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Abstract
The present article describes the informatization process of a hospital service, taking as an example the implementation of a prescription writing software. This tool allows doctors to prescribe via computer the pharmaceutical regimen to be prepared and dispensed by the nursing personnel. The ethnographic study in the hospital service describes the introduction process of this tool from the perspective of the daily activities of the nursing staff. The article highlights a number of difficulties the users are facing and describes the solutions they create, in particular the "compensation strategies" they develop for turning the tool operational, reliable and efficient. The article also shows that the compensation strategies the users are creating *in situ* are partly invisible for the designers of the software. Distant from the daily activities of the users, the software designers neither perceive the problems involved with the use of the product, nor do they perceive the locally created solutions. They ascribe the performance of the tool to the quality of its conception and possibilities of improvement. This article invites the readers to reflect about what turns an information system efficient and effective and about the lessons learned for the conception of these tools.

Keywords
Information system, hospital, compensation, invisibility, equipment

Introduction

The conception and implementation of information systems is an activity of increasing importance in the information society. The number and diversity of applications reach today almost any production and service activities, including the public health domain (YASNOFF et al., 2000). A variety of methods (development cycle[1]) are used by the designers in the conception of information systems, and in the literature one can find a great number of different methods for aligning the systems with changing demands (TAYLOR, 2003; WAGER et al., 2005). Investigations however reveal that, despite all these conception, development and divulgation activities, the new information systems are subject to difficulties and failure (SAUER, 1993; LYYTINEN et al., 1999; HEEKS, 2002; TAYLOR, 2003; GOLDFINCH, 2007). Those, who promote the implementation of these new tools face resistance from the part of the users, who in

turn complain about failures in the conception. Many authors explain the observed failures of the system with the supposed reluctance of the actors to accept changes and the new (PIDERIT, 2000).

Specialists in social sciences interested in innovation processes and technical change in scientific fields such as history (SMITH et al., 1994), sociology (KLEIN et al., 2002; WILSON et al., 2002; COUTARD et al., 2007) and principally economy (ALBERTO et al., 2008), describe the reasons and the rationale of the users and explain the rejection attitudes. According to the synthesis of HACKETT et al., 2007, the failures would be due to problems involving both the designers (HIRSCHHEIM et al., 1999) and managers of the change as well as the users. Thus, it is the concrete, individual and collective action, which explains the success or failure of an innovation (CALLON, 1986; BERG, 1999; ORLIKOWSKI et al., 2001; LATOUR, 2005) and not the intrinsic qualities of the innovating object or the social characteristics of the users and their perception of the innovations (CHIASSON et al., 2001).

This article analyzes the problems the actors are facing with the implementation of a new computerized information system and the solutions they develop; it observes the way the users deal with these difficulties, in particular the "compensation strategies"[2] (FERREIRA, 1998; PINHO et al., 2003), and the "equipment"[3] of the objects. The problem is of twofold importance. On one hand, the conception and introduction process of the new tools is less efficient than the designers believe, thus needing to be improved. On the other hand, some good performances have been obtained *in situ* and this is in part owed to the compensation work done by the users. Such compensation work however can reflect negatively upon the work of the users, their wellbeing or health (FERREIRA, 2000). This article analyzes a typical situation in the process of constructing compensations in information systems using the example of a medical prescription writing software in a hospital service. The article characterizes the "compensation work" developed by the users and describes the consequences of the "invisibility" of this work (SUCHMAN, 1996) for the conception and re-conception of these tools.

Going beyond the specific case of this medical prescription writing software, this study asks in general terms what makes a computer-based information system efficient. It strongly suggests considering the utilization strategies developed by the users, knowing that they are not easily visible and thus demanding for special attention, observation and analysis. The first part of this article exposes the conceptual framework characterizing the theoretical approach of this research. The second part refers to the field, in which the research was conducted and to the adopted ethnographic strategy. The third part considers the data and materials produced in the field investigation. Due to the ethnographic nature of this research, the produced data are essentially qualitative and circumstantial. In the third part, the article discusses the data resulting from the observation extracting their theoretical and practical meaning. In the conclusion, the authors highlight what they consider the essential lessons learned from the results of this research.

