A Dynamic View of Users' Exploitation and Exploration of Healthcare Information Systems in Long-Term Care

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ABSTRACT

Healthcare organisations are often confronted with the underutilisation of health information systems (HIS), preventing them from leveraging full benefits from their investments. The post-implementation stage requires several adaptation processes from users to appropriate the system. More specifically, appropriating a complex HIS and moving beyond satisficing use, or at least fighting against underutilisation, requires constant adaptation of use. Therefore, in this paper, we aim to discuss the appropriation of HIS from a user perspective. We report from a qualitative study in nursing home settings to understand better how healthcare users exploit and explore their HIS. Drawing on exploitation and exploration theory and using causal loop diagrams as analytical and visualisation device, we propose a dynamic model of HIS appropriation, and we demonstrate the importance of both users' cognitive style and the context in fostering HIS appropriation in stable and innovative situations. We conclude by identifying three propositions as suggestions for future research avenues but also to help users and managers find the right balance between HIS exploitation and exploration.

KEYWORDS:

healthcare information systems; exploitive use; exploratory use; long-term healthcare; nursing homes.

Une Vision Dynamique de l'Utilisation Exploratoire et Exploitante des Systèmes d'Information de Santé dans le Domaine des Soins de Longue Durée.

RÉSUMÉ :

Les organisations de santé sont souvent confrontées à la sous-utilisation des systèmes d'information de santé, les empêchants de tirer profit de leur investissement. La phase de post-mise en oeuvre requiert de nombreuses adaptations de la part de l'utilisateur pour s'approprier le système. Plus spécifiquement, s'approprier des systèmes d'information de santé évoluant en permanence et dépasser une utilisation 'satisfaisante', ou au moins prévenir la sous-utilisation, requiert une adaptation constante de l'utilisation. Le but de cet article est donc de traiter de l'appropriation des systèmes d'information de santé du point de vue de l'utilisateur. Nous appuyons sur une étude qualitative menée dans des EHPAD afin de mieux comprendre la façon dont les équipes médicales exploitent et explorent ces systèmes d'informtion de santé. Nous appuyant sur la théorie de l'exploitation et de l'exploration et sur les diagrammes de boucles causales en tant qu'outil d'analyse et de visualisation, nous proposons un modèle dynamique de l'appropriation des systèmes d'information de santé et démontrons l'importance du style cognitif et du contexte dans la promotion de l'appropriation des systèmes d'information de santé, tant dans les situations stables qu'innovantes. Nous concluons en identifiant trois propositions pour suggérer de futures pistes de recherche et aider les utilisateurs et les gestionnaires à trouver le bon équilibre entre l'exploitation et l'exploration des systèmes d'informations de santé.

MOTS CLÉS :

Systèmes d'information de santé, utilisation exploitante, utilisation exploratoire, soin de longue durée, EHPAD

1. INTRODUCTION

The question of information system (IS) appropriation and more particularly the issue of the dynamics behind such appropriation is particularly pressing in healthcare, considering that the sector is concerned with rapid digital transformation (Eden et al., 2019). The literature is rich in calls for understanding how benefits from health information systems (HIS) can emerge from richer forms of use (e.g., Eden et al., 2019; Burton Jones & Volkoff, 2017). The healthcare context is particularly challenging because it navigates high levels of complexity enhanced by the fact that it enrols multiple and diversified healthcare professionals who must continuously coordinate and communicate through HIS to achieve quality care in a rapidly changing environment (Barrett, 2018). Moreover, healthcare is one of the sectors with the highest pressure to mandate technology use (Melnick et al., 2021; Hsieh, 2015; Maillet et al., 2015; Hennington et al., 2009), which public financial mechanisms often encourage (Jones et al., 2014). In such mandatory use context, HIS are often considered one of the causes for employees' burnout (Johnson et al., 2021; Tutty et al., 2019). The use of advanced features of HIS, versus basic features, might be key for alleviating stress derived from HIS and for increasing physicians' empowerment (Chen et al., 2021). This makes the understanding of the dynamics behind users' appropriation of HIS crucial for both research and practice.

Although increasingly more studies state the importance of further exploring the appropriation stage and call for a better understanding of IS appropriation and effective use (e.g. Shirish et al., 2021; Lauterbach et al., 2020; Burton-Jones & Volkoff, 2017), the importance of the contextual elements in which appropriation occurs is generally neglected (Carter et al., 2020; Burton-Jones & Volkoff, 2017). This can be problematic because 'no system operates in a vacuum' (Chen et al., 2021, p. 17). Thus, understanding the environment in which the system is used is essential because appropriation is highly contextual (Burton-Jones & Volkoff, 2017) Therefore, in its uniqueness and characterising elements, the healthcare sector calls for an adaptation of IS theories to its social and technical peculiarities (Georgiou et al., 2019; Cho et al., 2008; Chiasson & Davidson, 2004).

In more general terms, research suggests that a balance between system exploration and exploitation may be essential to perform efficiently and realise benefits from IS at the appropriation stage (Burton-Jones & Straub, 2006; De Guinea & Webster, 2013). Exploitation of a system addresses the extent to which users use already known features of a system to perform their tasks, thus defining *routine execution of knowledge* (Burton-Jones & Straub, 2006). For example, it can be using the [*care*] button daily to validate the drugs administered to a patient. In contrast, exploration addresses the extent to which the user looks for innovative (to them) ways to use the system to support his/her tasks, which includes discovering and using new features or using already known features but in an innovative way (Saeed & Abdinnour, 2013). For example, it can be trying to find a way to receive an alert message when a patient is not treated on the planned date, or experimenting with a shortcut that allows compiling all the information regarding the patient in a single file.

The interest in exploitation and exploration is not new considering it was first developed by Tyre and Orlikowski, who stated that, 'exploration or experimentation as means of learning about the technology virtually ceased after the first weeks of use. Instead, users quickly settled on a computing environment and actively worked to maintain its stability' (1994, p. 105). However, in the healthcare sector, and to the best of our knowledge, only a few articles (e.g. Chen et al., 2021; Goo et al., 2015) have studied the effect of exploration and/or exploitation on users' benefits from HIS. These articles have provided useful insights on the essential role

they play in empowering and satisfying users. Nevertheless, neither the dynamics behind exploitation and exploration at the individual level nor the way users switch (or not) from one use behaviour to the other, and appropriate continuously the HIS, are entirely understood and generally agreed upon. Understanding these dynamics is key because even in mandatory contexts such as healthcare, there are large variations in the degree to which different users use HIS (Melnick et al., 2021; Lanham et al., 2014; Jensen & Aanestad, 2007). This is not necessarily always an issue because sometimes the routine exploitation of well-known features is preferred, while at other times, a problem's solution can only be found through exploring new features. However, benefits arising from IS are at risk of rapidly reaching a limit if users stop looking for new ways to apply the technology (Carter et al., 2020), especially in dynamic and hectic environments such as healthcare. Hence, the existing gap in the literature does not simply relate to how to address resistance to HIS, or its underutilisation, but it is in understanding the dynamics between exploitive and explorative uses of HIS and how, if possible, to strike the right balance between the two. Based on the above arguments, we formalised the following research question:

> *What are the dynamics behind users' exploration and exploitation of HIS in long-term care contexts?*

To answer this question, we conducted a qualitative study of the appropriation of an HIS (for which we use the pseudonym SOLIS) by operators in multiple long-term care facilities. Our study's main aim was to build a model that explained how exploitation and exploration coexisted and acted as ambivalent behaviours in HIS use and appropriation in healthcare. We showed that both exploitation and exploration behaviours can be beneficial and should be managed appropriately. However, we also observed that in systems as complex as SOLIS, users can end up locked in repetitive exploitative behaviours, even when exploration should be necessary. We called this phenomenon the *exploitation trap*. We also found that exploitation may lead to exploration. Nevertheless, after some time, healthcare staff tended to return to exploitation of known features of the system, which then became a trap (such as in the MS Word example provided in Footnote [1]). We have not observed the opposite case of not being able to stop exploring. Our analysis shows that the context, the tasks, the system and the environment all have a role in reinforcing the lock-in, but they can also facilitate the break-out from the exploitation trap in some situations when the exploitation behaviour frees up user time that can be dedicated to system exploration. The model allows us to derive three propositions as suggestions for future research avenues. Related to these, we identified areas of actions to help users and managers find the right balance between HIS exploitation and exploration. This model also helps to answer calls for identifying individual, social and technological factors motivating richer forms of IS use (e.g. Carter et al., 2020), especially in the healthcare context (Argawal et al., 2010; Blumenthal & Tavenner, 2010; Ford et al., 2010).

The rest of the paper is structured in the following way. First, we discuss the literature about IS exploitation and exploration in the post-implementation stage, together with the advancement in the use of healthcare IS. Then, after having detailed the research methods used,

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[1] At title of example MS Word has more than 400 different features but 5 features (paste, save, copy, undo, and bold) make up for the majority of commands used by users while after the 10th function the usage is extremely rare. As Microsoft reports: 'Beyond the top 10 commands or so, however, the curve flattens out considerably. The percentage difference in usage between the #100 command ('Accept Change') and the #400 command ('Reset Picture') is about the same in difference between #1 and #11 ('Change Font Size')'. (Microsoft own UI study, found on 18/4/2017 at this link: https://blogs.msdn.microsoft.com/jensenh/2006/04/07/no-distaste-for-paste-why-the-ui-part-7/)

we present the study's results and formalise the model that emerged from the data. We conclude by discussing the theoretical contribution and the policy implications for managers.

2. LITERATURE REVIEW: EXPLORATION AND EXPLOITATION OF IS

The concepts of exploration and exploitation in the IS literature derive from the concept of organizational learning (March, 1991), which considers that exploitation and exploration should not be considered separate activities, but they should be viewed as two ends of a continuum (He & Wong, 2004; Lavie et al., 2010).

Different terms are often use interchangeably in the IS literature to refer to IS exploitation, such as "routine use" (e.g. Li et al., 2013), "extended use" (e.g. Liang et al., 2015), or "exploitative use" (Luo et al., 2015). IS exploitation implies regular, structured, and standardized use of a system (Pan *et al.*, 2017; Koo *et al.*, 2015). It aims to create reliability in the use's experience (Goo *et al.*, 2015). Accordingly, IS exploitation refers to the idea of executing tasks and realizing them with speed, to achieve performance in the short term (Koo *et al.*, 2015). IS exploitation advocates routine execution of knowledge (Huang *et al.*, 2017); It is an automatic user behavior consisting in using features and skills already known. However, even though IS exploitative use entails routine and standardized use of systems, it does not fully exclude refinement or use of additional features when really necessary (Koo *et al.*, 2015). In fact, a focus on efficiency also implies that users who deal with IS exploitation seek to optimize tasks (Koo *et al.*, 2015; Subramani, 2004). Therefore, even if the goal is to minimize change (Luo *et al.*, 2015), IS exploitation is not completely fixed and can include gradual, small consistent improvements (Luo *et al.*, 2015). Many studies converge on the finding that IS exploitation involves using more already known features to complete tasks and improve efficiency (Koo *et al.*, 2015; Goo *et al.*, 2015).

