

---

# **“COMPUTER ASSISTED MONITORING OF SOCIAL AND HEALTH CARE PROCEDURES FOR FRAGILE OLD SUBJECTS AT HOME. THE “I-CARE” FORLI’ EXPERIENCE”**

---

Roberto Camporesi<sup>1</sup>, Paolo Mattarelli<sup>2</sup>  
Cedaf S.r.l.<sup>3</sup>

## **1. INTRODUCTION**

---

Recently it has been concluded in Forlì the testing of I-Care, a new ICT system designed to provide online access to health and social services, with a special regard to the service of providing care (medical or otherwise) at home to elderly people.

I-Care project has been partially financed by Emilia Romagna Region in the framework of a three-year R&D ICT Plan and represents an important example of co-operation and integration between local institutions (Forlì’s Municipality, Province and Health-care Agency), University (CIRSFID<sup>4</sup> and “Polo Universitario di Forlì”<sup>5</sup>) and private ICT Companies (Cedaf and Gruppo Formula).

In order to reach the defined objective, the ICT system supports a number of functions, including processing and assessing requests for service, putting together work plan and team entrusted to do it, providing the service itself, up to the eventual balance of the provided services.

So the main I-Care mission is to integrate social and health services and to do reversing the model on which basis this kind of care is typically provided, which means setting up a situation where citizens in need of care become the focal point around which the entire organizational system revolves, rather than the other way around.

## **2. ORGANIZATIONAL ISSUES**

---

Definition and formalisation of welfare processes is an important item for all organizations providing individual services. This issue has been especially important in I-Care, since the project was characterized from a remarkable complexity connected with the need to achieve a strict interaction between several local institutions (municipality, province and health-care agency) as well as various offices inside the same institution.

In-depth examination and optimisation of processes is in fact a milestone to define standard procedures required to obtain a good alignment not only in activities management, but also in technical, scientific and organizational culture at the base of a consistent and optimal operation of organizations.

A significant activity of Business Process Reengineering (BPR) has been therefore performed in the first part of I-Care project, at first within the one organization, then by unifying and harmonizing the results in a global guide line document.

BPR outcome has been a set of process models and data flows between the organizations concerning organizational, procedural and technological topics together with a few suggestions to handle the organizational impact and to plan specific activities to support the start-up of the new ICT system.

An example of the output of BPR is illustrated in Figure 1, where main actors and possible integration points within and between organizations are represented.

The BPR has been preparatory for the following step, regarding Change Management activities concerning:

- actions on organizational processes;
- possible adaptations in ICT systems;
- spread training activities;