Theoretical framework: from sociology of innovation to the notion of equipment

For studying the introduction of a new information system in the context of a hospital service, this investigation mobilizes the theory of innovation (LATOUR, 1987) that suggests following the *actors* and the activities they perform in practice. Following the spirit of the Actor-Network Theory (CALLON, 1986; LATOUR, 1987), the analysis also sought to consider the *non-human entities* involved in the action. According to the ethnography of the conception process (VINCK, 2003), the investigation paid special attention to the *intermediate objects* (VINCK et al., 1995), e.g. to all material entities produced and mobilized in the process. The actors construct socio-technical networks mobilizing and shifting human and non-human entities, negotiating and redefining their roles and relations. From this perspective, the integration and efficiency of a new technology depend on multiple articulations (BERG, 1999) constructed and established among the different actors and the multiple intermediate objects whose interrelatedness constitutes common activity. The Actor-Network Theory introduces a series of concepts to the analysis of information systems allowing not only an individual analysis of the technology on one hand and of the social system on the other, but of the socio-technical systems as such (ORLIKOSWKI et al., 2001; HANSETH et al., 2004).

The concepts of *articulation* (FUJIMURA, 1987) and *invisible work* (SUCHMAN, 1996) taken from the tradition of symbolic interactionism and situated action analysis help studying the day-by-day work of the nurses, aimed at delivering quality healthcare service. The actual activity is never restricted to the tasks prescribed by the organization or profession. The concept of *distributed cognition* (HUTCHINS, 1995) is also of help in the study of the mechanisms that expand the cognitive capacities of the individual.

The sociologic tradition of ergonomic work analysis (GUÉRIN et al., 2001) calls our attention to the details in an individual's work activities for managing priority conflicts, information flow, conflicting demands, complexity of interpersonal relations and the *variability* of work situations. The ergonomists propose the concept *regulation* for talking about the individual and collective management of variations in the external and internal conditions of an activity and the control of their effects. According to FAVERGE (1992), the regulation process structures the activity of the workers in such a way to be satisfactory for the individuals and for the organization. Regulation means resistance against certain demands, search for equilibrium, self-control and the development of "*compensation strategies*" (FERREIRA, 1998, 2000; PINHO et al., 2003). In the area of sociology of work, regulation also means production of autonomous rules (REYNAUD, 1989) by the work collec-

tives. Such rules differ from the *control rules* prescribed by the institution, sometimes via working tools. In this study we consider the individual and collective strategies of the actors, the learning process, the regulation mechanisms and all kinds of transformations (in particular on the level of support for the practices).

Finally, based on different studies in the domain of conception and innovation of which this study makes part, we propose an original concept of the term *equipping* for referring to the activity of the actors that consists in adding elements to the intermediate objects (traces, symbols or physical modifications). The resulting "equipment" consists of elements conducted by the objects themselves, modifying their nature and giving new use to them.

An ethnographic approach to the study of common activity

According to a research tradition in the field of sociology of innovation (LATOUR, 1987) an innovation process should begin with the study of a demand expressed by a customer, reformulation of this demand negotiated with the data-processing experts, analysis of the design process and validation of the tool. By following the informatics professionals and the tools they introduce, the researcher would end up finding the users, their reactions to the tool and the use they make of it (AKRICH, 1995; EDGERTON, 1998).

However, the sociology of work and ergonomics (GUÉRIN et al., 2001) make us apply an approach based on the common work situation of the nurses in face of the introduction of a new information system. In other words, what we are taking into account is the perspective and the practices of the users. In contrast to the sociology of innovation, this approach does not address the viewpoint of the innovators, who determine the use of the tools, the designers and the installation personnel. The approach consists above all in considering a productive activity under the influence of information systems and other management tools. To the contrary of what it may seem, in the context of hospital services the utilization of information systems does not make part of the routine activities. Although the medical personnel uses electronic patient records and examination results anchored in computer-based equipment, certain actors use the information system only during a few minutes per day. Thus, the present study is aimed at analyzing the common activity, many times only very remotely linked to the data processing tool. The techniques and their use are learned on the basis of a set of practices not necessarily connected with information systems.