As for IS exploitation, many labels are used in the IS literature for IS exploration such as "enhanced use of IT" (e.g Bagayogo *et al.*, 2014), "innovative use" (e.g., Li *et al.*, 2013), "emergent use" (e.g., Kim & Gupta, 2014), "adaptive system use" (e.g Sun et al., 2019) or "exploratory use" (e.g., Huang et al., 2017). Although authors use several different words to refer to IS uses that are exploratory in nature, most definitions include two main dimensions: innovativeness and the extra-role nature of the behavior. First, there is consensus in literature that IS exploration implies innovation and experimentation and is an innovative behavior *per se* (e.g. Huang *et al.*, 2017; Liang *et al.*, 2015; Maruping & Magni, 2015). According to Huang *et al.* (2017), IS exploration aims to develop IS-use alternatives; changing things or processes and testing novel and unconventional ideas (Luo *et al.*, 2015) in a search and discovery process (Maruping & Magni, 2012). In the work domain users explore mainly to improve their performance (e.g., Liang et al., 2015; Luo et al., 2015; Ke et al., 2012). Organizations rarely ask users to explore IS (Ke et al., 2012) and generally do not reward users who go beyond mandatory IS usage (Kim & Gupta, 2014). However, IS exploratory use is often considered as essential in the long term, to avoid stagnation and obsolescence and to maintain learning (De Guinea & Webster, 2013).

Both use behaviors can appear in the post-implementation stage, once users start to be familiar with the IS and try to appropriate it, but researchers do not agree on the way exploitation and exploration are triggered.

2.1 IS use in the post-implementation stage: The exploitation–exploration dilemma.

The post-implementation stage is the longest phase of the IS life cycle and it is where system-related costs are the highest (De Guinea & Webster, 2013). However, for a long time, it has been one of the most under-explored topics in the IS literature (Aanestad & Jensen, 2016) and we still need a richer understanding of individuals' IS appropriation (Carter et al., 2020).

Appropriation has been defined as building mastery and preferences related to the IS (Tsoni, 2017, 2012). It deals with both behaviours and psychological states associated with IS (ibid) as users "make the technology their own in a time-extended process of adaptation" (Riemer et Johnston, 2012, p.3). As for most studies interested in appropriation (Tsoni, 2012), we focus in this paper on users' behaviours toward the IS and more specifically on users HIS use behaviours to appropriate the system.

In the appropriation phase, users' exploitation and users' exploration of the system are considered as the two use behaviour types that lead to task performance (Burton-Jones & Straub, 2006). In fact, these behaviours respectively allow users to optimise use, and to adapt the system to their needs to perform more effectively, making them crucial to solve the debate of HIS effects on the use of healthcare employees' time (e.g. Moore et al., 2020).

Contrary to the innovation and strategy field, where exploitation and exploration are mainly studied together and frequently at the organisational level (e.g. Argote et al., 2021; Luger et al., 2018), in the IS literature, researchers often have studied them separately at the individual level, which has produced two contradicting and sometimes disconnected views regarding the role of exploitation on exploration and the antecedents of each use behaviour.

One side of the literature is mainly based on the *six-stage model* of IS implementation processes (Cooper & Zmud, 1990), where exploitation is essential to reach exploration. In this view, routinisation and then exploitation are a basis allowing users to gain competence with IS (Saeed & Abdinnour, 2013). Then, the automaticity generated by the routines frees up the users' minds, allowing them to gain time and resources to start exploration (Ohly et al., 2006). In this perspective, users are active actors, and exploration is a proactive and, most of the time, an extra-role behaviour (Maruping & Magni, 2015). Along the same line, Chulmo Koo and colleagues (2015) concluded that exploitation stimulates exploration by fostering knowledge and experience that will enable users to develop the ability to use the system more creatively. In this stream of research, exploitation and routines are necessary to store up the time/energy necessary for exploration, while intrinsic motivation is essential to start exploring the system (Li et al., 2013). In this sense, users' cognitive styles are an important factor to consider. Cognitive styles are individual differences in the way people learn, think, solve problems and relate to others (Witkin et al., 1977). When confronted with decision-making, people's cognitive styles can be classified along a continuum going from highly adaptive to highly innovative (Kirton, 1976). Innovators are more likely to perceive a technology as useful or easy to use and others do not easily influence them (Chakraborty et al., 2008). Faced with problems, they privilege exploration (Kirton, 1989). In contrast, adaptors tend to focus more on established frameworks and avoid venturing far from current ways of thinking (Carnabuci & Diószegi, 2015). They are precise, efficient and conform easily to rules, hence privileging exploitation behaviours. Thus, individual traits can drive users' attitudes towards exploration versus exploitation. In the IS literature, cognitive styles have been studied in the context of technology implementation (Benbasat & Taylor, 1978) and technology acceptance (Chakraborty et al., 2008) but, as Armstrong and colleagues (2012) underlined, more research is needed to understand how cognitive styles affect the way end-users interface with and use IS.

The other side of the literature focuses on appropriation patterns and considers the automaticity exploitation triggers as an inhibitor of exploratory behaviours (Carter et al., 2020; De Guinea & Webster, 2013). This view is also reminded by Sun et al. (2019) who highlight that IS use can foster strong routines that may quash IS exploration. These scholars, contrary to Ke and colleagues' (2012) view, argue that discrepant IS events, and thus extrinsic motivation, are essential to withdraw from automatic use and start exploration (De Guinea & Webster, 2013), which fits with Tyre and Orlikowski's (1994) original idea that after the initial period following the installation, specific events are needed for users to foster further adaptation. These discrepant IS events are also sometimes qualified as 'disturbances' (e.g. Carter et al., 2020, p. 10) triggered by the tasks users have to address due to the technology and/or the work context at stake. Research on adaptive system use, a concept sometimes considered equivalent to exploration (e.g. Sun et al., 2019), also aligns with this perspective and, building on Louis and Sutton's (1991), identifies novel situations and discrepancies as key antecedents of adaptive system use (Sun et al., 2012). For them, these triggers are essential in urging users to revise actively their use (ibid). As such, they might be necessary to overcome the inertia exploitation maintains (Schmitz et al., 2016) and move to exploration when needed. These triggers do not act directly on behaviours, but they entice users to think actively about their use, which is an essential step in making users prone to revise their use (Sun et al., 2012; Jasperson et al., 2005). Note that IS use in the work domain is perceived as a goal-directed activity (Burton-Jones & Grange, 2012). In such a perspective, exploration aims to improve use processes and increase efficiency. It is not performed for the pure pleasure of exploring. In this context, users are likely to explore only if perceived as necessary. Researchers in this field highlight that if some need triggers system exploration, it can lead to exploitation in the following periods as the newly explored features become part of IS routine use (Liang et al., 2015). Thus, the literature addresses exploitation and exploration from two perspectives: one stream that attributes the users behaviour to their intrinsic motivation and cognitive style, and another stream that attributes it to the organisational context and the nature of the problem the individual faces. Based on the above discussion, it appears that the dynamics of user exploitation and exploration are interwoven. However, their relation is still controversial and deserves further understanding. The concurrent presence of contrasting results can indicate that a broader, yet unexplored model of IS appropriation by use exists, which could explain concurrently explorative and exploitative behaviours at the individual level as well as different sequences between the two behaviours. This would be in line with recent findings from of Liang et al. (2022) at the organisational level, who highlight that IS exploration and exploitation might not need to be in perfect balance to reach expected benefits and to enhance and optimise organisational agility. Liang et al. (2022) also specify that the optimal proportion of IS exploitation and exploration could depend on contextual factors and matters particularly in dynamic environments. In the same vein, what is considered as triggers in healthcare might be specific. Healthcare, being a particularly dynamic context (Barrett et al., 2018), discovering how users appropriate HIS and balance exploitation and exploration in such field seems of both practical and theoretical interest.

2.2 HIS use and healthcare job requirements.

Despite claims regarding the necessity to adapt IS theories to the social and technical peculiarities of the healthcare context (Cho *et al.*, 2008; Chiasson & Davidson, 2004), and the increasing number of publications on HIS (Davidson et al., 2018)), research measuring and theorising HIS use is rare (Lin et al., 2019) and is so far a 'nascent science' (Melnick et al., 2021, p. 2149). In this sector, appropriation patterns are complex and entangled (Fichman et al., 2011). Thus, considering only use versus non-use, or considering only duration or

frequency of use might be of little value (Romanow et al., 2018). Above all, any sector's specificities might have a strong effect on the way IS are used in the post-implementation stage (Chen et al., 2021; Burton-Jones & Volkoff, 2017). The healthcare sector is specific for various reasons presented below. These specificities might all have an effect on the way healthcare users appropriate HIS and exploit or explore the HIS.

First, several IS scholars showed the effect of routines and habits on IS use (e.g., Polites & Karahanna, 2013; Limayem et al., 2007). In healthcare, routines are particularly important because healthcare workers deal with life-threatening cases (Fichman et al., 2011). In these conditions, there is little room for errors, and caregivers are often required to follow highly specific guidelines to administer care (Tucker et al., 2007). However, at the same time, healthcare employees have to adapt to each specific situation and take initiatives when necessary (Hong et al., 2021; Fichman et al., 2011). In fact, caregivers have considerable autonomy compared to other workers (Yang et al., 2015, Jensen & Aanestad, 2007), and autonomy is often considered a key element for their satisfaction (Hong et al., 2021). Healthcare is an environment in which individual 'heroism' and skills are considered, 'critical determinants of important outcomes' (Edmonson et al., 2001, p. 29). The healthcare industry is highly innovative and continuously adapts while having to remain highly reliable (Barrett, 2018). Thus, the healthcare context seems to both constrain and entice taking risks and actions. Therefore, in these conditions, it is necessary to look at the effects of such context on the exploration of the system, which is often considered risky behaviour (Thatcher et al., 2011).

Second, healthcare is a highly demanding sector, navigating high time pressure (Moore et al., 2020; Strong et al., 2014) and heavy workload (Yeow & Goh, 2015), which means that users will look for gaining efficiency with the technology. In these conditions, it is important to see if caregivers favour exploitation or exploration.

Third, healthcare work is multidisciplinary, and caregivers' work is highly interdependent across disciplines and work shifts (Pype et al., 2018; Oroviogoicoechea et al., 2008). Moreover, communication patterns in healthcare are multi-transactional and require iteration, feedback and confirmation (Georgiou et al., 2019). Thus, caregivers need to keep a certain degree of unity in their practices (Pype et al., 2018; Oborn et al., 2011) and must continuously coordinate (Barrett, 2018), which might affect their individual IS use behaviours in the post-implementation stage (Osterlund and Boland, 2009).

All these factors directly affect the individual's exploitation and exploration of HIS, but how this pattern takes form is yet to be clarified. Goo and colleagues (2015) have underlined that, despite the absence of training to do so, caregivers explored HIS at some point. However, the study of the dynamics behind exploitation and exploration received very little attention from IS scholars. Therefore, in this article, we set out to understand the conditions under which users decide to explore or exploit the HIS system in long-term care, and how exploration and exploitation relate to each other in the function of the importance of both users' cognitive style and the context.

3. METHODOLOGICAL APPROACH

This study is qualitative and exploratory in nature. It seeks to provide a rich description of user practices in the post-implementation stage that improve the understanding of the dynamics behind users' exploitive and exploratory behaviours in the long-term care sector.

3.1 Long-term Care as Research Context

The choice of the long-term care context serves two purposes. The first is to provide a demanding case for studying exploration and exploitation given that the long-term care sector is characterised by slower rhythms and longer cycles calling for exploitation. Moreover, the typical resident of a long-term care facility today presents various forms of needs and co-morbidities, calling for innovativeness and exploratory uses of IS.

