

Working Around Health Information Systems: The Role of Power

Completed Research Paper

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Abstract

In this paper we analyze the role of power relations in the emergence of workarounds in Health Information Systems (HISs). Using an explorative multi-case study of five healthcare organizations in the Netherlands, we identify 51 workarounds as well as the underlying power relations that underlie them. We distinguish two main types of power that are important for the emergence of workarounds: (1) hierarchical differences between actors and (2) system restrictions. Our study unpacks the link between power and HISs, illustrating how actors respond to hierarchical differences and system restrictions to exert their ‘power to work around’.

Keywords: Health Information Systems, workarounds, power, physicians, nurses

Introduction

Considering the importance of Health Information Systems (HISs) for the quality and efficiency of patient care (Haux 2006; Haux et al. 2004), the widespread failure of HIS implementations (Berg 2001; Heeks 2006) is striking. Determining what distinguishes successful HIS implementations from failed ones is challenging (Heeks 2006), but in general, “a well-functioning system exemplifies a match between the functionalities of the system and the needs and working patterns of the organization” (Berg 2001, p. 144). A mismatch between the two may result in *workarounds*, described as “intentionally using computing in ways for which it was not designed or avoiding its use and relying on an alternative means of accomplishing work” (Gasser 1986, p. 216). The potential consequences of such workarounds are severe. They include a loss of control over business processes (Sadiq et al. 2007), reduced productivity (Bagayogo et al. 2013), and even financial penalties imposed by authorities (Lu et al. 2007). Therefore, organizations typically aim to detect and prevent workarounds. However, technical solutions for preventing workarounds are often limited. While it may be possible to prevent obviously undesirable behavior (e.g., a nurse prescribing medication for a patient), it is far more difficult to prevent more subtle actions (e.g., a nurse prescribing

medication using somebody else's account). What is more, simply preventing a workaround by means of technical barriers ignores the reason why it occurs in the first place. Workarounds may in fact have positive consequences and in some cases, organizations may choose to adopt these (Beerepoot, Ouali, et al. 2019).

In this paper, we aim to develop an understanding of why HIS workarounds occur. Our theoretical starting point is that circumventing an information system (IS) and using it differently than intended can be considered as a manifestation of power. For IS users it is a way of responding to strict controls and aligning the rules enforced by management with the needs of users (Malaurent and Avison 2016). Against this background, we study the manifestation of power by HIS users and the other power dynamics involved in the enactment of HIS workarounds by raising the question: *What is the role of power in the emergence of workarounds in HISs?* We build on five case studies in Dutch hospitals, recording data through a combination of ethnographic observations, semi-structured interviews, and unstructured interviews, to uncover the power dynamics underlying workarounds in healthcare settings. Our contribution is threefold. First, we unpack the interplay between IS and power, as called for by Koch, Leidner and Gonzalez (2013), Marabelli and Galliers (2017), as well as Simeonova et al. (2018), amongst others. Second, we illustrate how workarounds emerge from episodic power. Specifically, we identified two types of episodic power; *hierarchical power* of different actors over one another and *restrictive power* of a system over the actors. Third, we show how actors use a form of systemic power to *work around the system* in order to reconcile problems that arise from hierarchical and restrictive power. Our findings may help healthcare organizations in managing workarounds that have negative consequences and help HIS suppliers in finding the right balance between restricting users on the one hand and giving them flexibility on the other.

The paper is structured as follows. In the next section, we review the literature on HISs, workarounds, and power dynamics. Then, we discuss the methodology used in the study, after which we present our results. Next, we position our findings within the wider literature of power and workarounds, and finish with a number of concluding remarks.

Theoretical Background

Health Information Systems and Workarounds

Over the last decades, the use of ISs in hospitals evolved from supporting simple administrative tasks to a much broader range of tasks; such systems now also include advanced technology such as clinical decision support systems and electronic health records (or patient records) (Boonstra et al. 2018). Contemporary HISs are aimed at improving communication and coordination among medical professionals, enhancing the safety, quality, and patient-focused nature of care, while aiming to contain costs and increase efficiency (Azad and King 2008; Ellingsen and Monteiro 2003; Harrison et al. 2007). In practice, however, it is often found that realizing such benefits is very difficult. Because of the complex nature of healthcare work, designing HISs in such a way that work processes are well supported is a challenge (Safadi and Faraj 2010). When HISs do not support work processes sufficiently, HIS users become dissatisfied and start to resist the HIS in the form of workarounds (Azad and King 2008; Van den Hooff and Hafkamp 2017; Safadi and Faraj 2010). Alter (2014, p. 1044) defines a workaround as: "A goal-driven adaptation, improvisation, or other change to one or more aspects of an existing work system in order to overcome, bypass, or minimize the impact of obstacles, exceptions, anomalies, mishaps, established practices, management expectations, or structural constraints that are perceived as preventing that work system or its participants from achieving a desired level of efficiency, effectiveness, or other organizational or personal goals."

Workarounds have been studied in several industries, such as the transport industry (e.g. Ignatiadis and Nandhakumar 2009), the service industry (e.g. Ferneley and Sobreperz 2006), and the retail industry (e.g. van de Weerd et al. 2019). However, the far majority of workaround studies is set in healthcare. The studies set in healthcare show two important effects of workarounds. First, they enable professionals to continue their work in spite of inadequate IT functionality and in support of their perceived need to bypass obstacles. As Zhou, Ackerman and Zheng (2011, p. 3353) argue, "healthcare professionals are masters at workarounds and oftentimes clinicians view workarounds as the only way to accomplish their work". A second effect of HIS workarounds, however, is that hazards emerge: since workarounds imply deviation from the standard process, they threaten the potential for gains in efficiency of a HIS by reducing process variability and can even negatively affect the quality of care (Azad and King 2008; Halbesleben et al. 2010). Previous studies have discussed such effects, but there is still a limited theoretical understanding of the processes through

which they emerge. Alter (2014, p. 1042) claims that workarounds are a well-known but understudied phenomenon, “[...] even in healthcare, where workarounds are widely recognized”. Blieven et al. (2017) observe that although studies have discussed different types of workarounds, their key features and several reasons for them, the specific rationales for the enactment of workarounds and their effect on healthcare professionals other than the one using the workaround, remains unknown.