This way of action demonstrates that the information the actors need for their work is spread over multiple supports and interacting users. Therefore the data processing tool must be integrated to the work situation. Within the system, the tool is only one element among others. For understanding the integration of the system we study the practices of the different actors, independently from their professional category or position in the organization. We seek to understand the diversity of tasks and activities, the diversity of proposed information systems, the diversity of applications and the variability of the practices and the experiences made with the tools. This way we can approach the division of knowledge, the coordination of the activities, the individual and collective strategies, the learning of these strategies, the regulations implemented by the actors and the transformations they make in the working tools.

The ethnographic research started with interviews held in the end of 2002 and with observations conducted during five months in the year 2003. The investigation combined open observations and observations of specific situations such as the daily medical visits[4], change-of-shift meetings and meetings with the informatics personnel. These interviews were complemented with interviews with different individuals, sometimes from outside the hospital setting, intervening in the hospital service: pharmacists, social worker, psychologist, secretary, nutritionist, informatics support personnel and nurses' representatives. The ethnographic study also includes assisting one day or one night shift of determinate professionals: chief nurse, nurse, nursing aids, residents etc. The list of items to be observed includes the activities, the interaction between the actors, the objects utilized and the actual practices. The observations were recorded in a field research diary. The research project also foresaw informing the actors of the observed services about the intermediate results obtained. This feedback created an excellent opportunity for discussion, resulting in new agreements with respect to the work organization and utilization of the tool. Finally, a complementary research was conducted in 2008 for checking the certain observations produced in 2003.

In the results we characterize the studied field and describe the difficulties the professionals face as well as the reasons of these difficulties. We also characterize the strategies developed by the professionals for dealing with these difficulties and turning the function of the system reliable and efficient.

In the field: a hospital care unit

Approximately fifty persons are working in the service of a great public university hospital in France, where this study was carried out. They are responsible for delivering care to mostly old-aged and dependent patients suffering from lung cancer, many of whom die during treatment. The unit is known as being open to new information technologies, a kind of pilot-unit receiving visits from physicians or informatics personnel from other hospitals.

The unit is divided into two parts: the outpatient unit receiving outpatients for chemotherapeutic treatment (10 beds) and the inpatient unit, where patients are hospitalized and stay for several weeks according to their case (14 beds). The staff considers the work in this unit psychologically hard to bear but to the type of disease, the dependence of the patients, the deterioration of their health status and the high death rate.

In 2003, the clinical team was composed by eight physicians, including residents and trainees, and by the care personnel: 1 chief nurse, 13 nurses, 10 nursing aids, 5 trainees, physiotherapists and 1 psychologist attending part-time. Finally, the team included 7 health and hospital agents, 2 secretaries, 1 social worker and 4 volunteers. In addition, the unit occasionally received the visit of a nutritionist and pharmaceutical assistants for evaluating the pharmaceutical stock of the service.

The tool: a medical prescription writing software

Special attention was given to a medical prescription software allowing the doctors to prescribe via computer the pharmaceutical regimen to be prepared and dispensed by the nursing personnel. The system serves in principle as a link between doctors and nurses for written transmission of the prescription, edition of the Plan for Drug Administration, validation of the drug administration and for the follow-up of the therapy by the doctor. This computer tool offers the possibility of a rational programming of nursing activities and helps in the distribution of drugs for being more legible. The objectives of the system desired by different actors are to ensure meeting the regulations of good medical prescription practices (written prescription including the name of the patient, name of the doctor, date and signature); improve the quality of the prescription by alerting to drug interactions and incompatibilities; reduce transmission mistakes through clearly legible records; improve the management of the pharmaceutical stock; ensure the traceability of the pharmaceutical therapy.

The implementation of the system implies in generalized use of the tool by the different professionals and in the different stages of the process, including those ideally performed on the bedside. This will involve desktop computers, laptops transported on trolleys, notebooks and an antenna network in the unit corridors to connect laptops to the hospital's computer network.