Clearly, there is also an underlying social agenda in choosing this context because, in the European Union (EU-27), the population has aged markedly over the last two decades and the proportion of elderly people continues to increase as a result of the baby boomer generation, increased longevity and low natality. This trend is going to continue in the future. In fact, the population of older people (defined here as those aged 65 years or more) in the EU-27 will increase significantly, rising from 90.5 million at the start of 2019 to reach 129.8 million by 2050. During this period, the number of people in the EU-27 aged 75–84 years is projected to expand by 56.1 %, while the number aged 65–74 years is projected to increase by 16.6 %. In contrast, the latest projections suggest that there will be 13.5% fewer people aged less than 55 years living in the EU-27 by 2050 (Eurostat, 2021). As a consequence, the need for long-term care services and nursing homes is growing in all European countries. Long periods of hospitalisation tend to decrease in favour of nursing home stays (Sebastiano et al., 2017). The increase of physically and/or cognitively impaired people generates several challenges for long-term care. First, this population tends to be fragile and to develop several pathologies simultaneously, which complicates the care process and often requires multiple caregivers' interventions (Mouratidis et al., 2003). Second, the residents of long-term healthcare facilities (nursing homes) require specific accommodations (Cohard & Marciniak, 2015) and they have increasingly more expectations regarding quality of care. Third, the increasing costs of long-term healthcare services and the simultaneous insufficiency of dedicated public funds forces institutions to contain costs, while still improving the quality of care. To adapt to these new demands, nursing homes, while typically being quite technology adverse, have now entered a period of IS-led transformation (Alexander et al., 2019). By digitising processes, gathering electronic resident data and enabling sophisticated care plans, HIS have become an essential tool to answer the needs of the growing and demanding elderly population. However, adoption levels and the use of HIS in nursing homes are still badly understood (Alexander et al., 2019).

Nursing homes participating in this study all had in common the use of the same software, which we will call SOLIS (pseudonym). A team of healthcare professionals created SOLIS in 1995, and it has gone through several updates and developments. More than 2,600 French nursing homes use it, which makes it a leader in the market. The software's main goal is to support nursing homes' staff in all its activities, with particular reference to the traceability of care and the transferability of information in teams. In its current version, SOLIS integrates all the data concerning nursing homes residents according to four main areas (Figure 1): administration, social and educational projects, rooms and material management and care and medical data. These areas, which multiple employee groups can access, are tightly related through features that span multiple areas. For example, *evaluations* are both part of the 'care and medical' and of the 'social and educational' areas. Moreover, it allows to fill in official assessments, create an individual plan for each resident, carry advanced data analysis and support clerks and caregivers in taking both administrative and healthcare decisions.

SOLIS use is a requirement in the work environment of long-term care. Indeed, the operators are required to interact with the system multiple times during every shift. Therefore, while the use is not continuous, it is extremely regular and appropriation can happen continuously. As shown in screenshots of SOLIS in Appendix A and Figure 1, SOLIS is a quite articulated

software with a large number of features and menus, which give users ample opportunities for exploration. However, it can also be overwhelming for some users, hence leading to their recurrent use of few – more familiar – features.

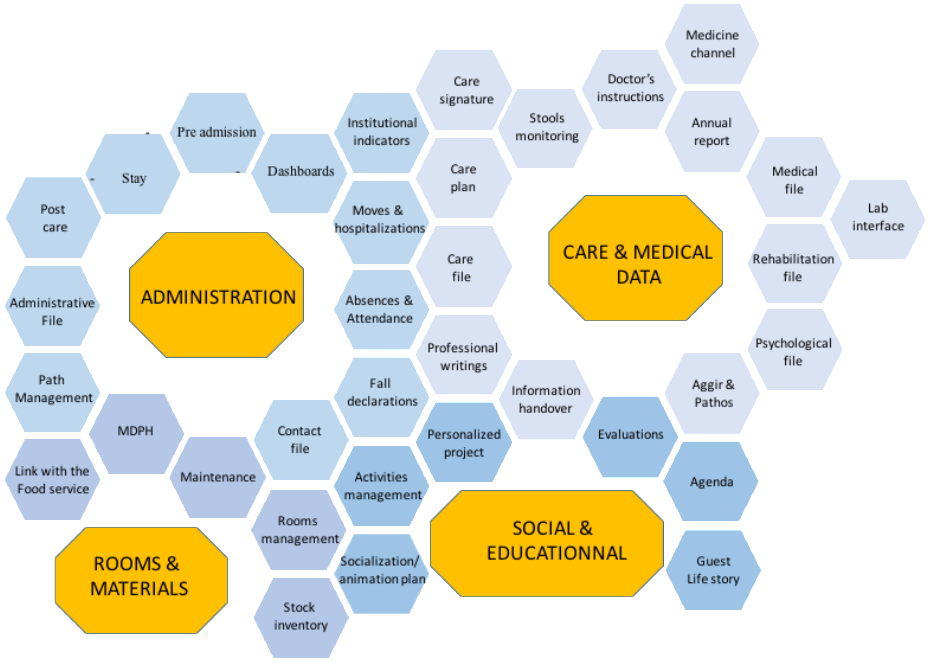

Figure 1. The areas and features of SOLIS

3.2 Data collection

All the nursing homes we visited and the caregivers we interviewed adopted and used SOLIS, respectively. In total, 582 residents are taken care of with this software in the nursing homes visited. We started the study with informal and exploratory talks with two employees from the software house in January and February 2015. In April 2015, we participated in an annual meeting the software house organised to understand better the context of IS use in the long-term healthcare sector in France and to discover the software's specificities. Then, the data collection took place between May and August 2015. The timeline of the different steps of the data collection process is available in Appendix C.

Following Sterman (2000), the data collection included 28 semi-structured interviews, notes from meetings and analyses of documents from six nursing homes and from the software company. All the interviews were recorded and transcribed verbatim. We aimed to triangulate the data and increase the reliability and trustworthiness of our results (Brewer & Hunter, 1989). We participated to two meetings where the software editor's sales representative met with the nursing homes' directors to discuss software use, potential problems encountered in use and new upgrading possibilities. We also attended two training sessions on the software. Regarding documents, we analysed: a) documents from the regional agency for health (ARS Nord Pas de Calais) published, which consisted in the detailed program regarding nursing homes' initiatives related to HIS in the region from 2011 to 2016; b) documents from the vendor of SOLIS, including details of the software's characteristics and features (e.g. these were the sources of Figure 1 and Appendix A), annual reports and testimonials from users; and c) documents from the six nursing homes taking part in the study, including minutes from meetings regarding software use and relative communications.

We recruited study participants following two criteria. First, the interviewees selected were people who had used the software for at least one year, a period necessary to get out of the shakedown stage and potentially experience both exploitation and exploration (Sterman, 2000; Bala & Venkatesh, 2013; Po-An Hsieh & Wang, 2007). Second, to understand better the entire

process and avoid elite bias (Myers & Newman, 2007), the interviewees had to operate at different levels of the organisation. As shown in Appendix B, we diversified our sample, ensuring to interview people with different job occupations. Most of our interviewees were women (85.7%), which is a close representation of the gender distribution (88%) in nursing homes in France (Prévot, 2009). Each interview lasted between 30 minutes and two hours.

Interviews were semi-structured and aimed to understand the ways employees used the software in the post-implementation stage. More specifically, we wanted to investigate the dynamics behind exploitive and exploratory use of the software. To reach this objective, interviews started with general questions to understand how the interviewees used and mastered the software. Then, the interview proceeded with questions more focused on whether and how users had modified their use of the HIS over time. We aimed to retrace use history regarding system exploitation and exploration. Note that the study is based on a retrospective analysis of events, in the sense that we asked interviewees questions about their current but also past use of the system to understand the dynamics behind their use. An example of questions following this approach is, 'How do you think the way you use the system has changed over time'?

The interview protocol is available from the authors upon request. The interview process stopped when no new data about appropriation patterns appeared, and we could assume to have reached theoretical saturation (Glaser & Strauss, 2009).

3.3 Causal loop diagrams and data analysis

To analyse the data and avoid recall bias, we followed Singh et al'.s (2015) guidelines and we triangulated the results carefully. First, we used *data triangulation* by using multiple data sources. To do so, we interviewed people with different job positions, working in different locations and at different times. Interviewing different informants allows obtaining detailed information and corroborating experiences. Second, we carried *methodological triangulation* by using multiple data collection methods such as interviews, observations and documents, as explained above. Finally, we used *analytical triangulation* by conducting multiple analyses of the same data. Singh et al. (2015) also advised a fourth type of triangulation, *investigator triangulation*, which consists of involving several researchers in the interviews and in the data analysis. However, only one author was in the condition to conduct the interviews. To support the analysis and display the results in a way that could capture the dynamics of the problem, we decided to use a modelling technique called causal loop diagramming (Akkermans & van Helden, 2002; Sterman, 2000). System modelling methods are particularly appropriate for understanding intertwined processes (Davis *et al.*, 2007), such as the evolving processes behind exploitive and explorative use that are of interest for this research. Specifically, causal loop diagrams allow generating an explanation for complex systems and human behaviours (Sterman, 2000), and conceptualising and articulating process theories, focusing on actions, activity and the organisational context (Perlow et al., 2002; Pettigrew, 1997) because it is the case with users' exploitive and exploratory use behaviours.

In causal loop diagrams, the relationship between two variables is represented by an arrow and a sign. This sign can be positive (+) or negative (−) if the two variables move in the same or in opposite direction, respectively. For example, an increase of the first variable will trigger a decrease of the second variable. Thus, even if circumstances change, the causal relationship between the two variables still exists (Sterman, 2000). Causal loops that contain an even number of negative relationships (including zero) will be *reinforcing* loops, growing as time passes. This will be indicated by an R in the centre of the loop. Conversely, causal loops that

contain an odd number of negative relationships will be *balancing* loops, decreasing as time passes. This will be indicated by a B in the centre of the loop. Causal loop diagrams can be combined to create complex dynamic models. Typically, the modeler starts with smaller, simple loops, and then builds upon those with the more complex ones. Figure 2 provides an example of three causal loop diagrams combined into one dynamic model taken for Senge's Fifth Discipline (1997).

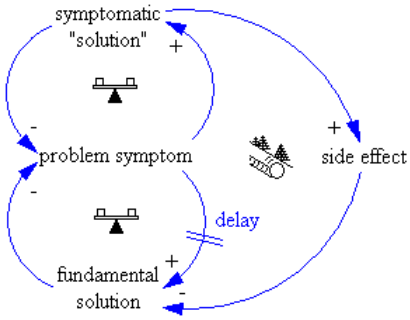

Figure 2. Example of causal loop diagram, from Senge (1997)

Supporting a qualitative case study approach with causal loop diagramming allows specifying the interconnections between use behaviours and the context. As Perlow et al. (2002) underlined, causal loop diagramming enables reaching a higher level of specificity regarding the relations the interviewees expressed. We used this approach to map the evolution of exploitive and exploratory user behaviours at the individual level in the nursing-homes context. Note that our use of causal loops is simply a visualisation of the relations found in the data as the interviewees expressed their interpretations of their activities and not as the representation of causality or correlation in a positivistic sense.

Considering qualitative analysis takes its strengths from an open and iterative process, the coding phases included several rounds of interpreting the data and a literature review (Miles & Huberman, 1994). The analysis started by looking at how the interviewees used SOLIS in the post-implementation stage, and at how different elements affected users' readiness to invest time in exploration. As the number of observations and interviews increased, we continually made choices regarding whether to keep, revise or exclude categories. We used an iterative process to confirm or disconfirm the links between categories, and we left space for unexpected issues to emerge (Patton, 2014). It quickly appeared that appropriation of the system was indeed a non-linear process, and that interviewees moved between periods of exploitation and exploration, most of the time reverting to exploitation. Thus, we revised our interview guide to sharpen the questions and make interviews and observations more focused on this shift back to exploitation. To design the key categories that related exploitation and exploration, we coded the behaviours and reasons why interviewees adopted one or the other use option. This coding was enriched by the coding for intermediate events in case of complex relations between events and exploratory or exploitative use of SOLIS. The appropriation difficulties expressed in the interviews or observed were also coded along with enhancers and barriers to explore the system.

The coding generated multiple cause–effect chains, which we catalogued and ordered in levels of complexity and used to generate causal loops of similarly varying complexity. The final model suggested in this paper should provide both a consistent and logical explanation of users' exploitive and exploratory behaviours, highlighting how internal and external factors can both reinforce and weaken the exploitation trap.

