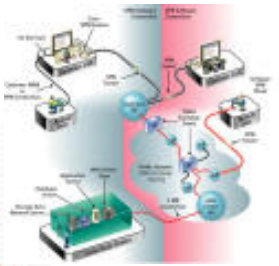
SIXTH FRAMEWORK PROGRAMME
PRIORITY 2.3.1.11
e-Health

COCOON (FP6 507126)

Building knowledge driven & dynamically adaptive networked communities within European healthcare systems

Problem Addressed

Patient



Regional healthcare services

General Practitioner

Electronic Health record of each patient

Community of Specialists

Research Objectives

The research aims at **supporting health care professionals in reducing *risk* in their daily practices**

PROJECT DETAILS

Project Acronym: COCOON
Project Reference: 507126
Duration: 42 months
Project Cost: 11.68 million euro
Contract Type: Integrated Project
Project Funding: 6.70 million euro

Patient

Regional healthcare services

Electronic Health record of each patient

Community of Specialists

COCOON Consortium

cefriel
ICT Center of Excellence For Research, Innovation, Education and industrial Labs partnership
Politecnico di Milano

ELYROS S.A.

Siemens Business Services

TELECOM LAB ITALIA
www.telecomitalialab.com

Microsoft
European Innovation Center

PE.S.Y.P REGIONAL HEALTH CARE SYSTEM EPIRUS

erisa

L&C
Language and Computing

LOGICOM

EMPHASIS SYSTEMS
The Software Production Company
ΔΗΜΙΟΥΡΓΟΥΜΕ ΠΡΟΤΟΤΥΠΑ

RegioneLombardia
Sanità

Fondazione IARD

EMA

GL 2006 Europe Ltd

AEC
Aquitaine Europe Communication
REGION AQUITAINE

European Dynamics

Information Society Technologies

Expected results

- large involvement of **healthcare professionals in the project trials activities**;
- more than **10 EU Regions directly involved in the project trials** and **through eris@;**
- **COCOON toolset for the risk management completely tested and refined** by the healthcare professionals involved in the project;
- **clear business plan** by the COCOON project results;
- more than **1.000 healthcare professionals trained on the COCOON risk management methodology and related toolset**;
- more than **50.000 healthcare professionals involved in awareness activities** during the project dissemination;
- a **permanent observatory on risk management** build up during the COCOON project activities

COCOON activities

Innovation Activities

Exploitation Management

Technological R&D

Socio-economic Research and Business Model Development

Pilot Activities

Demonstration

Support Activities

Training

Observatory for Innovative practices

Project Management

SIXTH FRAMEWORK PROGRAMME
PRIORITY 2.3.1.11
e-Health

COCOON (FP6 507126)
Building knowledge driven & dynamically adaptive networked communities within European healthcare systems

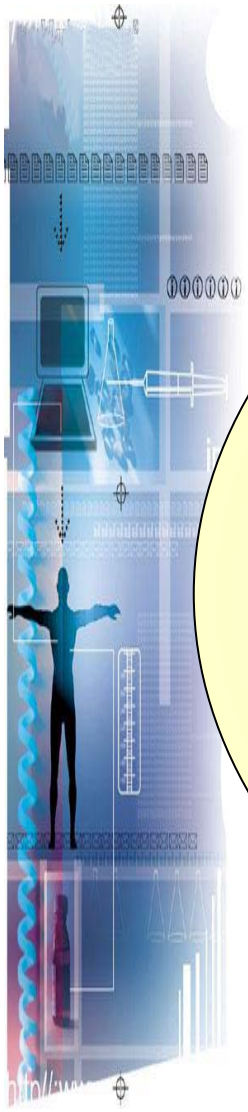
COCOON socio-economic and user requirement analysis

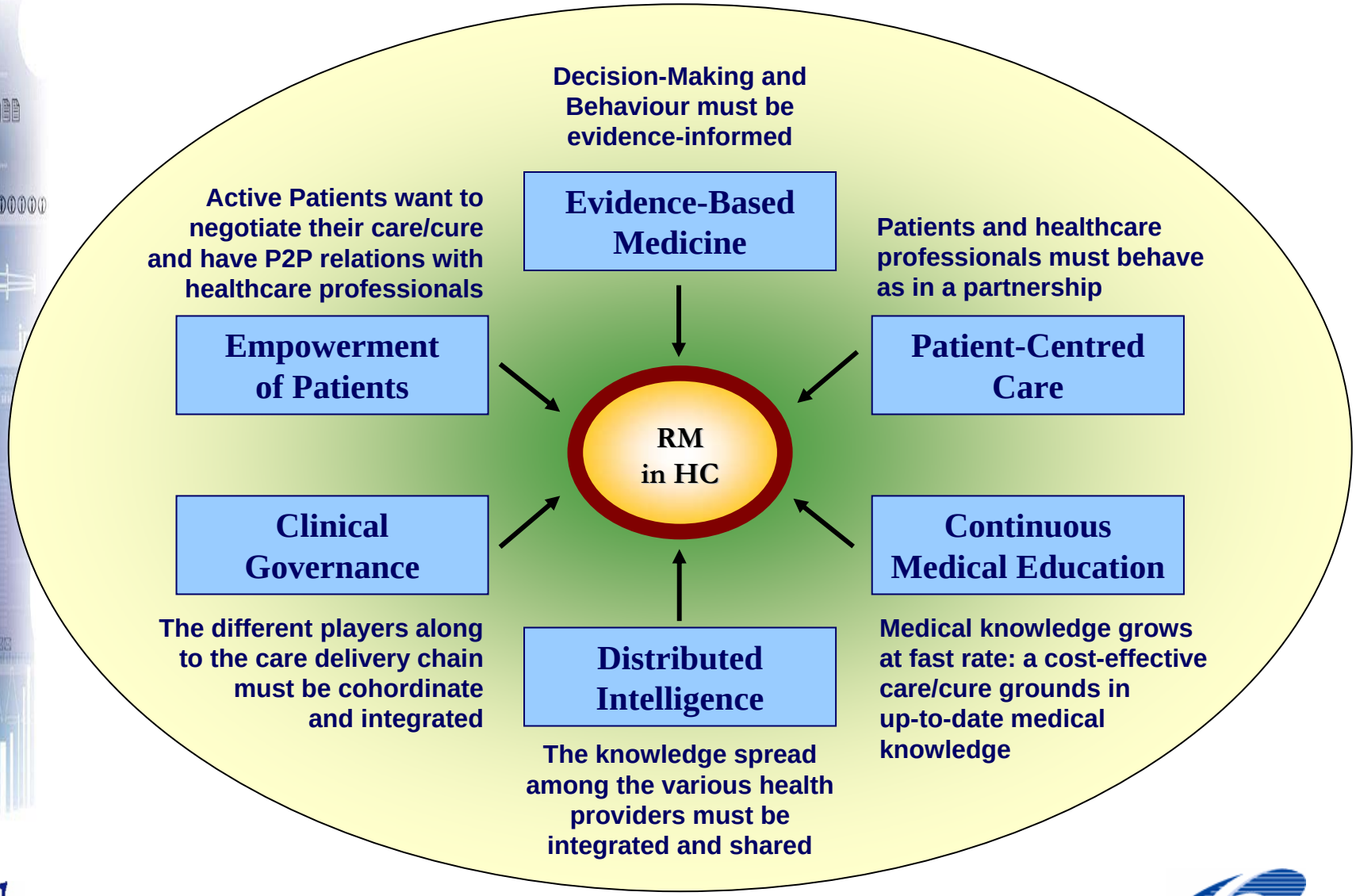
Socio-economic and user requirement analysis

SOCIO-ECONOMIC USER REQUIREMENT ANALYSIS

Prospective studies	Organisational studies	User Requirement Analysis
• analysis of HC systems • ICT penetration in the healthcare systems	• primary care & risk management: sociological and methodological perspectives • legal framework of risk management	

