Service development and evaluation in project MPOWER

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SINTEF ICT

Wireless healthcare workshop,
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Presentation outline

- MPOWER Facts
- Project goals
- MPOWER system development methodology
- MPOWER results
  - Middleware services
  - Proof of concept applications
- Evaluation of MPOWER

IST 034707 – Middleware Platform for eMPOWERing cognitive disabled and elderly
MPOWER Facts - Partners

Ericsson, Croatia

Jagellonian University – Medical College, Poland

University of Cyprus

Sintef, Norway

Norwegian Center for Ageing and Health

TB-SOL, Spain

DI, Spain

ARC, Austria

IST 034707 – Middleware Platform for eMPOWERing cognitive disabled and elderly
Subcontractors and associates

- International Association for Homes and Services for the Ageing
- Centre for Ageing Services Technologies
- Ecomit
- Municipality of Trondheim
MPOWER Facts – budget and timing

- Cost budget 3,9 M €
- Started October ’06 – last until April ,09 (30 months)
Objectives (from DoW)

- Define and implement an open platform to simplify and speed up the task of developing and deploying services
- Platform will support:
  - Integration of SMART HOUSE and sensor technology
  - Interoperability between profession and institution specific systems (e.g. Hospital Information System)
  - Secure and safe information management, including both social and medical information
  - Mobile users which often change context and tools
- Two end user proof-of-concept applications:
  - Individual plan management - the goal is to demonstrate the feasibility of the platform in relation to a dynamic sharing of plans and information
  - Smart home and sensor connectivity - this application will demonstrate the feasibility of the platform in relation to interconnectivity and integration of smart home and sensor technologies
- Contribute to standardisation by applying standards and report on their usage.
Objectives (from DoW) continued

- Result areas:
  1. A distributed architecture describing the platform, and the interfaces/interactions between middleware components.
  2. A set of middleware building blocks, providing the key application-level services needed to create integrated services, and which can be re-used in designing different services. Open APIs will be defined for each M•POWER middleware building block.
  3. Proof-of-concept applications for two user sites. Development of these applications will drive the project, and provide a mechanism to validate the platform.
  4. “Pilot evaluation report” to be used as basis for the deployment of both the platform and the Proof-of-concept applications.
MPOWER Results

MPOWER Guidelines
- Developer handbook
- MPOWER Architecture
- MPOWER Service lifecycle model

MPOWER Middleware services
- MPOWER Service
- Service

MPOWER Toolchain
- MDA Process
- MDA Tools

Norwegian proof of concept application
Polish proof of concept application

MPOWER Experiences

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Method - MPOWER work process

- Three phased project, 2-3 increments of items below
- Gather requirements
- Design and develop toolchain and middleware services
- Develop proof-of-concept applications (using the above)
- Evaluate the above
MPOWER Service Specification Process

Healthcare work
- User Workshop
- Expert Interview
- User Questionnaire
- Literature Study
- Evaluation report

Joint healthcare and technical work
- User Scenarios Specification
- UML UseCase Modelling
- ActorModel
- UseCase Model

Technical work
- ServiceModel
- Service Specification
- Model Transformation
- Reusable Services
- «WebService»

Application work
- Application Evaluation
- Application development

Iteration start
- Iteration end

IST 034707 – Middleware Platform for eMPOWERing cognitive disabled and elderly
Describe domain and scenarios

Figure 1: The iterative model-driven development process used to identify actors and services. Artefacts are shown as rectangles whereas the activities are denoted as rectangles with rounded corners.
Participants in workshops, interviews and questionnaires

- 62 Older people (22 in Netherlands, 40 in Poland)
- 11 Family carers of persons with dementia (5 in Austria, 6 in Norway)
- 49 Healthcare Professionals (all in Poland)
- 15 Dementia Experts (4 in Austria, 11 in Norway)
Identify and define Actors and Roles

Figure 1: The iterative model-driven development process used to identify actors and services. Artefacts are shown as rectangles whereas the activities are denoted as rectangles with rounded corners.
Use cases
Example of Actor-Role model
The ActorModel (diagram)

Figure 2: The ActorModel showing the elements of the system, stakeholder and role parts.
Identify and define service

Figure 1: The iterative model-driven development process used to identify actors and services. Artefacts are shown as rectangles whereas the activities are denoted as rectangles with rounded corners.
Chain of Artefacts

Configure homecare

Custom Stakeholder management

HealthCareProfile

Scenario

Manage stakeholder

Preconditions: none

1. Add stakeholder
2. Display relations
3. Edit stakeholder
4. Start stakeholder

Stakeholder 

ActorManagement::ActorControl

ActorManagement

ActorManagement::ActorControl

«WSDL»

