



# Corso di Laurea in INFORMATICA Magistrale

## Interazione Uomo-Macchina II



### Modulo A

### a.a. 2009-2010

### III

### Ambienti per EUD, SSW, esempi

Questi lucidi sono stati preparati da Maria Francesca Costabile, Università degli Studi di Bari, per uso didattico. Essi contengono materiale originale di proprietà dell'Università degli Studi di Bari e/o figure di proprietà di altri autori, società e organizzazioni di cui è riportato il riferimento. Tutto o parte del materiale può essere fotocopiato per uso personale o didattico ma non può essere distribuito per uso commerciale. Qualunque altro uso richiede una specifica autorizzazione da parte dell'Università degli Studi di Bari e degli altri autori coinvolti.

1



## Toward End-User Development



- **Users** are people interacting with software systems  
Even software engineers are users of tools and environments they use for their work (e.g. CASE tools)
- **End users** are people not experts in computer science nor willing to be, who use computer systems for their daily activities, for work as well as for entertainment or other
- “Using the system changes the users, and as they change they will use the system in new ways” [Nielsen 1993]
- Interactive systems must be designed to **evolve** as needs of **evolving** end users might require
- **Co-evolution** of end user and system [Costabile et al, AVI 2006]
- Allowing end-users to personalize and evolve at run time their own software environments and tools → **End User Development**



- “End User Development is a set of activities or techniques that allow users of software systems, who are acting as non-professional software developers, at some point to create or modify a software artefact ”  
[EUD-Net 2002-2004]
- EUD means the active participation of end users in the software development and evolution processes
- New challenges for system design and implementation
- The need of EUD is not a luxury but a necessity: computer systems modeling some particular “world” are never complete
  - the world changes and new requirements emerge
  - Skilled domain professionals change their work practices over time  
[Fischer 2009]
- Systems are in a “perpetual beta”



## End-User Developments activities

**NO:** activities that allow users to **choose** among alternative behaviours (or presentations or interaction mechanisms) **already available** in the application

– e.g., enter parameters

**YES:** activities that imply some **modification** through any programming paradigm, thus creating or modifying a software artefact



## End users' need...

- ... powerful and flexible software environments
  - Customized to their culture, skills, needs, age, training, ...
  - Tailorable
  - Suitable to manage the user view of the work activity
  - Exploiting concrete, situated, notations: based on icons, symbols, and words that resemble and schematize the tools and the entities used in the working environment
  - Allowing users to personalize and evolve (we say: “to shape”) their own software environments → End User Development

5



## End users in sw development

### Traditional development



### Participatory development



### EUD & Meta-design

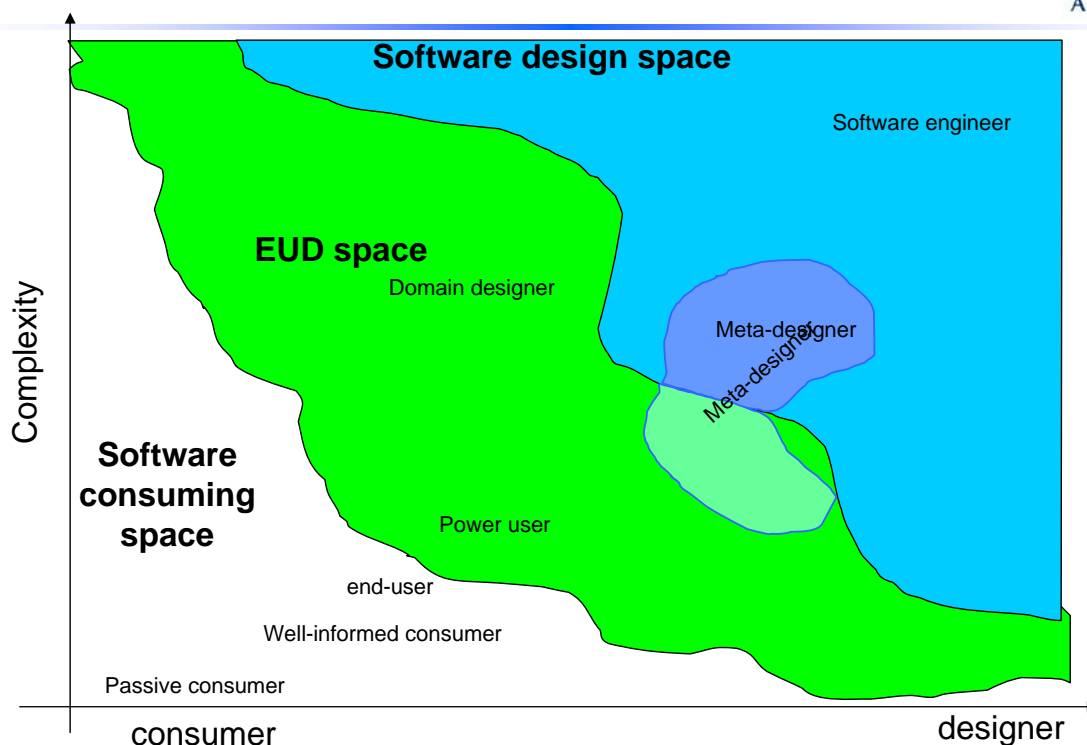


- Design for designers
- It creates open systems at design time that can be modified by their end users acting as co-designers at use time  
[Fischer and Giaccardi 2006]
- A design paradigm that includes end users as designers and provides all stakeholders in the team with suitable languages and tools to foster their personal and common reasoning about the development of interactive software systems that support end users' work.