When we consider workarounds in terms of coping with the conflict between the prescribed procedures encoded in IS and users' situated practices, there are clearly elements of power involved. Imposing prescribed procedures on users requires power; also, being able to work around these procedures requires power. The literature on power in relation to IS provides clues to the involvement of power dynamics in the use of workarounds (Alvarez 2008; Malaurant and Avison 2016; Silva and Fulk 2012; Simeonova et al. 2018). However, to the best of our knowledge, no research so far has attempted to provide a detailed account of the power dynamics that precede the emergence of workarounds. Therefore, in our search to provide more insight into these dynamics, we now turn to the literature on power in IS.

Power and Workarounds

Power is a multifaceted concept, which has been a “regular, if somewhat peripheral” part of the IS literature (Jasperson et al. 2002, p. 398). Research has addressed the use of power in *implementing* IS (Alvarez 2008; Azad and Faraj 2011; Silva and Fulk 2012), as well as the way power is manifested in relation to the *use* of ISs, for instance in terms of behavior monitoring and organizational control (Leclercq-Vandelannoite et al. 2014; Zuboff 1988). More in general, literature has discussed how ISs change or reinforce existing power structures in the organization (Dennis et al. 1997; Doolin 2004; Hitt and Brynjolfsson 1997).

In the literature, power has been defined in various ways. Historically, power is often described as something that distinguishes the powerful from the powerless (Dahl 1957; Emerson 1962; Jasperson et al. 2002). Other scholars argue that this resource-based view on power does not do justice to its complexity (Dhillon 2004; Hardy 1996). Hardy (1996) and Dhillon (2004) discuss three different views on power: (1) as something emerging from organizational decision-making processes (e.g. Bachrach and Baratz 1962), (2) as something residing in symbols, rituals, and language that are used to legitimize change (e.g. Clegg 1989), and (3) as something embedded in the organizational system itself (e.g. Foucault 1982) in the form of “values, traditions, cultures, and structures of an organization” (Dhillon, 2004, p. 636).

In this paper, we take a broad perspective on power and look for any manifestation of power, whether it is power as a resource or power residing in any other form. We adopt the proposal of Simeonova et al. (2018), who analyzed the concept of power in the context of IS mediated organizational activities. Building on Clegg's (1989) “Circuits of Power” framework, they distinguish between episodic and systemic power. *Episodic* power is framed in terms of power over (also: *ostensive* power), which is the dominant perspective on power (as illustrated by the definitions above). This type of power is focused on themes such as domination and control. A frequently studied example for episodic power in a healthcare setting is the relationship between nurses and physicians. As Currie et al. (2012, p. 940) note: “...extensive research shows how prevailing institutional arrangements tend to strongly favor the autonomy and power of medical specialists over other groups”. Workarounds may emerge then when “those subject to power and control (...) resist by means of challenging or diverting the systems and rules imposed on them” (Doolin 2004, p. 346). *Systemic* power, on the other hand, is conceptualized as the power to (or *performative* power) and related to human agency (Clegg et al. 2006). Studies using a practice lens (Orlikowski 2000) focus on how human agency plays a role in shaping technology use. They provide multiple accounts of how IT use is enacted in ways that deviate from the intentions of designers and implementers. Systemic power, therefore, relates to users who enact ways of using technology that serve their purpose and interest (Azad and King 2008; Boudreau and Robey 2005; da Cunha 2013; Leonardi 2009; Mazmanian 2013; Orlikowski et al. 1995). As noted above, to be able to challenge or divert systems, users are required to have the power to deviate from the prescribed procedures embedded in the IS.

Based on the literature reviewed here, we will focus our analysis on how episodic and systemic power play a role in the emergence of workarounds in the use of HISs. We will focus on both (i) the (hierarchical) relations between actors, which may lead certain actors to instigate workarounds in their use of the HIS, and (ii) on the power relations between the HIS and users, i.e. the power of the IS to enforce certain practices on these users. Furthermore, we will pay particular attention to the power of HIS users to *work*

around enforced practices. In the next section we elaborate on the methods used in our empirical exploration of these power relations.

Methods

We conducted an explorative multiple case study (Yin 2017) to investigate the power relations that are involved in the emergence of workarounds in HISs. A multiple case study allows for a cross-case analysis, as well as building and extending theory (Benbasat et al. 1987). By comparing our results among different healthcare organizations we increase the external validity of our insights (Yin 2017).

Setting

Healthcare institutions are an interesting research setting for several reasons. First, in terms of power, they are complex organizations with multiple lines of authority (Perrow 1965; Robinson 1997). Second, the misfit between computer-based and existing work processes is especially evident in healthcare (Safadi and Faraj 2010). Working around the prescribed procedures is seen as the norm, rather than the exception (Koppel et al. 2015). We conducted our multiple case study within five healthcare institutions in the Netherlands. All healthcare institutions use the same HIS, which is used to manage patient logistics, administration, patient records, among other information. Table 1 provides an overview of the five organizations and the number of identified workarounds per organization. The number of beds is used as it is the standard way of describing the size of Dutch hospitals, as staff numbers continuously change.

Case	Organization type	Department	Hospital size (#beds)
A	General hospital	Orthopedics and surgery	313
B	District hospital	Urology and cardiology	435
C	District hospital	Urology and pulmonary	474
D	Specialized center	Rehabilitation	112
E	Specialized center	Rehabilitation	61

Table 1. Overview of case organizations

The five healthcare settings were chosen on the basis of their broad range of organizational contexts. Settings B and C are large institutions with rich resources, while D and E represent smaller organizations with less resources and a flatter hierarchical culture. Setting A sits in between. By studying healthcare organizations of different contexts, we aimed at giving an insight into the emergence of workarounds in different types of healthcare organizations.

Data Collection

For our data collection, we used a practice lens (Feldman & Orlikowski, 2011) to study the daily activities of healthcare professionals. We used multiple sources of data in order to enhance the reliability of the analysis (Eisenhardt 1989). The main sources of data for this research are (1) ethnographic observations of healthcare professionals, (2) unstructured interviews with the observed professionals, and (3) semi-structured interviews with team leads, IT managers, and HIS experts. From April 2017 to August 2018, we conducted a total of 22 semi-structured interviews and carried out 16 observations which were accompanied by unstructured interviews. In addition, we organized a workshop with different HIS experts to reflect on our results. To all participants in the study it was communicated that they would be participating in a study on the use (in the case of the healthcare professionals: their use) of HISs in hospitals.