---

<sup>1</sup> Electronics Engineer, Cedaf Board Manager

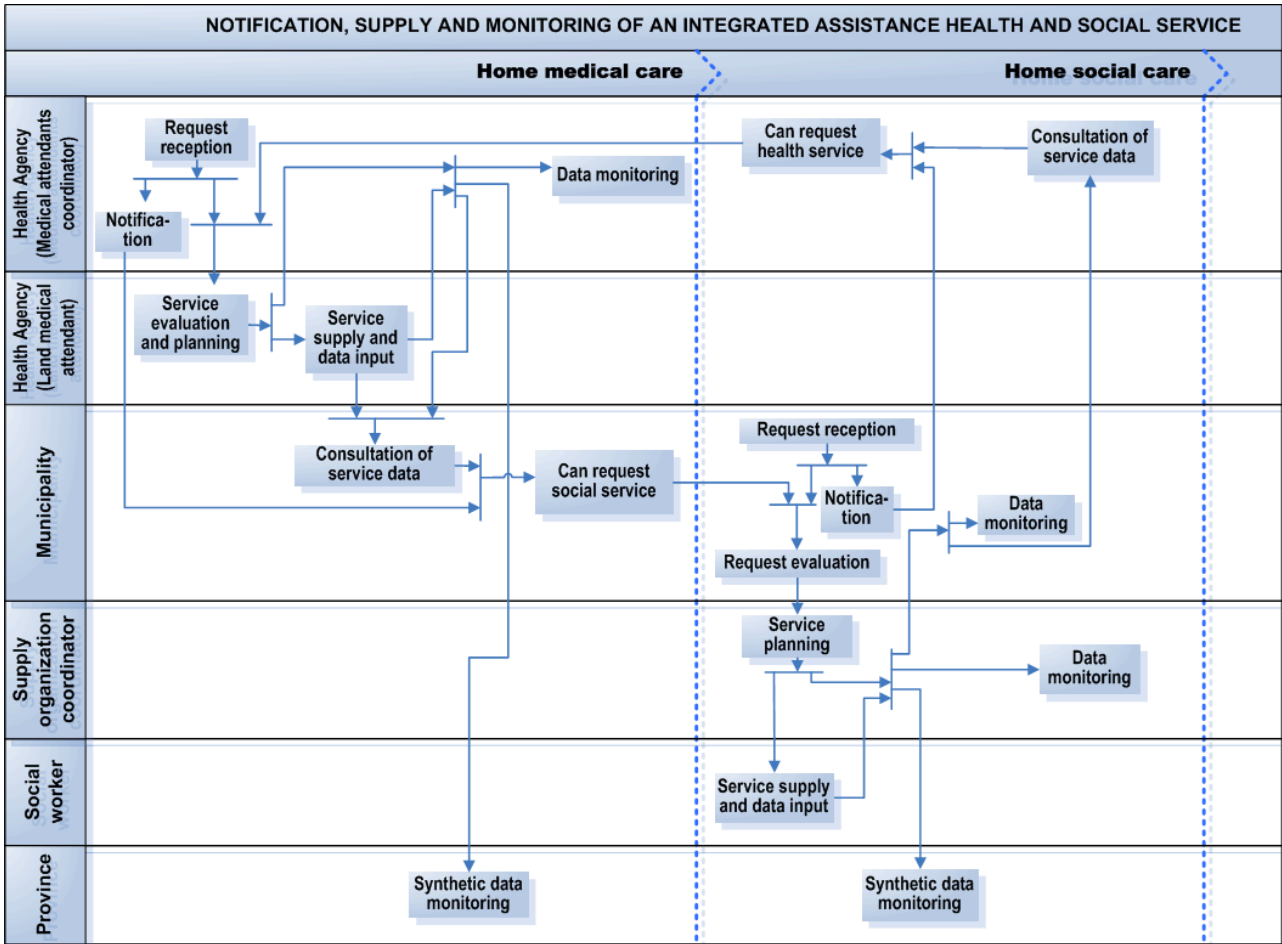
<sup>2</sup> Physicist, I-Care Program Manager

<sup>3</sup> Cedaf S.r.l is an ICT Company specialized in software applications and products for the Public Administration.

<sup>4</sup> CIRSFID is an interdepartmental centre of the University of Bologna specialized in the history and philosophy of law and in legal informatics.

<sup>5</sup> Faculty of Political Science, Bologna University, Campus of Forlì.

- data flow adjustment between organizations.



**Figure 1: schema of interactions between organizations for social and health services supply**

A particular emphasis has been reserved to the training, which involved a wide people variety belonging to different organizations, with cultural and working peculiarities and different integration targets.

Main goals of training have been:

- practice on the new ICT system;
- sharing of organizational and cultural hints come from BPR.

### 3. TECHNOLOGICAL ISSUES

#### 3.1 SYSTEM OVERALL FRAMEWORK

I-Care architecture is based on interchange information needs between the organizations involved in management and supply of health and social services.

These organizations, whose interactions are ideally represented in Figure 2, can in turn be classified as:

Management organizations: they are institutionally responsible of management and supply of the service (directly, or more frequently, by delegating other organizations). Municipalities and Health Agencies belong to this typology; their main tasks concern:

