintain an organizational culture of emancipation (Cecez-Kecmanovic & Janson, 2009). The constructive coexistence of enlightened management, strategic vision, and emancipatory practices not only drives the development over time but also limits improper and deviating uses of IT to support the general development of the organization.

The article is structured as follows: in the next section, we discuss the key role of IT in the healthcare sector and the theory explaining the concurrent, convergent, and emergent dyad of organizational and technological development. We then provide a description of the case study, including the functions and evolution of the HPMS software. We next present the research method with the data collection and analysis. We conclude with a presentation of the key findings: (1) that emancipation through system design is not a goal but rather the very instrument of sustained organizational change and (2) that management style plays a key role in supporting emancipation by allowing the creation of evolving information systems.

II. THE ROLE
AND CHALLENGES
OF IT IN HEALTHCARE

II.1 Theoretical Problems
in IT Driven Organizational
Changes

The contribution of IT in the modernization of the services sector is fundamental and has become even more important for intensive knowledge services. It is not surprising, therefore, that scholars and practitioners have paid a great amount of attention to the role of IT in the change of knowledge intensive healthcare organizations. However, despite its potential advantages, in-depth understanding of the transformative role of IT is lacking (Arnold, 2003). Technology can defy understanding and create work practices that are tangential to management plans (Orlikowski & Hofmann, 1997) and even downright deviating and deceptive (Cunha & Carugati, 2009). Arnold (2003) and Leonardi and Barley (2008) argue that the limited understanding of the relationship between technologies and their organizational consequences comes from the gap in theory in addressing concurrently the processes of IT development and use. Failing to address development and use as a single process shifts the focus on either the design of technology, causing a black box in use, or the use and consequences of technology, taking the technology as given. This approach is limited because it fails to consider the mutually constitutive relationship between IT development and use (Leonardi, 2009). Thus, a sole

focus on IT use, which is typically the case in healthcare IT research, is limited to the observation of how users either resist or accept a system (Jensen & Aanestad, 2007), how users augment the system with their own devices (Cunha & Carugati, 2011), or how users find ways around the limitation of the systems through changes in practices (Sewell, 1998). In this scenario, changing or upgrading existing technologies is perceived as compensating for the (at least partial) failure of previous systems. This image is likely to change with a study integrating development and use over time. In this second scenario, unexpected behaviors with IT can be perceived as inputs to the re-design of the technology, and thus a positive force, rather than indications of technology limitations. Contributing to the understanding of the constitutive relationship between IT design and use across the implementation line is therefore the theoretical challenge of this article. Furthermore, although this approach seems promising for the study of IT in healthcare (e.g. Østerlund & Boland, 2009), few studies have used it in healthcare contexts such as LTC.

II.2. The Role of IT in Healthcare

The healthcare sector is considered one of the most critical service sectors because of its intrinsic complexity and the financial resources it drains from public budgets. During the past 20 years, healthcare systems and organizations have been under significant pressure from two forces that, to a certain extent, conflict: containing costs on the one hand and improving the

quality of patient care on the other hand. A middle ground has been reached by improving care through the collection, categorization and analysis of patient data and information (Sheridan & Corcoran, 1999). Thus, IT plays a central role in the modernization of health services (Braun et al., 1999; Malato & Kim, 2004, Madon et al., 2007), though its speed in this case is relatively slower than that in other industries (Rosebaugh, 2004; Raghupathi & Kesh, 2007).

Investments in IT at the general country level and inter-organizational contexts fall under the category of health informatics (Bath, 2008). Examples span from the implementation of electronic health records (e.g. Raghupathi & Kesh, 2007), to the development of telemedicine projects (e.g. Miscione, 2007), to the building of a map-based health management information system (e.g. De Costa et al., 2008). All these objectives respond to the need to support complex day-to-day practices but, despite the many attempts, often result in lower-quality services for patients (Ellingsen & Monteiro, 2008). For example, despite significant investments, the goal of many governments of a fully functional electronic patient record (EPR) has remained elusive (Jensen & Aanestad, 2007). Such failures may be due to the intrinsic complexity of health services (Østerlund & Boland, 2009), a lack of integration between developers and users (Rajan et al., 2011), long implementation periods in a context of rapid changes, and resistance to change among healthcare professionals (Littlejohns et al., 2003; Bath, 2008). This evolution in a vacuum, artificially generated by researching before and after the implementation line, has contributed to viewing these consequences as paradoxes (Arnold, 2003; Jensen and Aanestad, 2007).

As such, previous research argues that the processes and practices of healthcare professionals have been renegotiated on case-by-case basis, leading to what Østerlund and Boland (2009, p. 1) call "a hodgepodge of information systems, some electronic, other paper-based or wall mounted into circular patterns," that support day-to-day clinical practice. In this environment, and with the separation of IT development from use, it is easy to confuse the "hodgepodge" with existing technology limitations and, therefore, to engage in new development projects.

For IT dedicated to care of the elderly, the situation is further complicated because aged people face complex health problems requiring the intervention of multiple caregivers (Mouratidis et al., 2003). Thus, the context involves a main stakeholder (the elderly) with none or very limited voice in IT development and multiple distributed stakeholders with varying goals. This tension is clear in the theory that posits, on the one hand, that an IT tool is needed around a "particular target of patients, modeling it according to [a] flexible and light platform susceptible of fluid process of customization" (Raghupathi & Kesh, 2007, p. 43), and, on the other hand, that the elderly are not always capable of or in the condition to explain their needs (Bath, 2008). These two positions contextualize the general need for evolving systems with a moving implementation

line for healthcare (Truex et al., 1999; Leonardi, 2009). If we are interested in evolving systems capable of adjusting to needs that both are difficult to express and change over time, we need to move the implementation line from a theoretical point of view to a practical point of view. The goal of the remainder of this article is to understand how design and use can be mutually integrated over time depending on the complex, emergent, and evolving needs of a nursing home.