Philosophies underpinning RM in HC





Thematic Literature Review of RM in HC

Formalisation of the RM process

+

Experience from other Industries

Different taxonomies for risks and errors

More Knowledge Different Choice

Context

Taxonomies of Risks / Errors

Contingencies of Environment

Process

Process of Risk Management

Enablers and Disablers

Performance

Clinical Decision-Making

Clinical Output and Outcome

Impact on health spending

Focus on the hospitals Little efforts about GPs

Like as Knowledge + ICTs

Like as Blame and Control

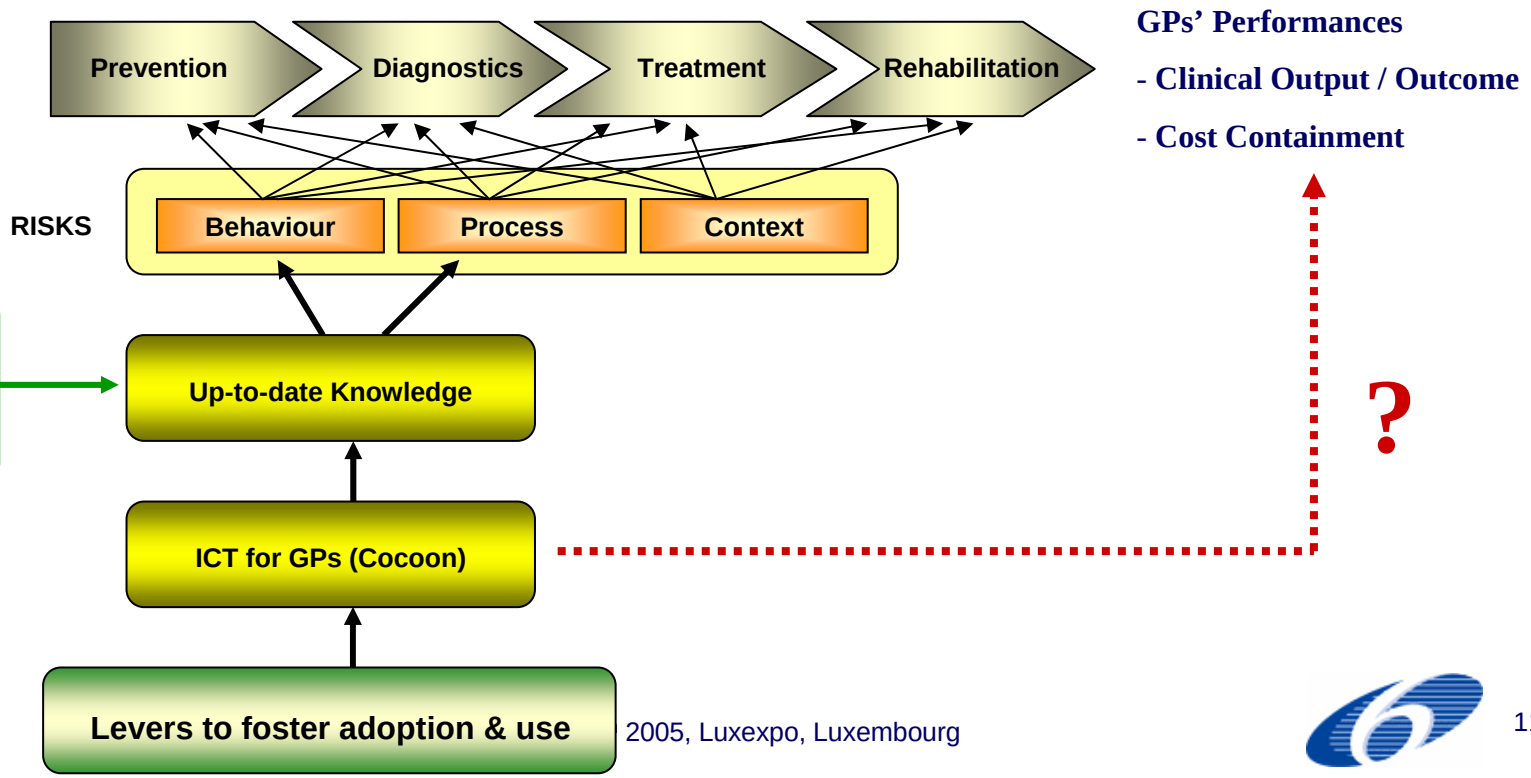
A few National Studies – More Studies on specific cases

A few National Studies

Gaps to bridged with COCOON

Within the WP1 we are trying to :

- formalise supported by the existing literature and research on the field a model that explain the linkage between ICTs adoption and risk management
- create evidence around the model itself (and the underpinning hypotheses)
- to demonstrate that Cocoon platform can and will bridge the gap !!!



COCOON URA: Objectives

AS IS analysis of the Pilots:
Lombardy, Epirus Regions

Innovative, intelligent,
user-friendly toolset

Effectiveness of healthcare information provision

Quality GP decision making

Quality of patient care

COCOON URA: Methodology (1/2)

1. Organisational context analysis
2. Existing IT infrastructure analysis
3. Analysis of GP/specialist activity
4. Analysis of existing data
5. Analysis of the EHR SW and normative rules

Definition of the field trial area

COCOON URA: Methodology (2/2)

Once defined the field trial area

Direct phone interviews to about 100 GPs/specialists belonging to the chosen field trial area

Definition of sample of **GPs/ specialists** who **will take part into COCOON field trials** and who **will test COCOON platform**

1st workshop: Definition of functionalities

2nd workshop: Identification of COCOON interface

SIXTH FRAMEWORK PROGRAMME
PRIORITY 2.3.1.11
e-Health

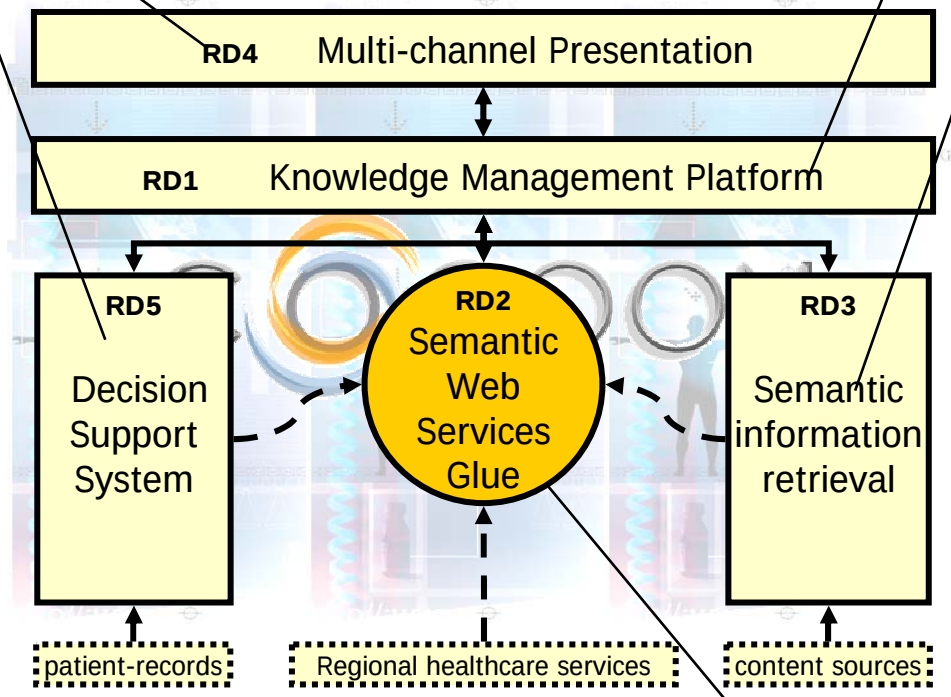
COCOON (FP6 507126)
Building knowledge driven & dynamically adaptive networked communities within European healthcare systems

COCOON architecture and components
COCOON Innovative aspects
COCOON Interface

a **multi-channel presentation** enables end-users to access the COCOON system from a wide variety of mobile devices

a **Knowledge Management Platform** allows a General Practitioner to effortlessly interact with the COCOON system, as well as to automatically personalize the presentation of the information, and allow online collaboration with other end-users, including specialists offering their advice

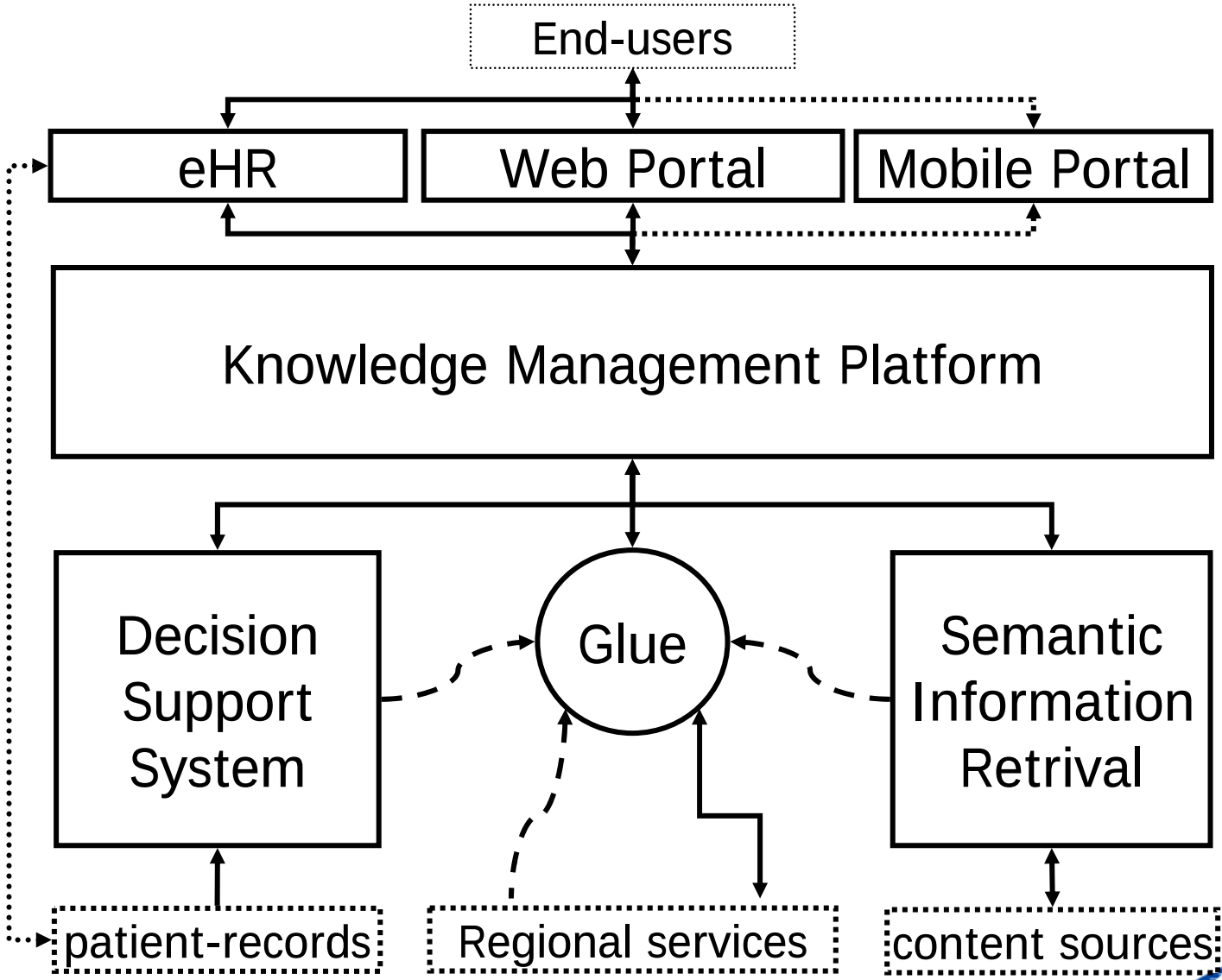
Decision Support System interacts with the patient record and provides clinical guidelines in an interactive form, factually guiding a General Practitioner's decision-making during his/her interaction with a specific patient.