[Costabile et al 2007]

7

## Consumers and designers spaces



Adapted from: Fischer, G., Piccinno, A., Ye, Y.: The Ecology of Participants in Co-Evolving Socio-Technical Environments. In: Forbrig, P., Paternò, F. (eds.) Engineering Interactive Systems, LNCS 5247, pp. 279-286. (2008)

8




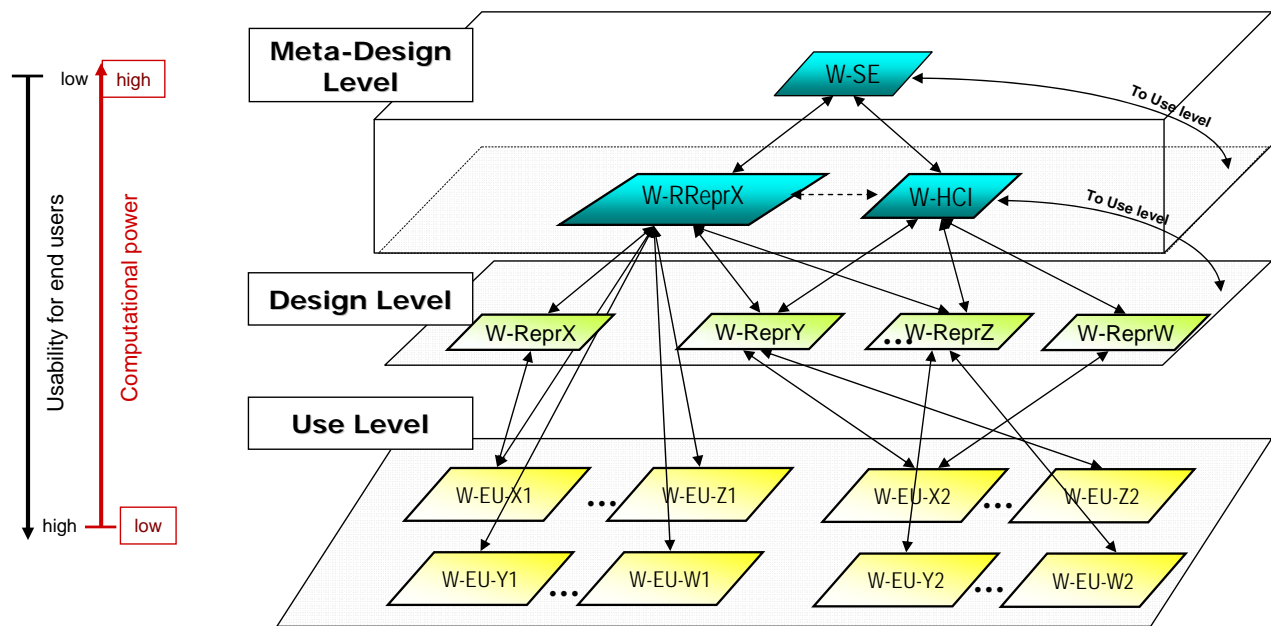
- Some basic principles:

1. In an application domain, there are **different communities of end users**
2. End users need software environments in which they find **all and only the tools** necessary to perform their activities, without being overwhelmed by unnecessary tools and information
3. Systems must be designed for **co-evolution of users and systems**



## Software Shaping Workshops

- A useful metaphor for conceptual design: **artisan workshop** 
- A **Software Shaping Workshop (SSW)** is a software environment devoted to a specific community of end users
- It is organized as a virtual workshop
  - end users find all and only the tools they need
  - end users carry out their activities and adapt environment and tools using high level visual languages tailored to their needs
- **Workshop** as artisan workroom, not as people meeting
- An interactive system to support the work practice in a given application domain
  - cannot provide the same interaction environment to all end users
  - must be designed as a **set of software shaping workshops**, each specific for a community of end users (SSW methodology)
- In some SSWs, end users perform EUD activities



Each SSW provides only the tools to perform the desired activities

11



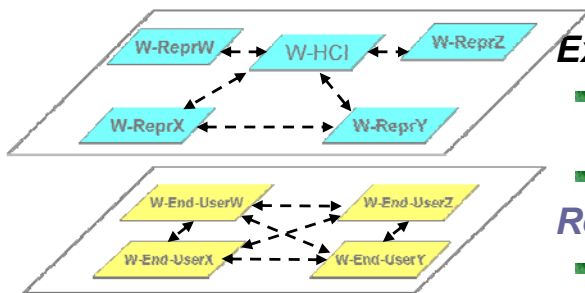
## SSWs permit to design and evolve a system through collaborative negotiations

- The negotiation is based on the exchange along the SSW network of two types of messages:
  - **annotations** about these workshops
  - **executable specifications** of workshops (XML-based documents)
- A stakeholder designs or updates a workshop (e.g. head physician) by using a domain specific language. His actions modify the executable **specification** that, when interpreted by the browser, generates the new workshop

12



# Communication paths in the network



## **Exchange paths:**

- the paths along which the exchanges of data and programs occur
- among the workshops at the same level

## **Request paths:**

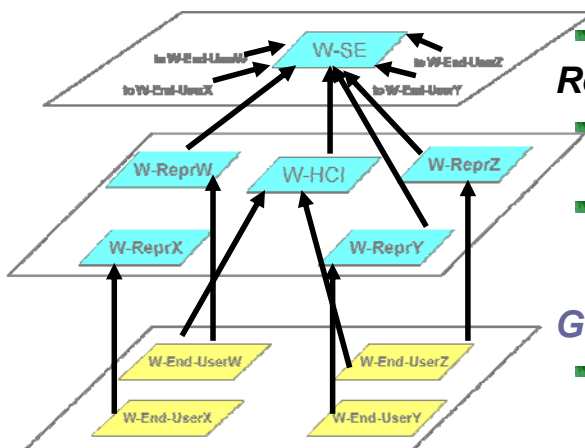
- concerned with the communications going from low levels to higher levels
- trigger the co-evolution process, carrying on the feedback from end users (requests for workshop modification or extension)

## **Generation paths:**

- represent the activity of using workshops at a high level to generate, modify or extend workshops to be used at the lower level
- new or evolved workshops are made available to lower levels along such generation paths



# Communication paths in the network



## **Exchange paths:**

- the paths along which the exchanges of data and programs occur
- among the workshops at the same level

## **Request paths:**

- concerned with the communications going from low levels to higher levels
- trigger the co-evolution process, carrying on the feedback from end users (requests for workshop modification or extension)

## **Generation paths:**

- represent the activity of using workshops at a high level to generate, modify or extend workshops to be used at the lower level
- new or evolved workshops are made available to lower levels along such generation paths



