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Julien Husson, Aicha Aguezzoul

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## Design of an innovative pharmaceutical platform for a public hospital

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JULIEN HUSSON, CEREFIGE, Maitre de conférences HDR, Université de Lorraine  
julien.husson@univ-lorraine.fr

AICHA AGUEZZOUL, LGIPM, Maitre de conférences, Université de Lorraine  
aicha.aguezzoul@univ-lorraine.fr

## Abstract

**Objective:** This study is based on the idea that if there are many opportunities for change in the hospital, this one remains impotent for catalyzing and managing the organizational change, especially for the design of projects change. The objective is to develop a heuristic organizational change in the case of pharmaceutical platform design, and decline it to an operating model for the hospital manager.

**Methods:** An intervention-research perspective is used in a hospital in the outskirts of Paris for nearly 5 years, which allowed us to immerse in the field for more than 100 days, and to participate in this project since its initiation until the opening of the new pharmaceutical platform.

**Results:** From a methodological point of view, our study's results allow to identify the major chokepoints of a heuristic for piloting the organizational change projects in hospitals. The proposed approach takes into account the hospital professional bureaucracy specificities, and allows us to highlight the caution need for a researcher who wishes to import industrial management tools in the hospital.

**Conclusion:** Our proposed approach provided an interesting conceptual framework for change management, and reconfiguration of hospital processes.

**Keywords:** public hospital, projects change, value analysis, pharmaceutical platform.

## Introduction

CHM hospital is a public hospital in Paris region which includes 1000 inpatient beds and covers a consultation unit in ambulatory care of 1000 detainees, representing for the hospital nearly 500 additional patients. The hospital has embarked on an innovative project design-construction of a new pharmaceutical platform, integrating the latest advances in technology: acquisition of automata for global or personalized medicine dispensing, computerization of the pharmacy supply chain management, and centralized reconstitution of cytotoxic.

This project needs a serious reflection on the design of an organizational model, the complete reconfiguration of information system, the definition of local needs and the choice of equipment and automata that are more from prototypes than real

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12 operational robots. Positioned in an intervention-research perspective.<sup>1</sup>, which  
13 allowed us to "immerse yourself in the ground" for more than 100 days, we  
14 participated in this project since its initiation until the opening of the new  
15 pharmaceutical platform. Our approach is inspired from the value analysis and the  
16 management by the value, for controlling complex projects.<sup>2,3</sup>. From a  
17 methodological point of view, our study' results help identify the major chokepoints  
18 of piloting the organizational change projects in hospitals.  
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28 This paper is organized as follows. Following this introduction, section 2 details  
29 the functional analysis of the new pharmaceutical platform. In section 3, we present  
30 our proposed model for piloting change. The last section contains some concluding  
31 remarks and some limitations of our proposed approach.  
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## 38 **Methods**

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41 The methodology used for the design of target organization of future  
42 pharmaceutical platform is inspired from functional analysis approach. This one is  
43 useful for group construction whose results materialized in form of "octopus" are  
44 used in communication.<sup>4,5</sup> We selected a few key points of this approach to  
45 deduce a methodological framework for managing a development project:  
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- 53 • The modeling phase of the target organization in its environment,  
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- The research phase of meaning, profile representation of the target organization by a functional tree,
- The phase of functions characterization to define specifications of the future organization for each target process. This has been the operating target scenario used to define architectural specifications (local) and techniques (automata, equipment, information system).

### ***Target Construction by Actors***

As researcher-speaker, we have positioned ourselves as a methodological facilitator of a working group of 11 people consisting of pharmacists, hospital director as project manager, IT manager, biomedical engineer, works engineer, healthcare direction, health managers, and preparers. Three sessions of 2 hours are been needed to validate the target organization model by the actors (Figure 1). The group worked on an object defined as "the organizational model of the CHM pharmacy at 5 years".