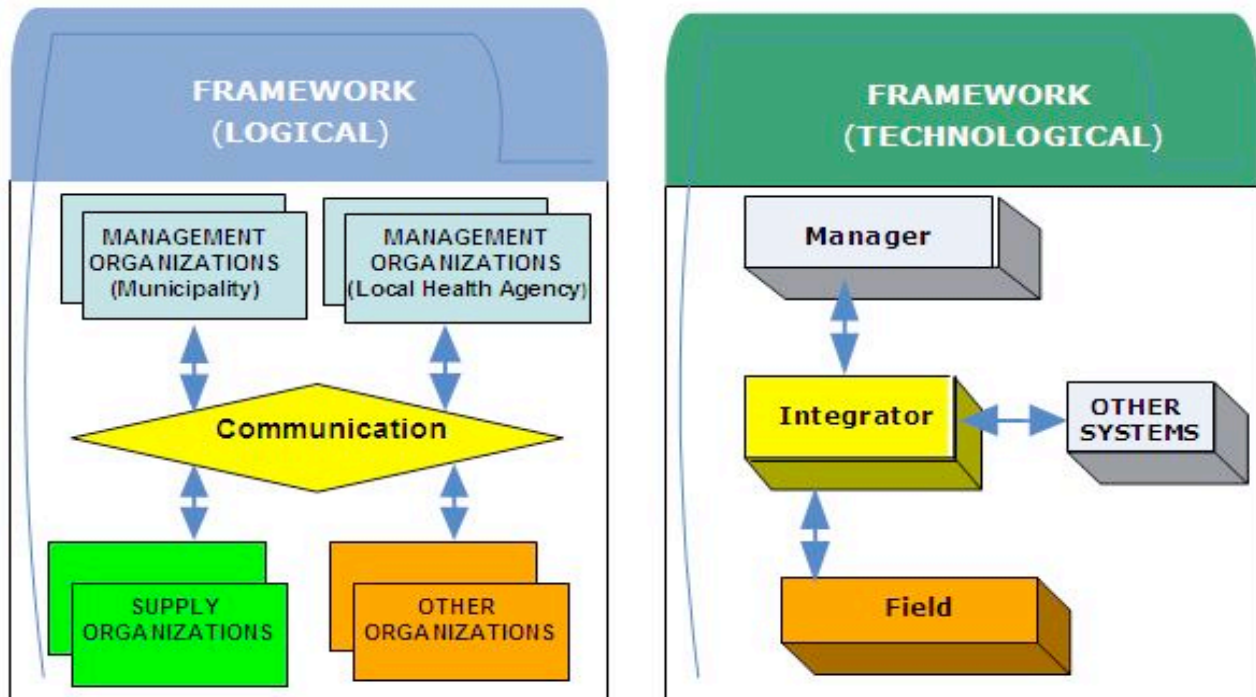
- receipt of service request;
- check of the existence of needed conditions for the service;
- definition of service supply conditions (priority, entity, economic contribution, etc.);
- assignment of the service to a supply organization;
- service economic reporting and monitoring.

Supply Organizations: it can belong to this typology both internal units of municipalities and Health Agencies, both delegated external companies. These organizations main tasks are:

- planning and execution of delegated services;

- re-planning resulting from unexpected events;
- reporting of performed activities to the delegating organization.

Other organizations: this category includes organizations (or single subjects) whose interest is only to receive information regarding social and health services, e.g. hospitals, provinces, regions, etc.



**Figure 2: logical and technological framework of I-Care system**

The technological architecture of I-Care system keeps the same articulation between the different subjects (see Figure 2) and is based on three main components:

- Manager, for the activities of management organizations;
- Integrator, to coordinate and integrate information flows between Manager, Field and other external systems;
- Field, for the activities of the organizations that supply services.

I-Care system is developed using J2EE 1.3 platform, the Java-centric environment universally accepted as industrial standard able to warrant high levels of reliability, hardware independence and maintenance.

The conceptual model adopted is a three-tier architecture (see Figure 3), a principle of software design that, for reasons of efficiency, separates software processes into layers. In other words it divides the application into areas based on various stages or tasks in a process; in this case:

- the presentation layer (GUI, “Graphic User Interface”, the part of the system that embodies the presentation of the objects in the system to the user);
- the middleware layer (business logic, the part of an application program that performs the required data processing of the business; it refers to the routines that perform the data entry, update, query and report processing, and more specifically to the processing that takes place “behind the scenes”);
- the backend layer (where the traditional data processing occurs, that includes database and services).