COCOON glue offers an efficient system for **seamless integrating** all the **Web Services** exposed by each RDs and external regional healthcare services

Semantic Information Retrieval utilizes ontology engineering for *concept indexing of free-text* documents, in order to provide relevant medical publications from multiple, distributed content sources

COCOON Global Framework



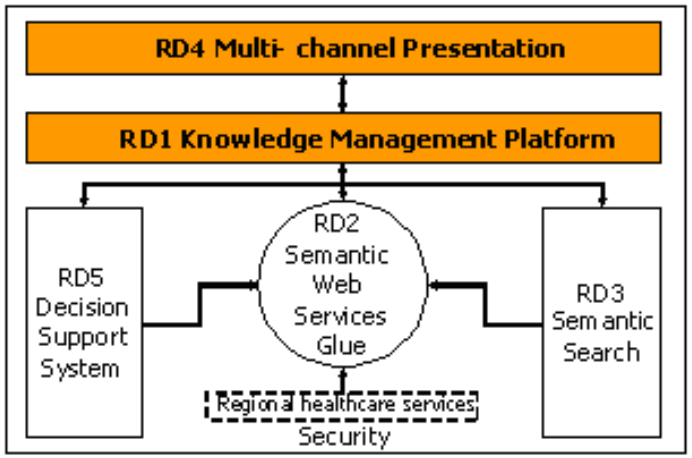
All for one and one for all

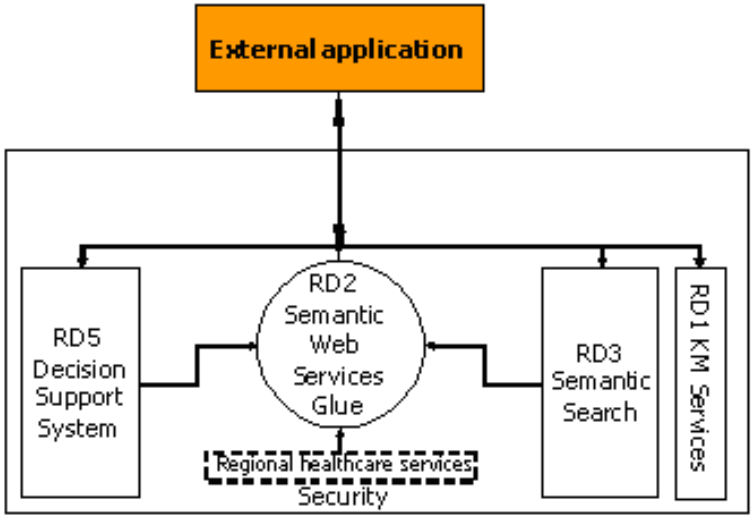
- All for one…
  - Each component
    - is orthogonal to the others
    - solves a specific problem of COCOON stakeholders
    - offers a clear set of related functionalities
    - adopts the best technologies for efficiently implementing them
  - Web Services technologies was chosen
    - to encapsulates the functionalities offered by each component
    - because they hide heterogeneity in platforms and technologies
    - hence simplifying composition and integration
- … one for all
  - A flexible (semantic-based) architecture was adopted because
    - It simplifies integration of COCOON services in already deployed applications
    - It is open and allows for the integration of regional eHealth services in COCOON
    - it supports different implementation strategies

COCOON innovation aspects

	System Generic	Component Specific
Technological	• **Complete service oriented architecture** • **Semantic Web Services discovery**	• **Semantic information retrieval** • **Grid technology for information retrieval**
User Oriented	• **Complete knowledge management platform for eHealth**	• **Clinical guidelines integrating pharmaceutical database**

COCOON implementation strategies





implementation strategy based only on the internal components that delivers **COCOON services via a Mobile and Web Portal**, which means “zero installation, anywhere, anytime

implementation strategy that embeds the **COCOON functionalities in wide-spread eHRMS product**, which seems to be a more comprehensive solution with a **coherent look-and-feel and ergonomics**

COCOON web interface: the result

- COCOON **Web-based version integrated with a web-based health record** collecting the clinic history of the patient, data previously collected
- the data content and format are **standardised** and include all information concerning the **result of diagnosis and treatments** and patient status

COCOON web interface: user registration

In this web application is possible to register and begin to use a Cocoon web based eHR with all Cocoon functions like SIR, DSS, COllaboration Tools, etc.