The environmental elements and the different actors of target organization of the CHM pharmacy are called "external environments". They cover all pharmaceutical activities, identified and qualified by the working group. From these "external environments", 10 significant functions are selected as described in table 1.

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12 The description of the 10 functions characterizes the expected target  
13 organization of the future pharmaceutical platform. Highly visual, the "octopus"  
14 model and its repository of functions are used to communicate about the project,  
15 and to validate it institutionally. All functions do not have the same "value". Some  
16 are directly related to the utility removed from product service by the pharmacy  
17 (example: F9), and others incorporate more subjective esteem dimension  
18 (example: F10) where everyone is proud of the project supported by the pharmacy.  
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### ***Crystallization of the organization representations***

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32 We used the functional tree, which can provide a profile of the target organization  
33 as perceived and experienced by the actors, and as they wish that the pharmacy  
34 may be positioned in the facility (figure.2). Among the various functional trees  
35 representing the meaning given to the future organization by the working group,  
36 the profile "clinical" is chosen by consensus.  
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43 Historically, the position of pharmacy in hospitals is often different from that  
44 profile because it's attached to economic services for a long time, and it's regularly  
45 treated as a "logistics" classic, such as hotel or equipment distribution services.  
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### **Results**

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### ***The piloting model of change***

As illustrated by figure 3, the functional octopus is declined in the form of specific criteria in 3 structural axes that constitute the operating dimension of the piloting model of proposed change. The explanation of various functions is made by criteria that specify the function, its operating principles, requirements and desired levels of performance. The rigor and precision of functional analysis have allowed us to decline, in addition to 800 criteria, the organizational specifications, and thus establish the functional rules of the future pharmaceutical platform.

*Scenario organization-procedures:* It is a detailed organization manual of future pharmaceutical platform. New improving activities of safety processes are thus formalized and implemented. Each activity is described using criteria on which an analysis of residual risks is performed. The organizational framework and the risks analysis stemming from functional analysis are valid at the time of implementation of new organization and that they must evolve. They are by no means a fixed state.

*Information System (IS):* The specifications of the IS are complicated in the hospital because the integration was not drawn in advance and its architecture is the result of the superposition of transverse/vertical software series, without single data source containing all the data for a patient. For hospital pharmacy, the IS is

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12 often limited to a tool for inventory management, and traceability of certain  
13 expensive products. The trend towards more security leads to a complete system  
14 for automatizing pharmaceutical analysis of prescriptions, dispensations  
15 management, and administrative management.  
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21 For CHM, we developed the masterplan of the pharmaceutical IS and selected  
22 software used by future pharmaceutical platform. We propose a focus on a specific  
23 example of IS specifications for the particular process of anticancer  
24 chemotherapies management. The softwares on the market cover all activities  
25 from the prescription until receiving chemotherapy, through inventory management.  
26 These are vertical software and are not integrated with the rest of the  
27 pharmaceutical IS. They generate the existence of several patient records:  
28 chemotherapy, general, or two supports prescription: one for cancer and one for  
29 the other drugs. Medical and pharmaceutical practices demanded this type of  
30 orientation, but it makes impossible consultation in one place, of all drugs  
31 prescribed for a patient.  
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46 The CHM needs are fixed from functional analysis of the processes of  
47 chemotherapies production, and according to *flexibility* criterion, by a pharmacy  
48 working group involving prescribers of cancer chemotherapy and health managers  
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12 of these services. The set has been formalized in a specification divided into six  
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14 following chapters:

- 16 • Management of pharmaceutical data,
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- 18 • Management of chemotherapy regimens,
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- 21 • Management of manufacturing,
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- 24 • Products delivery management,
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- 26 • Products administration management,
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- 29 • Management of the activity: traceability, costs, production statistics.
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31 A tender was launched and candidates responded by checking functional  
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33 analysis grid (table 2). The choice of the candidate is conducted on the differences  
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35 between the responses and the specified requirements, by measuring the  
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37 compliance rate with various levels of flexibilities.