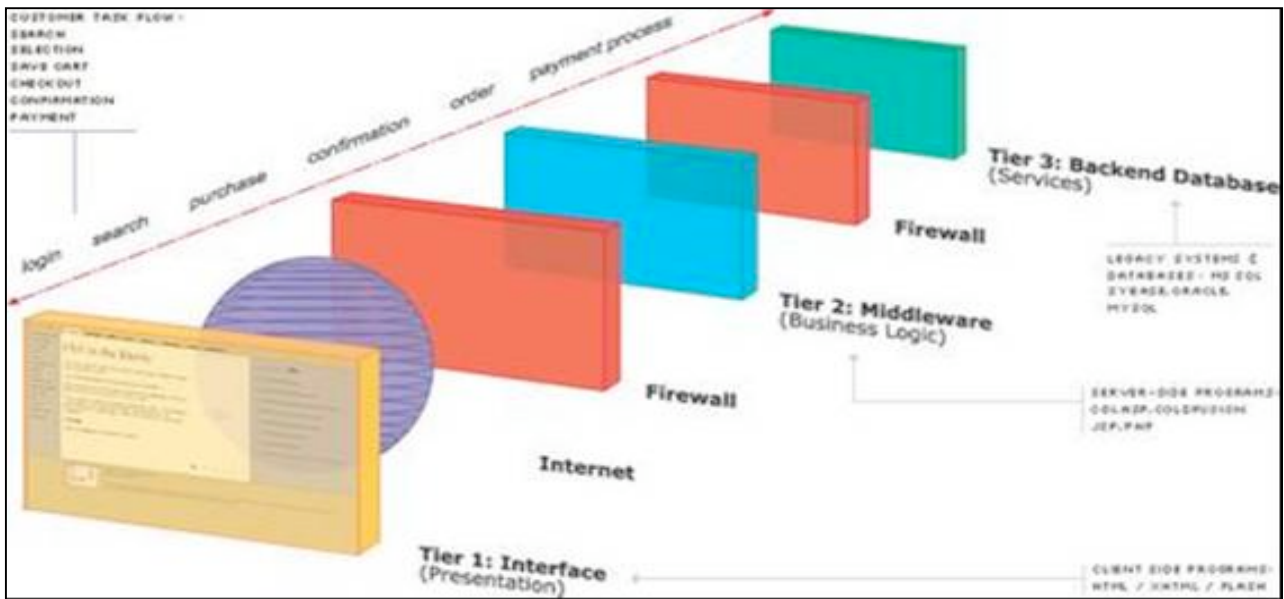


Figure 3: three-tier architecture, the conceptual model adopted for I-Care system

### 3.2 DESCRIPTION OF MAIN COMPONENTS OF I-CARE SYSTEM

As above mentioned, I-Care system consists of three main components: Manager, Integrator and Field, whose main functionalities are summarized in Figure 4.




<p>The part dealing with the support of organizational and managerial activities by the political and health authorities</p>	
<p>An EAI component that coordinates and certifies data streams among the application components (Manager, Field and other external and legacy systems)</p>	
<p>The part supporting the activities of the organizations serving the patients, either at the field level (through portable systems with good usability interfaces), either in the back-office</p>	

Figure 4: technological framework of I-Care system

Let now deepen the main characteristics of each component.

**Manager** is the system module designed to support the activities of the companies which manage the project; its functions include:

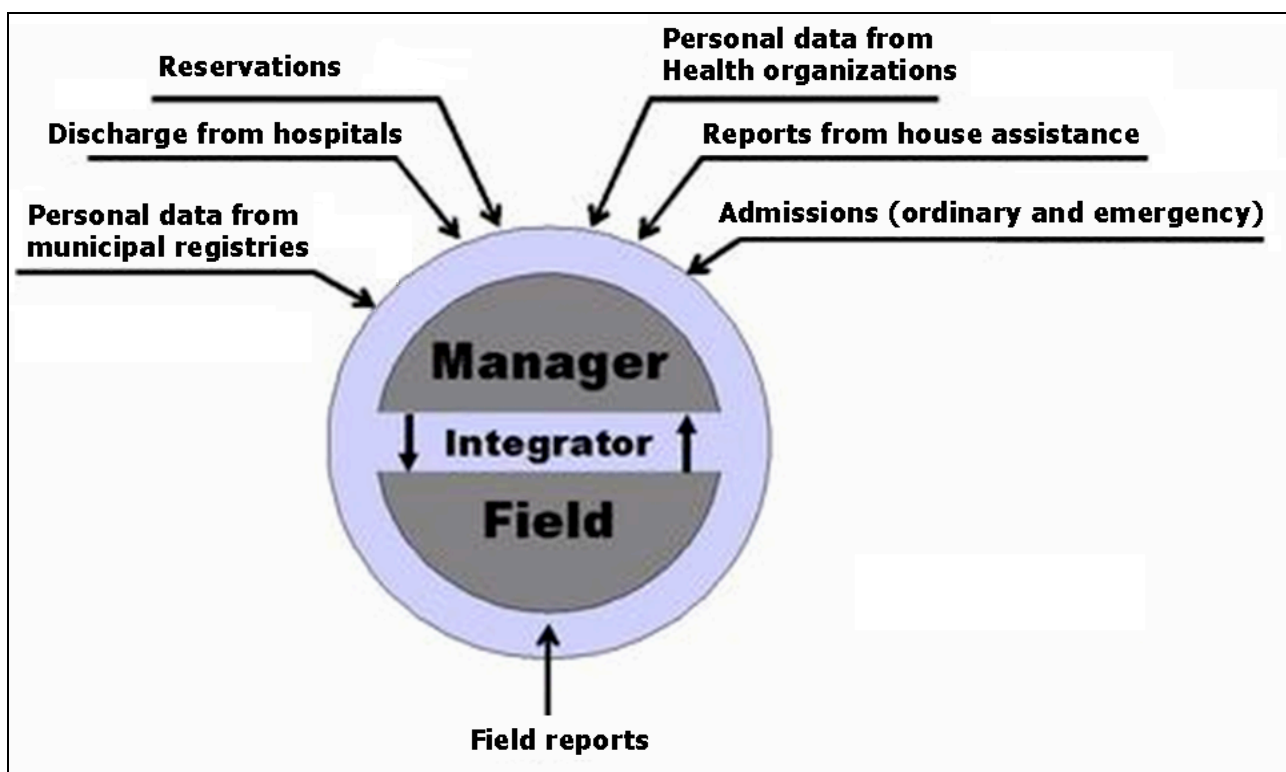
- registration and validation of the requests for assistance service;
- collection and consolidation of the information on the services allocated and executed;
- extraction and loading into a data warehouse of all the activities performed and registered by the connected Field components;
- control and reporting of assistance services supplied;
- tracing and maintenance of welfare and health history of the citizens to perform statistics and build benchmarks;
- interface toward legacy and specific back-office systems.