4. RESULTS OF THE ANALYSIS

Causal loop diagrams allowed us to understand and conceptualise the different loops in which users can enter or stay locked in, regarding exploitive and exploratory use of the HIS. The aim of this part is to describe and analyse these loops. To do so and to gain clarity, we present the different loops individually, showing first the loop, then explaining its emergence through quotes from the interviews and finally underlining its balancing or self-reinforcing effects. Having done so for each loop, we conclude with a causal loop diagram showing the full appropriation process.

The main loops that, according to our analysis, users can enter are: (1) developing skills and willingness to explore, (2) enjoying exploration, (3) becoming habituated, (4) reassessing priorities, and (5) being locked in and trapped in exploitation.

4.1 Gaining ability to explore

The first loop we observed was the balancing loop that connects systems exploitation with employees' ability and their readiness to invest time in exploration. We call this loop *developing skills and willingness to explore* (Figure 3).

Figure 3: Developing skills and willingness to explore – loop B1

As seen in the later steps of the model, users differ in their keenness on software appropriation. However, in this mandatory use environment, most of the users, after using the system for some time, grew accustomed to it. They started to exploit the system and used the basic features regularly (e.g. care follow-up, information handover). In this stage, following training sessions, most of the features used were understood in a learning-by-doing process, often fostered by colleagues' assistance. Once acquired, users tended to concentrate on these most important features to achieve their daily tasks without trying new features.

It is true that at the beginning, when I wasn't used to it, it was quite difficult to use this system. For doing searches, for doing other things. But after some time, no. We have [had] it since 2006, so we have had time to get used to it (laughing). (Nurse Auxiliary 6)

Incrementally, users developed computer self-efficacy (Bandura, 1977), and had the impression that they managed the system in a better way, allowing them to be more efficient. The exploitation of the system is even sometimes described as a virtuous circle, where the more the user exploited the HIS, the more he/she had the impression of using it effectively. Thus, exploitation helps users to appropriate the system by developing mastery of the HIS, one of the two key components of appropriation (Tsoni, 2012).

Of course, as I go along, gradually I get better at using it. Also, because I have become more familiarity with it. (Nurse auxiliary 6)

This step allows users to develop their abilities or 'can-do' motivation, and progressively helps to decrease users' fear of taking risks with the system. In fact, while users first described their fear of making mistakes when using the system, they also told us how, incrementally,

experience diminished this fear. Thus, when talking about her/his current use of the system, the animator stated:

It's true that here I am acknowledged as the one who has a knack for it. Well, not having a knack, but I'm the one who copes when it comes to information technology (…) I am not afraid anymore to explore and to make mistakes. (Activity director)

Considering errors in system use can lead to important consequences for the residents, a high propensity to take risks is essential for exploration. This is in line with the literature, which underlines that exploring the system is often considered a risky and uncertain behaviour (Thatcher et al., 2011). Here, increased exploitation by increasing can-do motivation to explore the system decreases users' fear of taking risks. This reduced fear to take risks induces them to *go off the beaten track* and enter the exploration enjoyment loop.

However, this dynamic is not so simple and – as it often appears in dynamic problems – the reverse is also true. In fact, as soon as users stop using one of the features regularly, they tend to forget the required procedure and sometimes have much difficulty when using it again, which immediately decreases their computer self-efficacy. Thus, maintaining a high level of exploitation is required to maintain a high computer self-efficacy and the perceived ability to manage the system correctly. As the director of one of the nursing homes stated:

If you don't touch the system, if you don't modify a care plan for a month, for example. Well, then when you have to do it, you don't know how anymore. (NH director 1)

This process explains why, at this stage, some users already stay locked in exploitation, afraid or demotivated by failure and not succeeding in developing enough can-do motivation, while others start to be increasingly more inclined to try exploration, with the knowledge they developed reassuring them.

4.2 Exploration enjoyment

The *exploration enjoyment loop* is the second loop that we identified. It is a self-reinforcing loop in which the user discovers and starts to enjoy exploration. More specifically, this loop connects readiness to invest time in exploration with exploration and enjoyment of exploration (Figure 4).

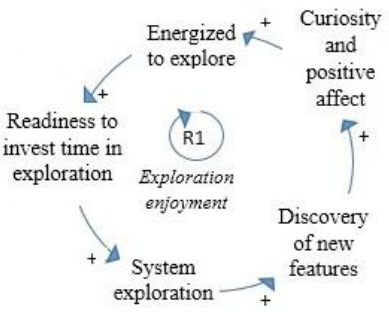

Figure 4: Enjoying exploration – loop R1

Even if some users get trapped in exploitation from the beginning, several users try exploration at some point. In fact, once they are able to explore the HIS and ready to invest time in exploration, users are often very interested in discovering the system and understanding it better.

Because we log on daily, looking for information gets easier. And we are also more inclined to ask, 'Hey, what's this'? Well, we click on it to see what it is. (Head nurse 3)

Here, the healthcare context plays an important role because management expects autonomy from professional nurses (Yang et al., 2015). Moreover, their education and competencies entice nurses to go a step further when needed. One nursing home director stated,

That's also the nurses' reasoning, which is, 'I analyse the situation, I make a diagnosis and I adapt my behaviour if needed'. (Nursing home director 1)

Nurses like to understand how things work and what opportunities they have when confronting a new case or a new tool.

They also tend to be curious about how colleagues use the HIS and often share ways to use the HIS more efficiently, making exploitation and exploration a social process.

Sometimes, the girls [colleagues] say, 'Oh, well, you did that'. For example, you know when you are in the, transmission, in, on the HIS, right? So you have the, so you go into transmissions, you have … information, you want to note something about the person. So you choose the sequence, you choose your person and then when you go, you have the person, you click on it, and you normally have a small, a small space. But, to avoid, because when you write, the sentence is erased and is not really visible, so you just click on it, and you have a bigger frame, and there you can add your message and make it visible and make sure colleagues will see it without wasting time. But that, the girls did not know. I do not necessarily tell them right away, but it is when I see someone using the HIS, and then I say, 'Well, listen. Look, click on it, and you will see', and then the girls learn. That's how we learn new things. We help each other a lot. (Nurse auxiliary 1)

In the beginning, exploration is challenging and users exploring SOLIS tend to discover new useful features or new ways of improving existing ones. These breakthroughs sometimes happened by chance but were then stimulated by the curiosity and positive effect they create in the user. In this context, one user explained that thanks to exploration, s/he discovered useful features, such as the ability to print tabs on a monthly basis that are organised in subcategories (e.g., resident, floor), allowing him/her to get a better picture of the current situation and helping him/her adapt treatments better. The activity director also explained that exploration supported her/his administrative tasks and exploration helped with her/his design categories, groups and subgroups in the software with secure full traceability of what was done and with whom for the entire year (quote Appendix B, Table 2b). Therefore, exploration in the nursing homes studied is triggered not only by curiosity but, above all, by the perceived necessity to improve or develop tools for better handling of the tasks at stake, with the intent to protect oneself by means of increased traceability and with a wish to boost residents' follow-up.

A bit by exploring, by touching, by seeing what it does. And then, pop, we discover new features. And it is always like this with IS tools, usually. Even if you have fifteen days of training, you won't remember everything, so you seek by yourself. This is how you learn. (Head nurse 3)

An increase in these discoveries often triggers a virtuous circle of positive effect for the system and explorative behaviours. The more users discovered new useful features, the more they were interested in the system's possibilities and tended to be encouraged to increase their investment in exploration. A positive self-reinforcing loop is created where exploration helps users to appropriate the system by helping them building preferences for the HIS, the second key components of appropriation (Tsoni, 2012).

At the end of the day, we are happy. For example, we succeeded in finding a document we didn't know before. (Housekeeping agent 2) *So I'm happy, and I want to continue.* (Nurse 3)

However, this loop never lasts long. First, users sometimes overestimate their abilities to manage the software and do not succeed in finding new useful features while exploring. In this case, they experience frustration and lose their motivation to explore.

Well, sometimes we look for… we would like something which pops up in our mind[, such as,] 'Oh, couldn't I get the synthesis of all our residents who have this thing'? So, we search, we search, we fiddle, we try. And sometimes we succeed in doing that, and sometimes we fail. And at that point, it is frustrating. (Nurse 1)

Second, even when users have not overestimated their ability to master the system, the loop can be broken, as explained by the third loop below.

4.3 Becoming habituated and reassessing the priorities

Time and experience trigger this third loop. It is a balancing loop that connects exploration of the system with diminishing chances to find new useful features and thus decreases the interest to explore. We called this loop *becoming habituated* (Figure 5).

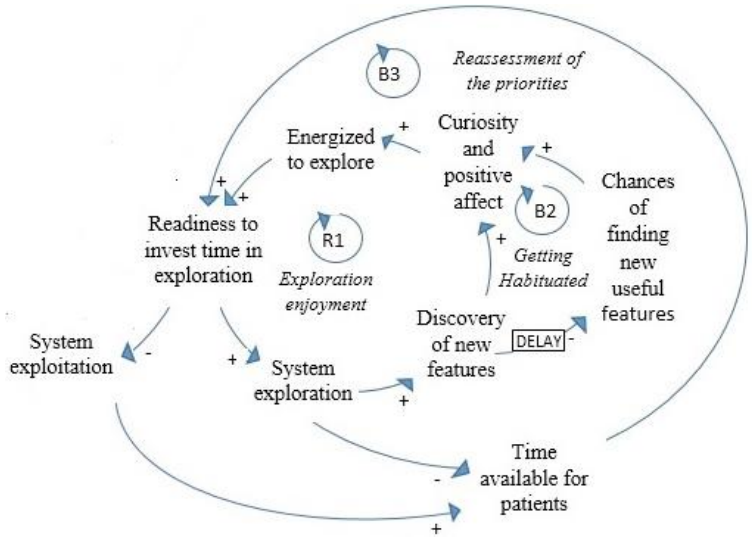

Figure 5: Becoming habituated– loops B2 and B3

At first, increasing exploration tends to lead to increasing discovery of new useful features, which in turn leads to increased curiosity and enthusiasm about exploration and the creation of a self-reinforcing exploration loop. Once discovered, these new features, if useful, are implemented and used regularly. They become habits as part of the daily routine and are no longer *new* features to explore. They are then regarded as dealing with exploitive use.

Each time we discover a new feature - once we realise its purpose, how we are supposed to use it and the benefits we could get from it in our job – afterwards, we use this feature all the time. It is a bit like Excel. The day we discover a new feature, afterwards, we use it all the time. (Nurse Auxiliary 2)

Moreover, the more newly discovered features are used and routinised, the less necessary it is to look for new features. In fact, contrary to studies underlining the role of hedonic factors and cognitive absorption in exploration (Magni *et al.*, 2010), exploration in the long-term healthcare domain seems first oriented towards the task at stake. In this context, users who explore aim first to discover useful features to complete their tasks more efficiently and effectively. This fits with Burton-Jones and Grange's (2012) theory, which states that use is a

goal-directed activity. Most of the time, in this context led by tasks and sense of urgency, employees do not explore only for their own pleasure. As one of our interviewees clearly explained, after some time, interest in exploring the system decreases (B2).

I am lucky to have a job which allows me this time because nurse auxiliaries may not have that time. But no, I no longer rummage through the system. I stay on my assets. I need this; I use this. I won't find out new features if I don't need them.… I have the impression I explored all possibilities as far as I am concerned. I mean, regarding the activities. (Activity director)

This shows that users start becoming habituated and sometimes even bored with exploration. They start to think that investing time is not worthwhile. Therefore, the more familiar users are with the system and with exploration, the more their opportunities to discover new features or innovative ways to use current features decrease. This situation increases users' tendency to choose exploitation over exploration.