III. ESEARCH CONTEXT AND METHODS

In this section, we provide a brief explanation of the evolution of LTC, in particular focusing on nursing homes in Italy. We then describe Fondazione Santa Clelia (FSC), the organization where we conducted the empirical investigation. We next present an overview of the development of the software ABC. We conclude by explaining the methods used to collect and analyze the data.

III.1. Trends in LTC

According to WHO National Health Accounts (2011), healthcare costs have increased in industrialized countries beyond their respective gross national product, regardless of whether the type of system is universalistic (Italy), insurance based (United States), or mutual (Germany). Moreover, the use of modern care technologies has reduced the need for hospitalization and increased the survival rates of several, once fatal, illnesses, leading to chronic conditions and collateral disorders. These factors have moved the care of the elderly from hospitals to nursing homes. This trend is unlikely to change given the demographic data for the next decades indicating a rise in demand for these services. Table 1 provides an example of the relevance of this aging phenomenon in Italy and the extent to which it will be critical in the future.

In this context, the provision of care is delegated to LTC structures such as the one we examine in this study. With its size of 85 beds, FSC is quite repre-

census	distribution for age groups			average age
	0–14	15–64	above 64	
1951	26,1	65,7	8,2	32,0
1961	24,5	66,0	9,5	33,7
1971	24,4	64,3	11,3	34,8
1991	15,9	68,8	15,3	39,1
2001	14,2	67,1	18,7	41,4
forecast 2021	12,7	63,4	23,9	45,7

Table 1. Distribution % per age groups and average age (1951–2021)[4]

4 ISTAT; Report on non-self-sufficiency, Italy, 2010.

sentative of the average size of nursing homes in the Western world (e.g. Unites States: average 105 beds[5]). The maximum bed capacity in Italy is established by law at the regional level, and several regions have established a maximum number of beds of between 80 and 120[6]. Comparatively, a large majority of Western nursing homes are also small or medium sized.

III.2. Nursing Homes in the Italian Health System

In the Italian health system, nursing homes are regional-based organizations geared to aid elderly people and non-self-sufficient individuals suffering from combinations of physical, psychological, and sensorial pathologies. LTCs deal with illnesses that cannot be treated at home, providing mid-level medical, nursing, and rehabilitative assistance along with a high degree of tutelary and residential support. The typical users/customers served are as follows:

- Age of geriatric interest (usually over 65 years; the average age is often closer to 80 years);

- Significant dominance of the female population, with a ratio of 4 to 1;

- Loss of self-sufficiency in daily activities;

- Health conditions characterized by co-morbidity, severity, and clinical instability but not severe enough to require hospitalization;

- Social conditions that do not allow individual to live at home even with domiciliary support; and

- Need of tutelary assistance comprehensive of social contacts and social animation.

During the past 10 years, the LTCs went through a period of radical transformation linked to different endogen and hexogen elements. The decreasing support of families, the aging of the population, and the progressively worsening health conditions of the very aged have transformed the nature and actions of LTC. Today, the need for LTCs refers not only to a better level of hospitality but also to nursing, medical, rehabilitative, and animation activities. LTC structures are places of socio-health integration and support to geriatric disabilities with a wide diversification of residential, semi-residential, and daily services targeted to different types of guests. Through this evolution, LTCs have become complex organizations that need to be run with managerial logics and the support of managerial tools of matching complexity.

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[5] National Nursing Home Survey, USA, 2004.

[6] Nursing Homes Sectorial Observatory of the Università Carlo Cattaneo – LIUC, Italy, 2011.

[7] In Italy, the accreditation system is decentralised at the regional level. For FSC, the competent body is the Emilia-Romagna Region with Bologna as capital.

Type of Structure	N. of Guests
nursing home – residential structure for non-self-sufficient elderly people with average/severe pathologies	27
rest home - residential structure for non-self-sufficient elderly people with weak pathologies	25
daily center – daily structure for elderly people with pathologies at different levels	9
family home – residential structure for elderly/disable people with weak pathologies	13
nursing apartment – apartment for self-sufficient elderly people who necessitate of assisting services of weak concern	11
TOTAL	**85**

Table 2. Distribution of services (in 2009)

III.3. Fondazione Santa Clelia

FSC is a non-profit, Catholic, public accredited[7] nursing home located in Vidiciatico, a small town near Bologna in the Italian Apennines. FSC was founded in 1982 by a local priest and Don Giacomo Stagni, the president of FSC. The institutional aims are to assist the elderly and young people, support cultural and social activities to promote patient well-being, and increase the living conditions of disadvantaged individuals. FSC fulfills these objectives by providing the following services: nursing home, rest home, family home, day center, nursing apartments, social center, Alzheimer's nucleus and garden, laboratory, social call center, gym courses, blood center, summer camp, and training days. In June of 2009, FSC hosted 85 guests in the different typology of structures according to table 2.

FSC's orientation to care and focus on animation and social activity are reflected in the costs of personnel, which represents 78% of the total operating costs. The ratio is of 1 operator to 1.5 guests. This ratio is higher not only than what is required by the legal framework of the authorization and accreditation process but also than that of the average LTCs (see table 3).

FSC currently uses an advanced IT system, called ABC, for all its activities, including all its operational and informational needs. The ABC system was developed internally by FSC during the past 12 years, and it continues to undergo improvements as new needs emerge. Therefore, this is an exemplary case both to extend the knowledge of IT in healthcare to the LTC context and to study the impact and meaning of a moving implementation line.