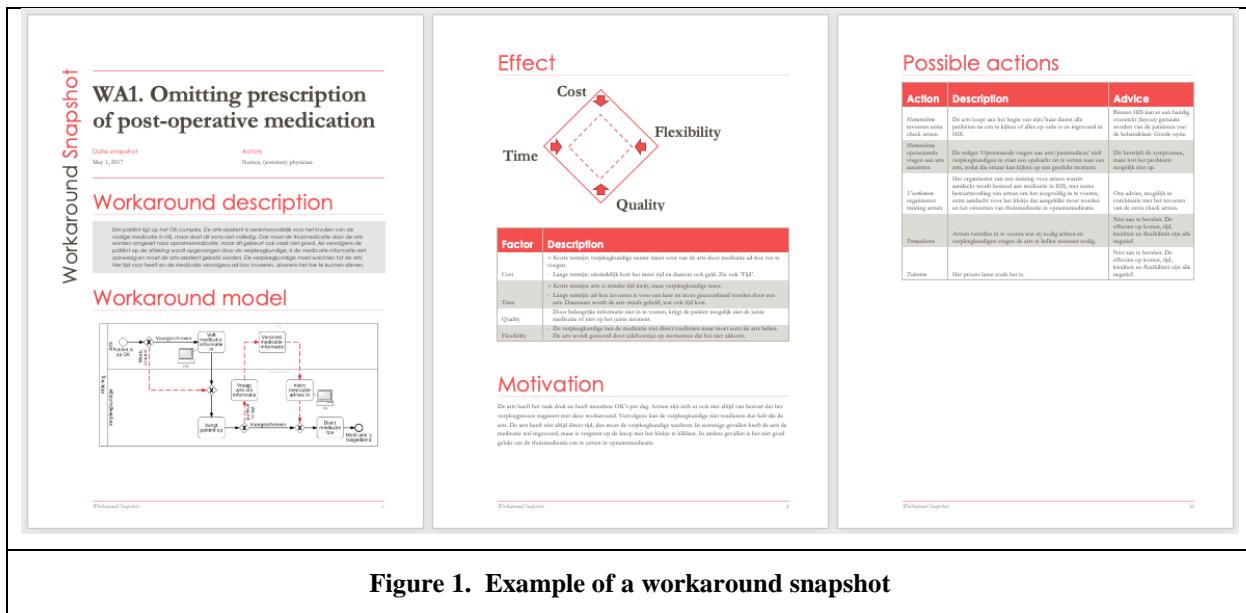
As can be seen in the overview of the different employees we observed and interviewed in Table 2, the study participants performed different roles in their respective organizations. In addition to hospital employees, we also interviewed HIS experts that are employed by the organization that implemented the HISs. These experts hold extensive knowledge of both the HIS and care processes; they often also have a background as healthcare professionals.

Type	Amount	Informants
Observations and unstructured interviews	16 (106 hours)	Healthcare professionals: physicians, nurses, office secretaries, clinical secretary, physician assistant, pharmacist, team lead, therapists
Semi-structured interviews	22 (24 hours)	Team leads, information architect, HIS experts, IT managers and coordinators, care administration employee
Workshop	1	HIS experts

Table 2. Overview of data collection techniques and informants

The interviews were tape-recorded and transcribed and during the observations we took notes. We explained to each of the participants that we were studying their use of the HIS and that we were interested in hearing and seeing what obstacles they come across using the HIS. Each time we observed a possibly deviating practice, this practice was discussed with the team leads and HIS experts to determine whether it was indeed a workaround. In this discussion, we used Alter's definition (2014) of workarounds as a reference. We then dived deeper into the workaround and aimed at finding out: What does the workaround entail? What is the prescribed process and what is the workaround? Who are involved? What is the user's motivation to use the workaround? What is the obstacle they perceive?

We organized the interview transcripts and notes in workaround snapshots (Beerepoot and van de Weerd 2018). The idea of workaround snapshots is to capture a description of the workaround, along with the motivation, the resulting effects, and possible follow-up actions. We determined all of these with the help of the different informants and evaluated them systematically during the semi-structured interviews. Therefore, the workaround snapshots are the outcome of a structured process of discussing the observed workarounds with all those involved. As such, they provide the required input for the data analysis phase. In Figure 1, we provide a screenshot of one of our workaround snapshots. More elaborate examples of components of the workarounds can be found in the original paper (Beerepoot and van de Weerd 2018).

**Figure 1. Example of a workaround snapshot**

Data Analysis

We coded our workaround snapshots and their related transcripts in Atlas.ti. First, all members of the research team separately coded five snapshots, one from each case organization, and compared their codes. Based on this exploratory coding round, we developed a coding scheme together. Second, the first and second author (the coders) both coded three workaround snapshots separately and then synchronized their coding. During this coding step, we developed sub codes and compared them. Next, we coded another two

identical snapshots separately and compared them, which resulted in a mutually satisfactory basis to code the remaining ones. In the fourth step, the coders were randomly assigned half of the snapshots to code. In the final step, each coder checked those of the other. In case of conflict, we discussed the codes until both coders were content. This iterative process ensured that at the end, all snapshots were coded using the same standards and checked by at least one other coder to ensure reliability. Table 3 provides two example codes with illustrative quotes.

Code	Description	Example
Motivation	Motivation for the workaround, e.g. time, costs, and system limitation	<i>System limitation:</i> “Yes there is a shortcut, but not for medication with a varying schedule. [name supplier] had developed that, but they didn’t want to provide it when we went live.” (Information architect, case A)
Power	Statements that indicate who holds power over whom	<i>Physician over Nurse:</i> “This is a bit of a physician’s thing, because if they say “I won’t do it” they just don’t do it. (Nurse team lead, case A)

Table 3. Example codes

For each workaround snapshot, we coded one or more power relations. For example, when it was mentioned in the snapshot that the HIS restricted the user in some way (e.g. by enforcing authorizations that prohibit a nurse making changes) and the nurse responded by enacting a workaround (e.g. by entering text elsewhere), we would describe the power relation using the following sequence: System over Nurse; next, Nurse over System. We visualized this power relation sequence as shown in Figure 2, where the solid line denotes the first event and the dashed line the one that follows.