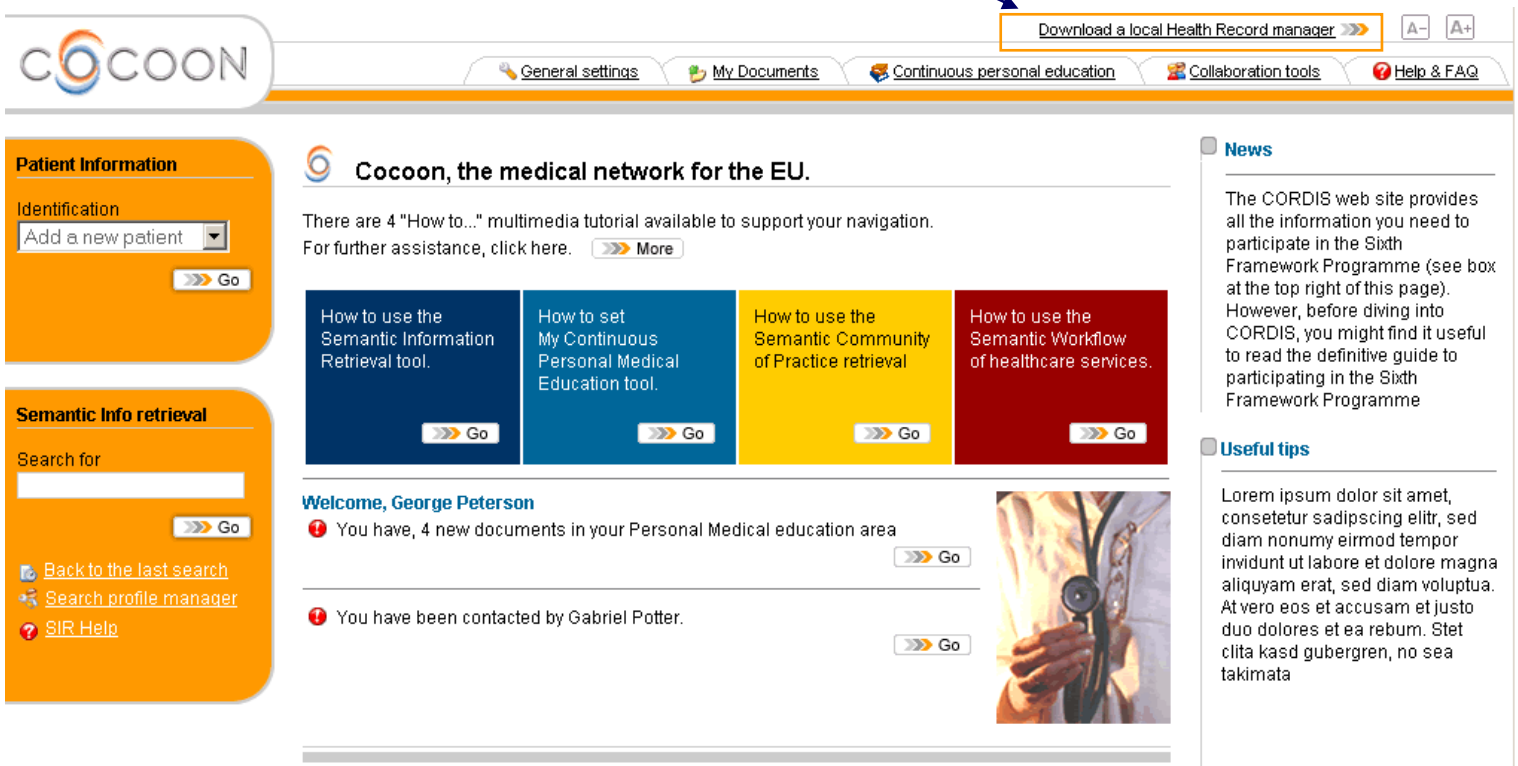
Registration mask

COCOON web interface: user login

Login mask

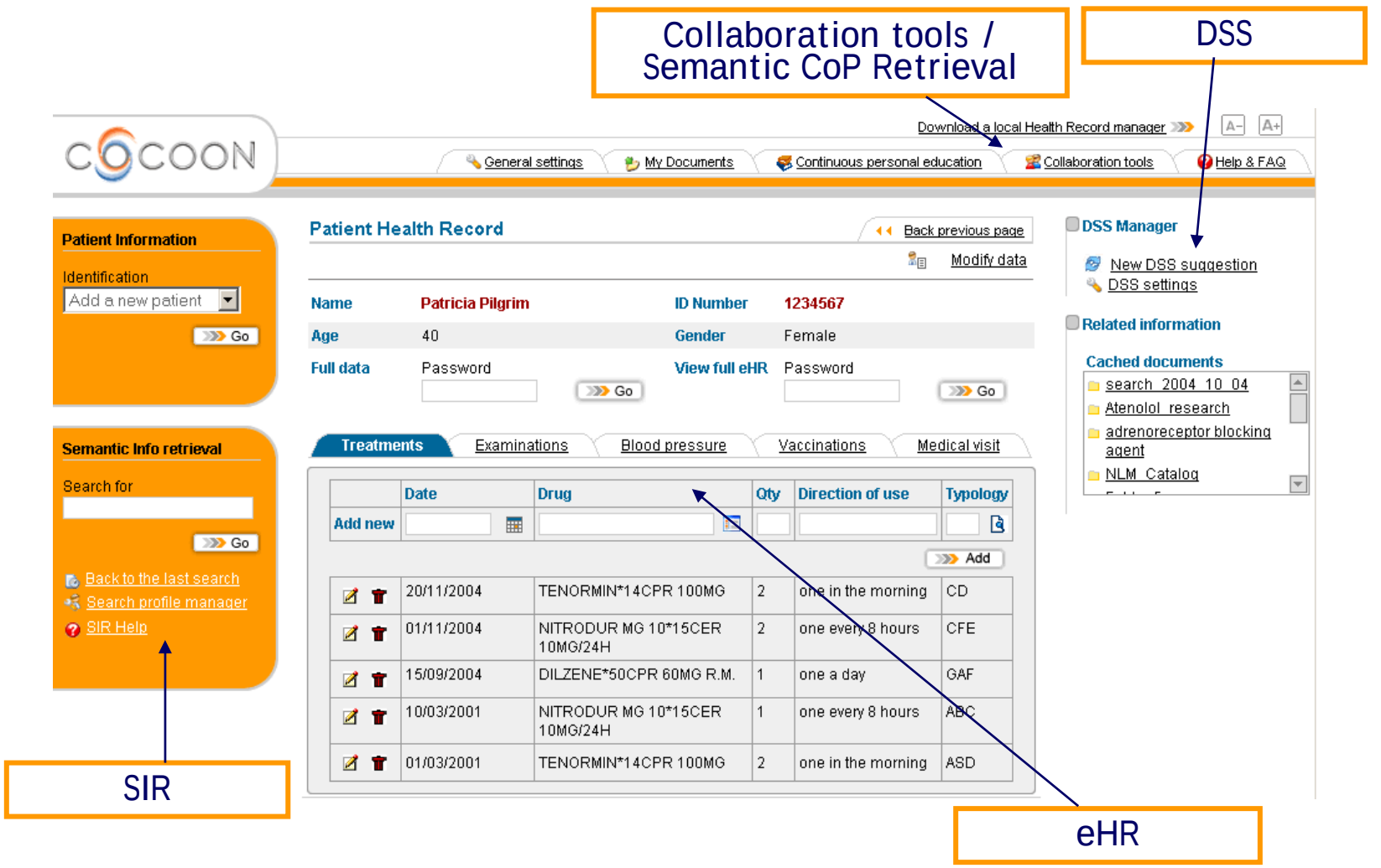
COCOON web interface: local eHR download

LHRS Download

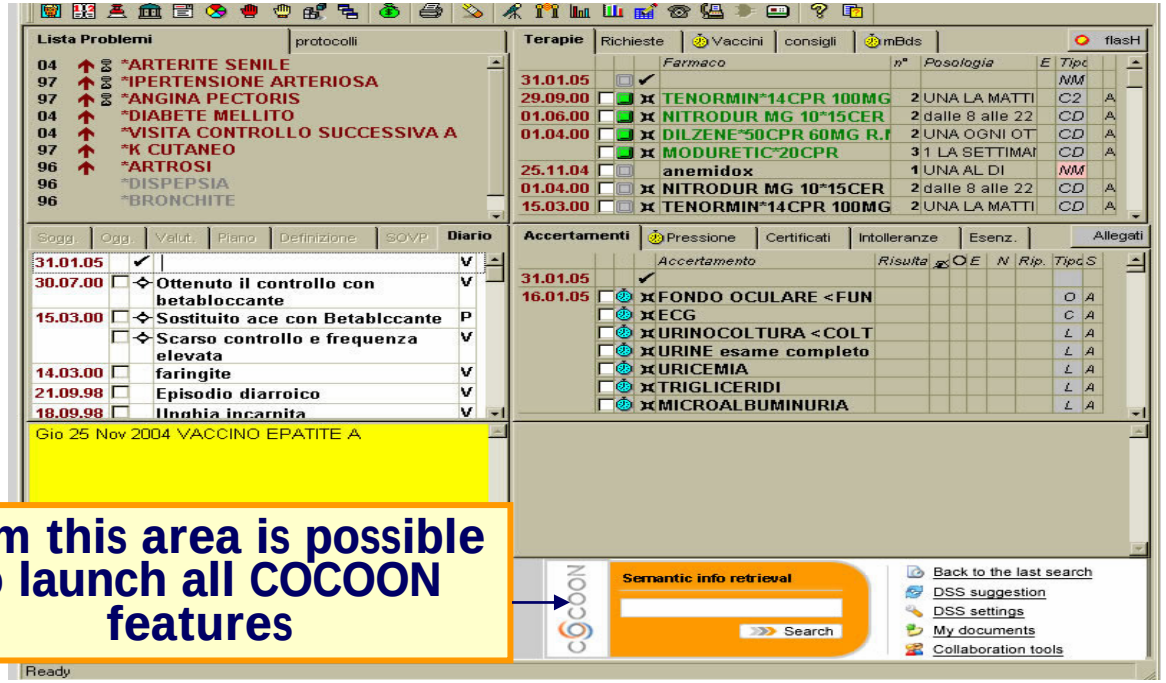


The GP always is able to download a eHRS to be installed in his personal computer.

COCOON web interface: web based eHR



External application: the result



- **COCOON functionalities in wide-spread eHRMS product**
- COCOON Decision Support System will offer to the electronic patient record a **set of services** that will enable the enactment and follow-up of a **specific clinical guideline for a specific patient**
- COCOON DSS stores Clinical Guidelines in executable format and they expose services able to **evaluate the patient's condition and propose future steps and enquires that the patient should perform**

SIXTH FRAMEWORK PROGRAMME
PRIORITY 2.3.1.11
e-Health

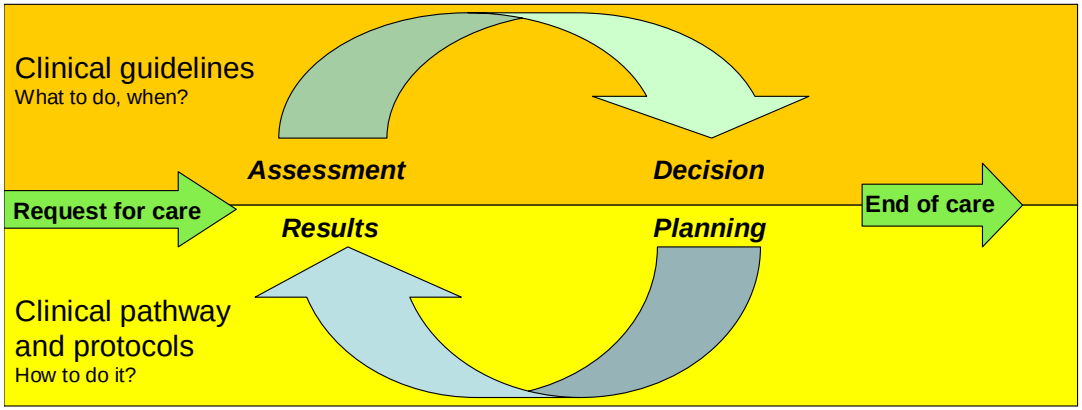
COCOON (FP6 507126)
Building knowledge driven & dynamically adaptive networked communities within European healthcare systems