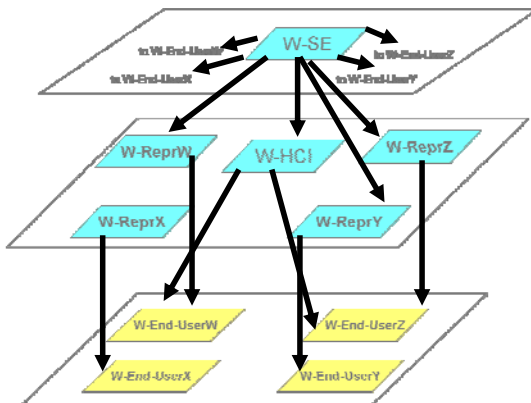


## Exchange paths:

- the paths along which the exchanges of data and programs occur
- among the workshops at the same level

## Request paths:

- concerned with the communications going from low levels to higher levels
- trigger the co-evolution process, carrying on the feedback from end users (requests for workshop modification or extension)



## Generation paths:

- represent the activity of using system workshops at a high level to generate, modify or extend workshops to be used at the lower level
- new or evolved workshops are made available to lower levels along such generation paths



# Future scenario for Software

- Recent projects describe a future scenario for software systems
  - Software will increasingly be part of integrated, heterogeneous, and continuously developing infrastructures
  - End users will actively change the tools they work with and orchestrate different services as building blocks to provide the functionality they need
  - In cases where the required functionality cannot be obtained by simple tailoring, they will **communicate** and **cooperate** with local and other professional designers who in turn might call upon a **network** of peers or developers of the base products and frameworks used
- The described SSW approach already supports this scenario





# Interfacce utente flessibili e personalizzabili

- Le **interfacce utente flessibili** e personalizzabili danno agli utenti la possibilità di configurare la presentazione e le funzionalità del sistema che usano senza dover necessariamente cambiare l'applicazione complessiva

17



## Esempio di interfaccia flessibile: Google, Home page personalizzabile


Home page classica | [Accesso](#)


Web [Immagini](#) [Gruppi](#) [News](#) [altro »](#)

  [Cerca con Google](#) [Mi sento fortunato](#) [Ricerca avanzata](#) [Preferenze](#) [Strumenti per le lingue](#)


Cerca: ☒ il Web ☐ pagine in Italiano ☐ pagine provenienti da: Italia


Benvenuto alla tua home page di Google. [Rendila la tua.](#)


**Libri - Home** [modifica](#)   
[Il romanzo che fa tremare le Banche](#)  
[La scuola dei desideri](#)  
[Identità e violenza](#)


**Komix.it Fumetti @ 360°** [modifica](#)   
[MonoAnteprime - Luca Enoch](#)  
[MonoAnteprime - Fabrizio Lo Bianca / Bruno Olivieri](#)  
[MonoAnteprime - Marco Tunini](#)

**Repubblica.it > Homepage** [modifica](#)   
[Operai, politici e banchieri nella rete del grande spione](#)  
[Masso killer a Frosinone arrestati i due colpevoli](#)  
[Figc, Petrucci proporrà Pancalli come commissario straordinario](#)

 Previsioni meteo per la tua città e i tuoi luoghi preferiti in tutto il mondo.  
[Impostazione](#)

**Prima pagina** [modifica](#)   
[Nassiriya, gli italiani passano le consegne agli iracheni](#)  
[La Repubblica - tutti gli articoli 33 correlati >](#)  
[Sassari, ritrovata l'auto utilizzata nel sequestro Pinna](#)  
[IGN - Italy Global Nation - tutti gli articoli 28 correlati >](#)  
[Papa: «Le mie parole sono state fraintese»](#)  
[Corriere della Sera - tutti gli articoli 52 correlati >](#)

**Eurosport** [modifica](#)   
[La B senza continuità](#)  
[Loeb a caccia del titolo](#)  
[La favola dello Spezia](#)

**DGMag vacanze** [modifica](#)   
[Tornano le Giornate Europee del Patrimonio](#)  
[Vacanza a Marsa Alam tra mare e deserto](#)  
[Vacanza a Copenhagen in cerca della Sirenetta](#)

18



## Case study in the medical domain: designing the Electronic Patient Record (EPR)



UNIVERSITÀ  
DEGLI STUDI DI BARI  
ALDO MORO

- Several projects on EPR
- Many hospital in Italy do not adopt EPR
- We conducted a field study on the use of paper patient record at the “Giovanni XXIII” Children Hospital of Bari, Italy
- Patient record is *many-sided*
  - it is a document to be read and understood by various and very different actors: physicians, nurses, patients’ relatives, the family doctor, etc.,
  - it must have the ability to speak different “voices”, i.e., to convey different meanings according to the actors using it

19



## From the field study



UNIVERSITÀ  
DEGLI STUDI DI BARI  
ALDO MORO

- Various operators use patient records in different ways and to accomplish different tasks
- Specific patient records for each ward, even in the same hospital
- Example:
  - in a children neurological ward, information about newborn feeding must be available
  - in an adult neurological ward, information about alcohol assumption is required
  - In a surgery department, a lot of specific data collected by different specialits (cardiologists, pneumologists, ..) to indicate if the patient can undergo a surgery are required
- Operators are reluctant to accept a common unified format, they want to adapt the patient record to their specific needs

20

- Patient records can be seen as being composed by modules for collecting patient data
- The patient records used in different wards assemble a subset of modules in different ways, customized to the need of the specific ward