III.4. Development of ABC Software

Until 1999, FSC was a traditional nursing home, led by paternalistic management. Paperwork records were maintained mainly to satisfy the au-

Type of profile	N. of employee	Parameters required by the Regione Emilia-Romagna
paramedical and social staff (nursing home)		
coordinator	1	1
socio-sanitary operator	12	11
animator	2	not required
professional nurse	3	2.5
rehabilitator	1	0.5
paramedical and social staff (rest home)		
coordinator	1	not required
socio-sanitary operator	7	2.5
animator	1.5	not required
professional nurse	1	on demand
rehabilitator	0.5	not required
paramedical and social staff (daily centre)		
socio-sanitary operator	2	1
animator	0.5	not required
professional nurse	on demand	on demand
rehabilitator	0.5	not required
paramedical and social staff (family home)		
socio-sanitary operator	3	not required
professional nurse	on demand	on demand
rehabilitator	on demand	on demand
administrative staff	5	not required
general services (kitchen, cleaning, laundry)	9	not required
general practitioners	3 in agreement with the health district authority	———
health director	1 on a voluntary basis	———

Table 3. Workforce composition (2009)

thorities. The structure worked well, according to the guest, but it was smaller and provided fewer services. In 1999, the current general manager, with a background in management, took his position after having served as vice director for 2 years. He wanted more data for decision making, but lacking financial resources or skilled IT personnel, he turned to a retired computer engineer who volunteered to help create new software. The development process did not involve specific methodologies but rather focused

on two aspects: to involve the people with the domain skills and to keep things simple. Thus, the process was emergent, and discussions frequently occurred most appropriately during the task at hand.

The ABC software became operational in September 2000, after almost a year of preparation. The reaction of the caregivers to what was considered an experiment far exceeded the management expectations. Testing and feedback proceeded rapidly, and the experiment became a broad effort, moving from DOS to Excel, to Access, to SQL. This process followed the evolution of needs and requests from nurses, rather than being pushed on them:

We decided to start with nurses because they had finite information needs and it could be useful both for them and for all the others. At the beginning we fixed a nine-month deadline [for evaluation] but after one month they already had suggestions on how to improve it. This told us that they were confident with the program. (software developer)

The current version of ABC follows a modular logic, so that it can be implemented according to the needs of the organization and the speed with which operators learn its functions. Figure 1 lists the six information areas covered by ABC that FSC uses to create personalized development and care plans.
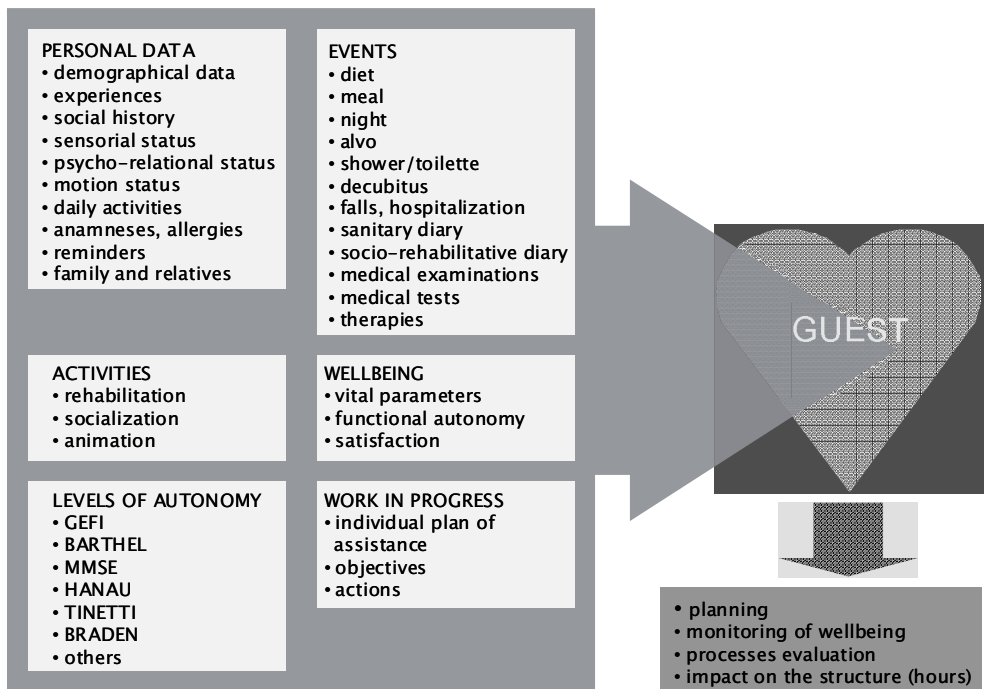

PERSONAL DATA
• demographical data
• experiences
• social history
• sensorial status
• psycho–relational status
• motion status
• daily activities
• anamneses, allergies
• reminders
• family and relatives

EVENTS
• diet
• meal
• night
• alvo
• shower/toilette
• decubitus
• falls, hospitalization
• sanitary diary
• socio–rehabilitative diary
• medical examinations
• medical tests
• therapies

ACTIVITIES
• rehabilitation
• socialization
• animation

WELLBEING
• vital parameters
• functional autonomy
• satisfaction

LEVELS OF AUTONOMY
• GEFI
• BARTHEL
• MMSE
• HANAU
• TINETTI
• BRADEN
• others

WORK IN PROGRESS
• individual plan of assistance
• objectives
• actions

GUEST

• planning
• monitoring of wellbeing
• processes evaluation
• impact on the structure (hours)

Figure 1. ABC functional logics

Built around the needs of guests, ABC is capable of producing both descriptive statistics and behavioral indexes. Data and information are collected through a bottom-up approach from nurses, animators, physiotherapists, doctors, and support staff, depending on their daily contacts with the guests. With ABC, operators can interpret events and solve problems, discern information efficiently, and arrange data for multiple purposes, similar to what Brynjolfsson & Hitt (2000) indicate as the business value of current technology that continually develops beyond the forecasts of the future.