A second reason for users to reassess their priorities and go back to exploitation is that although enriching SOLIS's exploration is time consuming (B3), long-term healthcare is a sector with high time pressure and task urgency. Nursing staff members' first job is to take care of the residents and maintain their quality of care. The resident is the real priority for the nursing staff. Even in nursing homes where managers encourage system exploration, they expect the staff to prioritise their availability for the resident above all.

Their first role is to be at the resident's bedside. (Head nurse 1)

Most of the interviewees recognise that system exploration can allow them to increase the quality of care. However, they tend to focus on the fact that exploring the HIS gives them less time for the resident in the short term.

[Talking about exploration] It takes time. This is the problem. I mean, during this time, we aren't with the residents. (ASH 3)

As previously stated, exploration of the system triggers the discovery and implementation of new features, but these discoveries sometimes also contribute to an increase in the user's workload:

Because we can always find (new things in the software by exploring), I think. But if I still discover new things, this means an additional workload and therefore less time for my residents. (Activity director)

Therefore, users become less inclined to dedicate time to exploration. However, it is important to underline that employees in nursing homes do not all play the same roles. For those who have an administrative role in addition to their nursing responsibilities, spending time with residents can be, at some points, less crucial. To understand this point better, it is important to underline the fact that healthcare staff tend to take the time to explore the system, not to be in front of the resident but behind the scenes. Some employees rarely have time to withdraw to the office to explore the system. Even if healthcare staff are ideally supposed to enter data into the computer after seeing each resident, in the nursing home, most of the caregivers using computers entered all the data at the end of their shift. At that time, other staff members were also waiting to enter their data into the system, which created pressure for staff to rush when using the system.

Above all, nurse auxiliary 2, nurses, head nurses and the activity director, who had more administrative responsibilities and time in the office, recognised that increased exploration decreased the time available for residents in the short term.

Today I have time because I am in 'coordination'. (Head nurse 2)

Look, right now, I'm a nurse; I'm not wearing my white lab coat. So today, I may have more time than my colleague who wears the white lab coat to do this kind of stuff [IS exploration]. (Nurse 1)

Our data did not clearly explain the exploitation's effect on time available for residents, but regarding the literature, we can argue that contrary to exploration, exploitation by routinising IS use should give nursing staff more time for residents in the short term. In fact, exploitation frees up the user's mind, allowing them to spend time on other tasks (Ohly *et al.*, 2006).

The priority of the residents coupled with the becoming-habituated loop explains why people revert to exploitation after some time.

4.4 Locked-in exploitation

Habituation and routines trigger this fourth loop. When coming back to exploitation, users are soon locked into this behaviour. Although exploitation is suitable for developing users' perceived ability to handle the system in the short term, it also triggers repetitive exploitative behaviours in the long term. As several interviewees emphasised, high exploitation means routinised use of the system, which triggers habits. In other words, as our interviewees exploit SOLIS, they tend to use the same features constantly, even when better options are available. We call this self-reinforcing loop *the exploitation trap* (Figure 6).

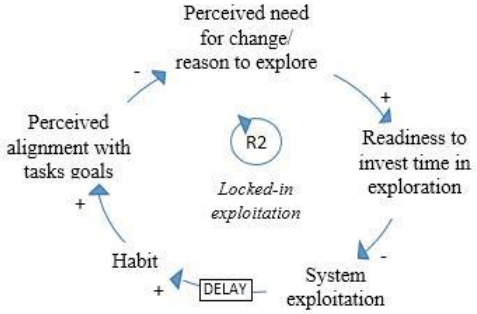

Figure 6: The exploitation trap – loop R2

As one nurse explained, this behaviour is also reinforced by the healthcare culture, which requires the ability to take initiative and manage uncertainty but is at the same time highly routinised and standardised.

I think that healthcare jobs are.… Well, there is the everyday reality. There is some kind of a routine and also a certain urgency in nursing. I would say, 'We have to do this, we have to do that before so and so'. Therefore, when considering how to do things, very few new questions come up because we always use the same things. (Nurse 3)

At one point, users tend to repeat the same use behaviour without thinking about it.

Once we know how … well… we always do the same things. (Housekeeping agent 3)

In this sense, the more users exploit the system, the more they tend to develop habits, which tend to decrease the perceived necessity for change.

So far, for us, it works well like this. Our follow-up works well like this, so we are satisfied. (Nurse 5)

This low perceived need for change entices users to continue their exploitive use of SOLIS. In fact, the activity director emphasised there is no point in exploring the system if there is no need to do so.

I mean, searching in the settings, all these kinds of things, I don't do that anymore. I am used to it now. I don't need to explore anymore. (Activity director)

However, even if the power of habit is strong and users seem completely locked into exploitation in the long term, it would be misleading to stop the analysis here. In fact, as Burton-Jones and Grange (2012) emphasised, in the end, the user, the system and the tasks all play a role in use behaviours. Exploitive and explorative use behaviours are not exceptions. In healthcare, things are even more complex, and the environment becomes an important factor to consider. All the above-mentioned elements can play a direct role in can-do and reason-to motivations, turning the situation around and enticing people to switch to exploration. Therefore, there are still opportunities to escape from the exploitation trap.

4.5 Escaping the trap?

The interviewees explained how the tasks, the system, and the environment at some point induced them to go back to exploration by impacting their perceived need for change and ability to explore (Figure 5). In line with Tyre & Orlikowski (1994), an increase in tasks' novelty and discrepant IS events have been cited as the main reasons to revert to exploration. These events tend to create the perception that the current use of the system is not efficient anymore and that the user needs to find an alternative:

There may be some incident, sometimes a malfunction, or a problem, or a good thing, and we think, 'Well, here we could do that. It would be better.' It is true that if we have, for example, difficulty in terms of nursing or if we see that there is a problem, we can sometimes find a solution to prevent it from happening again, thanks to the software, by an improvement or a new use. (Nurse 3)

However, specific events are not the only reason healthcare employees go back to exploration. Daily workload and time pressure can also entice caregivers to optimise the process in which they are involved.

No, it's because I realise … since I've been here, the workload has increased really quickly. If we want to compensate for that, well, we won't have more staff members who will arrive like this, overnight. We absolutely have to optimise our tool. If we don't optimise our software, at one point, we will just saturate really quickly. We have to go that far; it's undeniable. (Nurse advisor)

High levels of workload and time pressure are a reality in healthcare and are often related to understaffing issues (Carayon & Gurses, 2008). Although they most of the time entice caregivers to concentrate on exploitation of the system, as seen in the *reassessment of priorities* loop, they can at some point entice managers, such as nurse advisors, to try to optimise IS use and thereby start exploring the system. In such a case, the caregivers who succeed in finding a new feature or make one existing feature more efficient as a result of exploration often share this information with colleagues, spreading it into new usage practices.

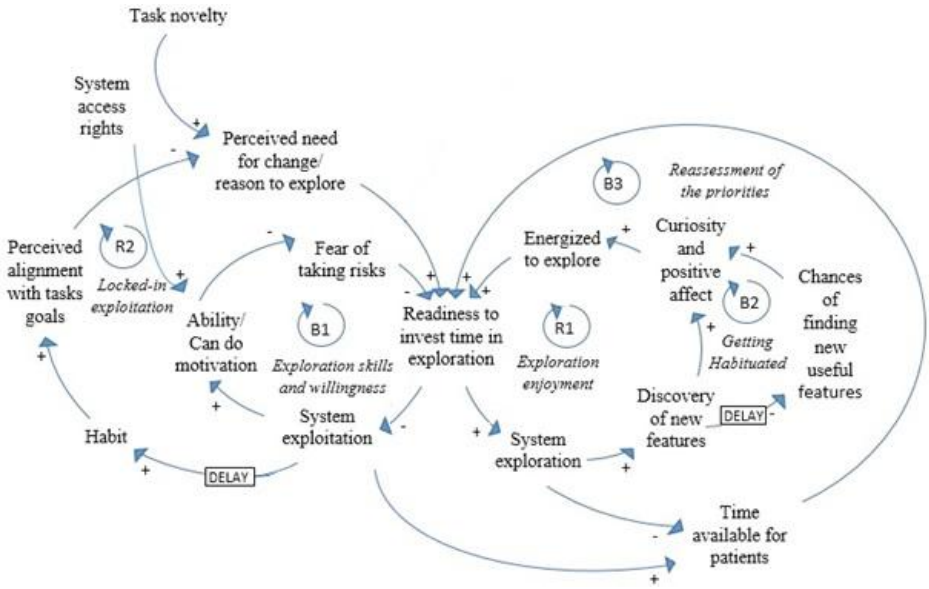

Figure 7: Exploration and exploitation dynamics to escape the exploitation trap

The system, especially system access rights, can constrain exploration, with a decrease in system access rights reducing the user-perceived ability to explore the system.

We aren't allowed to use these features. For example, to add, well, it would be nice to add monitoring regarding the number of glasses of water that residents drink per night. That's not possible. We can pass on the information, saying we would like to have this feature; it is desirable. And then they [the nursing home headquarters' IT support department] check the possibility and send us an answer later. But we can't explore it directly. We can't include something directly. I think it is to standardise the use, in a general way, in all the healthcare facilities [of the group]. That's what I believe. (Head Nurse 3)

Therefore, the tasks and the system affect exploitation and exploration behaviours. By increasing the perceived need for change and the reasons to explore, task novelty tends to foster exploration whereas by reducing users' ability to explore the system, system access rights tend to constrain it. In this case, users feel they cannot really explore the system and therefore turn to exploiting it (Figure 7).

4.6 Users' cognitive style and the timing of exploitative and exploratory behaviours

Although our model explains the dynamics of switching between explorative and exploitative behaviours, it still has some shortcomings in explaining why these activities motivate some users more than others. We also need to understand why, even when they face the same conditions, some users start exploring the system immediately after its implementation whereas it takes months or years for others and why users spend more or less time in each loop.

Analysing our data on the users' cognitive style allowed us to add the dynamics related to individual characteristics to the model. Interviewees who started to explore the system right after its implementation and tend to explore it often all explained that it was part of their identity to explore things. They are *innovators* in the sense that they try to figure out how things work and how these things can be modified or used to make the best of them.

Personally, at home, I have had access to the internet for years, since (the little one…. What were they called?) the 56K modem. I have always explored. My husband and I have computers apart. Apparently, it's called 'being a nerd'. (Activity director).

These innovators like to understand things by themselves and dare to take risks to do so:

It's like, I don't know, buying a new phone. Before reading the manual, I want to discover by myself by exploring all the options. If really there is something I don't know, I check the manual. Otherwise, I try to find out by myself. (Housekeeping agent 1)

As they venture to explore the system more quickly, they learn, following a learning-by-doing progression curve. As some interviewees emphasised, the more one practices, the more able they are to deal with the system and feel confident in their ability to master it, which reinforces their propensity to have a go and their readiness to invest time in exploring the system.