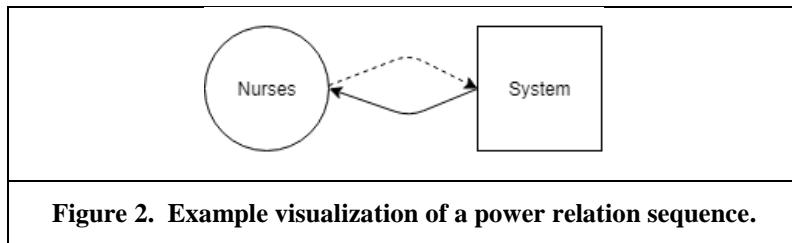


Figure 2. Example visualization of a power relation sequence.

Findings

In total, we discovered 51 workarounds through our interviews, observations, or both. For all workarounds, we analyzed the power relations between physicians, nurses, therapists, secretaries, and the HIS. We represented these in power relation sequences. After analyzing the sequences, we were able to distinguish two main categories. The first category relates to workarounds that emerged from hierarchical differences between actors. One subcategory of this hierarchical difference concerns actors from different actor types, e.g. between a physician and a nurse. The other subcategory concerns actors of the same type, e.g. between nurses. Workarounds in the second main category emerged from HIS restrictions, which cause users to look for alternatives and initiate the emergence of workarounds. These restrictions can either be *deliberate restrictions* implemented in the HIS’s design or *limitations in functionality*, as perceived by users.

Table 4 gives an overview of the range of workarounds we found. It shows typical examples from each type, along with the actors involved: i.e. the *possessor* and *respondent* of power. The possessor is the person who exerts power over a subject, whom we refer to as the respondent. Below, we go into more detail about each of the categories and corresponding workaround sequences.

Workarounds emerging from hierarchical differences			
Actor having power over other actor types	Possessor	Respondent	Example
	Physician	Nurse	Physicians omit registering prescriptions in the HIS, forcing nurses to a one-time prescription which still needs to be approved by a physician.

	Physician	Therapist	Physicians do not search the HIS for a patient's test results, obliging therapists to copy-paste the results to a place in the HIS more accessible to physicians.
	Physician	Secretary	Physicians do not request follow-up actions for patients through the HIS, requiring secretaries to look for the necessary follow-up actions in the consultation summary.
Actor having power over actors of the same type	Physician	Physician	Physicians do not enter a formal request for a fellow physician's council on a patient, requiring the consulting physician to enter the formal order themselves.
	Nurse	Nurse	Day nurses do not draft daily schedules for patients, so that night nurses are tasked with drafting them.
Workarounds emerging from HIS restrictions			
Actor overcoming HIS restriction	Possessor	Respondent	Example
	HIS	Physician	The HIS restricts junior physicians from using functionalities through its authorizations, resulting in them signing in using a senior physician's user account.
	HIS	Nurse	The HIS restricts nurses by not allowing them to sign off the registration of medication for a patient without the consent of a second nurse, such that nurses memorize each other's passwords and enter them when the HIS asks for consent.
	HIS	Therapist	The HIS restricts therapists by not providing them with all required fields for entering certain test results, resulting in therapists using text fields meant for other purposes.
Actor overcoming perceived HIS limitation	HIS	Secretary	The HIS restricts secretaries by enforcing rules on text fields, forcing secretaries to delete certain information from their text fields to make sure that the form accepts their input.
	Physician	HIS	Physicians find the digital procedure related to medical imaging too cumbersome, causing them to print the image and show the print-out to the patient.
	Nurse	HIS	Nurses ignore the portable computers for recording patient checks, favoring the use of notebooks or paper to write it down and then registering them on a desktop computer.
	Therapist	HIS	Therapists enter the patient's first name in a free text field on the cover sheet of the patient's medical record in the HIS, because they prefer to talk to patients on a first-name basis even though this is not the organization's policy.
	Secretary	HIS	Secretaries add symbols to text fields to denote extra information about a patient's consultation, because they rather see the information listed in the overview than having to click through the menus.

Table 4. Overview of the different types of workarounds including an example.**Workarounds Emerging from Hierarchical Differences**

Of all the workarounds, 14 emerged directly or indirectly from one actor possessing more hierarchical power than another. These workarounds can be distinguished from the workarounds in the other groups by their sequence start. This can be an actor having power over an actor of another actor type or of the same type that the actor belongs to. For example, a number of sequences is initiated by a physician having power over

a nurse. By contrast, some sequences include instances of workarounds where actors have power over other actors of the same type, e.g. physicians over other physicians or nurses over other nurses. Figure 3 presents a visualization of the power dynamics involved in workarounds that we have seen emerging from hierarchical power differences. Solid lines indicate the first event in the sequence. Dotted lines indicate subsequent events caused by this event. The numbers along the lines indicate the number of instances we observed of that particular power relation.

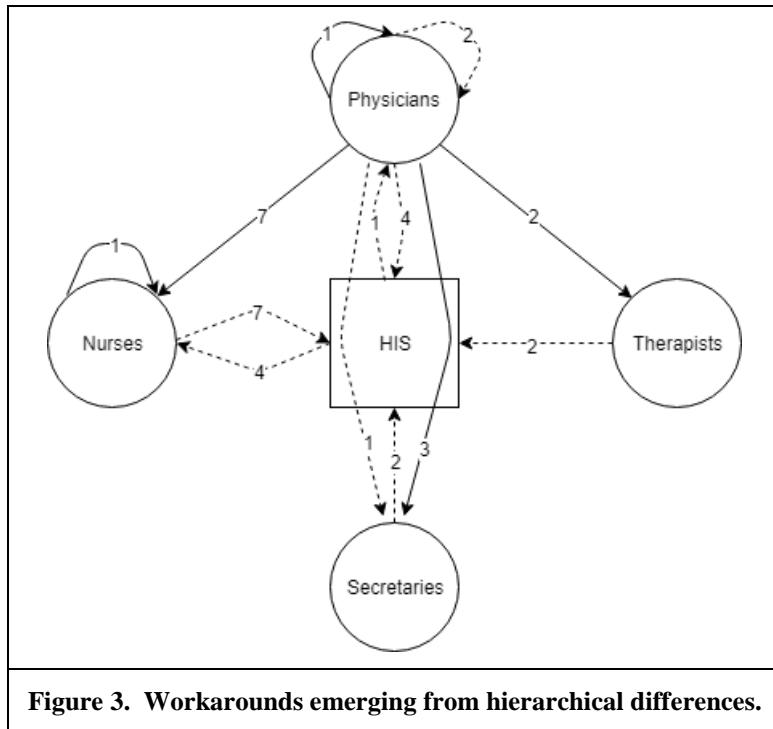


Figure 3. Workarounds emerging from hierarchical differences.