III.5. Data Collection

The data collection at FSC began with informal talks in 2005, though the data used in this article were collected formally in two field trips, in October 2008 and September 2009[8]. During the first trip, we interviewed five people: the general manager, the software developer, the administrative assistant, and two nurses. For the first two people, the interview lasted 2.5 hours each, while the others lasted 1 hour each (see table 4). We used semi-structured interviews to understand how the software was developed and implemented from the original idea to the current use. Specifically, we investigated the circumstances related to the generation of the idea for the system:

how the tool was designed, whether the risks pertained to the change in work practices, the timing and freedom of people to provide suggestions, the development of the process, and the modifications implemented after the first release.

After analyzing the first set of data, we adopted the grounded theory technique of theoretical sampling to update the interview guide for the second round of interviews. In particular, because the first round clearly indicated that emergent needs and development went together, we focused the second round of interviews on the individual uses and organizational consequences of ABC and how these changes were fed back to the programmer and included into the software. In this round, we interviewed 14 people: 10 employees, 2 guests, the general manager, and the developer. The aim was to collect a large number of interpretations of ABC at work and eventually reach saturation in the interviewees' statements. We interviewed the person responsible for the health area and five of her collaborators, two social animators, one physiotherapist, and the administrative clerk who connected the users and the developer. We also interviewed two guests with experience at FSC "before" and "after" the software introduction. Each interview lasted about one

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Time	Interviewee	Duration (in hours)	Tenure in FSC (in yrs)	Notes
T 1	General manager (GM)	2,5	15	last 12 y as GM
T 1	System developer	2.5	10	as volunteer consultant
T 1	Administrative assistant	1	12	before the development
T 1	Nurse	1	15	before the development
T 1	Nurse	1	12	before the development
T 2	Head nurse	1	20	before the development
T 2	Nurse	1	19	before the development
T 2	Nurse	1	10	just before the development
T 2	Nurse	1	10	just before the development
T 2	Nurse	1	15	before the development
T 2	Nurse	1	19	before the development
T 2	Social animator 1	1	12	before the development
T 2	Social animator 2	1	11	before the development
T 2	Physiotherapist	1	15	before the development
T 2	Administrative clerk	1	8	5 years in this position
T 2	Guest 1	1	12	before the development
T 2	Guest 2	1	14	before the development
T 2	General manager	2.5	15	last 12 years as GM
T 2	System developer	2.5	10	as volunteer consultant
T 2	Nurse	1 shift of 6 hours	19	before the development

Table 4. Overview of interviewees at T1 and T2

hour. Moreover, one of the researchers directly observed a nurse during her shift to understand how the software was used and the impact of this IT tool on the way people worked and interacted. We timed our visit in the structure with the presence of the system developer and thus were also able to observe how new needs were communicated to the developer and integrated into the software. Because it was clear by the second round of interviews that development and use went hand in hand, we carried out two aditional interviews of 2.5 hours each with the general manager of FSC and the software developer to obtain more details, respectively, on the link

between organizational development and the procedures of system development.

III.6. Data Analysis

All the interviews were digitally recorded and transcribed verbatim. They were then translated from Italian to English by a translator not familiar with the organization and the topic. The content of the interviews and field notes was qualitatively analyzed using Nvivo software (Hutchison et al., 2010). To ensure that the system development activities and the development of the organization were grounded in the data, we performed coding to search for interconnected evidence of positive and negative experiences with ABC, use and abuse of the system, and acceptance or resistance that caused any form of organizational impact (Eisenhardt, 1989). In particular, we followed Leonardi's (2009) framework for analyzing cases across the implementation line. This framework codes elements such as work practices, interaction patterns, and perceptions at the organizational level and momentum, groups, negotiation, and closure at the technology level. The data analysis involved three cycles of coding (Charmaz, 2006). First, we performed open coding, assigning interview statements to emergent codes. Second, we performed theoretical coding to identify relationships between the codes. Third, we performed selective coding to ensure that all available data were associated with a category and that core categories were identified to support the conceptualization of theoretical concepts that, grounded

in data, would provide a practically relevant method to develop IT tools in evolving healthcare settings. The analysis stopped when no further categories emerged. Finally, we cross-checked our coding scheme to control for the reliability of the analysis. Table 5 shows an extract of the codes associated with the theoretical categories of technological and organizational change and the underlying themes of internal drive, external drive, enlightened management, and emancipation.

IV. CASE ANALYSIS

In this section, we present the analysis of the data. Because our purpose was to find the factors that keep the implementation line moving in systems development, we present the analysis of the organizational change first and then the analysis of the technological change. We provide this division mostly for clarity, however, coding across the implementation line revealed that many codes were shared or overlapped in both categories. The specific elements that, according to our analysis, keep the implementation line moving are (1) *internal drive*, or the internal appreciation of success; (2) *external drive*, or the feeling that the external environment appreciates the development; (3) *enlightened management*, or the management style that supports change through guidance rather than authority; and (4) *emancipation*, or feelings of empowerment that allow employees to challenge the status quo and drive the development further.