On the contrary, adaptive people tend to have a greater propensity to stay with their current assets and maintain their current behaviour. This tends to affect their ability to gain confidence and to develop their 'can do' motivation sufficiently to feel ready to explore. Therefore, they tend to be more risk averse and can remain locked in a vicious exploitation cycle:

I know that, apparently, we could add things. But I don't really know yet. I haven't tried yet. (Nurse auxiliary 1)

Other users specified they didn't even think about exploring the system. They just follow the rules and guidelines and perform them well without trying to change anything. Change is not natural for them. However, when we explained the various possibilities, they didn't resist and accepted changes in their behaviour:

It's true that we never thought of trying to find what we used to do on paper on the computer. They explained it to us, and right after, we all – well, the four of us – took up using it really quickly. (Nurse 3)

Other users are aware that they can do things differently but just think it is a question of personality:

There was a nurse student who did well. She succeeded in finding links that we weren't able to find.… She was an exceptional girl. She arrived one hour earlier at work in order to check her information handovers, exploring the system.... Well, this is a girl who is curious about everything. So it was in her personality, not in her job profile. She loves understanding everything. (Nurse, power user)

Moreover, perceived risks of doing things wrong and of diverging from the beaten track keep people in exploitation:

Oh, no, this I won't change because I know there are things which are only for doctors, only for nurses. I know what is meant for us. I know the basics for us regarding care … but making decisions alone, no. And it is visible when.… Well, everything is stored and then printed, so people can see if we have made a decision on our own. (Nurse auxiliary 8)

As one of the interviewees explained, cognitive style is an important part of the decision to start and maintain exploration:

… because there are some people who try to find out and other people who won't. If they don't know, they don't know, and that's perfect. It's better that they don't touch. I have colleagues. Well, if they start to explore the system, that's the end. They get lost, and it will become worse and worse. Some of my colleagues are 'computer averse'. That's the way it is. And I have other

colleagues who are even more passionate than I am and who will even explore more than me. It depends on one's personality. (Nurse auxiliary 2)

However, surprisingly, some people tend to be quite innovative at home but not at work. They explained this by saying that it is not in their role to explore the system at work:

At home, yes. Maybe when I want to look for something, yes, I can explore.… Most of the things, I learned by myself… but I think it is not the same with [name of the system used in the nursing homes] because it was already fixed, predefined. They carefully designed the project, and there are people still working on it, so I think it is their job to improve the system or to find out whether to change something. (Nurse 4)

This explains why the interviewees' preferences and the environment in which they evolve impact the way they use the system.

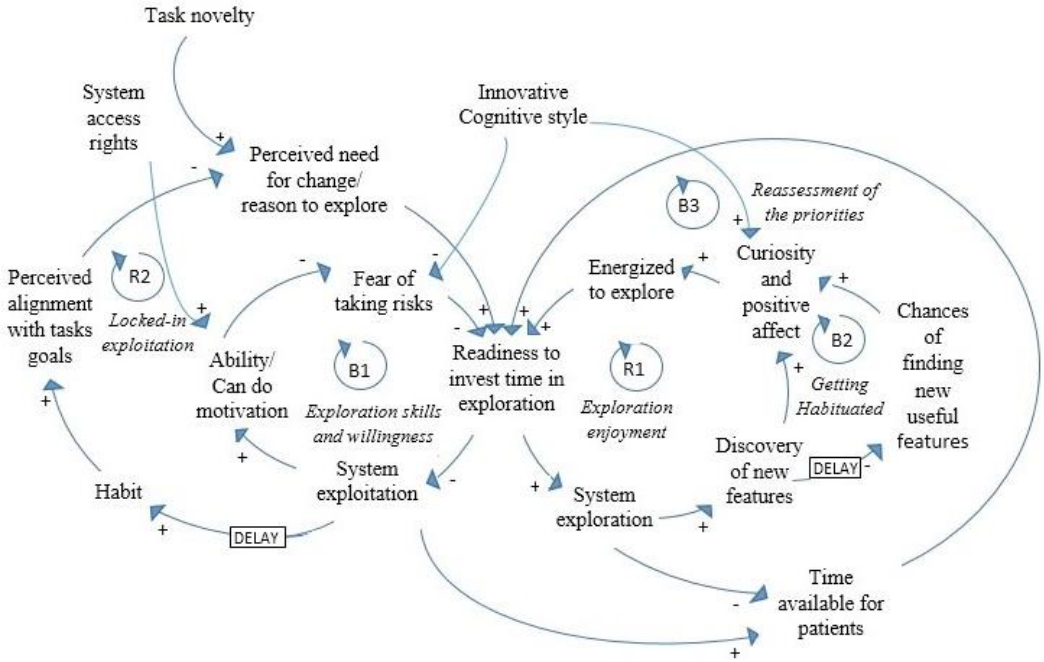

Figure 8: The role of cognitive styles in exploration and exploitation.

All in all, these cognitive styles reflect what cognitive psychologists have hypothesised, that people have preferences in their attitude towards innovation and those differences are evident in their appropriation of IS. However, because most people are positioned in the continuum between exploration and exploitation rather than at the extremes, it can be hypothesised that with the right motivation and the right conditions, even the most explorative people will conform and even the most exploitive person will explore (Figure 8).

5. DISCUSSION

In this study, we investigated how caregivers in nursing homes exploit and explore SOLIS, an HIS system, and we discovered how exploration and exploitation are related and in fine balance, contributing to the appropriation of the HIS.

As the nursing homes employees started to exploit or explore the system, they changed their ability to deal with it and the environment in ways that influenced the course of their future decisions, in many cases leading them to choose exploitation more often than exploration. In the cases we observed, the employees accepted and used the HIS. In this sense, there was no

problem with resistance. However, the system was often used only with a minimum of its potential, and the users rarely explored new features and possibilities. Building on previous research on underutilisation (for example, Hsieh & Wang, 2007), we observed that the problem of underutilisation is not a stable one, either fixed around specific features or where the number of features used increases in a fixed slope. Instead, utilisation and appropriation proceed in bursts based on the five causal loops that we have identified. Three of them, namely *exploration skills and willingness* (B1), *becoming habituated* (B2) and *reassessment of priorities* (B3), tend to balance loops, allowing users to switch between exploitation and exploration. Meanwhile, *exploration enjoyment* (R1) and *locked-in exploitation* (R2) are self-reinforcing loops requiring time and experience or external events to be broken. As showed by the causal loops, users need to feel that they can go further in their use but they also need to perceive the need for change to opt for exploration.

5.1 Theoretical and policy implications

A number of theoretical and policy implications for managers emerge from the present study. Sterman stated, 'Diagrams, conceptualizing dynamic models, are never final' (2000, p. 166). Therefore, we need to be very cautious when presenting our findings. Based on Akkermans and Van Helden's (2002) recommendation, we opted to discuss the value of our results by designing propositions for managers that we encourage researchers to test, confirm, improve or refuse in future research.

5.1.1 Theoretical implications

Our analysis shows that, respecting the hard constraints of the healthcare context, users tend to prioritise exploitation among exploration. In fact, although it is highly procedural and deals with a lot of uncertainty, the healthcare environment also, paradoxically, requires employees to deal with highly routinised tasks (Essén, 2008). As mentioned above, the SOLIS users' priority was definitely the residents' well-being, particularly the time spent with the residents, because most of the elderly expect frequent social interaction. Most of the nursing homes visited suffered from staff shortage, and caregivers often complained about work overload. In this context, while considering exploration of the system appealing and interesting for increasing performance, the interviewees were subsequently subjected to time constraints and task urgency. Thus, our results are aligned with Tsoni (2017) findings on appropriation, which highlight that professional users are ready to engage in learning to use an IS, despite cognitive efforts required, if results from these efforts improve professional practices, but goes a step further. Indeed, after some time exploring, workload, tasks urgency, role priorities and reduced potential of exploration make users fall into the exploitation trap. Moreover, the highly procedural and routine environment of healthcare reinforces this phenomenon, locking users into exploitation. This might be problematic because findings suggest that developing the use of advanced features might be key in alleviating stress derived from HIS use (Chen et al., 2021).

Proposition 1: *HIS users are willing to overcome the cognitive efforts required to appropriate the HIS if they consider that the results from these efforts will improve professional practices.*

In our sample, those able to explore the system tended to be employees with administrative responsibilities. This is interesting because Goo et al. (2015) found that caregivers explored more than pure administrative staff in South Korean hospitals. Nevertheless, they did not make the distinction between kinds of caregivers. Therefore, it will be important to go a step further and study how caregivers' roles and responsibilities impact their system use in the post-

implementation stage. Above all, it seems urgent to study the impact of stressors such as overload on exploitation and exploration behaviours. In fact, our interviewees described their sessions in the office and outside the *care pressure* as the appropriate and best time for exploration. However, this result contradicts one part of the literature on stress, which states that stressors, such as time pressure and workload, can increase innovative behaviours (Baer & Oldham, 2006), which would also explain why some of the managers we interviewed stated that overload could at some point entice them to explore. The stress level can be at stake here because some authors suggest an inverted u-shaped relationship between stress and innovation. Therefore, this partially unexpected result could be explained by an extreme level of stress appraised in the nursing home visited.

Proposition 2: *The level of stress and work overload influence healthcare users' choices related to exploration and exploitation of HIS.*

Another interesting factor to examine would be the level of support for exploration. In fact, Maruping and Magni's (2015) findings reveal team empowerment's positive impact on individual exploratory use behaviours. This is confirmed by our results, which show that IS appropriation in healthcare is also a social process, in which caregivers are curious about how they could use the HIS more efficiently, and share effective practices with colleagues to help them become more efficient and have more time with the guests. In this context, caregivers, when discovering a new feature or improving an existing one, often explain to colleagues how they could do the same.

Proposition 3: *Peer to peer support and the sharing of good practices/experiences will affect HIS appropriation both in exploration and exploitation.*

It is also important to underline that several users voluntary reverted to exploitation after some time. For them, exploring the system lost its attractiveness as they became familiar with exploration. They believed that gaining more from exploration was difficult. Above all, the limited access rights to the system, linked to the criticality of information security and privacy, are also likely to contribute to the exploitation trap.

5.1.2 Policy implications

In terms of policy implications, (long-term) healthcare managers should try, on one hand, to allow a more user-friendly access to HIS and, on the other hand, to ensure the best possible conditions in terms of time and organisation of work to encourage further exploration of the system.

Extending this research to group-level analysis would allow us understand better how exploration and exploitation behaviours are spread and interrupted between individuals and across roles.

These considerations point to a critical role of the healthcare context in influencing exploration and exploitation behaviours. This leads us to formulate the following proposition:

Proposition 1: *Healthcare job requirements tend to constrain exploration and make healthcare users fall into the exploitation trap.*

From a managerial point of view, our results also provide indications regarding HIS system design. In fact, (long-term) healthcare managers should require software houses to make functionalities more accessible or even automated rather than adding more features to the system. More features will in fact add complexity for the user and therefore are likely to lead to even less exploration. This leads us to formulate the following proposition:

Proposition 2*: Increasing functionalities in an already complex HIS will lead to less exploration of new features and more exploitation of known features.*

As underlined in the method section, causal loop diagrams do not provide a unique behavioural pattern but can explain the result of an increase or decrease in multiple linked variables. This is particularly interesting because it means that managers are able to regulate the levels of exploitation and exploration indirectly by increasing or decreasing time available for residents via workload, the level of task novelty and system access rights.

The literature suggests that managers lack practical guidance regarding how to promote innovative behaviours at the workplace (Carter et al, 2020; Maruping & Magni, 2012; Amabile *et al.*, 1996). This is a significant problem because explorative behaviours are considered crucial for long-term performance in some situations (Carter et al., 2020; Park *et al.*, 2015; March, 1991). Under these conditions, our findings highlight that several managerial actions could indirectly influence users' exploratory behaviours. For example, by confronting employees with new tasks, managers can stimulate them to feel the need to change their use habits and entice them to explore the system. This increase in users' reasons to explore the system will then increase their readiness to invest time in exploration. On the same basis, regulating each employee's workload and giving them more time for their residents would increase users' readiness to invest time in system exploration. Because night shifts differ from day shifts in terms of working conditions and may differ in terms of workload, patient conditions and work norms (Peterson, 1985), it could be interesting to study the differences in IS use between shifts and how norms about IS use spread from shift to shift.