COCOON care process model
COCOON scenarios

care process model and errors

Care Management

Decision making



Care Delivery & documentation

Care Delivery

Causes of errors	Frequency
Healthcare systems dysfunction	82,6 %
Main Sub-Categories of errors	Frequency
Treatment delivery lapses	23,0 %
Miscommunication	5,8 %
Wrong treatment decision	4,2 %
Wrong diagnosis	3,9 %
Gaps in knowledge and skills	13,4 %

Source: US reports about risks in Family practice

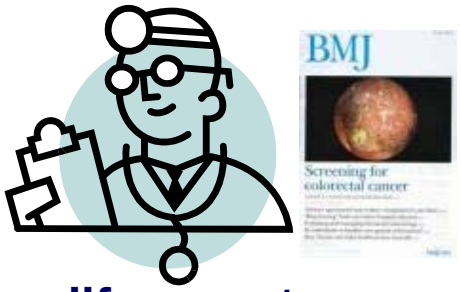
COCOON scenario: Continuous Medical Education

- **Continuous personal medical education (CME):**
  - COCOON provides general practitioners with a **Knowledge Management platform** which gives access to heterogeneous and distributed medical information. The KM platform allows the GP to **homogeneously navigate the results**, deepen or generalise the search and **cache valuable information**;
  - COCOON offers the opportunity to **store query** in relation to a specific medical information, so that the system can **push** to the GP **new relevant documents** which increase and **update** his/her **knowledge cache**

Two use cases:

- User driven semantic information search
- Knowledge driven information notification

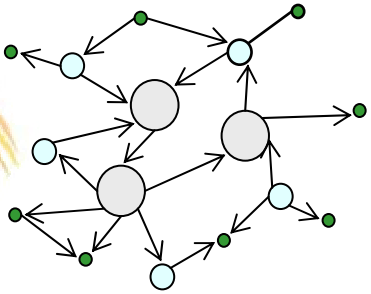
CME: Retrieving - Personalisation - Navigation of search results



life expectancy and quality life breast cancer

NLP

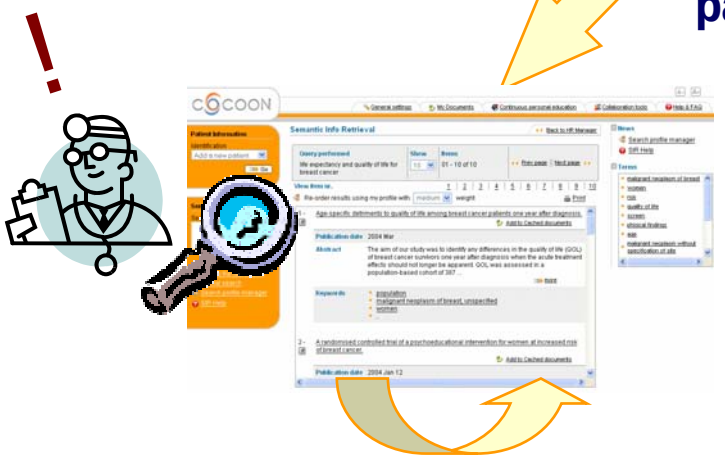
additional information



ontology

search results

profiling parameters



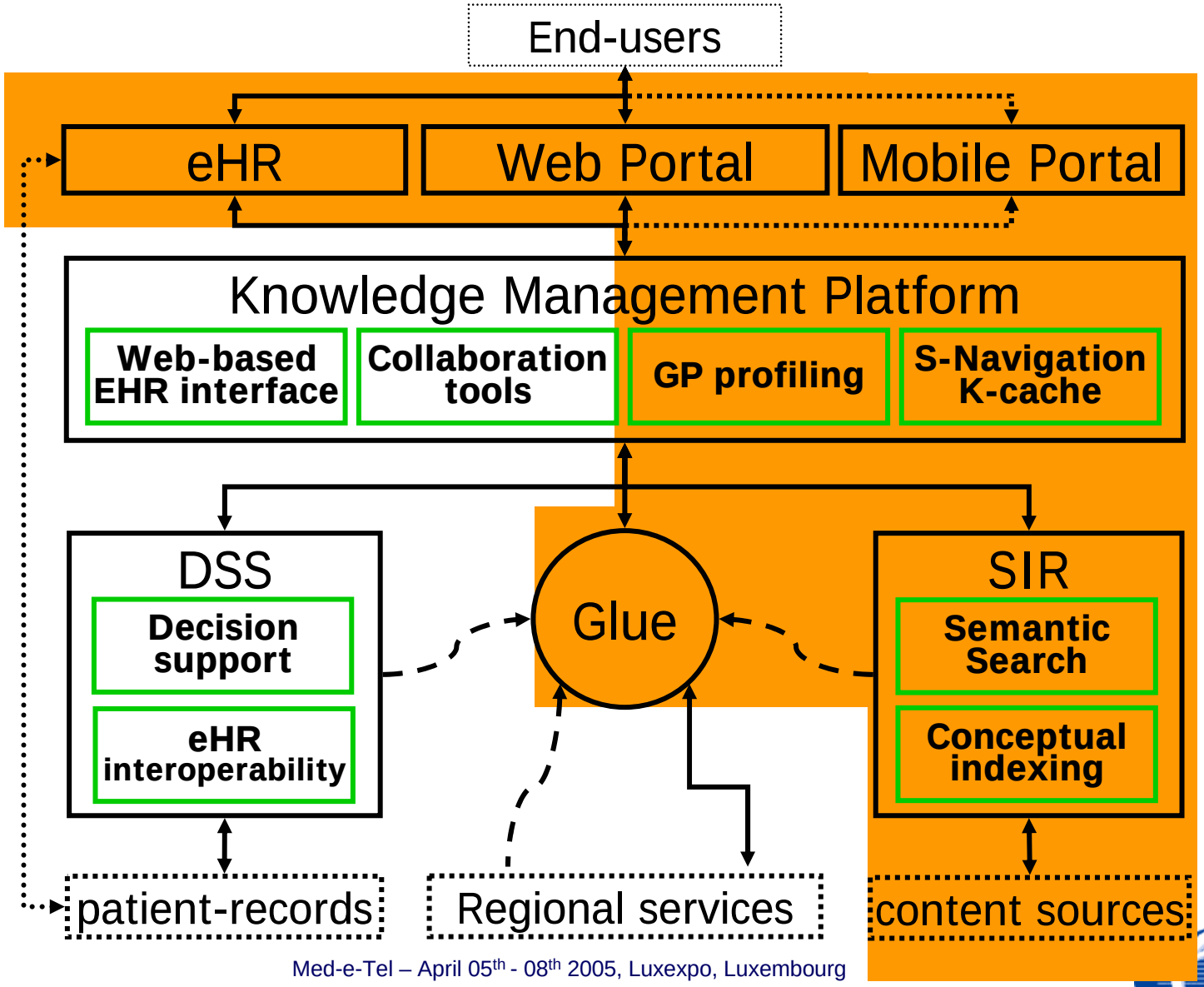
Navigation

Navigation

CME: Retrieving - Personalisation - Navigation of search results (2/2)

- George, a general practitioner, has lately come across an article in the British Medical Journal about **life expectancy and quality of life for breast cancer**;
- intrigued by the article, George decides to use COCOON platform, in order to collect **additional information** regarding this topic that may come useful in his future practice;
- George takes a look into **COCOON Breast Cancer ontology** and submits a **natural language query** inquiring about topic;
- a **large amount of documents** is retrieved from multiple content sources, but Georges is facilitated in **navigating the results** by COCOON which offers links to documents similar to a selected one, links to terminology used in indexing the document and annotations provided by the users;
- Lacking time and attention to manually inspect the numerous search results, George decides to turn the **COCOON platform** for assistance;
- George instructs COCOON platform to apply his **profiling parameters** to the search results. These are re-presented to George, filtered and sorted in a personalised way

Scenarios categories vs. COCOON components
Continuous personal education scenario



COCOON scenario: Decision Support System

- **Decision Support System (DSS):**
  - COCOON DSS uses **Clinical Guidelines**, issued by medical Authorities, as a basis for designing **care path**. CG is transformed into steps that may include diagnostic and treatment activities. Based on **patient eHR** and results of previous steps, the DSS offers a set of r**ecommendations** regarding **next steps** to be taken;
  - COCOON DSS consults **pharmaceutical databases** to match medications to patients and detect **individual counter-indications**;
  - COCOON DSS provides support to the care delivery phase preparing a **care path of treatments and examinations** for patient

Three use cases:

- Supporting Diagnosis and Treatment by Guiding Decision Making
- Semantic Coordination of Healthcare Services
- Remote Management of the Electronic Health Record