Categories	Themes	Codes	Example
Technological Change	Tech - Internal drives	Tech-Change-Request	*We gave the software to the users and we asked feedback in 3 months but after one week they were already demanding changes. Then we knew we were ready to proceed.*
		Savings-Care	*Thanks to this technology we have decreased drastically the use of drugs.*
		Savings-Management	*As this system is becoming more and more functional we have almost zeroed the number of extra baths. Do you have any idea of the [organizational] chaos that an extra bath can cause?*
		Old-Management-Change	*The idea of the software came from the need of having all the information we needed, not to have a software. It came from our needs, because it became too risky to make decisions without information.*
		New-Function-Request	*If we have an emergency we know we're going to panic, and we are going to forget something such as photocopy a document. So we asked for a new function: to have a function to easily print a form to be sent with the guest to the hospital.*
	Tech - External drives	Diffusion-Software	*As my colleagues saw the system in use for us they demanded to borrow the CD.*
		Professionalization	*We looked, and found, a software house that would further develop our product and now they have sold more than 100 licenses.*
		External-fit	*As soon as the Region agreed on a standard for data transmission we implemented in the software. It was an easy but brilliant change.*
		Diffusion-Political	*The Region has decided to mandate the ABC software to all nursing home in the region. They want to standardize quality control and save on data collection.*
		Success-Care	*We are victims of our success. Now the region sends us the most difficult cases.*
Organizational change	Emancipation	Show-Skills-Development	*At the beginning, the software was very simple and we were working with little information. After that, we started thinking about how to improve it "[if] we introduce this one or that one."*
		Role-Emancipation	*Doctors arrived, wrote a prescription, but didn't read the diary. So, the nurses made a request for a module called "showcase." [When] the doctor logs in the system he cannot move on until he has read the showcase.*
		Show-skills-External	*It has become alpha and omega. I use the computer here, I learn. I go home – now we have bought a computer – and I explain to our son… internet … writing.*
			When they attended training courses with employees coming from other companies, they boast their computer knowledge and they often say that they wouldn't know how to go back…. [We] had [even] some cooks that attended Access courses.

		Autonomy-internal	*He [the general manager] never tells us what to do and how to use the software. He gives general direction - to be sure - but always listens to us regarding our work.*
	Enlightened management	Old-Organization-Change	*[The idea of the software] mostly it came from the need to make big changes to an organization that previously had been managed in a* family *manner.*
			Therefore, the idea was to use this software like a caterpillar to destroy all those bad situations [old organization].
		Complexity-Change	*Our guest situation is very different from when I first came. The guests arrive older and in worse physical conditions. We have different "nucleuses" for different main pathologies but most guest have co-morbidities of varying degrees. The complexity has increased and we have to match that complexity.*
		Guest-Care	*I know that many nursing homes keep their guest sedated constantly. I do not want to do it here. If the fall from the bed we do not put constraints [drugs or bars] but we try to understand why.*
		Flexible-Work-Support	*These paths are not mechanized because nobody has defined them. So, if one says, "put in training about entertainment activities" there is no problem, because putting data together is easy. ... [R]elations are investigated by surfing the net of information.*

Table 5. Example of codes, themes, and categories

IV.1. Organizational Change

At the end of the 1990s, FSC was a traditional nursing home, with few guests, low complexity of care, and short guest tenure. It was a family-run business, in which the mother served as general manager and the daughters worked as nurses. With few guests and few needs, execution of the care processes resided with the personnel, and registrations of information were mainly recorded on paper. Such paper documents were not considered necessary to support management decisions, because regular staff meetings helped keeping everyone informed of the situation. It was during this time (in 1997) that the current general manager accepted a position as vice director.

The market was changing, however, with more and more elderly people in good health resisting retirement in nursing homes. Rather, at the end of the 1990s, the elderly went to nursing homes only when their health was so compromised that they could not live at home any longer. It is in these conditions that the current practices reached a breaking point and the case of organizational change at FSC began.

> *The idea of the software came from the need of having all the information we needed, not to have a piece of software. It came from our needs, because it became too risky to make decisions without information. And, mostly, it came from the need to make big changes to an organization*

that previously had been managed in a family manner. (general manager)

Organizational change was not an easy task for a newly appointed general manager without a medical background. However, the manager was able to communicate his vision to an external person, the programmer, who followed the development of ABC and FSC for the past 12 years. The programmer shared the manager vision and helped with the IT tool he implemented.

Previously, the organization was extremely influenced by few people … everything had to pass through them…. They wanted to manage and to secure all the information regarding their responsibilities, on their own. Therefore, the idea was to use this software like a caterpillar to destroy all those bad situations … so, from now on we have to use this software, these are the information to be uploaded and once all the information are inside the software, they are the truth and they are no longer arguable. (programmer)

As the changes started, some employees began to feel that they were taking part in something new, while others began to feel excluded. For the manager, this was not a witch hunt but rather the pursuit of a better performing organizational design in which information was visible and could be shared and used by all.

With this program, we have touched each level: operational, strategic…. It was different from other programs because implies a specific organizational structure … you can't build a program without a well-structured

organizational model. It was a helpful structure to create. (general manager)

As the new organizational design was coming together, the practice of sharing information became engrained in the organization to such an extent that it even became mandatory to read others' input:

Now everybody knows everything and if someone has a question, she asks… the diet of a guest… he comes back from hospital with a diet. In diets [function in ABC], there is the list of what he can eat. If you only hear it then you could forget. Instead, it remains because all is written. (nurse)

Doctors arrived, used to do some prescriptions, but didn't read memorandum. So, the nurses made a request for a module called "showcase"…. [Now] when the doctor arrives and enters the system, he identifies himself and until he doesn't read the memorandum in the showcase, he can enter nowhere. (administrative assistant)

The requirement to read specific parts of the systems was important for users external to the organization, such as medical doctors, because they did not interact with guests on a daily basis. In contrast, the nurses not only produced the information that populated the system but also were the primary users. As the point of production and consumption of information, it did not take long for the functions of ABC to become habits:

I think that it became a habit. I mean that we knew we had to write the

diary and, maybe, we had to record glycaemia values not only in the diary itself, but also in the sanitary information so as to make graphs and read historical series…In other words they were instructions that became habit. (nurse)

With care and IT practices becoming habits, the ABC software quickly expanded to include more complex functions.

IV.2. Technological Change

The ABC software went through four main phases. It began as a local application for use in the offices of the nursing home; became a networked application that gave access to medical doctors outside the structure and then, as a result, to every employee from anywhere; became a commercial product sold to more than 100 LTC structures; and finally became the key to the EPR for the elderly in the Emilia Romagna region. These are noteworthy steps for software that started development in the nursing home's morgue.