Proposition 3: *Managers' actions regarding expanding employees' tasks and autonomy and reducing pressure will allow users to balance exploration and exploitation of HIS better.*

It is important to highlight that the real challenge that our analysis and model show is striking the right balance between exploration and exploitation so that users, at any given time, can switch between these two types of IS use. Indeed, time invested in exploration does not transform immediately into performance outcomes (March, 1991), and results are uncertain and not always as expected (Burton-Jones & Straub, 2006). Therefore, system exploration seems essential for long-term performance but is probably less efficient than system exploitation for short-term performance (De Guinea & Webster, 2013). For these reasons, it is also important for managers to reduce users' exploration when necessary. To do so, managers have several options. First, they can use the opposite strategy and limit the level of task novelty. possibly thereby decreasing users' perceived need for change and decreasing their readiness to invest time in exploration. Second, managers can reduce users' system access rights, which seems an efficient way to discourage exploration. This is quite surprising because based on coping theory (Lazarus and Folkman, 1984), we would expect that reduced access rights would induce users to explore the system to find a solution or to work around the system, as is the case with system malfunctions (De Guinea & Webster, 2013). One explanation could be linked to the perception of risks. In fact, system access rights are highly challenging in healthcare because they are linked to information security and privacy issues. In this context, users may

not dare overstep their rights. This would fit with our results, which showed that the reverse action, increasing access rights, motivated users to explore the system by increasing their perceived ability to do so. More research is needed to understand more clearly the impact of access rights on users' behaviours. However, managers must be aware that reduced access rights seem to prevent users from exploring the system. A balance should then be found that will protect residents' privacy and information security while allowing employees some autonomy.

5.2 Limitations of the study

Like every study, despite its strengths, ours has some limitations, which one must consider when interpreting the findings. First, causal loop diagramming is based on our interpretation of the users' statements and actions (Davis *et al.*, 2007). Based on the literature, we considered exploitation and exploration two elements of a continuum (March, 1991), which implies that an increase in exploration will decrease the resources available for exploitation and vice versa (Walrave *et al.*, 2011). However, this assumption can still be challenged. Second, our analysis is mainly based on self-reported measures and user perception. As Devaraj and Kohli emphasised, it can be a problem because the 'the comparability of self-reported use and objective or actual use remains a controversial point in information systems research' (2003, p. 274). In fact, self-report and retrospective data are subject to recall bias. To counter this problem, we followed the guidelines Singh et al. (2015) provided to increase our findings' validity. However, it could be interesting to study the exploitation-exploration dynamics with a longitudinal approach using objective measures to compare the results. Conducting this study with a full ethnography could also deepen our understanding of the dynamics behind HIS exploratory and exploitative use practices by helping collect details on how the HIS is really used in practice. Third, while the issue of dissatisfaction with the system itself did not come up salient in our interviews, we do not pretend SOLIS is perfect. Indeed, users were neutral with respect to the system and did not express explicit satisfaction with it either. What leads, to some extent, to dissatisfaction, were more external elements associated with SOLIS such as for example, wifi not working or insufficient number of access points to the system. This might be the sign that users get the impression the system provided the functionalities needed and that it seemed to be sufficient for them. However, studies of other HIS might lead to different results. Thus, more studies on this point would be welcomed. Finally, our study's richness comes from integrating the particularities of the long-term healthcare sector into our analysis. We made this choice because long-term healthcare is a particularly challenging sector for society and needs adapted models to take its specificities into account. However, while it brings richness to the understanding of IS use in the post-implementation stage in the long-term healthcare sector, this also triggers a decrease in the results' generalisability. These results might also apply to other contexts in which IS use can have critical outcomes, such as general healthcare or the military. However, future studies examining the exploitation/exploration dynamics in these and other contexts would provide valuable knowledge.

6. CONCLUSION

Responding to calls urging researchers to seek a better understanding of HIS use in the post-implementation stage (Melnick et al, 2021; Lanham *et al.*, 2012; Vest & Jasperson, 2010) and to calls underlying the necessity to understand more clearly the process by which individuals make new and innovative uses of IS features and get out underutilisation (Bagayogo *et al.*,

2014), this paper focuses on a scarcely understood phenomenon: the evolving dynamics behind users' exploitation and exploration of HIS.

Based on our study, we conclude that exploration and exploitation are not separate behaviours but rather two equally important sides of the same coin. However, the two sides are not balanced, and healthcare staff tends to get trapped - at some point - in exploitation of the system. We propose how this trap can be managed by controlling certain aspects of the tasks and the context. Being able to impact the environment, management can motivate employees to exploit or explore the system depending on the institution's requirements. However, exploitative and explorative behaviours are not linked by linear relations, so we also present three propositions on the links between exploration and exploitation.

We hope this approach will prompt researchers to consider the dynamics of users' IS exploitation and exploration in other contexts and at various levels. This study has raised new questions regarding the exploitive and exploratory use mix required to optimise systems' performance in various situations and the appropriation of IS.

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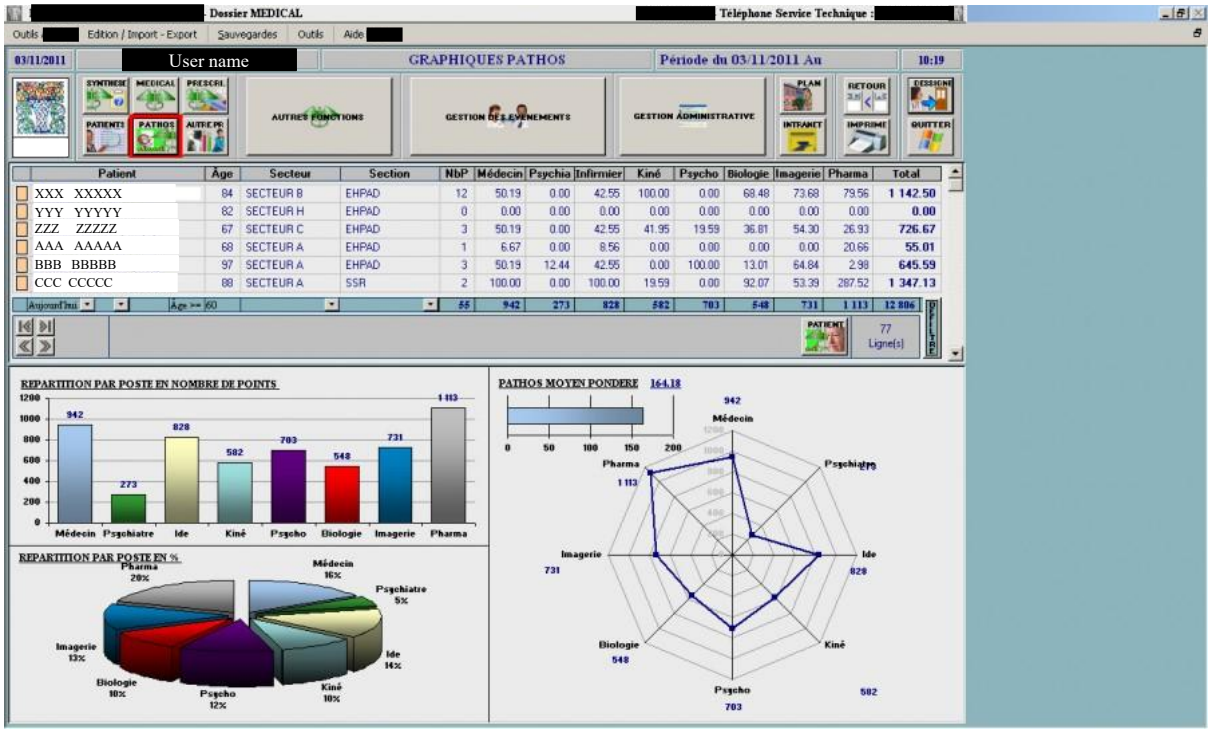
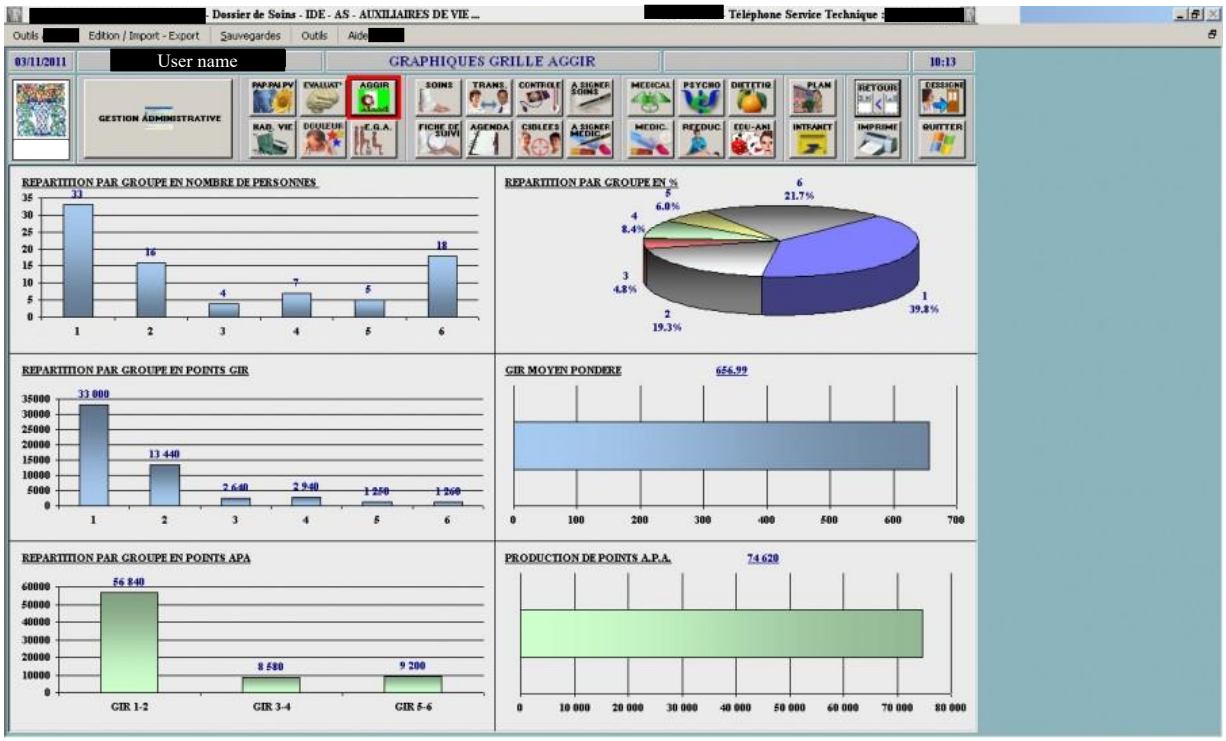
Appendix A: Example of SOLIS menus and features

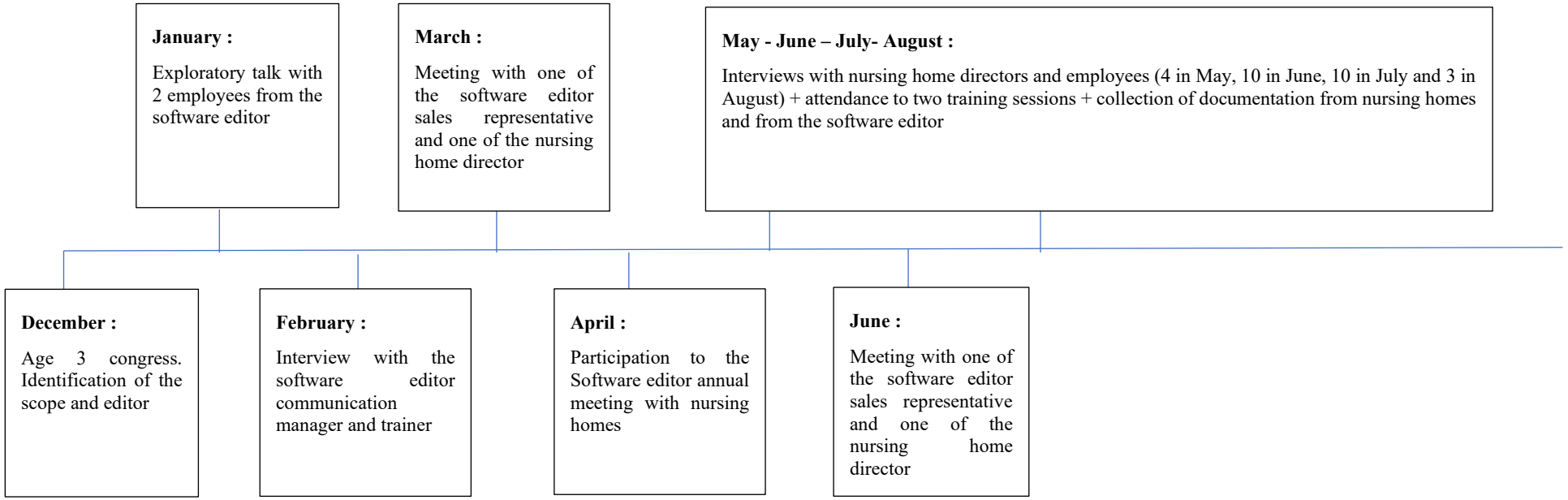




Appendix B: Overview of the interviewees (Total N=28)