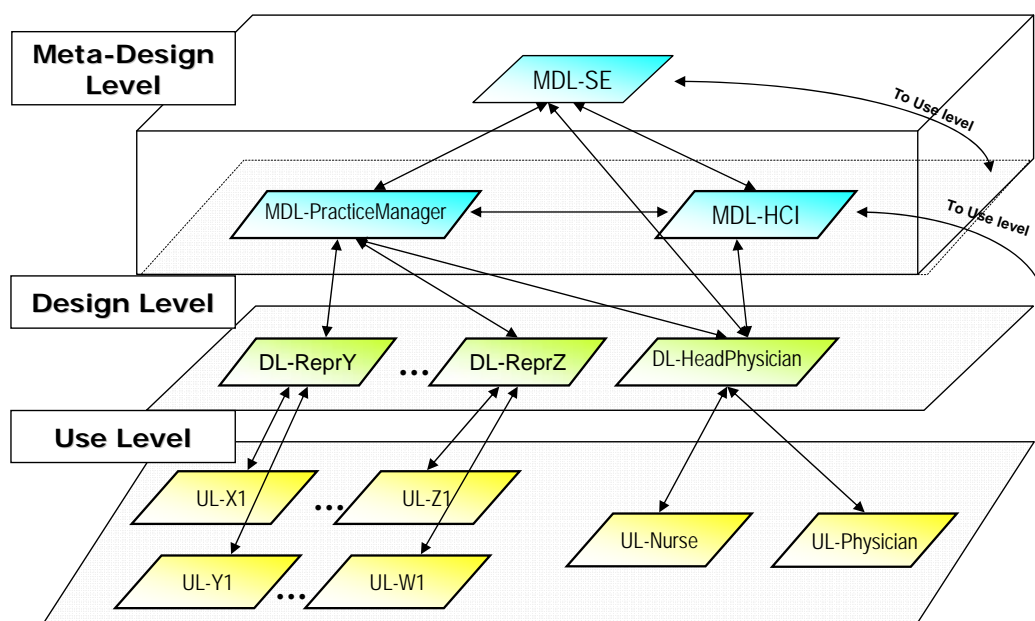


## Our approach

- to identify the data modules that have to be managed in the whole hospital
- let each head physician to design the EPR for her/his ward by composing the ERP through direct manipulation of such modules
- physicians, nurses, ... will use this ERP

21

## The SSW network in the case study



22



# Workshop for Head Physician

**W-RapprPrimario** is used by each head physician to create and update the specific application workshops "W-End-Infermiere"

Utente: Dan Tipologia: Primario Reparto: Neurologia

**Moduli Inseribili**

Diagnosi di Ammissione

Allergia ☐ Si ☐ No

Terapie in corso a domicilio ☐ Si ☐ No

**Misure Antropometriche all'ingresso**

Peso Kg Percentile

Altezza Cm Percentile

Circonferenza cranica Percentile

**Allattamento**

☐ Materno ☐ Artificiale

Latte c.c. n° pappe

Miscela Latte ☐ SI ☐ NO

Alimento MI

**Esami Fuori Sede**

Data Esami Fuori Sede Ritiro

**Cartella Clinica**

Ospedale Giovanni XXIII - Bari  
Reparto Neurologia

Cognome Nome

Data Nascita Data Ingresso

Num Cartella Num Stanza

Tipo Ricovero ☐ Programmato ☐ Urgente ☐ Day Hospital

**Routine Ematica**

Data Routine Ematica Esami Ematici Metabolici Ed Endocrinologi

**Consulenze Inviato**

Data Consulenze Inviato Eseguite Data Richieste radiologia Eseguite Data

Logout  
Salva Layout

23



# Workshop for Nurses

- W-End-Infermiere** is used by nurses to daily fill in the measurements on the patient (and required in the patient record)

Utente: Cic Tipologia: Infermiere Reparto: Neurologia

Cartella Clinica Paziente

**Ospedale Giovanni XXIII - Bari  
Reparto Neurologia**

Cognome Nome

Paese Nicola

Data Nascita Data Ingresso

1981-11-18 2006-06-06

Num Cartella Num Stanza

1 3

Tipo Ricovero ☒ Programmato ☐ Urgente ☐ Day Hospital

Su Giù

**Routine Ematica**

Data Routine Ematica Esami Ematici Metabolici Ed Endocrinologi

Su  Nuovo

**Consulenze Inviato**

Data Consulenze Inviato Eseguite Data Richieste radiologia Eseguite Data

Su Giù Nuovo

**Esami Fuori Sede**

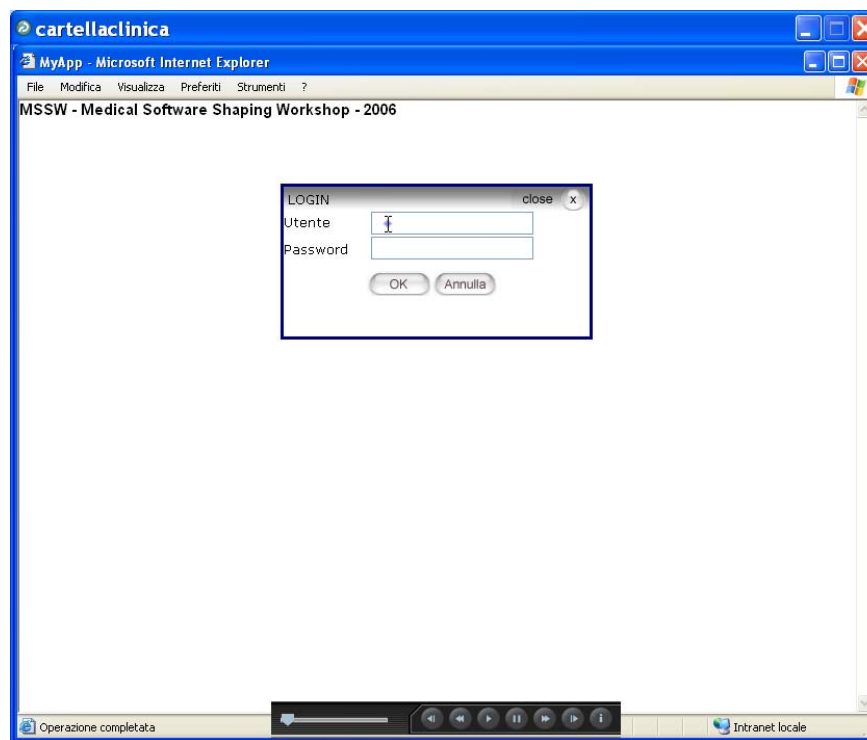
Data Esami Fuori Sede Ritiro referti

Logout  
Salva Layout

24



# video



25



## Another example in the medical domain



- Physicians of two categories collaborate to reach a diagnosis:
  - neurologists
  - Neuro-radiologists