Power Between Different Actor Types

An example of a workaround that emerges from hierarchical differences between different actor types was observed in case organization A. This workaround occurs when a patient is treated in the operating room. Physicians are responsible for entering the necessary medication information for patients into the HIS, but they do not always do so because they are often busy, perform multiple operations per day, and are not aware how their action (or rather their lack of action) impacts the care process downstream. When the patient is transferred to the nursing ward next, the medication information is not present in the HIS. Nurses will typically try to call the physicians to recover this information and find out which medication is to be given to the patient. However, the physicians are often unavailable, since they may be involved in another operation. Therefore, nurses enter and administer the information into the HIS using ad-hoc functionality, which means they administer and register medication that is not approved in advance by a physician. Afterwards, a physician should approve all ad hoc prescriptions and add the complete medication information in the HIS. If this is not done in time, the nurses have to call, administer and register a new ad hoc prescription for the next round of medication. As one of the nurses explains: “*it takes the entire day to get it all in there, before someone can get their medicine. Either you keep administering it ad-hoc... because ad-hoc is only for once. While if the physician would just verify it, it would be in there automatically and he would not need to be called all the time.*” (nurse, case A)

The team lead adds: “*The physician is responsible for that whole area around medication, but they don't do it. Causing the nurses to constantly be confronted with questions about pills, things that are incorrect, the need to make calls, having to go after it. And then the physician says: 'I just got my hands covered in blood, so it's going to take half an hour.'*” (Team lead, case A)

In this example, different power dynamics are at play. Because the physicians fail to enter the medication information into the HIS, the nurses are affected. Nurses cannot administer medication that is not

registered in the HIS and enact a workaround by calling the physician and entering the information into the HIS themselves as an ad hoc prescription. Thereby, they deviate from the prescribed procedure where physicians are expected to prescribe a patient's medication.

Power Between Actors of the Same Type

The second subcategory of workarounds emerging from hierarchical differences relates to power differences between actors of the same type. An example of a workaround in this subcategory was observed in case organization B. Here, physicians of different specialties ask their colleagues for medical advice on a patient. Following the standard process, the patient's main physician should formally request the consultation through the HIS. In this way, the request appears on the job list of the specialty that is consulted for advice. A physician of this specialty can then accept the request and carry out the consultation. However, some physicians that are asked for advice enter the request for consultation in the HIS themselves. As one of the urologists explains: *"I can create it myself. Of course, it's best if people create an order and call us as well. That is the agreement: you ask someone else for advice, so you say: 'I will call you and the request is in there'." ... "But ok, sometimes it's busy and you do that for one another."* (Urologist, case B)

The urologist points out that the normal procedure prescribes that the applicant formally requests the consult through the HIS, but that there are instances where he does not follow the procedure and creates the formal request himself. The IT manager of this particular health institution explains that a hierarchy exists even among physicians themselves. Those lower in the hierarchy sometimes accept the deviations from procedure by those higher in the hierarchy: *"We always say: 'the urologist and the pulmonary physician, those are the boy scouts.' ... "what they should do is shake the lapels of the surgeon: 'I want you to create the request'. The surgeon is way ahead already. You need to confront each other more."* (IT manager, case B)

This quote illustrates that even between actors of the same type, physicians, there are differences in hierarchy. Those lower in the hierarchy (the urologist and pulmonary physician) do not seem to possess the power to confront the other actors (in this case the surgeon) and force them to follow the procedure.

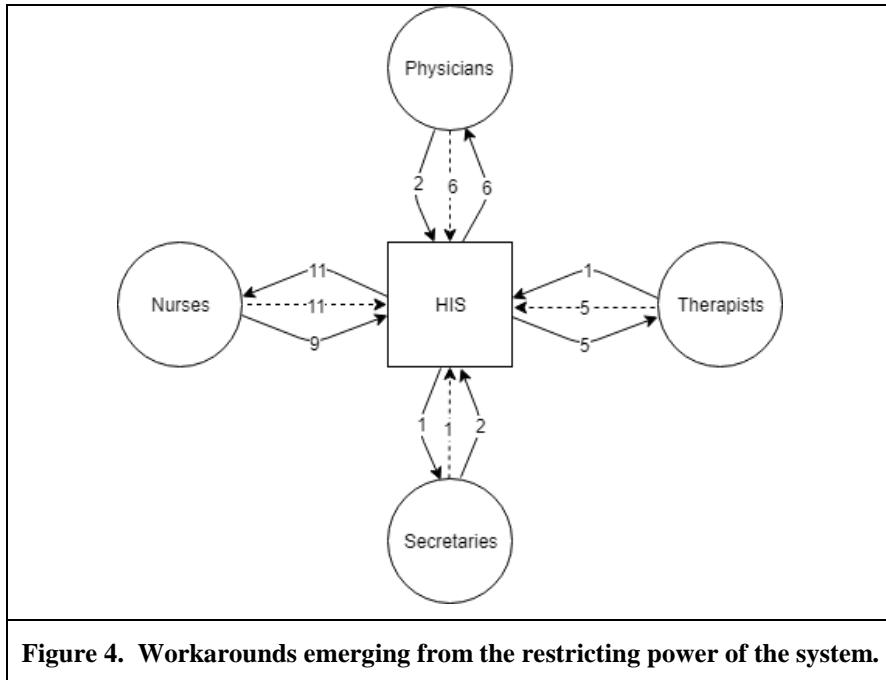
In our interviews and observations, we have noted multiple examples of nurses, therapists, and secretaries bypassing the HIS and prescribed work practices because physicians are unwilling or unable to perform certain tasks. The hierarchical power that some actors have or lack over other actors sets into motion complex sequences of events that end with users of the HIS enacting workarounds. Hence, forms of hierarchical power may result in another form of power. We term this as the 'power to work around': a reaction of actors at the respondent side of hierarchical power. Not only do actors respond to *hierarchical differences* by enacting workarounds, we see the same response to *HIS restrictions*. This is what we discuss in the next section.