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40 *Technical specifications:* The entanglement between equipment and IS are  
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42 strong and we had to deal with functional requirements broken down into technical  
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44 specifications for equipment and heavy purchases procedures of public hospitals  
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46 reporting to the procurement code. The majority of heavy equipment of the  
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48 pharmacy depends on computer tools that represent about 5% of equipment costs  
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50 and upon which depend on the proper functioning of automata. However, these  
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12 monitoring IT tools are not always "linked" to equipment; it is possible to acquire a  
13 computer tool and equipment separately for the sake of overall performance.  
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16 At CHM, such a case is happened, and the question of project management,  
17 which should logically be under the IT service provider for the interfaces creation  
18 between equipment and hospital IS became the critical point. We were faced with  
19 this ground reality, since the IT service providers refused to wear the project  
20 management. But for an institution like CHM, the automata represented a colossal  
21 investment of 1.4 million Euros, and depended on proper functioning of software at  
22 35,000 euros. For proper functioning of automata, CHM decided to use  
23 procurement procedure "competitive dialogue" type, comparable to former tenders  
24 on the performance. This procedure allowed us to build with suppliers, the  
25 technical specifications of equipment and associated IS (co-construction logic) to  
26 align the reality with the needs on the ground.  
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12 *Architectural specifications:* They arise from the proposed risk management and  
13 reconfiguration of "pharmacy" processes, which have been documented in a  
14 specification called "detailed technical program." This document is divided into 2  
15 volumes:  
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21 • *Functional program:* it lists the functions or processes identified by specifying the  
22 flow of personnel and materials they generate. This is a general description of  
23 how to operate, which synthetically incorporates the operating target scenario  
24 elements,  
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- 30 • *The list of local which constitute pharmacy,* specifying the target surfaces,  
31 functions that are performed, operating principles, structure of local, its layout,  
32 furniture, its equipment, and potential sources of danger. We implemented a  
33 standard form (Table 3) for each local of the pharmacy, and which was  
34 approved by the working group.  
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42 From these documents, the architectural competition has been launched and the  
43 plans have been established. The offers analysis between 3 candidates was  
44 performed by measuring differences between architectural specifications, and  
45 offers for different items of "local" records.  
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## Conclusion

The approach we propose provided an interesting conceptual framework for change management, and reconfiguration of hospital processes in the sense that:

- The design phase of change project, guided by functional approach, allows including "the meaning of the project in a broader sense". Thus, functional tree use provides an appropriate framework for a shared vision on the future, and participates in the federation of logics of actors (pharmaceutical, medical, nursing and managerial).
- The medical profession legitimacy is strong in hospital because its values are around care. Today, budgetary logic helps to restore legitimacy to manager. However, if the catalyst for change is in with the manager attributions, it cannot do without pilotage instruments, reconcilers between medical and administrative.
- The proposed model is operating and allows users to restore their place. Too long, hospital staff (doctors and pharmacists) have been disconnected from organizational and architectural choices, enrolled in the institutional projects. The functional model variation according to structural axes is an operating guide to integrate and continuously monitor the user needs