- Techniques offer physicians *new possibilities*
- Working organization requires physicians to use new *technologies for collaboration*
- Different physicians collaborate working in different hospitals and having different expertise
- They overcome their communication hurdles by using electronic tools in a naïve way
- They required us to improve the quality of their communication, and therefore of their diagnostic capabilities



**Paziente** → Sintomatologia → **Medico di Base**

**Medico di Base** → Referto (Quesito diagnostico specifico) → **Neurologo**

**Neurologo** → Consulto → **Neurologo** (EEG + (referto))

**Neurologo** → Referto (Linguaggio tecnico e dettagliato) → **Neuroradiologo**

**Neuroradiologo** → Consulto (spiegazione breve e mirata) → **Medico di Base**

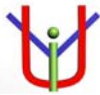
**Medico di Base** → Sintomatologia → **Paziente**

**Laboratorio esterno** (es. genetico, metaboliche, lastre, ecc) → Referto → **Neurologo**

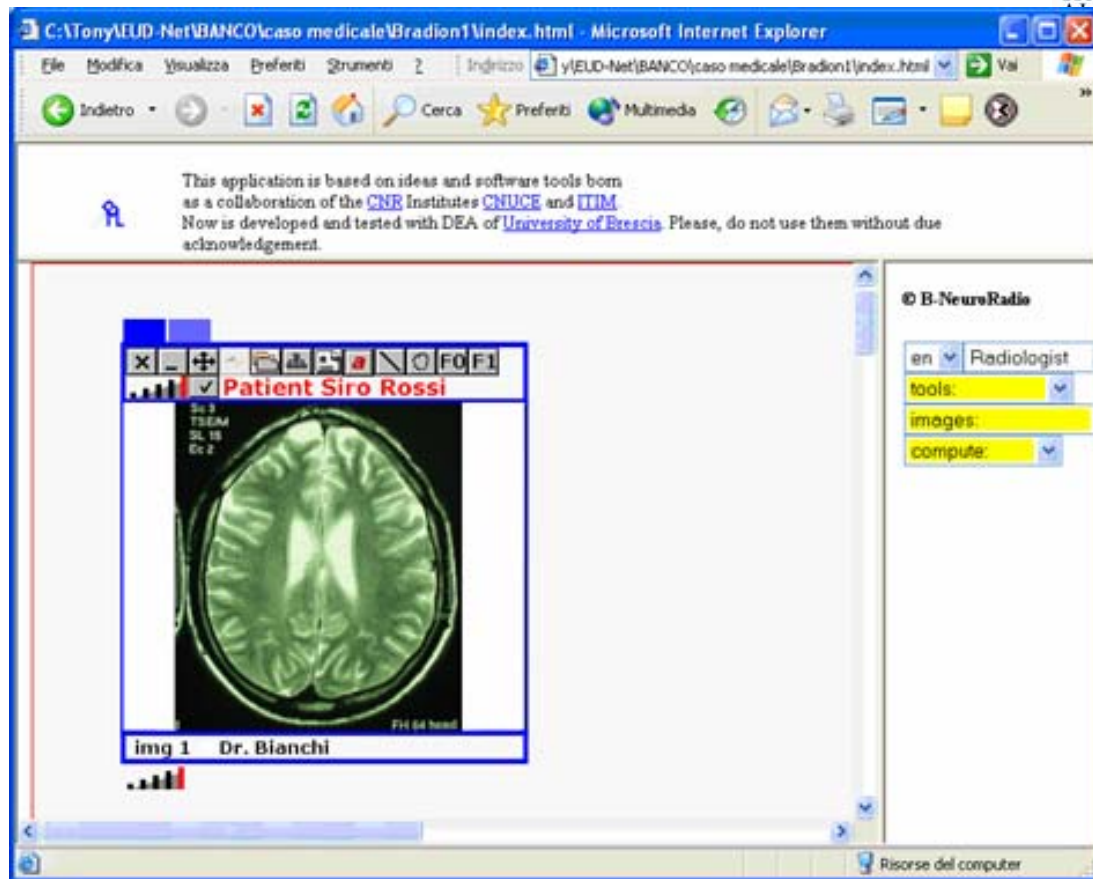
**Laboratorio Interno** (EEG) → Referto → **Neurologo**