The software must also be able to interface with all the equipment in the healthcare unit and with other computerized systems within the hospital so as to enable data import and export related to the administrative services involving the patient, authorizations, distribution of digital identifyiers and passwords, the pharmaceutical database, drug interactions and incompatibilities, management of the pharmaceutical stock, etc. The application of the software also presupposes that doctors and nurses are capacitated for using the software and that technical support is available for the users in case of difficulties or failure.

Our observations in 2003 demonstrated that the software was used intensely and systematically, confirming the reputation of the unit of being open to new technologies. The doctors made their prescriptions, modifying them according to the evolution of the patient. The nurses accessed and printed the therapeutic regimens and the Plans for Drug Administration and validated them after administration of the medicines.

Figure 1 - Trolley to transport notebooks, 2003.

Figure 2 - Trolley to transport notebooks, 2008.

Figure 3 - Trolley to transport notebooks, 2008.

The Head of the Department showed interest for the computer-based prescription writing during a long time and contributed to its development. In 1996, the unit had already served as test site of a medical prescription software. Thus, the adoption of the new, more efficient software was easier, in part because the personnel had already experience with this kind of software but also because old conflicts regarding oral prescription cold be solved and the "social peace" between doctors and nurses had been established again.

An information system seen from the perspective of conflicting professional logics

The information system poses strong restrictions to the doctors, obliging them to strictly follow the regulations and good practices. If the prescription is not correct, the tool will not validate the prescription electronically. The nurses consider the computer-assisted prescription more legible; it frees the nurses from having to decipher the handwriting of the doctor or to memorize the name of a medicine passed to them in the corridor or by phone. As the head of a service observes: "With this software we nurses have a proof of the medical prescription and thus we are covered."

The system also makes the doctors rationalize their prescription, turn the information (time of administration and doses) more precise and consider drug interactions. In addition, the system limits the list of medicines to those available in the pharmaceutical stock of the hospital and avoids that a drug is not found because its name is written incorrectly. Another problem appears when patients complain about the lack of certain medications they are used to take, while the central pharmacy does not replace them in the database, or for being considered inefficient or because less expensive equivalents are available.

The pharmacists, refusing to follow the commercial logic that results in a multiplication of medicines frequently representing mere variations of the same product, limit the list of medicines available to the doctors. One doctor concludes: "It is not the mission of the tool to satisfy all desires". The system is thus a place of confrontations between different professionals (doctors/pharmacists/informatics personnel) and professionals and patients. The nurses on the other hand, day by day confronted with the demand and suffering pressure from patients and their families, defined tacit rules with respect to accepting certain solicitations. Their professional logic integrating moral support to the patient enters in conflict with the restriction efforts expressed by the system.

The doctors use the system as a resource in their negotiations with the nurses and try to refuse "satisfying a request, which is on the limit of the scientific", as one of them put it. The system is used for guiding the user in some practices or for forcing them to abandon other current practices. This is part of a control regulation in confrontation with an autonomous regulation, not only with regard to the relation between doctors and nurses but also as refers to the question of how a request of patients and families will be dealt with.

The tool also presents some limitations that are known and pointed out by the professionals: the fact of not allowing the prescription of chemotherapies although in the observed unit this therapeutic measure corresponds to more than half of all prescription activities; the absence, in 2003, of interfaces with other computerized systems in the hospital for allowing access to results, making it necessary to consult the records on paper. In addition, the doctors, used to "prescribe everything" (in the words of a doctor) accuse the tool of not facilitating their work, for example prescription of an additional pillow or blanket, the plum compote, the bandages, the food products making part of the diet, the special devices and aids, the clothing, the visit of the psychologist and even the messages directed to the nurses like "happy birthday" or "please let my family in". The fact that the professionals are making reference to these limitations characterizes much more the desire to have more efficient systems than rejection.

The difficulties and the solutions created by the users

Let us now return to the analysis of the difficulties related to the utilization of the system and of the strategies developed by the users for adapting the system. The prescriptions are generated and transmitted via computer and daily updated by the doctors. Mistakes however are unavoidable. The reason for this, according to a nurse, is that "the doctor does not know how to use the software" and thus he must be asked to "check his prescription". This means that he will have to check if the prescription in the computer really corresponds to what he wanted to prescribe and, in case of mistakes he will have to write his prescription again. Sometimes the doctors forget to validate their prescription. In other cases, the doctors receive error messages they do not know how to interpret.