You should go out the typical schemes of management schools. Here, everything has happened in a more rudimentary level, friendlier, simpler. Therefore, you will never find a written analysis. With staff, everything happened through informal chats. Think that the first chat took place in the morgue where the poor guests, that had left this world, were kept. (programmer)

The development followed a simplified path so that, on the one hand, the general manager could have the man-

agement system he needed and, on the other hand, the employees could have something that worked for their specific level of IT proficiency (which at the beginning was low). The easiness of the approach taken with the development during the first phase became beneficial during the following phases. That is, the new work practices could be integrated in organizational routines, which then allowed the nurses and other employees to take ownership of the development process.

We appreciated the fact that we felt involved. The software grew up with us. When we saw that it worked well, we were stimulated, we were more involved. It was gratifying having everything under control. We found other elements to be taken in consideration … for example the number of falls or excoriations… "Why are there falls? Can we do something to prevent them? Thus, they created this new module to record some elements regarding each fall, such as time, place, type and activity of patients. If a patient fell always one hour after therapies, it means that the two things are connected and we can be prepared. They have done the same thing for excoriations. And, with a certain frequency, we analyze all the information recorded to make prevention. (nurse)

As the nurses became more confident with the technology, they showed increased creativity with the requests. The next two passages from an interview reveal how the ABC software changed the practice of sending a guest to the hospital and receiving him

or her back as a result of the increasing sophistication of the nurses' inputs:

Nurse: If we have an emergency we know we're going to panic, and almost for sure we are going to forget something such as photocopy a document. Now we have a function ready to print a form to follow the guest to the hospital. It only takes a press of a button.

Interviewer: Are you able to update all the information regarding the patient's stay in hospital, when he comes back to your structure?

Nurse: Yes, of course. We have a special section for that. We scan all the hospital letters of demission just in case of a second admission, because in the hospital they want to know patient therapies, last admissions and so on. And, when you have to find all this information quickly, you could feel panic. Sometimes we wasted time going to the archive to find them. Now, when the patient comes back from the hospital, we scan all the documents signed by doctors, and they are ready to be used. The idea was to do the best also during patient's stay outside our structure.

The ABC software has now reached a level of sophistication such that in some cases, it is superior to that used by the hospitals where guests are taken. Myriad stories exist of the interactions between organizational change and technological change that have occurred at FSC during the past 12 years, as the following one taken from our field notes exemplifies:

The two nurses are seated near the computer when I enter the room. *They say hello. The one closer to me (Nurse 1) says that they are exchanging ward, she just got here. The other nurse (Nurse 2) is new in the structure so nurse 1 says that they are using the ward exchange to do some training on the ABC software for the newcomer. Nurse 2 has a paper notepad where she has jotted down the names of guests she has dealt with in the morning and what she did with them. Nurse 1 guides Nurse 2 through the screens for one patient. The face of the patient looks happily at them from her picture that appears on every page for this data registration. Then she says, "now show me how you do it for the other guests". Nurse 2 starts the process but she gets blocked here and there. Nurse 2 seems worried but Nurse 1 laughs it off: "time will come", she says. As Nurse 2 leaves Nurse 1 begins to prepare for the afternoon tour. First she studies the diaries of the morning in details then she starts to print the lists of medications that she will administer this afternoon. She takes the drugs for three guests and leaves the room. After a short while she is back with some notes jotted on her notepad. She starts transferring the notes to the ABC. She is very precise and extends the handwritten notes with more lines in the computer. Then suddenly she realizes that she is not logged in the system as herself. It is still Nurse 2 logged in! She says that it could be useful to have also the picture of the operator in the system, why only that of the guest?*

Notably, the next day we overheard the developer discussing the addition of this feature with the general manag-

er. This indicates that in this late stage, even the smallest details in the system are still under development. Thus, the implementation line continues to move.

As explained previously, our analysis shows that four factors helped the integration between organizational and technical changes: internal drive, external drive, enlightened management, and emancipation. We explain these in detail next.

IV.3. Internal Drive

The ABC software was motivated by a functionalist goal—namely, to support work and provide more information. For both the manager and the developer, the software needed to provide some advantages from the beginning. The initial specification the nurses required was simple: to design a function where they could register what they normally wrote on paper. This simple but beneficial function allowed the nurses to easily search for even the most basic information.

I can say that working with the software was much faster. For example, before the introduction of the software, if you needed information about the previous week, you had to look for them in the archive. Now I have just to press a button and I can see all the previous information. (nurse)

In turn, as the nurses began to take advantage of the system and the quality of their work improved, their motivation to do more and request more increased. Positive results created a virtuous cycle in which more led to

more. Concurrently, the level of proficiency with IT increased, which also led to more ideas and more requests.

I remember that, at the beginning, the software was very simple and we were working with little information. After that, we started thinking about how to improve it. "If we introduce this one … or that one …." In the end, we were able to replace all paper documents with the software. (nurse)

In many cases, the new functionalities were implemented to provide better services. For example, service in LTC often includes the family of the assisted.

The family of one guest came to complain that their relative lamented not being taken to the gym. I went into the system and plotted his training sessions. He went regularly. So we agreed with the family that the following time they should not announce themselves and go directly to see him at the gym. They did, and they saw him there. Later at lunch they asked him how it was going with the gym. He answered, "They never take me to the gym!" (general manager)

In other cases, new functionalities provided cost savings. For example, in one case, they led to a decrease in expenses for medications while providing better service to the guest.