28





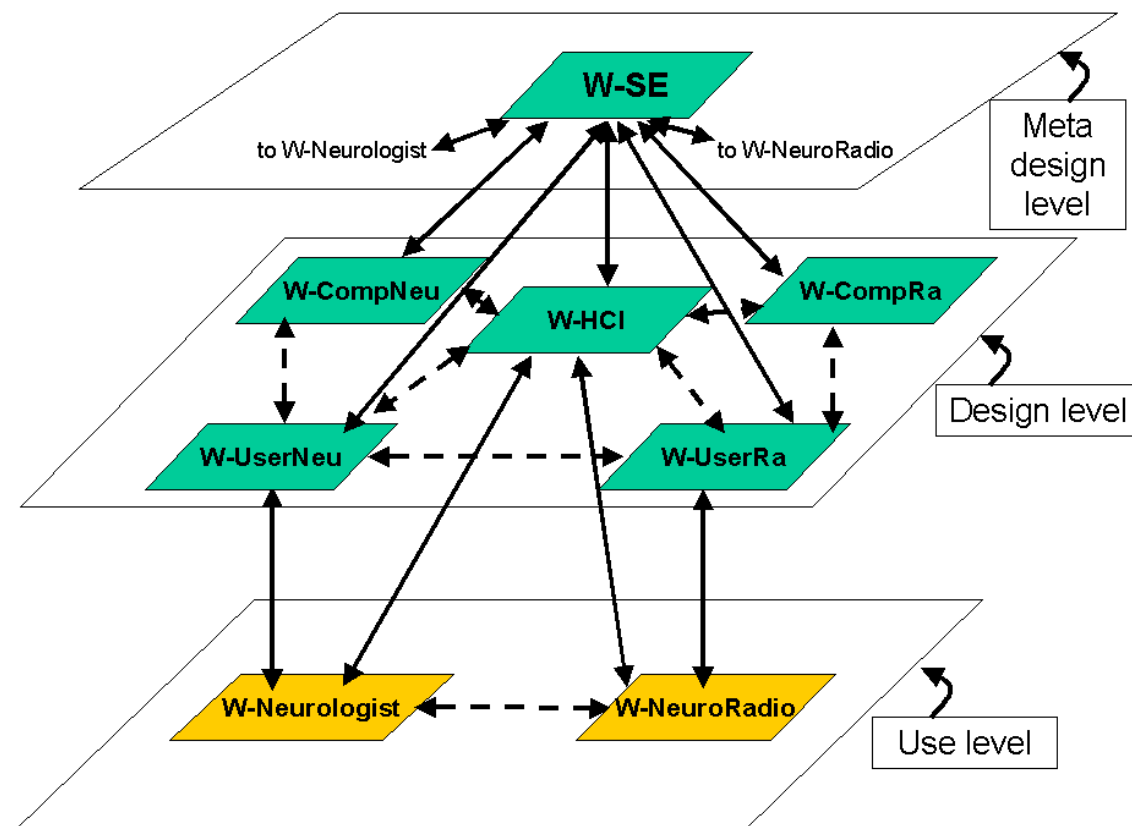
# Primo prototipo SSW neurologo



29



## Rete di SSW nel caso medico



)





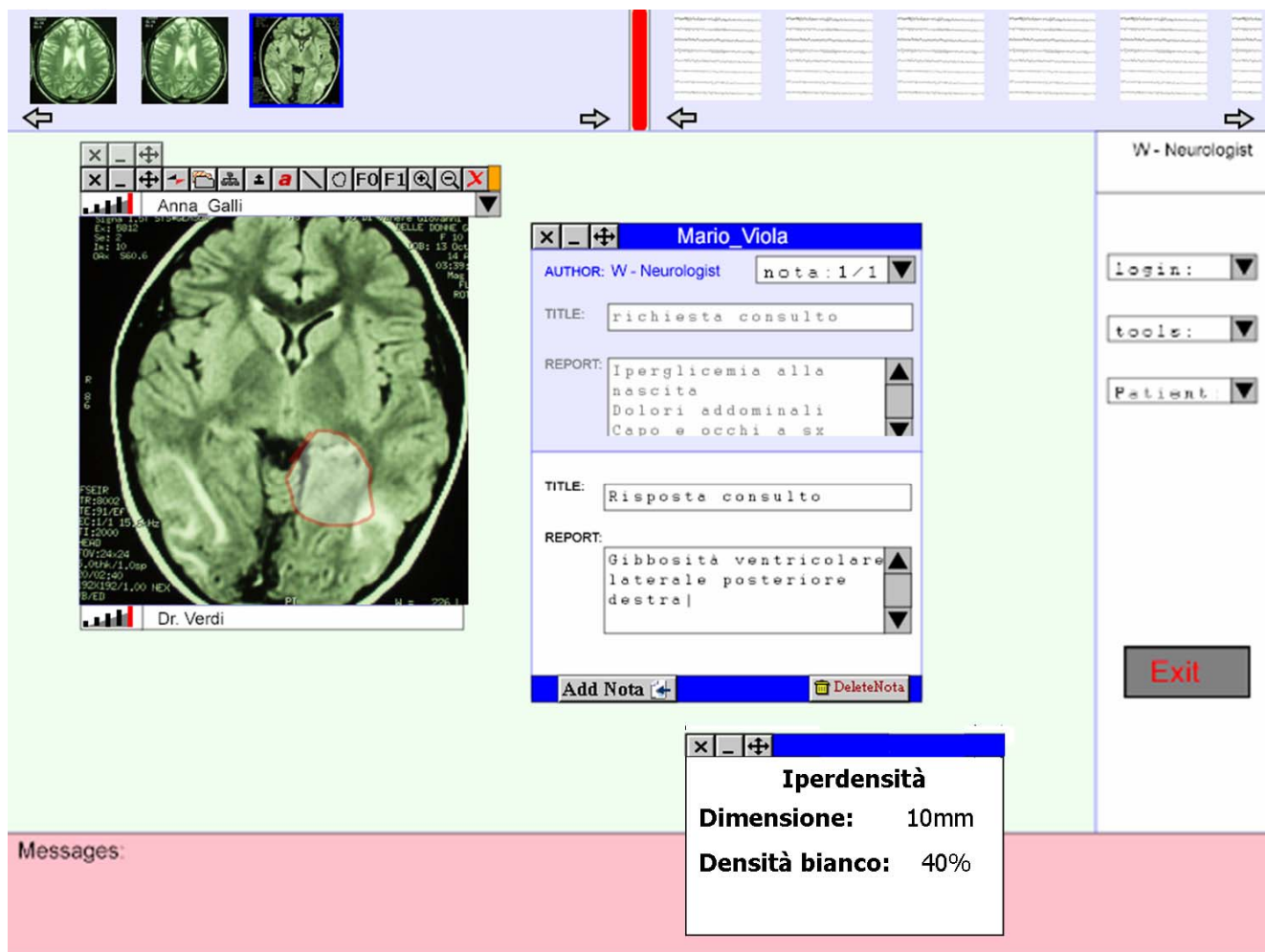
## Secondo prototipo SSW neuro-radiologo