Once the prescription is established and electronically validated by the doctor, the nurses can access the prescription from their own computer in order to prepare the medication. The tool displays a variety of images and different pages for individual printing as showed below:

- A list of patients including date, hour, name of physician and a field for validation. This list is consulted on the screen for identifying the modifications.

- A summary of the treatment regimen for each patient, including the list of prescribed drugs, the route of administration of the drug, the galenic formula and distribution over the day, the posology and duration of the treatment. This document is printed and exposed in the patient's room.

- A "Plan for Drug Administration" including the list of prescribed drugs, route and hour of administration. It also indicates the number of tablets, capsules, flasks,

units or devices to be administered. This Plan is printed every day by the nurses serving as a basis for the preparation of the medicines and during the administration of the therapy for indicating if the medication could be administered or if the patient refused it.

Immediately after the printing the nurses examine the Plan and insert manually a series of modifications. They may highlight certain items, change the time of administration and complete the plan with other observations. For example, a nurse will not allow that a drug figures twice in the list, thus avoiding a misinterpretation by another nurse, who could understand the repetition of the drug in the Plan as two prescriptions instead of one prescription extended to the next day. This way of action allows avoiding possible incidents by preserving only the pertinent information in the Plan. "The prescription is not always very clear", explains a nurse.

The nurses also complete the Drug Administration Plan when, for unexplained reasons, the medical prescription doe not appear in the printed version. We also observed that sometimes some information (the name of the patient or the route of administration) appears highlighted in the Plan.

The nurses sometimes modify the time of administration of the medication. If a medicine is prescribed for 6:00 p.m. it will be administered at 4:00 p.m., shall say in a moment when two nurses are available. One of them will be in charge of dispensing the medicines and the other will care of the other patients. The work is organized according to the availability of the personnel and not according to what the Plan determines. The nurses organize themselves according to the "weight" of the patients, to the kind of care to be delivered, to the possible "economies of scale" (working scales per kind of action) in an attempt to deliver integrated care to the patients. Certain actions must be performed together and be coordinated. The time for drug administration in the Plan is determined by the doctors, who do not know how the nurses' work is organized. Thus, the printed Plans are corrected, complemented and highlighted and the nurses indicate in the Plan if the medication was administered. This way, say the nurses, transformed and equipped, the computer-assisted prescriptions become more legible and practical.

The nurses still have to deal with another problem: The variable time lag between the generation of the prescription by the doctor and the availability of the prescription on the desktop of the nurses. Sometimes this takes one hour sometimes they have to wait one day. Whatever it is that causes this problem (perhaps doctors and nurses have not understood the logic of the system), the important thing for the actors is to avoid mistakes in hospital care actions as a result of the functioning of the information system.

Below we give some examples of local solutions developed by the actors: a doctor prints the Drug Administration Plan and passes it to the hands of the nurse in order to keep her informed about the modifications he made in the Plan; another doctor considers that printing the Plan is not part of his work and that the nurses should print it several times a day for keeping up with the modifications that appear during the day. In the opinion of the nurses, however, this kind of organization would result in a series of problems. Sometimes the professionals gather around the computer in order to construct information that can be shared among all because the electronic transmission alone is not sufficient. A nurse asks a doctor to confirm the interruption of the therapy of a patient while the modification of the Plan does not appear on the screen. In other words, the nurse uses a circuit different from the information system to verify some information she had heard of.

The same way, the doctors reinforce verbally the modifications in the Plan already available on the screen. This parallel verbal communication is to ensure that the information circulates and will be considered quickly. The nurse takes note of the modification, first on a sheet of paper she puts into her pocket and later, manually in the Drug Administration Plan. She also communicates the modification verbally to he colleagues, in the corridor or in the change-of-shift meeting. This way it is ensured that the team of nurses took knowledge and will consider the modification. The medications for the next 24 h will be prepared on the basis of these corrected and adapted Plans. Later, during the administration of the therapy, the nurses will take notice manually if the medication was administered, if the patient refused to take it or other occurrences. Thus, the nurses validate the prescription in real time on paper. The electronic validation is performed later. In addition, electronic validation in real time is impossible when, due to organizational reasons, a drug foreseen for 6:00 p.m. is administered at 4:00 p.m. because the system would only accept validation after 6:00 p.m.