DSS: Clinical Guidelines

high blood pressure

symptom

lab exam

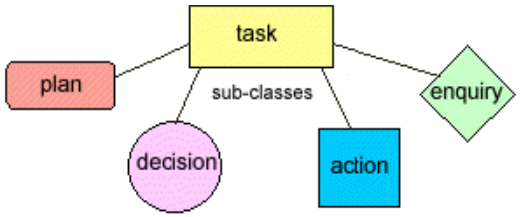
eHR

relevant information

Specific Patient Profile

eHR updating

DSS



SUPPORTING DIAGNOSIS

Clinical Guidelines

DSS: Clinical Guidelines (2/2)

- George, a general practitioner, visits Patricia, one of his patient, who suffers from dizzy spells and balance instability;
- he finds that Patricia has **high blood pressure** and decides to ask for **lab exams** (i.e. blood exams, electrocardiogram, thyroid analysis) and gives her an “holder” for 24 hours;
- George enters Patricia’s personal details into her **eHR**, along with the results of the lab exams (once available);
- after that, George wants to know which is the best diagnosis to follow and turns to **COCOON platform for assistance**;
- **COCOON DSS** is able to **run clinical guidelines**;
- the relevant information from Patricia’s eHR is anonymously transferred to COCOON platform as **Specific Patient Profile**;
- COCOON platform uses this information to activate a **decision support procedure**;
- George is presented with various clinical guidelines for Patricia’s case and selects the **most appropriate** one;
- George updates Patricia’s eHR

DSS: Pharmaceutical Database

symptom

medication prescription

eHR

WARNINGS SUPPORTING TREATMENT

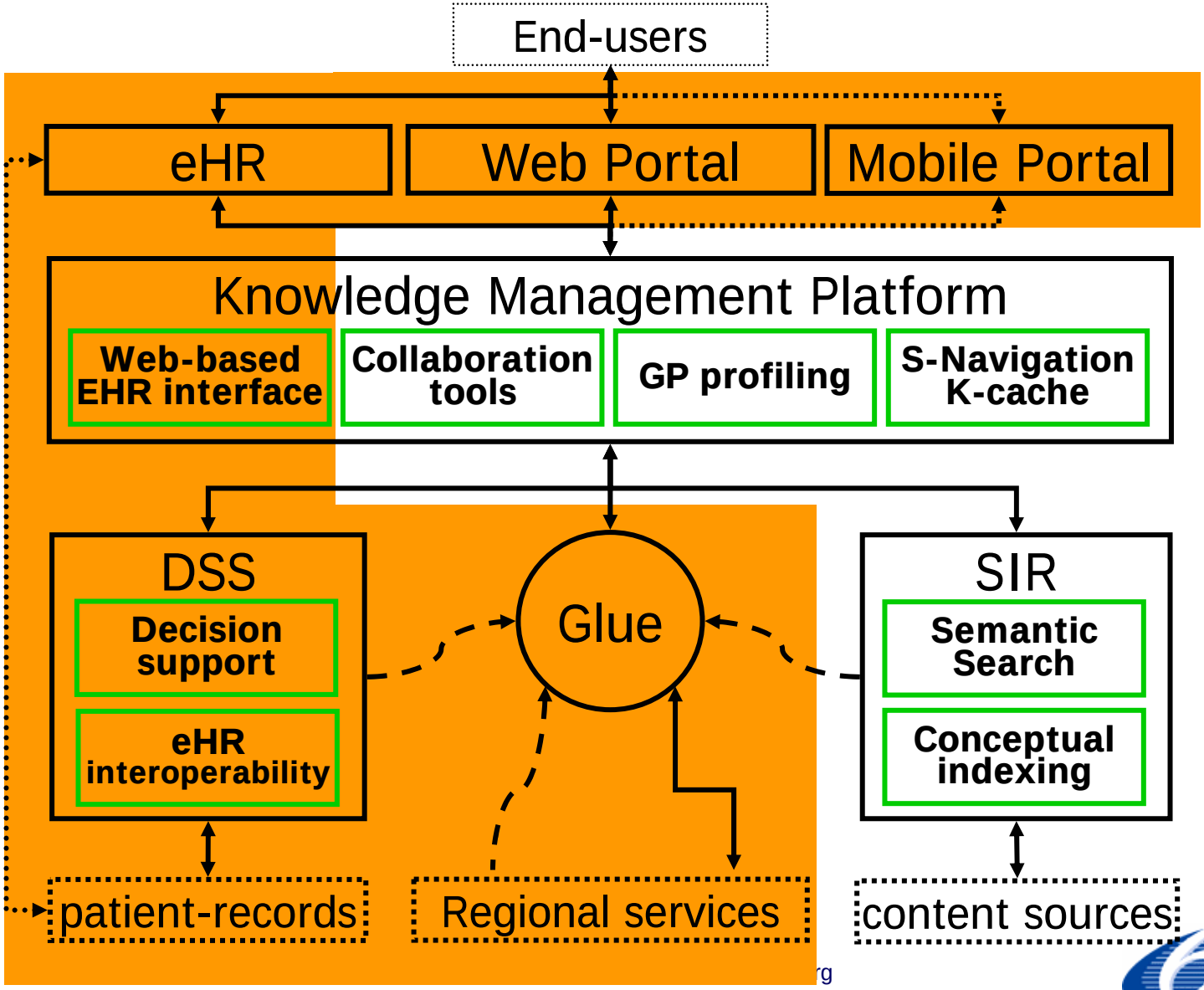
DSS

pharmaceutical database

DSS: Pharmaceutical Database (2/2)

- Patricia recently started **suffering from a nephropaty** and she is on medication for her **diagnosed hypertension**;
- George examines Patricia and decides to prescribe her an **additional medication** in order to care nephropaty;
- George updates Patricia's eHR;
- in order to prescribe the most suitable medication, George turns to **COCOON platform for assistance**. The request is transferred as a query to the **Pharmaceutical Database**;
- **COCOON DSS** compares the information retrieved from the Pharmaceutical DB with the patient profile;
- George is presented with the **search results** that include eventual **warnings** in case there are medications with potential **undesired side effects** for Patricia or medications which are incompatible with her current treatment

Scenarios categories vs. COCOON components
Decision Support System scenario



COCOON scenarios: Advice

- **Advice:**
  - COCOON aims at supporting healthcare professionals in finding the **most appropriate group of experts** to ask for an advice;
  - once the group of experts has been identified, the involved actors can **exchange information** and **share data** via COCOON multi-channel collaborative work platform. The results of the work sessions might be **indexed** using COCOON ontology and **stored** for a future use

Two use cases:

- Semantic discovery of Community of Practice
- Multi-channel Collaborative Working

Advice: Discovery of Community of Practice

symptom

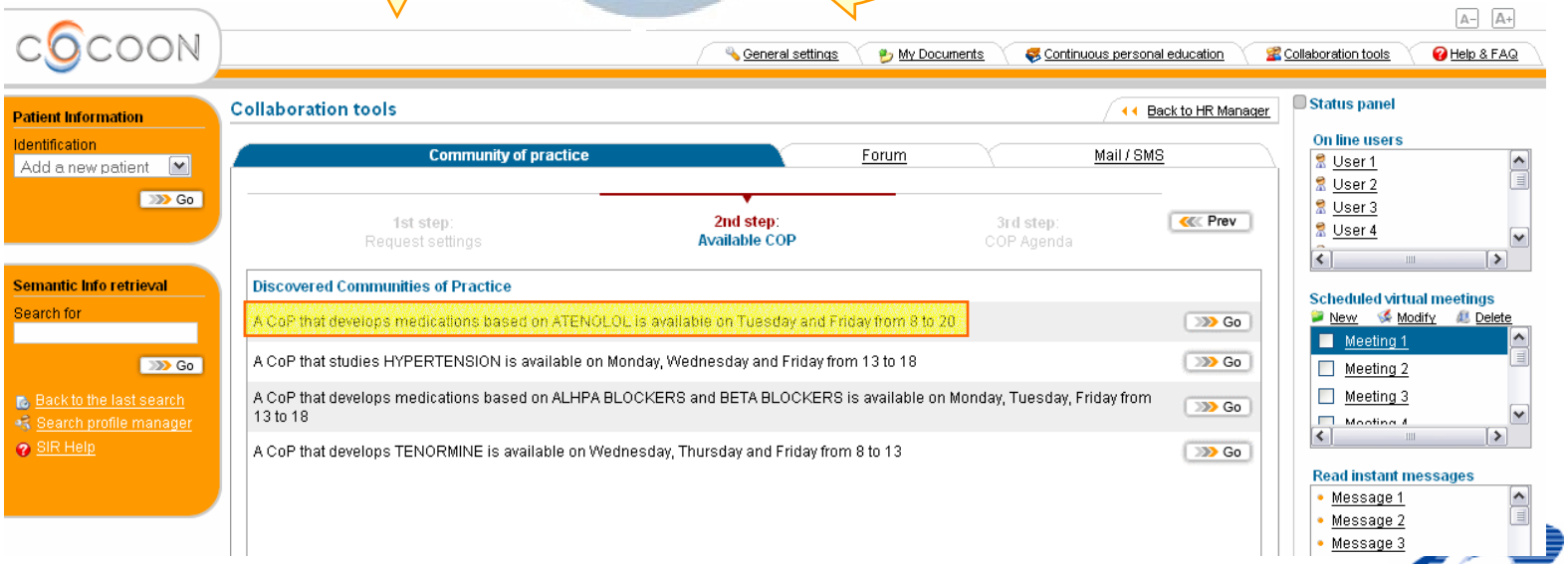
Community Invoker

Request Goals:
Time: March 10th from 10 to 13 or
March 11th from 13 to 16
Medical Issue: ATENOLOL