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11 integration. It helps make legitimate in the stakeholders eyes, the change  
12 project.  
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16 However, our approach has some limitations that are mainly due to its  
17 maturity. The model would need to be tested at a larger scale to be validated  
18 empirically. We also emphasize that road is long between the approaches of  
19 change management and the implementation of change itself, as distance is  
20 great between understanding of the context, choosing a method, its  
21 implementation, its pilotage, as decision-making in hospital is still problematic,  
22 and linked to a random of uncontrollable reforms.  
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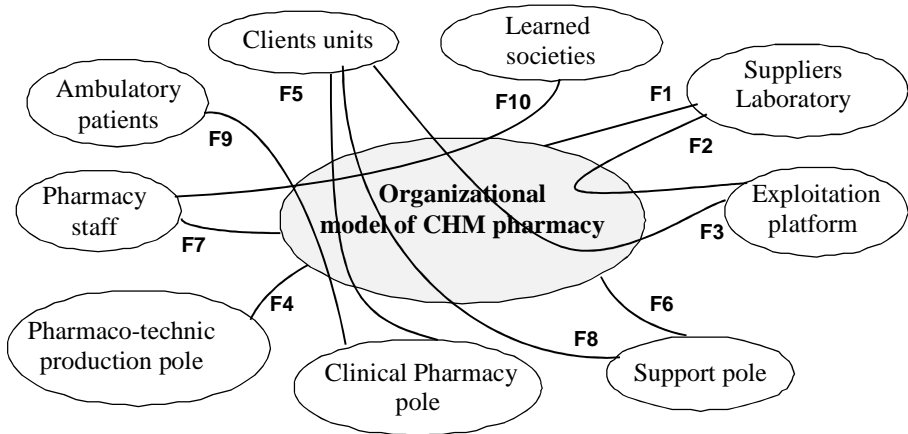