The "equipment strategies" five years later

In 2008, five years after the first investigation, it was observed that certain attitudes changed but other ways of acting created by the users continued the same. The hospital unit passed through a crisis that resulted in a strong reduction of human resources and substitution of ¾ of the personnel. The lack of physicians resulted in even less time for interchange of information increasing the communication problems between nurses and clinical staff. As refers to the tool, new software was introduced reducing the importance of transmission of information on paper. The nurses have access to more information via computer. Different laptops are available in the units. The prescription writing software was improved; chemotherapeutical prescriptions and other functionalities such as prescription of controlled drugs were included. The nurse can also adapt a prescription according to a given situation.

In general terms, the unit became much more dependent on the information systems and more susceptible to failures than in the past. The verbal transmission of information in addition to the information

system remains unchanged. The Drug Administration Plans are still printed and manually adapted, for safety or for practical reasons, although younger nurses intend to abandon this practice. In practice, although now having laptops on their medicine distribution trolleys, the nurses continue their comings and goings between screens or between screens and papers. These professionals complain that they are spending a lot of time dealing with the information system but at the same time they admit that they hardly could work without it. Several problems pointed out five years ago continue unchanged (the time lag between the computer-based prescription and the availability of the prescription on the desktop of the nurses; divergence between the prescription appearing on the screen and the Drug Administration Plan) while others could be more or less solved by improving the tool (for example the possibility to validate the administration of a medicine before the foreseen time of administration).

After all, why does it work?

Seen from outside, shall say, from the viewpoint of a doctor distant from the daily activity of the nurses or from the perspective of the informatics service, it may seem that "it works": the tool is widely used and presents a great number of advantages and only a few problems.

An ethnographic observation however reveals a number of dysfunctions: a timetable that does not combine with the organization of the hospital care delivery; prescriptions that do not appear or delay to appear or appear in double on the same paper; not foreseen medicines;

The printed version of the Drug Administration Plan comprises several pages without repeating the titles of the columns in the beginning of each page; mistakes in the transmission of information by the information system (perhaps due to wrong manipulation of the tool). The dysfunctions are due to divergences between the foreseen functioning and what actually happens and can be explained by the difference between *utility* (prescriptions meeting the legal requirements, legible prescriptions) and *usability* (effective transmission of information, generation of operational support - FERREIRA, 1998).

These divergences are associated with three factors: *the challenges inherent to the work*: in our case administration of the medicines at suitable times but in accordance with the prescription; *work-related restrictions*: in our case reliability and traceability of the service; *the socio-technical conditions for the execution of the tasks*: punctual use of the computer in the course of a common action, in which the presence of the computer would normally be insignificant.

The investigation shows that the actors a facing several "minor" problems related to the utilization of the system, not because they are reluctant to accept the change or the new information technologies but because of the real divergences between the resources the tool offers and the demands of the daily practice. The dysfunctions however do not make them desist. Instead of rejecting the tool, they try to "get along" with it, get used to it (memorizing passwords, transforming old habits), adapt their organization and transform the tool, at least marginally. The actors correct and complete Drug Administration Plan after the printout (highlighting, underlining, correction, etc.) and during the administration of the medicines. These corrections represent a *regulation activity* consisting in prevention and correction of mistakes through the creation of *compensation strategies.*

These strategies include the construction of original objects and practices which, combined and complementing each other, lead to a satisfactory result from the perspective of the actors. The strategies they invent turn their work at the same time more reliable (in terms of care quality) and more bearable (in terms of personal emotional stability). By "equipping" the Drug Administration Plan with observations, they transform this intermediate object into action equipment. Thus the actors adjust the support produced by the computer by highlighting certain information in the Drug Administration Plan and give a hierarchical organization to the information different from that in the printout but according to their work situation. They also complement the tools for a new work, for example verifying the printouts for identifying and correcting mistakes. This activity consists in regulating the effects of the opacity and difficult control of the data processing tool. This compensation strategy rests upon an attitude of inter-individual cooperation, constituting a new procedure of the work collective. It is like a professional rule constructed by the actors for ensuring the reliability of their work.