Workarounds Emerging from Restrictions

Many workarounds emerge from the power of the HIS to restrict users in some way. Some restrictions arise from the way the HIS is designed by the suppliers; others are determined by the configuration the organization's IT department has chosen out of the possible configurations provided by the HIS supplier. In both cases, the HIS supplier plays a large part in determining the restrictions in place. The workarounds in this main category can be distinguished from the workarounds in the other main category in that actors respond to some type of restriction by enacting a workaround, rather than by a difference in direct hierarchical power.

The first subcategory of workarounds emerging from restrictions is related to users of the HIS overcoming restrictions as designed during implementation. Examples of this first subcategory can be found for all actor types. The second subcategory relates to workarounds that emerge when actors try to overcome perceived HIS limitations, e.g. when they ask more functionality of the HIS than it was intended for. Again, we see examples of this subcategories for all actor types. The difference between the two subcategories is that for the first, we can see a clear HIS restriction in place. Therefore, the first event in the sequence is the HIS having power over an actor by restricting them, after which the actor exerts its power to work around the HIS. The sequences of the second subcategory exist of only one event: an actor exerting its power over the HIS by enacting a workaround. There is no clear, deliberate HIS restriction, but there is a perceived HIS limitation according to the actor. In figure 4, we visualized the different ways in which the restricting power

of the HIS leads to workarounds. The figure shows that this restricting power of the HIS often causes a direct response of the actor trying to cope with the restriction, namely by enacting a workaround.



Overcoming HIS Limitations

An example of the restricting power of the HIS resulting in a workaround was observed in case organization A. During their shift, nurses frequently check the so-called *activity plan*. The activity plan is a list of care tasks the nurses need to complete for each of their patients. During their shift, nurses complete such tasks and may add new ones as well. The tasks need to be carried out at specific times. These times are filled in automatically according to a template in the HIS, as designed during implementation of the HIS. However, these times do not fit with the actual schedule of care. Therefore, the nurses ignore the times and type a new one in the text field. One of the nurses explains: “[The patient checks] are scheduled for 4PM, but they are done at 11AM. We have tried changing it [in the HIS], but the standard template indicates 4PM.” (Nurse, case A)

The nurse is restricted by the HIS in the sense that there is no way to work with times other than the ones listed in the template. The information architect acknowledged that the hospital can indeed not change the configuration of this functionality: “*You cannot configure the activity plan in such a way: during the day shift..., during the evening shift... You need to attach a time indication to it.*” (Information architect, case A)

The HIS restricts the nurse, who in turn comes up with a workaround to deal with the restriction, namely by adding the actual time of the task she carried out in the free text field. The supplier of the HIS deliberately works with templates for purposes of standardization and does not provide the possibility of changing the times.

Another example of a workaround that emerged from the HIS restricting users was observed in case organization E. Here, a therapist has performed a gait image analysis on a patient and stores it in a blank letter. The letter functionality is normally used by healthcare professionals to send a letter to, for example, the patient’s general practitioner. Some therapists use these letters to visualize gait image analyses, since this gives them more freedom to add all kinds of custom visualizations that are not possible in the standard layout for these types of analyses. An example of such a customized visualization is an overview where measurements of the left knee are on the left side and measurements of the right knee are on the right side. One of the HIS experts agrees that this customized visualization in the standard layout is impossible: “*Creating a new layout, that is simply not possible in standard content. Then it would have to be a request*

to [name of supplier]. I think they [therapists] want to achieve something cumbersome, that [name of supplier] will not do." (HIS expert 5)

The HIS is standardized in the sense that standard content is used even though this sometimes prevents users to work in the way they desire or are used to. This standard content is used by most hospitals in The Netherlands and makes the HIS better maintainable for the supplier. Indirectly, the supplier thereby exerts power on the users of the HIS, since they decide on what the HIS offers. A common response of the users is to deal with the restrictions by working around the HIS.

Overcoming Perceived HIS Limitations

Several workarounds emerged not because of an actual, deliberate restriction being in place, but because users try to overcome a perceived obstacle. In our study, physicists, therapists, nurses, and secretaries have all been seen exerting their *power to work around* by enacting workarounds that enable them to circumvent these perceived obstacles. An example of such a workaround was observed in case organization C. Here, secretaries on the outpatient clinic are tasked with preparing the patient-physician consultations. They check whether everything is in order for the patient to arrive (for example whether the blood test results are in). The overview of consultations for that clinic shows table rows with, among other information, the time slots of the day, the patients that are planned for each time slot, and so-called *descriptions*. A description is a free text field that is meant for entering remarks on a patient that do not fit any of the other fields. The outpatient secretaries have come to use this text field in various other ways. Some enter star symbols in the field to mark the ones they have checked. Secretaries are regularly called by other patients requesting to make an appointment and by their use of star symbols they can keep track of where they were when they got interrupted.

Another use of the description field is to mark which of the secretaries planned the appointment. By doing so, the secretaries know who to ask when they have questions about the appointment. In some clinics, they mark the planner of the appointment by ending the description with a number. This number represents one of the secretaries in the clinic. When asked for the reason for recording this number, the team lead (also working as outpatient secretary) answered: *"I have also wondered about that when I came to work here. That was the case. Well, I thought: if that is a sacred cow, then I don't have many problems with it. Let's keep that up."* (Team lead, case C)

In other clinics and settings, people invented similar ways of working. The same team lead continued: *"I know from the general practice where I worked some years ago, they would enter '/' and their initials after each sentence you typed and each consultation you planned."* (Team lead, case C)

Apparently, the secretaries feel the need to tick off tasks and to keep track of the appointments they or their fellow secretaries have planned. The HIS does track which user planned the appointment and which user last changed the appointment, but this information can only be retrieved by browsing through to the extra information behind the appointment. By entering this information in the description field, it appears in the overview of patient-physician consultations, which allows for easy access. Therefore, by providing the user with a free text field, the HIS affords its users to keep individual records. The HIS is now used in a way it was not intended to be used and did not promise to provide for.