Profession	Nursing home studied	Gender	Age	Tenure in the nursing home (in years)	Use of the software (in years)
Activity director	1	Female	43	10	9
Personal support worker	1	Female	56	7	7
Housekeeping agent 1	1	Female	26	1.5	1.5
Housekeeping agent 2	1	Female	50	20	9
Housekeeping agent 3	3	Female	40	20	9
Nurse auxiliary 1	1	Female	45	13	9
Nurse auxiliary 2	1	Male	44	7	7
Nurse auxiliary 3	1	Female	26	3	3
Nurse auxiliary 4	1	Female	38	17	9
Nurse auxiliary 5	2	Female	35	11	3
Nurse auxiliary 6	3	Female	35	17	9
Nurse auxiliary 7	3	Female	34	15	9
Nurse auxiliary 8	3	Female	20	3	3
Nurse auxiliary 9	3	Female	23	2	2
Nurse auxiliary 10	3	Female	45	26	9
Nurse auxiliary 11	3	Female	32	14	9
Nurse 1	1	Female	40	9	9
Nurse 2	2	Female	35	1.5	1.5
Nurse 3	4	Female	23	2	2
Nurse 4	6	Female	33	2.3	2.3
Nurse 5	6	Female	24	1.5	1.5
Nurse power user	5	Female	50	2.5	2.5
Head nurse 1	1	Female	44	17	9
Head nurse 2	2	Female	38	10.5	3
Head nurse 3	6	Female	47	2.5	2.5
Nursing home director 1	4	Male	29	1.5	1.5
Nursing home director 2	5	Male	40	1	1
Software company		Male	42	/	/

Appendix C: Timeline of steps in the data collection process (2014-2015)



Appendix D: Qualitative Data analysis

Table 1: Data Structure the dynamics behind exploitation and exploration of the system		
First order codes **(Respondent generated)** Statements about…	**Second order codes** **(Researcher generated)**	**Aggregate theoretical themes**
Ability to manage the system	Exploration skills and willingness (B1)	Exploration tendency
No fear of taking risks		
Need to explore		
Curiosity	Exploration enjoyment (R1)	
Energized to continue exploring		
Few chances of finding new useful features	Getting habituated (B2)	Back to exploitation
Features discovered become exploited		
Workload and priority of the guest	Reassessment of the priorities (B3)	
Impression of wasting time/ Cost-benefits analysis		
Habit	Trapped and locked-in exploitation (R2)	Exploitation trap
Satisfaction with current use		
No reason to change		
Non at ease with the system	Never leaving exploitation	
Fear of making mistakes		

TABLE 2a: Dynamics from exploitation to exploration/ behind Exploration tendencies

Descriptive summary	Illustrative quotes
Exploration capacity	
Developing abilities to manage the system	The more we use it, the better it works. (Nurse 5). A piece of software, it is, the more you use it, the more you succeed in using it (…) In the end, I found some tips by dint of using it [the system]. (Head nurse 2) People often come to see me saying 'do you know how we can print this' or 'do you know…', because they know perfectly well that I know how to do it (laughing). (Activity director) I used to give up quickly, because I thought I wouldn't succeed. I gave up. But now it is ok (Nurse auxiliary 7)
No fear of taking risks	I'm not afraid to explore and to make mistakes. Most of the time, people are afraid to explore, because they are afraid of making mistakes. But it's by making mistakes that we learn. (Activity director) I think I master it adequately. I mean, even when we have an error message, I start to try to find the error, before calling the after-sales service. (Head nurse 1) Anyway I can't make mistakes. All the files we open, we can look at them. These are tools. - What do we call them? When you click on something, it opens and then you can open something else -. So you open and you can't delete important things. (Nurse auxiliary 1)
Need to explore	But there is always some point where something will be missing and we will explore and look for it in the system, to find some hints. (Nurse Auxiliary 2) At the beginning I especially sought to redo what I did before with the previous system and that we don't do anymore with the new system. Sometimes when I have the times I explore. I try to find out how to do this or that or to do something I used to do with the previous system. For example, I looked to find the blood pressure curve of guests. In order to have a better follow-up care (Head nurse 2) For example, I know there is a traceability regarding the follow-up of guests' stools. We haven't implemented it yet and I absolutely want to have it quickly in the next weeks. Because it is a real problem in nursing homes. We need to have a regular follow-up. So I will try to find out how to set it up in the system. (Nurse advisor)

Descriptive summary	Illustrative quotes
Exploration aspirations	
Curiosity	Because as we log in on a daily basis, well, we will look for information more easily. And we are also tempted to explore: 'Hey, what's this'. So we click on it to understand what it is. (Head nurse 3) Because there were some features and I thought: 'Why don't I use them?' And I started to try them little by little. (…) with the questions I asked myself, I tried to find solutions (Nurse auxiliary 7) It is not the case anymore, but at that time it was from curiosity (…). I thought 'Well, we can do a lot of things with this system'. (Nurse 2)
Energized to continue exploring	I am happy I found that. When I can inform my colleagues I told them, look I found that or for example this little thing (…). That means it is important to seek. (Nurse auxiliary 1) By exploring from time to time, by clicking a bit on everything. At the end we think 'Hey, this is interesting, it exists'. And that's how we continue (Nurse 5) I felt excited because I told to myself « That's cool, I have time, I'll be able to explore again (Nurse 1)

TABLE 2b: Dynamics from exploration to exploitation/ Back to exploitation

Descriptive summary	Illustrative quotes
Getting habituated	
Few chances of finding new useful features	But no, I no longer rummage through the system. I stay on my assets. I need this, I use this. I won't find out new features if I don't need them … I have the impression I explored all possibilities as far as I am concerned. I mean, regarding the activities. (Activity director) [Talking about exploration] It is a good thing if we found a tip or a new feature which can help the care or which can help us in our way to work. But we are really confined. We won't make the discovery of the century (Head Nurse 2) [Talking about exploration] Not anymore. I don't find or try to find new features anymore. It was more at the beginning. Now it is finished. I think I know the essential things. I mean as nurse auxiliary, I know the most important things. The rest may be something I don't need. (Nurse Auxiliary 11)

Descriptive summary	Illustrative quotes
Features discovered become exploited	At the activities' configuration level I created groups (…) micro-files. I use them regularly (…) For me, having a track record of my activities during the year, giving my report to the management. I know how many people go to the reading club, how many people go for a walk. I write down everything in the file I have created (Activity director) We created some tables beside the software, whereas the software was able to provide them. For example we made a satisfaction survey for guests without using the software. I realized I could do it in [software name] (…) So now I do it each time with [software name] instead of making an Excel file or instead of using other tools, whereas we can include everything in the software. (Head Nurse 1)
Reassessment of the priorities	
Workload and priority of the residents	[Explaining why she stopped exploring the system]. It may be that I realized I spent more time on the system and less time with the guests. If I go, if I take the time, because it takes time to change the parameters, to explore. It is not complicated in itself but it takes a lot of time. And that's the time I don't have any more to listen to a person's complaints or something else (Activity director) The problem is that there is also the time factor. We don't really have time to use [name of the system] as we want to. We only have little time to do the handover so we can't really manipulate it. That's a pity. (Nurse Auxiliary 5) After that, the time to explore, to rummage through the system, not too much, because work and guests are stills there. (Nurse auxiliary 2)
Impression of wasting time/ Cost-benefits analysis	[Talking about exploration] That's also a waste of time sometimes. I prefer spending more time with the guests than on exploring the computer. (Nurse auxiliary 6) But to gain time we have the impression we have to waste a bit of it on the software (…) because all the time we spend on the computer, is time we don't spend at the guests' bedside. (Head Nurse 1) Because it is too time consuming to explore, to understand. We can spend one hour on it, sometimes without progressing (Nurse advisor)

TABLE 2c: The Exploitation trap

Descriptive summary	Illustrative quotes
Trapped and locked-in exploitation	
Habit	[talking about system use] Now it is instinctive, we know where to click (Nurse Auxiliary 4) [talking about system use] It tends to be more and more systematic (Nurse, 2) We essentially use, every time, always the same things. (Head nurse 2) [We use the system] in the morning on arriving. In the morning we do the personal care and wash the guest. Usually around 11.30 -12.00, we have finished the personal hygiene care. Then we do the information handover [on the computer]. So we have a ritual. (Nurse Auxiliary 8)
Satisfaction with current use	For the moment I am at ease and satisfied with this. For the moment I don't need other information (Nurse auxiliary 3) Now, I handle it well. The software is perfect like this. (Nurse Auxiliary 11) I don't necessarily try to explore more. Now I think I can work it well enough. I'm satisfied with it (Head Nurse 1)
No reason to change	[Talking about the system features]. There are some I don't use at all, because I don't know what they are. I mean I know what they are but at the same time I don't need them. So there are things I never use and I can't even tell you which ones. Well, we often use the basics: handovers, targets on guests. (Nurse Auxiliary 8) I don't need to explore. So if there was an obligation well I would explore. But it is not a fundamental point. (Head nurse 3) We can access all features but they are things that don't affect us. (Nurse auxiliary 1)
Never leaving exploitation	
Non at ease with the system	I have already been blocked. I don't know why. And no way to get out. I turned it off to reboot but it left me in the same spot (…). (Housekeeping Agent 3)

	It is not always easy to use the software. We don't always have the good "key" and it is also because I'm not really good at it. There is a girl here who knows everything on the system, she knows how to explore, to shift among features. I think it is because she is more at ease. Maybe she has understood the way it works better (Personal support worker) Trying to find new features, no, I don't want to search for it. If someone tells me you have to do it, I will do it, of course. But I won't start to explore the system (…) Because even at home I'm not really fond of computers. That's true that here it is a work tool, so it is not the same. However, I'm not one who is going try to explore the system. No, because it is not easy. (Nurse Auxiliary 10)
Fear of making mistakes	After, regarding the rest I don't know. There may be other features but I don't dare try. I'm afraid to do something stupid (…) I would like to learn a bit more but (…) I don't know, they never showed me. (Nurse Auxiliary 4) I use it for essential stuff really, but don't ask me to do a lot more than that. It is due to the computer, I'm afraid to click on the wrong button. Sometimes when using the software I'm thinking 'What should I do next?' I'm a bit lost in the system and when it happens, that scares me. However I use it, I do what I have to do. For me it is a real tool in my job. I use it because it is implemented, because they [the managers] asked me to use it and also because it is part of my job. I haven't asked myself more questions, I respect what they asked me to do. (Personal support worker)
Role/felt responsibility	[talking about exploration] It is not our responsibility. There are three managers here. It is their job. (Nurse Auxiliary 9)