ActorManagement::ActorManagementInterface::iActorManagement

+ addActor(addActorRequest, addActorResponse*)
+ disableActor(disableActorRequest, disableActorResponse*)
+ enableActor(enableActorRequest, enableActorResponse*)
+ getActor(getActorRequest, getActorResponse*)
+ removeActor(removeActorRequest, removeActorResponse*)

«WSDLservice»

ActorManagement::ActorManagementInterface::Services::iActorManagement

+ addActor(addActorRequest, addActorResponse*)
+ disableActor(disableActorRequest, disableActorResponse*)
+ enableActor(enableActorRequest, enableActorResponse*)
+ getActor(getActorRequest, getActorResponse*)
+ removeActor(removeActorRequest, removeActorResponse*)

«WSDLportType»

ActorManagement::ActorManagementInterface::PortTypes::iActorManagement

+ addActor(addActorRequest, addActorResponse*)
+ disableActor(disableActorRequest, disableActorResponse*)
+ enableActor(enableActorRequest, enableActorResponse*)
+ getActor(getActorRequest, getActorResponse*)
+ removeActor(removeActorRequest, removeActorResponse*)
The Service Model

- Derived from the Use Case models
  - Communication Services
  - Information Services
  - Management Services
  - Sensor Services
  - Security Services
The Service Model (diagram)
Develop applications on top of services

Figure 1: The iterative model-driven development process used to identify actors and services. Actors are shown as rectangles whereas the actors are denoted as rectangles with rounded corners.
Norwegian proof-of-concept application
Tirsdag

I dag

06 mai 2008

Ingen aktiviteter!
# Medication List

**Tirsdag**

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Calendar

Torsdag

06 mai 2008

Ingen aktiviteter!

Startside  Kalender  Medisin
Kontakter  Beskjeder  Nyheter
## Contacts

**Tirsdag**

**Kontaktpersoner**

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<tr>
<th>Navn</th>
<th>Telefon</th>
<th>Ring meg</th>
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<tbody>
<tr>
<td>Albert Johnson</td>
<td>4797034099</td>
<td></td>
</tr>
<tr>
<td>Jane Millner</td>
<td>35799519002</td>
<td></td>
</tr>
<tr>
<td>Peter Smith</td>
<td>4793411597</td>
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**Natt**

6 Mai 2008
Messages

Tirsdag

BESKJEDER

Ingen beskjeder!

9:25

Natt
6 Mai 2008
Ikke akkurat hagen for latmark

-Dette bør alle meglere kunne
Notars tilbud til kunder i april om 40 prosent rabatt på meglerspesialiteten, får andre meglere min til å se i godt.
Forbrukerombudet er ikke mindre kjent, og ber om forklaring på det det mener kan være villedende markedsføring.

Våldig kjækkenforty else

Utsatt hvit perle blir ny

Her får du bilen med på boligkjøpet
Det er slett ikke bare meglerne som skjænker at det er viktig å bli satt i boligmarkedet. En boligsekker i Melhus tilbyr nå bilen på kjøpet til den som vil overta huset hans.

Lilla er den nye blå

Europas GPS er på vei

New Orleans slo NBA-mesteren igjen
Polish proof-of-concept application
Patient side
Patienr frontpage

Sesión de María

Selecciona una opción:

Correo

Teléfono

Desconectar

Sesión de María

Correo

Teléfono

ALARMA
Received messages

El correo de María

1 2 3

Rte. Cecilia, Cena de aniversario.

Rte. Paco, Campeonato de mus.
Write message

El correo de María

Sali a dar un paseo,...

Enviar  Borrar

Borrar

Salí a comer
Tomando un baño
Salí a dar un paseo
Jugando al mus

IST 034707 – Middleware Platform for eMPOWERing cognitive disabled and elderly
Staff side
Location of residents

Residents

Search: Julian
By Floor: - floor -
By Room: 2
By Name: - name -

Michael
Pedro
Alarms

Register of Triggered Alarms
Environment

Floor 1

This page should contain the list of residence's floor and the devices containing on it.

Please, click on one of the device to see the available options.
Tracking

Tracking control

Search by Floor:
Search

Search by Room:
Search

Search by Residents:
Search
MPOWER – evaluation

- User acceptance test
- Site acceptance test – studies
- Evaluation of MPOWER middleware services and toolchain
User acceptance test as part of product and service development in the MPOWER project

Objectives of the study
The MPOWER project (Middleware Platform for eMPOWERing cognitive disabled and elderly) aims to develop a middleware platform that facilitates communication between different types of existing technology. A graphical interface is developed by the project partners, in order to test and evaluate the understandability of the platform.