Fig.1- Model of target organization of future pharmacy

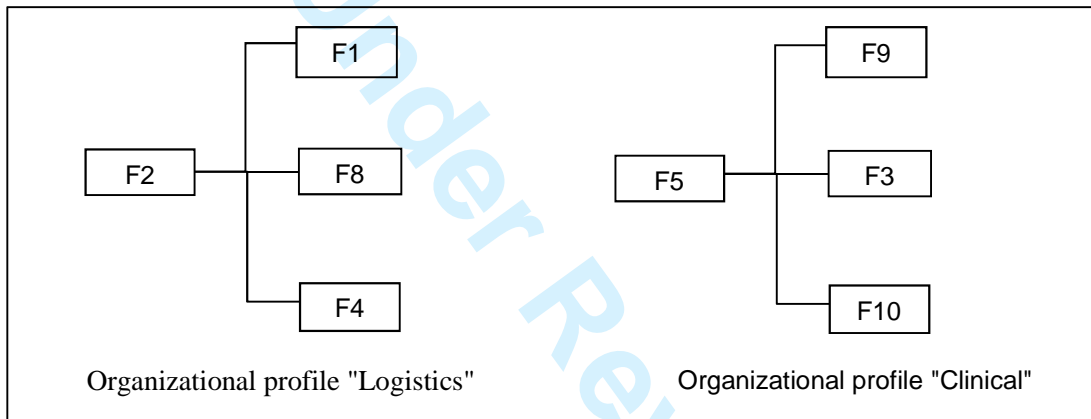


Fig. 2- Functional Trees: meaning and ownership of the target

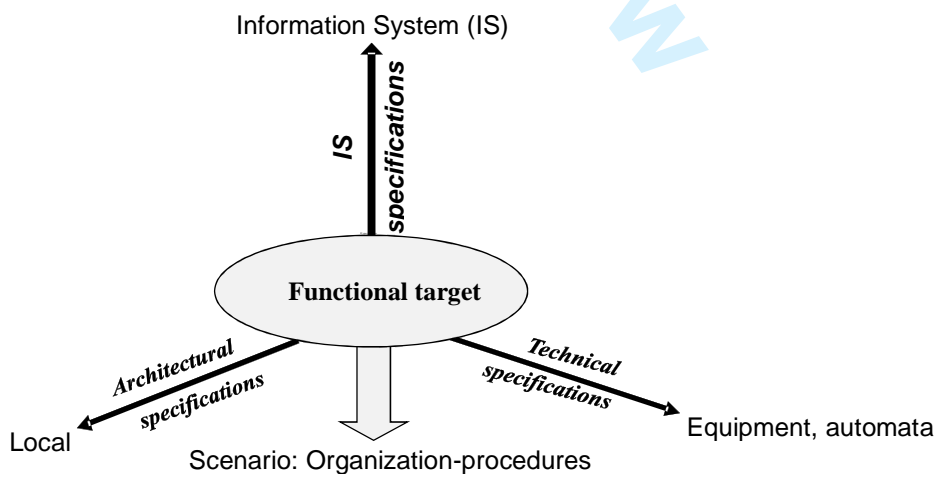


Fig. 3- The Piloting model of change

**Table 1** The repository of the 10 functions

| <i>No.</i> | <i>The functions</i>  |
|------------|---|
| F1         | Manage procurement, inventory, and receive supplier deliveries.   |
| F2         | Supervise, plan and sequence the production and distribution of drugs and sterile medical devices           |
| F3         | Make delivery of drugs and sterile medical devices in "global"  |
| F4         | Ensure pharmaco-technique production in area with controlled atmosphere.                                    |
| F5         | Meet the needs of client units, prescribers, caregivers, and patients, in advising to the therapeutics use. |
| F6         | Ensure hygiene, maintenance, and disposal of waste pharmaceuticals.   |
| F7         | Make secretarial and administrative management of the pharmacy.   |
| F8         | Ensure transfer logistics between various sites, pharmacy, and care units.                                  |
| F9         | Make delivery of "registered" drugs by patient  |
| F10        | Inform, ensure visits, disseminate information, and communicate on innovative project of CHM pharmacy.      |

**Table 2** Extract of Information system specifications

| <i>Criteria characterizing the functions</i>             | <i>Flexibility</i> |
|--|--------------------|
| Patient identification                                   | X                  |
| Number of patient (patient record or observation number) | X                  |
| Patient date of birth                                    | X                  |
| Patient sex  | X                  |
| Hospitalization service                                  | X                  |
| Active ingredient prescribed                             | X                  |
| Prescribed dose  | X                  |
| The product administration duration                      | X                  |
| The product administration route                         | X                  |
| Free comments / prescription                             | X                  |
| Identification of the person who provided the product    | X                  |



**Table 3** Interactions "Functions - Local"

| <i>Local record: Store of drugs storage</i>  |  |
|--|--|
| Local type   | Store "Drugs" of the operating platform                              |
| Number of local  | 1  |
| Target area  | 150 m <sup>2</sup>   |
| <i>Surface contribution</i>  | <i>Related functions</i>   |
| 20%  | F1: Manage procurement, inventory, and receive supplier deliveries   |
| 30%  | F3: Make delivery of drugs and sterile medical devices in "global"   |
| 40%  | F9: Make delivery of "registered" drugs by patient                   |
| Use and principles of operation  |  |
| Storage and distribution of drugs into "global" and "registered" per patient. The teams of preparers work in parallel for the activities of global distribution, and nominative individual dispensation. |  |
| Collection of drugs is carried out using different automata. At maximum 6 preparers will be attributed at the same time to these tasks, and possibly a 7th for supply management and inventory.          |  |
| <i>Structure of local</i>  |  |
| Need natural light, personal are working continuously during the day   |  |
| Local open, no intermediate partitioning   |  |
| <i>Furniture and equipment</i>   |  |
| <i>Quantity</i>  | <i>Quality</i>   |
| 5  | Automata of storage such storage with computer control               |
| 2  | Automata of nominative individual dispensation with computer control |
| 1  | Storage shelves over 4 floors and 130 linear meters                  |
| 2  | Workstations of office type  |
| 1  | Worktop of large area (3m <sup>2</sup> )                             |
| 8  | Carts of dispensation on wheels                                      |
| 8  | Electrical sockets   |
| 2  | Telephone sockets  |
| 5  | Computer sockets   |
| 1  | Electrical power of automata   |
| 1  | Regulation of hygrometry and temperature                             |
| 1  | General lighting   |
| 1  | Specific lighting  |
| Local planning   |  |
| <i>Quantity</i>  | <i>Quality</i>   |
| 1  | Flooring industrial type and washable                                |
| 1  | False ceiling soundproof   |
| 1  | Washable wall covering   |
| 1  | Ventilation and air renewal system                                   |