Submits to

Matching

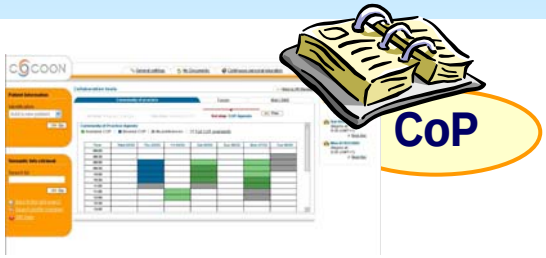
CoP Selection

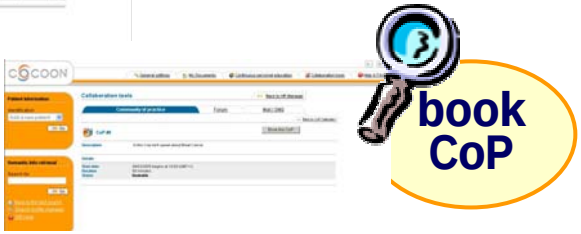


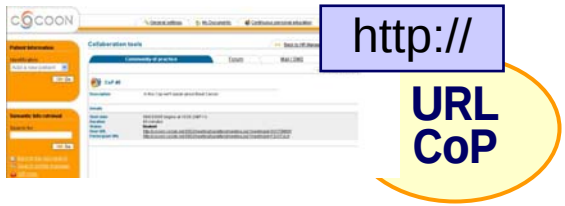
Advice: Discovery of Community of Practice

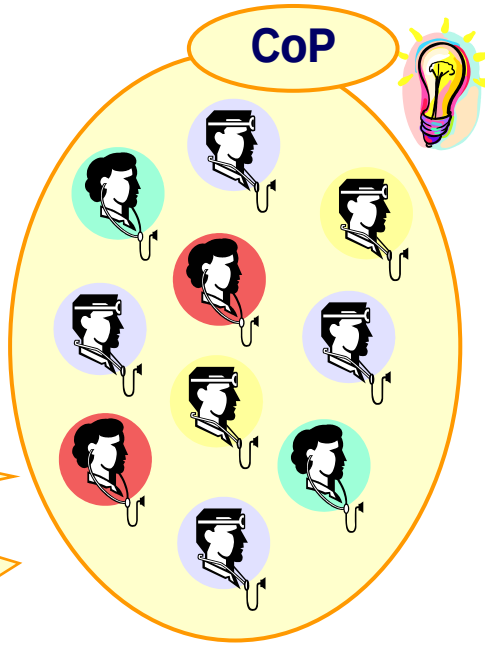
- George, a general practitioner, visits Patricia, one of his patient, who suffers from breathing difficulties after the assumption of the **medicine ATENOLOL**;
- George decides to ask for a specialist (**community invoker**) for an **advice** and turns to **COCOON platform**;
- George submits his **request** for asking an advice specifying the **knowledge** of medicine ATENOLOL and **time availability** on March 10th (Thursday) from 10 to 13 or March 11th (Friday) from 13 to 16;
- COCOON platform matches George's request with the **available advice services** and the results are presented to George;
- George selects the **most suitable advice service** in terms of offered expertise and availability

Advice: Collaborative working



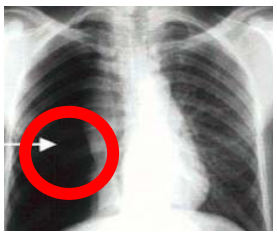






Scheduled day

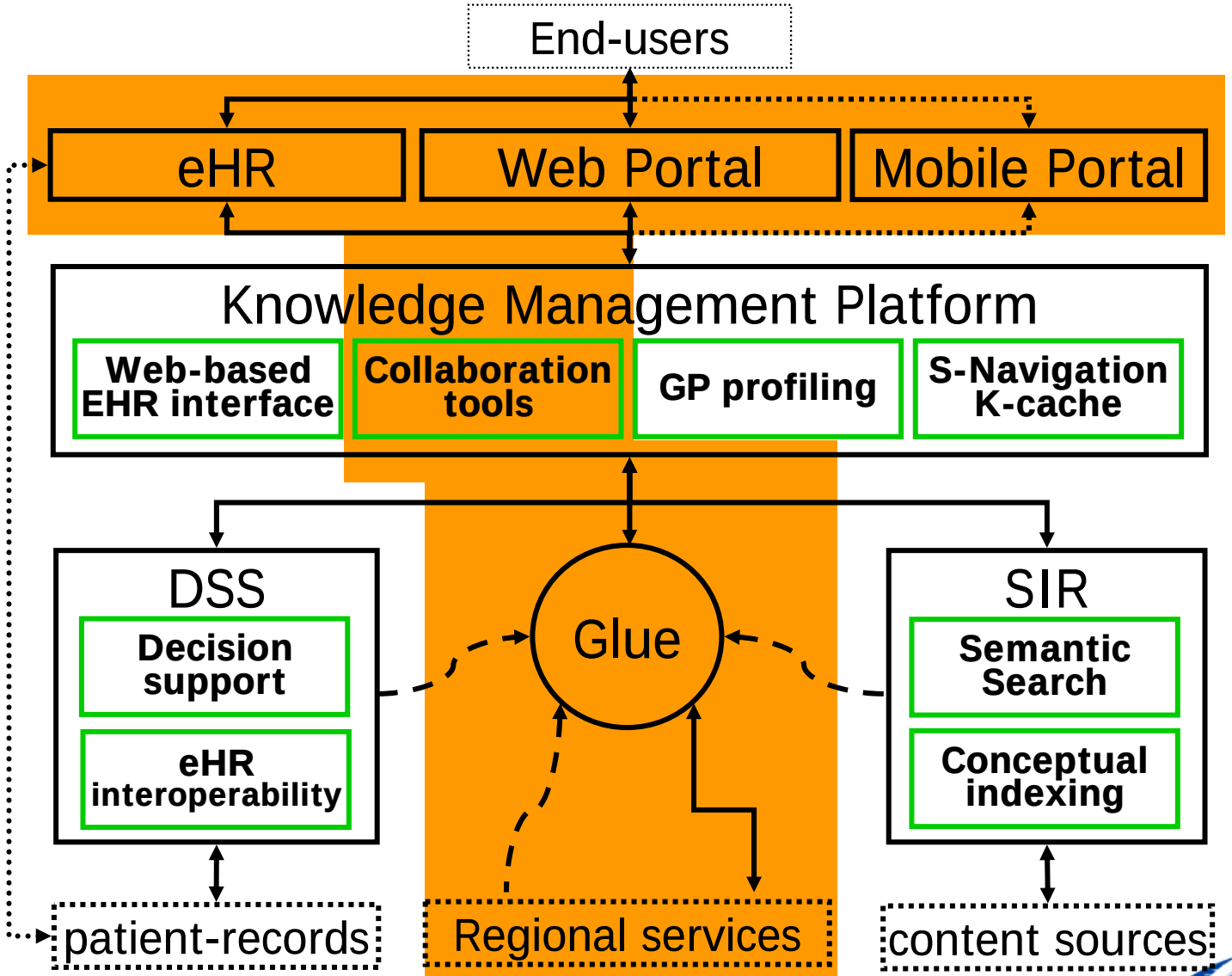
http://



Advice: Collaborative working

- George **schedules the consultation** with the selected CoP. In order to do that, George interacts with COCOON platform:
  - he sees the **agenda** of the selected CoP;
  - he sees the **details** of the CoP;
  - he **books** the CoP;
  - he sees the **URL** to access to the booked CoP and receives an e-mail with the same information
- On the scheduled date, George uses the URL to access to the CoP. George and the experts writes in the **same whiteboard** and **exchange in real-time documents and images** in order to increase **accuracy of Patricia's diagnosis** and **efficiency of her treatment**;
- At the end of the meeting George receives via e-mail a meeting's summary. The **meeting is recorded and stored** as knowledge object