Discussion

As stated, in this study, we examined 51 workarounds carried out by various healthcare professionals across five different healthcare organizations. By focusing specifically on the power relations underlying the workarounds, we could distinguish two main categories of workarounds: (i) those emerging from hierarchical differences and (ii) those emerging from system restrictions. Furthermore, we showed how actors *work around the system* in order to reconcile problems that arise from hierarchical and restrictive power. Although the five healthcare settings differed in terms of context and this affected their view towards workarounds and how to address them (Beerepoot, van de Weerd, et al. 2019), the two main categories of workarounds were evident in all five of them.

The different types of power relations underlying workarounds can be further examined using the two types of power relations described in the literature: episodic and systemic power. In the next sections, we will discuss these in more detail and describe how they relate to the workarounds we observed.

Episodic Power and Workarounds

Episodic power is especially evident in the first category of workarounds: those emerging from hierarchical power. Many workarounds are enacted because physicians have hierarchical *power over* other physicians, nurses, secretaries, and therapists. This is a latent form of power, something that exists, rather than the productive force of systemic power. The hierarchical differences observed in this study are testament to the power asymmetry that exists in hospitals (Abbott 1988; Battilana 2011; Currie et al. 2012). Our cases show how actors lower in the hierarchy performed work because those higher up failed to do theirs. Pirnejad et al. (2009) have noted similar findings that involve physicians delaying the prescription of medication, resulting in nurses being held up in their work and forced to call physicians. In the meantime, they would ask patients to use their home medication, take it from the pantry, or from another ward's supply.

As the above example and many of our study's examples show, behavior involving hierarchical power often has consequences for actors *downstream* in the process. Choices made by actors *upstream* (i.e. the first event in the sequence) have an impact on the actions and choices of actors in subsequent events (Drum et al. 2017; cf. Feldman and Pentland 2003). Many of our identified workarounds are part of a sequence that starts with one actor deviating from the procedure, whose actions affect the activities of other actors further down the sequence. In the majority of our cases, the actor upstream was also the actor higher in the hierarchy. This finding is in line with that of Simeonova et al. (2018, p. 13), suggesting that "the deep embeddedness of power results in reoccurring and enduring contradictions rather than resolution and change" and "the way IS are deployed often reinforce power structures rather than emancipate subjects". The examples also show that there is often a recursive relationship between different power relations, since "one person's 'power to' may involve asserting 'power over' many other people" (Clegg et al. 2006, p. 191).

The second type of power that can be classified as episodic power is the *restricting power of the IS*. The IS has in a sense *power over* its users. An IS may restrict its users in their desired work practice by means of the ostensive aspects of the routine; the procedures and constraints *inscribed* in the IS (Gosain 2004). The users can be viewed as trapped in an *iron cage*, similar to the iron cage of oppressive control that bureaucracy brings with it (Weber 1958). Where citizens are constrained by the rules underlying bureaucratic processes, ISs constrain users in a comparable way (Gosain 2004).

In the five cases within our study, the supplier of the HIS largely determines the functionalities that the HIS provides and does not. This implies that the supplier has a substantial influence on the work practices in health institutions, since they "build into the technology certain interpretive schemes (rules reflecting knowledge of the work being automated), certain facilities (resources to accomplish that work), and certain norms (rules that define the organizationally sanctioned way of executing that work)" (Orlikowski 1992, p. 410). Aside from the fixed design of the HIS, there is a layer on top of this that can be customized by the hospital. Hospitals are encouraged to stay as close to the supplier's recommended *best practices* as possible. Organizations using all kinds of ISs other than HISs are pressured to use system configurations based on best practice processes (Gosain 2004). Thus, suppliers largely influence and control the use of these systems, effectively guarding the iron cage. In other words, a system's *power over* users in fact represents the power of the supplier in situations like these.

Systemic Power and Workarounds

If users perceive an IS to be too restrictive and leading to obstacles in their work practices, they start working around the technology (Malaurent and Avison 2016). Previous studies have shown how a difference between top-down requirements and bottom-up needs often results in a misalignment of ISs and the work practices they are built to support; this causes users to enact workarounds (Azad and King 2012; Huusonen and Vakkari 2013; Malaurent and Avison 2016; Markus and Tanis 2000). Our study supports these findings and shows how there is a common dual relationship between the HIS and its users. Physicians, nurses, therapists, and secretaries alike are first constrained by the HIS through its episodic *power over* its users, after which the users exert their *power to* work around. The user is allowed to exercise agency by deviating from the procedure (Boudreau and Robey 2005). The power to work around is therefore a systemic power, a productive force which implies agency of the possessor, rather than the more latent form that is episodic power.

All actor types in our study have been seen exerting their power to work around the IS. Possessing the power to work around can be seen as a means of breaking out of the iron cage (Huusonen and Vakkari 2013).

Contrary to the idea that users are trapped by the designers of the IS, the existence of this power suggests that users are active agents that can appropriate the IS to their own needs. They enact workarounds to better fit the IS to their work practices (Azad and King 2012; Hovorka and Germonprez 2010). Workarounds are in this sense a form of empowerment of users. Again, there is a recursive relationship tied to these power relations, similar to that of the *power to* and *power over* recursion. Empowerment of users inherently means disempowerment of the system (Clegg 1989).

The two types of HIS restrictions that we distinguished – actual restrictions and perceived limitations – loosely correspond to the two types of ERP misfits as described by Strong and Volkoff (2010): deficiencies and impositions. *Deficiencies* “are problems arising from ES [Enterprise Systems] features that are missing but needed”, whereas *impositions* “are problems arising from the inherent characteristics of an ES such as integration and standardization” (Strong and Volkoff 2010, p. 737). Van den Hooff and Hafkamp discussed these in the context of workarounds, arguing that “imposition misfits will likely lead to workarounds that entail changes in technology use, whereas the perception of deficiency misfits will be related to workarounds in the form of adaptation of routines” (2017, p. 14). In our study, we observed actors overcoming HIS restrictions (i.e. imposed misfits) and perceived HIS limitations (i.e. deficiency misfits). In both categories, we have seen examples of changes in technology use and adaptation of routines.

Hierarchical Power, Restricting Power and the Power to Work Around

In Figure 5 we illustrate the three forms of power involved in the emergence of workarounds: hierarchical power, restricting power and the power to work around, and how they compare to the episodic *power over* and systemic *power to* discussed in extant literature. The episodic hierarchical power is evident in the relationships between different actors. The other type of episodic power, restricting power, is the means of the supplier to influence work practices of actors through the IS. Both hierarchical and restricting power can result in actors exerting their systemic power to work around the system.