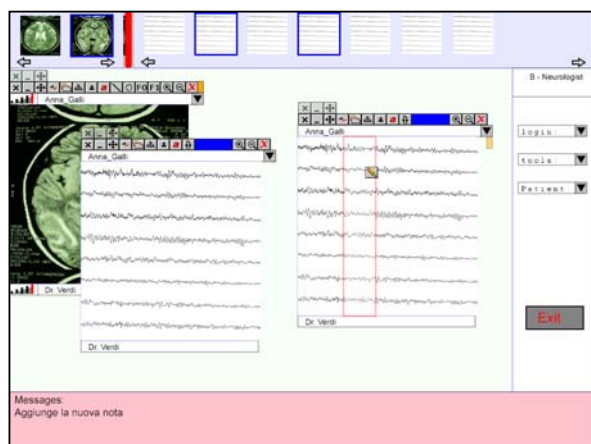




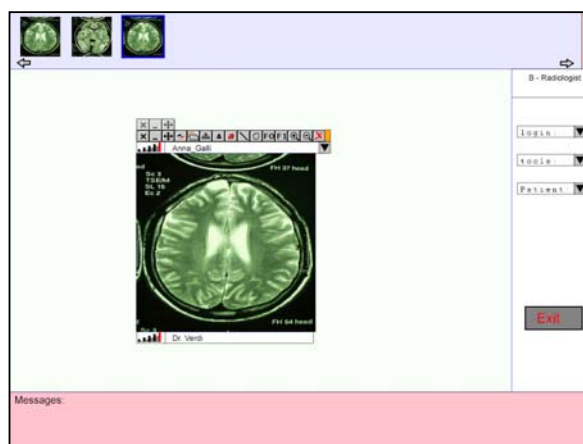




## The developed prototypes for neurologists and neuro-radiologists



software environment for neurologists



software environment for neuro-radiologists



## System adaptation to context

- The SSW associates the user defined widget with tools and materialization methods suited to the physician's culture and skill

39

Officina di sistema per la composizione del banchetto di lavoro medico

aree

- canvas
- area operativa
- nome del medico
- nome del paziente

contenitori

- bottoniera banchetto
- bottoniera pila

bottoni banchetto

- bottone annota
- bottone cancella
- bottone chiudi
- bottone clona
- bottone comprimi
- bottone disegna linee
- bottone disegna mano libera
- bottone filtra
- bottone minimizza
- bottone muovi
- bottone secondo piano
- bottone separa
- bottone sovrapponi

bottoni pila

- bottone chiudi pila
- bottone minimizza pila
- bottone muovi pila

slider

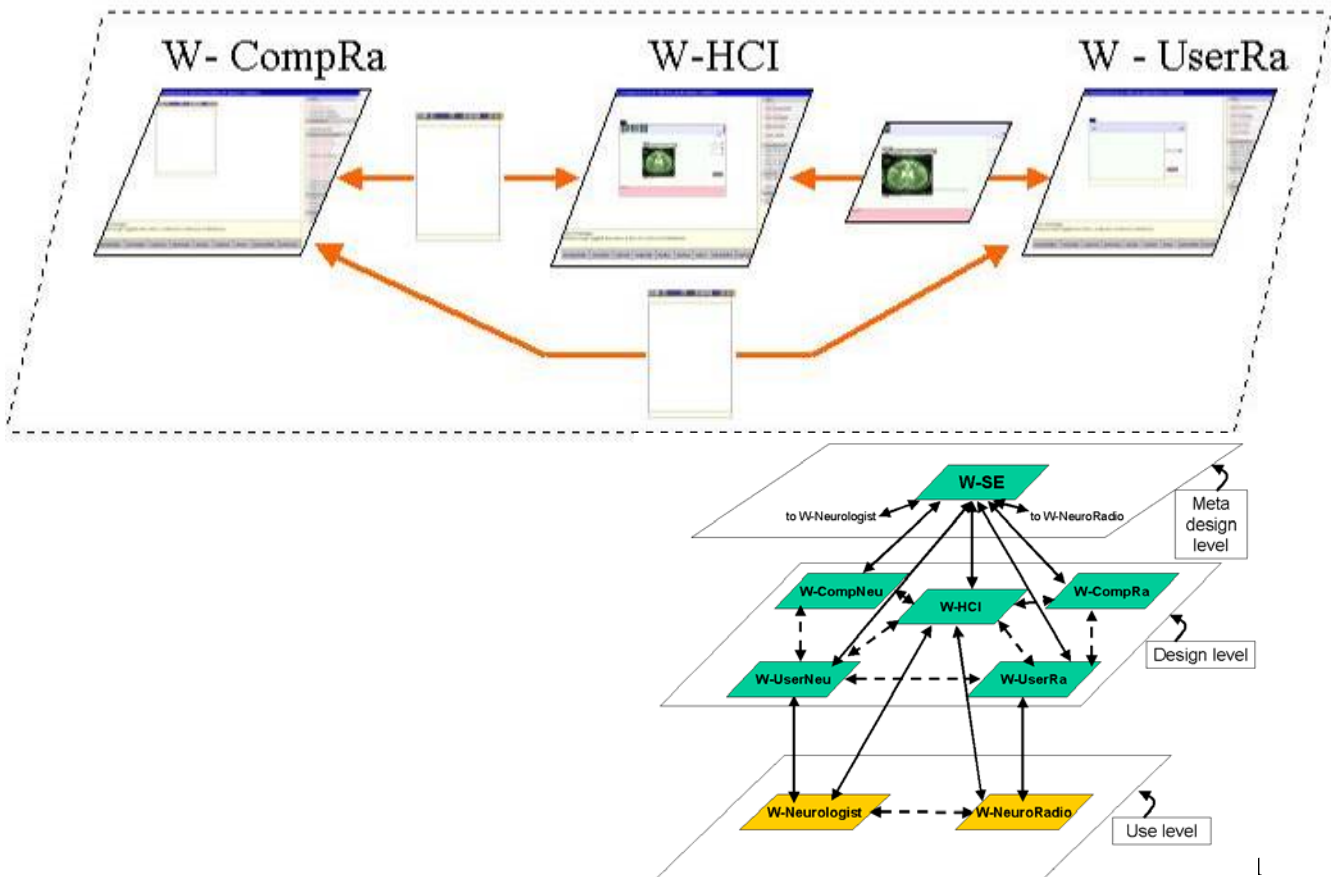
- regolatore sfondo
- regolatore immagine