The "equipment" of the intermediate objects (the printouts) and the duplicated information transmission are strategies developed by the actors that make all this personal and collective efforts visible, in special when introducing a new element like the modification of a prescription. The doctors develop strategies for communicating modifications to the nurses and the nurses transmit the information verbally and on paper to the doctors. They "compensate" the system in order to increase the safety and allow the colleagues to anticipate action. This collective effort to "equip" the action is related to their awareness that mistakes can occur.

The uneasiness in relation to the information technology makes the professionals verify once, verify twice, print, take notice and ask a colleague for verbal confirmation. The nurse makes sure that there are no problems related to the computer system before she trusts in the printout, and the different professionals supervise themselves mutually. The question is to understand what makes the system work. This survey showed that in face of the difficulties, doctors and nurses create solutions that explain the successful performance of the tool. The different functions of the tool alone however are not sufficient for turning the service efficient.

Conclusion

This article analyses the successful performance of data processing tools functioning in a hospital unit. Far from being explained by the characteristics of the tool itself, by the social characteristics of the users or a combination of both, their performance is actually explained by the work situation and the common activity. The tool as such does not meet the professional requirements of the work situation. In face of these difficulties the actors make efforts to transform and equip the tool at the same time they adapt themselves and their organization in such a way to compensate the limitations they encounter in the utilization of the systems.

The present survey identifies and characterizes a series of strategies developed by the actors for turning the medical prescription software reliable and efficient. The article gives special emphasis to two concepts that are useful for analyzing the performance of the prescription software: the concept *compensation strategy,* e.g. the different forms of regulation for preventing and correcting possible errors; and the concept *equipment* that refers here to the process in which the actors collectively negotiate and construct additional entities (notes, for example) which, fixed onto the object (a sheet of paper, a trolley, a computer) modify the possibilities of use of this object in a given space of professional interaction. These compensation strategies and this "equipping" are not forms of rejecting change, on the contrary, they are socio-technical investments made by the actors in order to ensure the reliability of the computer- assisted service.

It must be pointed out that the compensation and equipment strategies the users are creating are partly invisible for the designers of the software. The system works because the professionals invent individual and collective practices and adapt their organization and the tools to the needs of their practice. The individual and collective investments made for compensating the difficulties however remain invisible.

Another reason why the compensation strategies are not apparent is that the professionals themselves integrate the created solutions into their routines, turning them natural and therefore invisible even to their own eyes. The designers and installers do also not realize that the success of the instrument is not owed to its intrinsic operation capacity but to the users' capacity to ingeniously adjust it to meet their own demands and also to the apparently not very important objects. The integration of the technology is not simply the result of having been adopted by the actors. It is also the result of a very important but scarcely visible transformation of supports, persons, practices and regulations, and of the reconstruction of a new fabric of relations between all these elements in a hospital setting. Little by little new practices are implemented and become so natural that they are invisible for the observer from outside and sometimes even for the observer accustomed with the hospital unit; only a very attentive or recently arrived observer will be able to distinguish the culture and the very singular local arrangements of the work situation.

The designers of the software loose the opportunity to receive feedback that would be precious for improving the proposed tools. Far away from the places where the tool is used, they have the impression that the tool is working well but they are mistaken about the reasons of this successful performance. The question is therefore how to make the compensation strategies developed and applied by the users visible to the designers so that they can be used for making improvements.

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Notes

1. The first phases of this cycle correspond to the expression of the needs (of clients, innovators etc.) and to the conception of the solution, followed by short interactions during the construction of the product. Different methods were developed on the basis of this philosophy, expressed in the *Agile Manifesto* (Highsmith, 2002).

2. The compensation strategies are part of the used strategies like the adaptation strategy and the substitution.

3. In the context of this article we define the term "equipment" as the act of equipping persons or objects as well as the process resulting from this action.

4. The daily medical visit takes four hours in the morning and counts with the chief physician (a university professor), the residents, the trainees and the chief nurse.

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