**Integrator** is the system module designed to coordinate and certify the information flows among the components (see Figure 5); its function is to give assurance for:

- the integrity of data exchanges, either in synchronous and asynchronous way;
- the observance of security constraints (e.g. access rights, respect of privacy, encryption);
- the mapping of communication protocols and information ontology in the information interchange with external systems;
- the management of communication protocol with Manager and Field.

**Field** is the system component designed to support the operator giving field assistance (through Personal Digital Assistant or Tablet-PC); its functions include:

- planning and optimizing of the resources to be distributed according to specified standards;
- managing interactions for exceptions and unforeseen situations (scalability aspects);
- automatic reporting of time, treatment, materials used and supplied to the patients;
- reporting on access to medical unrehearsed data, upon specific call;
- accessing special services, upon request;
- producing reports and statistics.



**Figure 5: information flows among the components of I-Care System**

#### **4. LEGAL ISSUES**

A part of the study aimed at working out all the legal issues involved in setting up and running an e-health service: of special concern in this regard is the issue of the privacy and security of medical and other personal records. A reconstruction of all the legislation, jurisprudence and precedents bearing on the issue of the privacy of medical data made it possible to figure out the requirements that such a system has to meet. There are in particular at least three questions that need to be addressed in this regard:

- the question of the right to privacy: here it is necessary to publish a legal notice setting out the responsibilities and obligations of those in charge of processing the data and obtaining the user's consent to go ahead with such processing;
- the question of data-processing techniques: here it is necessary to set out requirement for cryptography and digital signatures and the responsibilities of the individual whose signatures these are;
- the question of authenticating the system operators: here, access codes and digital signatures are needed for all documents to be underwritten for administrative purposes.

The project concurred to provide a basis for drawing up a code of conduct setting out rules for all the operations required in carrying out the online service.

The survey of the legal issues involved in the I-Care project brought out three problem areas that need to be looked at:

- the first problem is that the project, being designed for delivery of both medical and social services, accordingly made it necessary to process two types of personal data, medical and non-medical. So two standards (a double set of regulations) needed to be set according as the data to be processed is classified as medical (under art. 76 of the Italian code on privacy<sup>6</sup>) or otherwise;
- the same problem applies to the personnel themselves: under the above-mentioned art. 76, only medical personnel can handle medical data. So, here too, a double set of regulations was needed, one for medical personnel and the other for social workers;
- the third problem is that of assigning a legal and administrative status to the document being processed and affixing a digital signature accordingly. This kind of specification made it necessary to work closely with the administrations involved, and also required a back-office apparatus capable of supporting the new document-management system and protocol.

## 5. CONCLUSIONS AND PROSPECTS

---

The ICT system prototype released by I-Care project represents a first step towards a complete welfare system able to manage all topics and subjects - other than old people – that municipalities and health agencies have to care of (families, handicapped persons, immigration, drug addicts, etc.).

Cedaf is now engaged in further development activities for the implementation of a commercial package; to this end, close attention is dedicated to the integration into the system of some opportunities offered by telemedicine, like collection of clinical data from different systems, remote monitoring of clinical parameters, wide diffusion of medical information, etc., shooting for an efficient and all-comprehensive “home-care” service, that in many cases seems to be the main alternative to traditional provisions like admission in hospitals or residential/nursing homes.

## 6. REFERENCES

---

- [1] I-Care Project: Internal documentation
- [2] C. Maioli, C. Rabbito: “*Promoting e-participation to qualify territorial e-government policies*“. *International Conference E-Democracy*, European Public Law Centre, Athens, 3-4/06/2005
- [3] C. Maioli, C. Rabbito: *Privacy and identity management in a European e-health system: an experience in the making*. LEFIS - Legal Framework for the Information Society- meeting on Privacy, Rovaniemi, Finland, January 2007, 19-20.

---

<sup>6</sup> Law Decree n. 196, June 30, 2003.