We had a guest affected with epileptic attacks, periodically… sometimes he displayed attacks and we couldn't understand why. Then we realized that whenever he saw his wife, he felt strong emotions that leaded to attacks. We could see that crossing

data from different graphs and we were able to make specific adjustments talking to the wife and increasing assistance after her visits instead of embarking in massive medications that give side effects and are also costly. (general manager)

In general, we observed that positive experiences led to more development, but we also observed that FSC staff remained focused on care as their primary goal. We asked the nurses why they went around with a pad of paper instead of using a tablet PC or portable computer. One nurse answered:

My primary goal is to connect with the guest. If I have a tablet it will make my job of writing in the computer easier … but my job is not to write in the computer. I do that because it helps but I do not want a notebook or a tablet to seat between me and the guest. (nurse)

IV.4. External Drive

The external drive came from requests of other structures to implement the same technology. The general manager was proud of this achievement because it indicated that his facility's efforts were appreciated on the outside. As the software began to diffuse into the community, FSC realized that it could not keep up internally with the maintenance of the software off-site, so it entered into a distribution agreement with a software house. This agreement reflects the general development philosophy of ABC:

We gave the software to the software house to sell it; we do not receive money but we are entitled to continued free upgrades. If one of the (client) structures comes up with a very good idea we provide the upgrades for free to keep the software evolving. (general manager)

Currently, other nursing homes are using ABC to improve their services and quality. A web search indicated that clients even use ABC as a public standard for quality control. The following is an excerpt of a nursing home web page[9] (translated from Italian):

Since 2008 Villa Sorriso has implemented the management system ABC to manage all processes related to the guest. In particular the system:

- *helps the staff to program and register all interventions helping them to monitor warnings;*

- *provides quality indicators;*

- *supports inter-professional communication;*

- *provides information to the local health offices and to the Region to insure the accreditation.*

Another software improvement responded to the requirements imposed by the Regional Authority on nursing homes for information collection and retrieval. With the normal process, Regional inspectors are sent out controllers at given time intervals to collect data on care processes. This was the main reason FSC kept paper records before the implementation of ABC. Given the dif-

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[9] Website: http://www.villasorriso.net/informatizzazione.php visited on 10-10-2011

fusion of IT solution in nursing homes, the Region created an interface for the online upload of care data.

As soon as we knew that the region had created the standard we immediately created a module that could send data automatically to them. This has been always a problem for us, having to print paper only for control purposes. Now we do not do that anymore. There is a competitor solution but it is independent and needs manual work. Our just works … like magic. (general manager)

As external drives continue to arise, the functionalities of the system will continue to move forward. Entering into a partnership with a software house not only guaranteed the diffusion of the software product but also guaranteed the continuity in development of the system, even after the retired (and volunteer) programmer stopped working on it.

IV.5. Enlightened Management

The sustained cycle of the concurrent development of the organization and ABC could not have occurred under a directive management style (Gibson, 1985). We discovered that the general manager engaged in diverse practices to maintain the development easily, viably, and profitably: he created a vision, delegated responsibility to the right people, and did not enforce changes to practices. The vision involved not only a professionalized structure with sophisticated management tools; it also involved creating a solid team of motivated staff with the

interest and capability to solve problems.

He [the general manager] asked me strongly not to work on the basis of what I had understood, even if it was much, but to speak with the cleverest and the most available, enthusiastic or interested people that were involved in the structure. Moreover, quite often these people coincided with the team that wanted to emerge with respect to a group of older people that wanted to keep all things bureaucratically the same. Therefore, speaking with these people we involved them and let them think that they were telling us new stuff. The enthusiasm was extremely high. Once we had involved two or three people, obviously, they spread their feeling of "well-being". This was greatly important because we asked them to check and insert the data and to start with the first simple statistics. (programmer)

For the delegation, the decision was mainly pragmatic, but it fit the idea of starting simple and then gradually augmenting the system as the organization grew. For FSC, this meant involving the nurse staff first rather than the medical staff.

Why now are we considering the involvement of nurses a successful idea? Because if we had tried to build up something for this sector, starting from the top, involving a doctor, we would [have] made the software almost impossible to manage. Drugs that are administered in a hospice are max 100. If I talk with any doctor, he will tell me that the software can't work if it doesn't contain the

ministerial list of 7800 drugs; as if people have to waste time surfing through this drugs dictionary … we would have completely failed. (programmer)

Finally, the manager did not want the software to interfere with the freedom of the operators to carry out work processes as needed in specific situations. This is in accordance with the attention to care previously described.

These paths are not mechanized because nobody has defined them. So, if one says, "Put in training about entertainment activities that make the guests move," there is no problem, because putting data together is easy. Thanks to this module, relations are investigated by surfing the net of information. (general manager)

IV.6. Emancipation

Emancipation, the final element contributing to the continuous evolution of organization and technology, emerged from the employees' feelings of empowerment and commitment. This might seem surprising compared with a traditional context in which medical doctors are in charge of leading IT development projects, but the FSC case is not traditional. It was clear that for the people involved, their contribution was not being made to some remote technology that may come someday (or not). Rather, they experienced their contribution and its subsequent impact immediately, which helped enhance and sharpen their attention.

I feel very involved in the planning and very confident that the system

should be more and more developed.… I mean, when he [the programmer] arrives he shows us some news, "look, we have done this" and then we say, "It's wonderful", even we if hadn't thought about it.… It started well, now it's continuing and improving. (administrative assistant)

As such, the nurses, both the newcomers and the veterans without computer skills, felt comfortable talking about their ideas and bringing them to the table.

One day a young nurse…Amanda, she had joined us from an hospital and she said, "Why don't we collect also information about medications?" Then, we talked together about it and we did it. What I am trying to say is that all the input and analysis comes from operators. (programmer)

I believe that operators feel important, the simple fact to use a computer makes them feel important. I go to work at the Foundation and there are also 50-year-old people that have never used computers. At the beginning they say "impossible" but then they see other people going on very well with that and they think "Why you can and I can't?" and then I think that they feel very important in learning how to use computers. (administrative assistant)

Emancipation also helped people across groups engage in professional discussions. During our observations, a nurse noticed that the doctor had logged into the system and placed a prescription for a guest. She looked at the screen, going into the medication history for that guest, and noticed that

the guest had previously problems with the medication. She then placed a call to the doctor, who acknowledged the problem and prescribed another medication. Thus, emancipation works positively both in defining a better ABC and creating better organizational routines. Such conversations would not have been possible without a system that kept everyone similarly informed. In addition, the system would not have had that function if someone had not thought about the importance of registering medications. Technology and organization go hand in hand— moving the implementation line and supporting the process of evolution with the right practices.