Scenarios categories vs. COCOON components
Advice scenario

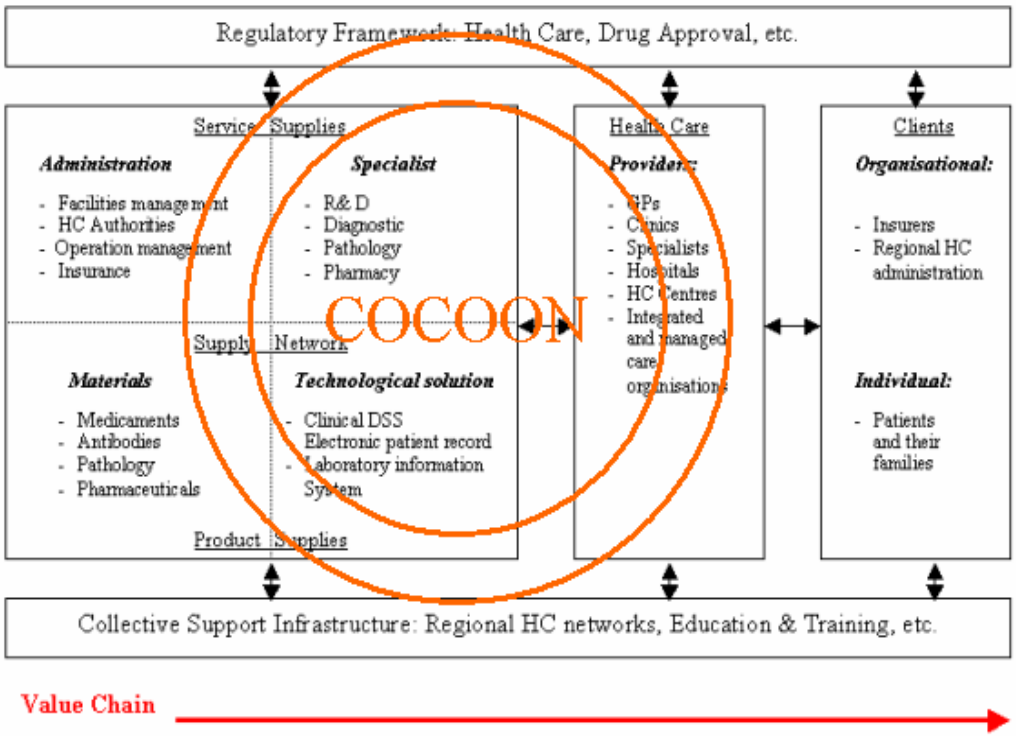


SIXTH FRAMEWORK PROGRAMME
PRIORITY 2.3.1.11
e-Health

COCOON (FP6 507126)
Building knowledge driven & dynamically adaptive networked communities within European healthcare systems

COCOON business plan

The HC value chain
The impact of COCOON

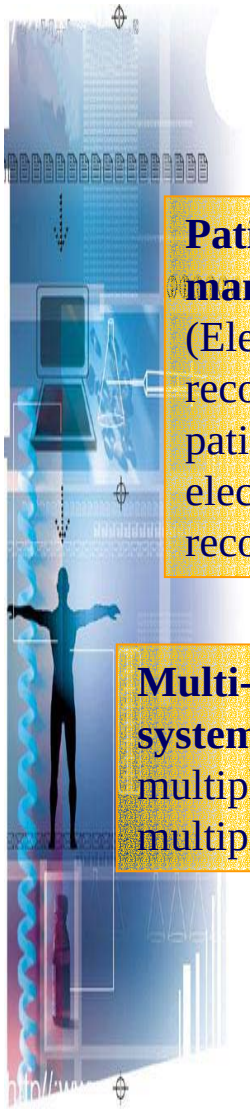


Payers to coordinate information and services across organizations, to take a more process-oriented view of health care delivery with appropriate organizational and information infrastructure

HC technological providers linking and integrating health services. Collaborative partnerships between COCOON consortium and the leading players on the referred market.

HC Practitioners - they are the main users of the COCOON system; the system will offer them the adoption of practice management tools, clinical tools and online communication systems, , the use of the decision support systems (DSS) and evidence-based care in diagnosis and treatment.

Competitive Environment
COCOON positioning



The COCOON market is characterised by mainly 7 types of competitors:

Patient data management (Electronic medical record, Computer based patient record, electronic healthcare record)

DSS (Simple DSS, advanced DSS, innovative DSS)

GRID solution (No GRID system, free GRID, private GRID)

COCOON possible competitors

Distributed system integration (ad hoc system, EAI, web services, semantic web services)

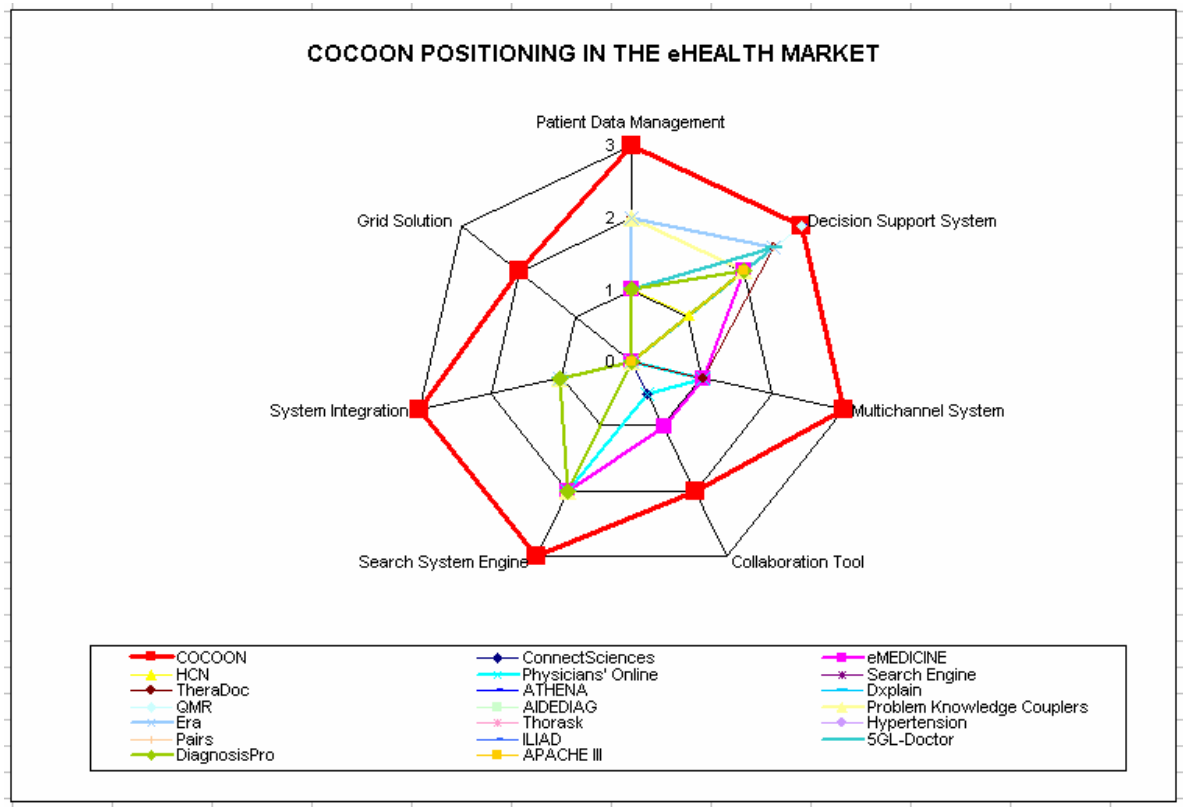
Multi-channel delivery system (Portable devices, multiple interaction methods , multiple channels)

Collaboration tools (Groupware services, communication service, enterprise collaboration platform)

Search system (Search on a managed repository , Federated search engine, Semantic search on an ontology domain)

Competitive Environment
COCOON positioning

The main innovative aspect of the COCOON portal is the incorporation of different functionalities and services in a single solution; all the functionalities are exposed as Web Services



SIXTH FRAMEWORK PROGRAMME
PRIORITY 2.3.1.11
e-Health

COCOON (FP6 507126)
Building knowledge driven & dynamically adaptive networked communities within European healthcare systems

COCOON future plans

Future plans: technological development process

- Individual prototype refinement
- Platform integration
- Definition of the metrics of “performances at large”:
  - actual performance of each component and of the system as a whole
  - “usability” (and matching of the components to concrete needs of the GP)
  - legal aspects connected to real-life scenarios of usage in each region
- Experimentation with user groups in the pilot regions
- Testing and validation
- Feedback from the fields

Future plans: Demonstration process

- Regional pilots
  - 3 regional pilots up and running in 2005
  - 3 more regional pilots for the beginning of 2006
  - 4 more regional pilots by the end of 2006
- Workshops and seminars (AEC in charge)
  - organisation of a conference in a European Capital (Paris, Brussels or Geneva);
  - organisation of a workshop in Paris;
  - exploitation of some COCOON deliverables by producing 4 documents in French language (to be sent to a list of 3000 subscribers at the Regional & National level)
- Training activities agreed with the regional pilots
- Domain usage extension
  - Guidelines increase
  - Pathologies increase
- COCOON portal free access, with performances indicators on COCOON platform usage, continuously updated

Thank you very much for your attention

Any question?

Contacts:

Emanuele Della Valle: dellavalle@cefriel.it

Lara Gadda: lara.gadda@polimi.it

Valentina Perdoni: valentina.perdoni@fondazioneiard.org

www.cocoon-health.com