The interface contains a calendar with reminders, a message box and a contact list, and is designed for older people and people with cognitive impairment. The interface is operated by a touch screen.

Methods
A user panel, consisting of five elderly people, aged 70-85, attended a product demonstration, to evaluate the graphical interface, and determine its user friendliness and usefulness. All users tried to navigate through the interface, and opinions were recorded on navigation simplicity, and operational aspects.

Results
The user panel concluded that the interface would be easy for older people, as they may hold the screen to get information and to check time for appointments or new messages. Opinions on contrast, font size, and orientation were recorded as well as opinions on user friendliness regarding navigation and operation in general.

Conclusions reached
It is almost important that older people can use products that aim to serve older people with cognitive impairments and dementia, in order to address the need for better design, testing and usability testing in Trondheim during 2009.

www.sintef.no/mpower
User acceptance - method

- User panel consisting of five older people aged 78-88
- Users used the solution, navigated the pages
- Opinions on visibility and size of text and icons, contrast, and operational aspects were recorded
User acceptance – results

- User panel concluded that solution would be useful as they might use it to get information and to check times for appointments or new messages.
- Several changes on size of buttons, text size, contrast etc.
User acceptance – conclusion

- Very important to include elderly actively in the requirement, design, development and test phase of such systems. There are always challenges we have not thought of…
User studies in Norway

Methodology:

- Evaluation conceptualised as learning process that involves "considering failures and weaknesses, reflection and critical analysis, recommendations and further action" [1]
- The evaluation aims to discover whether the intervention (the POCA) has effects or value for the target groups and the causes of any effects (experimental)[2]
- Investigate what does the respondent think of the product, and what does it mean to them to have the product at home.
- Interviews before (1) and after (3) intervention
- The respondents will be followed up till one year,
- We will not use a control group, as the circumstances will vary from person to person and impossible to compare.

User studies in Norway

Aspects of the evaluation (from [2]):

- Local – done for and with people in one municipality (Trondheim), but with the aim of producing general descriptions and knowledge which are of use elsewhere
- Close collaboration – between the MPOWER evaluators and service providers and patients/respondents during all stages of the evaluation
- Continual feedback – applying emerging findings from the evaluation to practice during the evaluation process
- Of single or a few cases – target respondents are patient/receiver of home-based services, her/his next-of-kin and home nursing staff, using case-study techniques, but no case-control design
- No controls – no attempt to control the evaluated or to create experimental and control groups. The respondents are their own control over a period on up to 12 months
- Non-experimental design – the evaluation is not designed as an experiment to test a hypothesis
- Inductive – concepts and theories will be built up inductively out of the data which the evaluators gather
- Qualitative techniques – like face-to-face interviewing, focus groups and observations at home are planned

User studies status and experiences

- **Status**
  - Deployed in the homes of 5 people

- **Experiences**
  - Ongoing evaluation, results to be published
    - Feel valuable
    - Contact / social features highly appreciated
    - Stability extremely important
  - Many technical challenges, requires immediate fixes
  - Organisational challenges, need motivated staff in the municipality
Evaluation of the MPOWER toolchain

- Proof of concept applications
- Additional studies on developers’ acceptance (TAM)
- In January 2007 to January 2008, developers from one university (3 participants), two SMEs (7), one research organization (2) and one large multinational company (4) were introduced to a MDSD toolchain for software service development.
Evaluation of the MPOWER toolchain – main findings

- The evaluation results show that perceived usefulness and perceived ease of use have an impact on the developers’ current use of MDSD. This finding is confirmed by the statistics from the tool performance factor and the free-text comments made by some respondents. They find models useful in development, and MDSD is useful to improve collaboration, traceability and generate code.

- Furthermore, the analysis shows that none of the proposed factors have an influence on the developers’ future use intentions of MDSD. This is a neutral result that can be explained by a general positive attitude to MDSD in the development process, and mixed experience with tool stability and functionality.

- The results from the evaluation may indicate that the factors chosen in the evaluation were not appropriate. For most of the factors, correlations were not significant. Based on the textual comments from the developers, factors addressing perceived ease of use, compatibility and usefulness are appropriate. Similarly, tool performance is relevant, whereas subjective norm may have been left out.
Future work

- Deliver final versions of toolchain and middleware services
- Deliver final versions of the MPOWER applications
- Evaluate the above
  - Continue evaluations in Norway and Poland
  - Experiment with MPOWER toolchain
More information:
http://www.mpower-project.eu