V. DISCUSSIONS AND IMPLICATIONS

This study examines how an Italian nursing home advanced its organizational structure by developing an HPMS. We began this research with the assumption that a major limitation in IS research is the artificial definition of an implementation line (Leonardi 2009), a line that separates technology development from use. Identifying and studying this issue is not the only problem however. Truex et al. (1999) identify another challenge in IS research: developing systems that support the evolving needs of organizations rather than developing systems for a specific purpose. Our theoretical challenge therefore was to identify the elements or factors that helped keep the implementation line moving.

Our results partially confirm what a few previous studies have also ob-

served: the sedimentation in organizational routines likely depends on the capabilities afforded by the technology (Barley, 1986; Orlikowski, 1993), and the development of technology likely depends on some intuition of need for specific functionalities (e.g. Orlikowski, 1996). Our longitudinal analysis reveals, however, that access to real development resources and the ability to use them are more compelling forces for organizational change with respect to unplanned local adaptations and augmentations previously put forth in the literature. This is because changes can happen as soon as the capabilities to support them emerge. This argument is different from previous studies (e.g. Barley, 1986), but the conditions we study are different as well. While other studies considered the implementation of major technologies (CT scanners, CASE Tools, Notes) with a well-defined implementation line of planned functionalities, in our study the technology started out simple and grew in complexity in accordance with user demands. As such, we did not observe the long period of institutional changes that are required to make new practices stick (Barley, 1986). We also found that while the use of IT became routine, work practices stayed nimble; it was the expectation of changing practices through IT that became institutionalized. Surprisingly, we found this expectation to be true at all levels of the organization, not only at the managerial level (e.g. for the general manager or the head nurses).

Through our analysis, we discovered four elements that mediate the constitutive relationship between organization and technology: (1) the internal

drive, (2) the external drive, (3) enlightened management, and (4) emancipation. These four elements serve as mechanisms that keep the techno-organizational implementation line moving (for 12 years in the case of FSC). With these four elements in place, we also did not find the extreme paradoxical or ironic consequences of IT use (Arnold, 2003). Rather, we found a high degree of peer-to-peer social control made possible by a tight network of employees who incentivized the creative approaches to system use when these approaches contributed to the internal drive and sanctioned them when they did not. We found that as the internal drive to accomplish tasks differently and more efficiently increased, the need to update the technology increased as well. Updating the technology created a feeling of emancipation that enabled employees to work more independently and to engrain new practices in the organization. However, emancipation requires support of enlightened management that seeks changes and encourages their sedimentation in the organization. Finally, we observed that the process was boosted by external drives as well, such as the recognition of the work done by another structure or by the governing body, which spurred additional changes to the technology.

Several results can be drawn from this study. The first pertains to the importance of emancipation as a key component of systems and organizational development. Previous studies (e.g. Hirschheim & Klein, 1994; Cecez-Kecmanovic & Janson, 2009) have struggled with the idea of system development as an instrument of emancipation. Emancipatory design on its own has been criticized for being disconnected from reality and the traditional practices of management (Alvesson & Willmott, 1992), and so emancipatory design has remained elusive. Our study shows that emancipation can emerge from and be strengthened by systems development provided that it is also a precondition of it. If emancipation is in accordance with management, its conflicting nature, as previous studies have highlighted, will disappear to the advantage of systems inherently supportive of work.

Second, despite our best efforts to prove otherwise, this case did not present the many paradoxical consequences of IT that Arnold (2003) and Cunha and Carugati (2009, 2011) evidenced. Although this conclusion seems paradoxical, a partial explanation is that in our case, the users used, commented on, defined, and co-created the technology—a technology that provided as much freedom as possible to the user. In such a case, it might be that the need to tweak and deceive was simply not there from the start. Thus, additional studies of evolving system development are warranted to test whether this type of development is more robust against drifting (Ciborra, 2002).

Finally, the case provides some indications for the factors that lead to successful innovation and diffusion of IT. By starting small and relentlessly pursuing the betterment of the organization from both the top and the bottom, FSC was able to obtain the kind of user-driven innovation that many organizations strive for (von Hippel, 2007).

In our case, because of the positive cycle created, it was relatively easy to establish the conditions for user-driven innovation (ibid) and then enhance them over time. Doing so brought advantages not only to the focal organization but also to other, similar organizations and, subsequently, to the controlling authority as well. By exchanging the software for free upgrades (instead of money), FSC was able to boost user-driven innovations, leading to additional innovations in inter-organizational communication and coordination. To our knowledge, this is the first case of a real, functioning EPR and possibly the first grassroots one. To advance this study, further studies could be carried out with other nursing homes and the controlling authority to shed more light on the diffusion of the innovation process.

VI. CONCLUSIONS

In this article, we investigate how an organization can keep a core IT system evolving and performing over a long period while also undergoing evolution itself. Through the analysis of a longitudinal case study, we show that management can control two factors (other than resources) to foster positive, constructive development behavior among employees: (1) how much authority is applied to the direction and control of the employees and (2) how much empowerment or emancipation is allowed in the organization. By controlling for these two factors, while creating internal and external value with IS, management can motivate employees to contribute to the

development of the system over a long period. These factors have implications for both the behavior with the technology and the diffusion of innovations. Consciously avoiding being biased by the implementation line became a constructive device for this research. Although this construction is certainly plausible for studies on IT organizational change, it is mandatory for studies on evolving information systems without formal implementation lines.

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