

# MEDICATION INFRASTRUCTURE INNOVATION IN A HOSPITAL GROUP

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## Abstract

*Medication supply is a critical infrastructure component in hospitals. For many hospitals, their in-house pharmacy has been the hub, which procured and supplied medication to the wards, controlled quality and provided pharmaceutical advice. Organizational rules, division of tasks and the use of technology enabled, supported and reinforced the hospital pharmacy model.*

*We have studied the case of a hospital group, which decided to establish a centralized medical logistics hub, which provides medication to most of the members of the hospital group according to the negotiated service-level agreements. Thereby, the traditional infrastructure has been drastically reformed and an innovative infrastructure model has been created instead.*

*The purpose of our paper is to reflect this transformation against the background of practice theory, specifically constellation of practices.*

*Keywords: Medication logistics, hospital group, practice theory.*

## 1 THE CASE

We have studied the case of St. Paul's hospital group<sup>1</sup>, a group of private hospitals and several other care providing facilities spread over North-West Germany, in which management addressed the rising cost of medication by introducing a centralized pharmacy and the requisite organizational adjustments regarding logistics, ordering and replenishment of medication. St. Paul's hospital group is collaborating with a logistics provider to run the medical logistics hub (MLH) which delivers to hospitals in the group in a perimeter of about 100 km. Orders of pharmaceuticals are transmitted electronically to MLH. By the end of 2007, the MLH provided services to 18 hospitals and 24 other care facilities. This amounts to a total of 2.500 points of consummation (e.g. wards) which can order from catalog of pharmaceuticals comprising roughly 1.350 items.

## 2 DATA COLLECTION

We have collected case material across different organizational units. A major source of information has been the management of SPH and MLH. We conducted three extensive tape-recorded, semi-structured interviews, one with the logistics manager of MLH and the other with a manager of the hospital group. In addition, we had the opportunity to visit wards, the hospital logistics unit and a community pharmacy associated with the hospital. Thereby, we were able to familiarize ourselves with the practices and to talk to members of different organizational units and professions about their daily routines, the use of technology and their perception of the changes. Furthermore, we collected and analysed secondary sources (presentations, web-pages, annual reports, image-films, and brochures) concerning the transformation.

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<sup>1</sup> All names have been anonymized.

### **3 MEDICATION SUPPLY AS INFORMED HOSPITAL INFRASTRUCTURE**

We distinguish between information infrastructures and informed infrastructures. The former are “pure” information infrastructures such as the Internet, Wikipedia, Google search or Facebook, while the latter are ensembles of material infrastructures, such as logistics, traffic control, energy or water, linked to dedicated information infrastructures, which have been designed to enable, control or coordinate the “underlying” material infrastructures.

In essence we argue that the key characteristics which are typically ascribed to information infrastructures (e.g. Star & Ruhleder 1996) at the interorganizational level are represented in this case. Typical characteristics are, amongst others:

- a complex configuration of technological artifacts and organizational arrangements, i.e. warehousing, logistics, IS as well as organizational rules and routines,
- a multi stakeholder arrangements, e.g. hospital administration, doctors, pharmacists, nurses, logistics provider,
- standardized components, which are used in a non-strategic manner, e.g. the medication list, which is based on a standardized codes for active ingredients,
- an ongoing dynamic of the infrastructure development whereby development, design and use happen concurrently, which is reflected in the design of the constellation of practices and in the practices of management to monitor the transformation, provide space for individual appropriation and make adjustments as necessary.

In this sense medication supply has been designed and functions as an informed interorganizational infrastructure for the hospital group: medication procurement and logistics, cost accounting as well as quality control and counselling are supported by information systems. Medication supply is critical for the operation of a hospital and the supply infrastructure typically operates in a transparent manner in the background. Different components, such as

- the medication order system linking the Logistics hub and the wards,
- the medication list, which is based on active ingredients and allows to link to branded medication,
- a tracing and tracking system for deliveries, or
- the cost accounting modules, which documents medication cost per patient,

are linked to the hospitals’ information infrastructures as well as to the medical logistics hub information infrastructure.

### **4 PRACTICE THEORY AS ANALYTICAL LENS**

Practice theory<sup>2</sup> has been suggested as analytical lens on information infrastructures (Reimers et al. 2012). It takes (routinized and embodied) practices and communities of practice rather than individual action as unit of analysis. Technology is conceptualized as material complement to the human body. Moreover, practice theory provides a contextualized view of “IT in use” (Orlikowski 2000). Persistence is seen as the result of continuing reproduction of practices.

From a practice perspective we can look at infrastructure as background which not only enables the seamless performance of routines but also functions as a reference point for sense making. Infrastructure comes to the foreground if it breaks down. It can be brought to the foreground during periods of development, innovation and transformation.

Multiple, heterogeneous stakeholder groups that are interconnected by infrastructures have been conceptualized as constellations of practices (Wenger 1998).

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<sup>2</sup> Schatzki (2001) provides an overview of the practice theoretical tradition and thinking.