Area messaggi:  
Cliccare sugli oggetti dai menu a lato per costruire l'interfaccia

consolida   simula   carica   annota   aiuto   salva   esci   cancella   nomina



# Comunicazione tra SSW



1

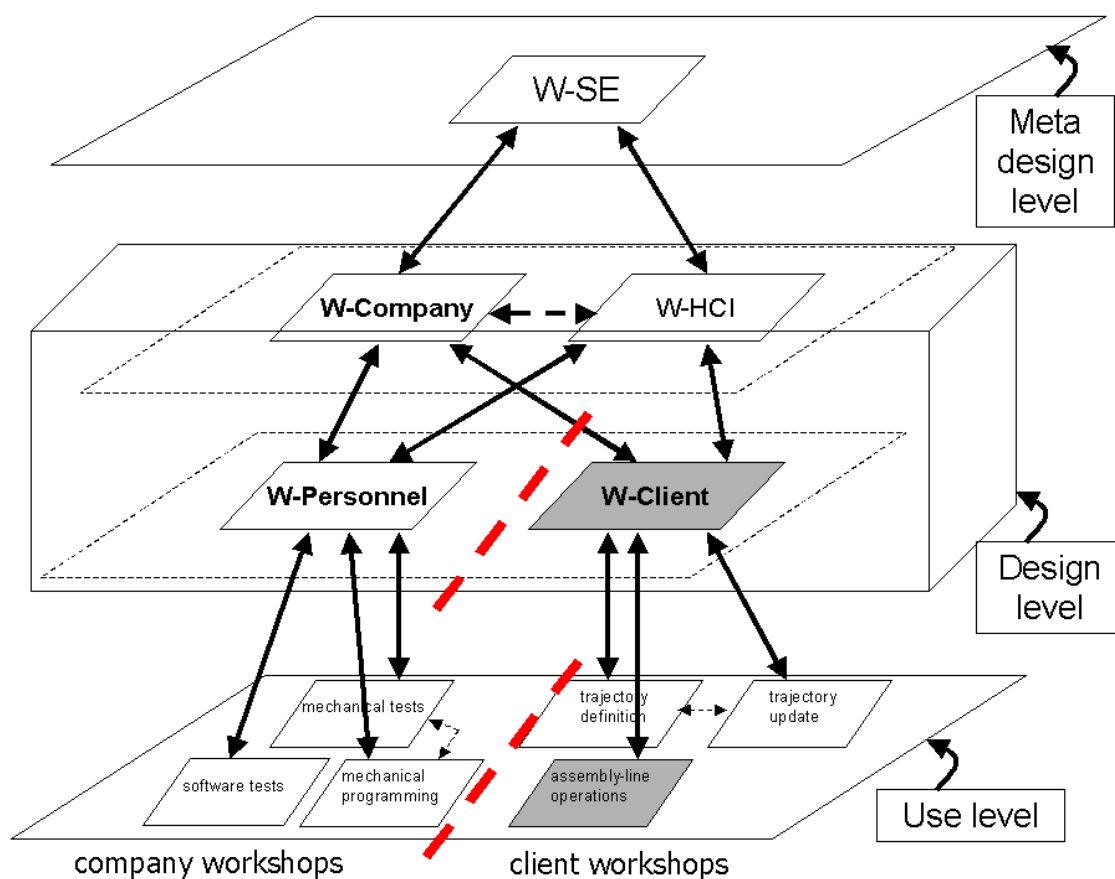





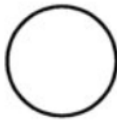

The screenshot displays the W-NeuroRadio interface, which includes a list of images at the top, a form for annotations on the left, and a button panel on the right. The form contains fields for 'nota: 1/1', 'AUTHOR: B - Radiologist', 'TITLE: menu', 'PROBLEMS:', 'NOTE: c'e' un problema con chiusura dei menu', and 'add Nota'. The button panel includes buttons for 'id:', 'tools:', 'images:', 'Esci', and a 'button panel for workshop annotation'.





# Rete di SSW nel caso meccanico



Automatico	Manuale	Diagnostica	Impostazioni	Statistiche
<h2>Macchina ETA</h2> 				PEZZO
				
				MOTORE
				
				TRAIETTORIA
				
				PINZA
				
Area messaggi:				
annota aiuto salva esci spegni				



## Officina di sistema per la composizione di interfacce



Area messaggi:

Bottoniera operativa, va posizionata su di una canvas

contenitori
bottoniera di navigazione
bottoniera di sistema
<b>bottoniera operativa</b>
area archivi
aree
area operativa
area messaggi
canvas
bottoni di navigazione
bottone automatico
bottone manuale
bottone diagnostica
bottone impostazioni
bottone statistiche
bottoni di sistema
bottone annota
bottone aiuto
bottone salva
bottone entra
bottone spegni
archivi
archivio pezzi
archivio motori
archivio traiettorie
archivio pinze

salva officina	simula	carica	annota	aiuto	salva	esci	
----------------	--------	--------	--------	-------	-------	------	--

## Officina di sistema per la composizione di interfacce



Area messaggi:

Trascinare gli oggetti dai menu' a lato per costruire l'interfaccia

contenitori
bottoniera di navigazione
bottoniera di sistema
bottoniera operativa
area archivi
aree
area operativa
area messaggi
canvas
bottoni di navigazione
bottone automatico
bottone manuale
bottone diagnostica
bottone impostazioni
bottone statistiche
bottoni di sistema
bottone annota
bottone aiuto
bottone salva
bottone entra
bottone spegni
archivi
archivio pezzi
archivio motori
archivio traiettorie
archivio pinze

salva officina	simula	carica	annota	aiuto	salva	esci	
----------------	--------	--------	--------	-------	-------	------	--



## Conclusions

- The SSW methodology is aimed at allowing
  - designers to create systems adequate for a user community, on the basis of users' knowledge, languages, and notations
  - Domain-experts users, not expert in Computer Science, to use and tailor their systems and to perform EUD activities
- Overcome phenomena that make HCI difficult
- Gentle slope of complexity

47



## Esempio di EUD all'Università'

- A una riunione in cui si presentava la proposta di un portale per certi servizi, e' proprio venuta fuori l'esigenza di un utente di creare il suo report personalizzato.  
La risposta del progettista e' stata che ci deve essere il call center, al quale fare una richiesta telefonica di creare un nuovo report secondo le proprie esigenze.
- Un'attivit  di EUD dovrebbe mettere in grado l'utente di personalizzare il suo report.

48