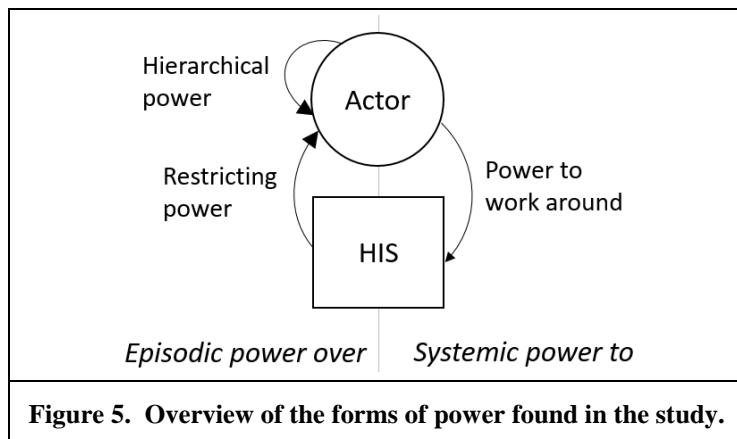


Figure 5. Overview of the forms of power found in the study.

Practical Implications

The findings that IS users respond to hierarchical differences and restrictions by enacting workarounds both have practical implications for the design and use of ISs within organizations. Although addressing hierarchical issues in healthcare organizations remains a sensitive subject, the workarounds emerging from hierarchical differences may possibly be prevented by creating awareness of the effects one person's actions have on others downstream. For example, our study shows that physicians are often unaware that the care process of nurses stagnates when they do not enter a patient's medication information in the HIS. By making them aware of the consequences of their actions and rewarding them for improving their work practices, the efficiency and quality of care may improve.

Suppliers may use the findings of our study by taking into account that many workarounds emerge from IS restrictions. When they try to enforce too much control in the form of restrictions, they may achieve the opposite effect. Our study shows that workarounds often emerge from restrictions, perceived or real, and they inherently result in decreased control (Ignatiadis and Nandhakumar 2009; Lapointe and Rivard 2005). Therefore, designers of IS need to search for a balance between restricting users – thereby achieving

control – and giving them the functionalities and freedom that they desire – thereby preventing them from enacting workarounds. Moreover, decision-makers would need to distinguish between those practices that work around deliberate restrictions and those workarounds that arise from perceived limitations. Overstepping deliberate restrictions might have dangerous consequences, whereas workarounds emerging from perceived limitations might not be as harmful. Both types, however, could indicate processes that need redesigning (Beerepoot and van de Weerd 2018).

Limitations and Directions for Future Research

This study has a number of limitations. We only studied cases from the healthcare domain, focusing particularly on healthcare organizations in the Netherlands. Since the healthcare industry is known for the commonality of power dynamics and hierarchical differences (Perrow, 1965; Robinson, 1997), this was a particularly suitable context for our study. However, the forms of power may not be as evident in other domains. We expect similar patterns in other domains that have standardized ISs and highly hierarchical structures. Future research may support whether workarounds in different domains emerge from the same power dynamics distinguished in this study.

Second, in our study we focused on power dynamics that we encountered during our observations and interviews. We did not specifically consider governance and regulatory frameworks that are used in healthcare, although we do discuss how participants are restricted in their activities by the IS. An interesting future research direction would be studying the specific role of such governance and regulatory frameworks in relation to workarounds and how they can influence the frequencies and types of workarounds used.

Regarding the data collection, we identified all workarounds through interviews and observations; i.e. exclusively using qualitative methods. We do not expect to have achieved saturation in terms of the workarounds enacted in the departments studied. The qualitative identification of workarounds may be supplemented by quantitative methods of workaround detection, such as process mining (Van der Aalst 2011), a set of data analysis techniques that take event logs drawn from ISs as input and is used for process analysis. Although some research has been done on detecting workarounds using process mining (Outmazgin and Soffer 2013), many types of workarounds cannot yet be detected using data analysis techniques. This provides a highly relevant area for research to come.

Last, we have come to our theoretical findings only after finishing our data collection. Hence, we did not reach theoretical saturation in our data collection. However, we repeatedly encountered the categories of power relations distinguished in this study across several actors. Future research may reveal whether the same findings surface when our framework of categories is used *a priori*. A possible extension of our framework could focus on the relationship of the power dynamics with the motivations of actors to enact workarounds and the consequences thereof.

Conclusion

The aim of our study was to reveal how power influences the emergence of workarounds in HISs. We examined this issue by analyzing 51 workarounds in terms of the power dynamics involved in their emergence. Our analysis resulted in two main findings. First, workarounds emerge as a response to episodic power. We distinguished two types: those workarounds that emerge from hierarchical differences and those that emerge from HIS restrictions. The second main finding is that workarounds emerge when actors use their systemic power to work around the HIS. This often happens in response to the two types of systemic power described before. The forms of episodic and systemic power involved in the emergence of workarounds are tightly related; the workaround sequences show how episodic power, in the form of hierarchical differences and HIS restrictions, are directly or indirectly followed by systemic power, in the form of workarounds. The power to work around can be seen as a means of breaking out of the iron cage, in the sense that actors are empowered to circumvent the restrictions as put in by the supplier. Although these restrictions are often inscribed in the HIS to achieve a certain level of control, too many restrictions may achieve the opposite: users will start enacting workarounds that are difficult to control.

Our contributions lie in unpacking the link between power and HIS usage. We drew on the literature on episodic and systemic power to explain which power dynamics are involved in the emergence of workarounds. We showed how actors respond to hierarchical differences between actors and to HIS

restrictions, terming their activities as proof of the *power to work around*. Thus, power within the use of HIS is not one-sided, but is a recursion of *power over* and *power to* dynamics.

This paper provides a first step towards understanding the relationship between power and workarounds in HISs. We propose that power relations between actors and the HIS can be exposed by tracing the sequence of events that precede the emergence of workarounds. However, it remains difficult to mitigate harmful issues of power, since it is often regarded as a sensitive subject. We hope this study can aid in addressing these issues, thereby improving work practices and the quality of patient care.

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