## 5 DISCUSSION

We look at the design and introduction of the medical logistics hub as an infrastructure innovation. Partly serendipitously, because there was an acute lack of space in one hospital, partly as a response to an increasing cost pressure on hospitals as a result of changing regulation, management explored the option of the MLH as an organizational innovation to maintain or even improve the quality of medication supply while at the same time reducing cost. By reducing the number of items on the medication list and bundling as well as centralizing procurement, warehousing and distribution of medication, management aimed at cost reductions. However this not only implied changing practices across the hospital but potentially compromised the identities of (a) doctors, specifically their right of choice for medication, (b) pharmacists, specifically the quality of their counselling and (c) nurses with respect to the availability of medication when needed.

We observed practices of management, which showed an awareness of the conflicting logics of economics and care providing. Even at a structural level, the different stakeholders (or communities of practice) of the hospital, namely administrators, doctors, pharmacists, nurses, were represented in the management board. The practices of infrastructure design were based on conversational practices in order to identify what was crucial to the various communities and to ensure that the respective identities would be recognized and reinforced:

- Specialized medication committees were established so that doctors amongst themselves could and had to decide about necessary items on the medication list. While this acknowledged doctors' freedom of medication albeit not at an individual but at a group level, it still yielded cost reductions by reducing the number of pharmaceuticals and active ingredients. Since all chief physicians of the same speciality take part in the decision making, conflict is contained to the same level of expertise and reputation. In this way, their expertise and responsibility were acknowledged and at the same time a mechanism has been established to critically examine every item from a medical point of view.
- Organizational rules and technology were used to retain or even increase the informational "visibility" of the logistic supply chain because the material visibility based on physical proximity was reduced. Simple cards functioned as material tokens to signal minimum stock level, order placed or order received. Service level agreements were negotiated between the hospitals and the MLH as assurance for a continuing quality of supply. The average need of medication was established and minimum stock levels at the wards agreed. This particular set-up of physical token and digital representation takes care of nurses' need for continuous supply while it reduces unintended overstocking and the need to dispose of medication beyond the expiry date.
- During the transformation, the number of pharmacists was not reduced, rather their role was changed in terms of extended responsibility for quality and price of medication: MLH would negotiate with suppliers for the entire group and pick products based on active ingredients. Moreover, the pharmacists provided extended counseling to doctors and nurses when needed. Thus, their professional role of pharmacists was strengthened.

Management established boundary objects (Star & Ruhleder 1996) such as the order cards or the medication list as well as boundary practices (counseling, order taking and delivery) between the different communities. Overall we have interpreted the infrastructure innovation as a transformation of a constellation of practices. Recently a new consultation practice has been established at the intersection between patients, their GPs and the hospital pharmacists: Incoming patients are asked to have a confidential conversation with a pharmacist in order to establish what medications they take and to clarify, which of those need to be (dis-)continued or replaced during the hospital stay. A similar confidential conversation takes place when patients leave the hospital in order to clarify, which medication has to be (dis-)continued or replaced by the GP. The practice acknowledges frictions at the intersection of medication practices in hospitals and by GPs, which might have detrimental effects of suboptimal medication and unnecessary cost. Moreover it also acknowledges the patients' right to privacy.

## 6 CONCLUSION

Against the backdrop of profound economic and indeed managerial challenges for hospitals, the paper sets out to study organizational innovation by employing the analytical lens of practice theory on information infrastructure innovation. We have used a particular case of forming a centralized medical logistics hub, which substituted the individual hospital's pharmacies. The innovation followed an economic logic of cost reduction while substantial efforts were made to maintain the level of service quality in order to solicit support and active buy-in into the new solution. While the innovation can be presented as a result of managerial process management and organizational design, we would propose to understand the innovation as the result of particular management practices of participation, showing respect, engaging in conversations and eventually rule setting.

The constellation of practices lens allows us to reconstruct the transformation by illustrating the establishment of new communities of practice at the group level and the transformation of boundary objects and boundary practices. Our conclusion is that sustainable infrastructure innovation initially requires a transformation of a constellation of practices.

While technology remained largely in the background, it has been the backbone of the new solution (providing standards, order platforms, means of communication). This is particularly important in a hospital setting which aims to align a professional organization based on routines and accountability with care giving to the patients. The use of technology has become an integral part of the practices, technology is not the enterprise of the practice but patient care or efficient medication logistics.

We traced the transformation of practices inside and across different communities. This allowed us to highlight how potential sources for conflict were contained and channeled. Furthermore, new practices were cultivated that serve as sources of improvement apart from operational efficiency. As such an investigation from a constellation of practices perspective offers a rich picture of the complexity that comes along such infrastructure innovation projects. It provides clues of what in the end makes the transformation succeed or not. In the specific case, management showed prudence in not only looking for a smart organizational design but also stewarding (Wenger et al. 2009) the development and transformation of the constellation of practices. The theoretical lens regards transformation of a constellation of practices as an emergent process that cannot be simply designed but needs to be cultivated.

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