A personalized platform for life and health services

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Information Society Technologies, e-Health: IST507019

Project budget: 14 million € (grant 9,8 million €)

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Personalized Information Platform for Life & Health Services

The PIPS Partners

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Personalized Services for Life & Health …

…for a healthier lifestyle

He needs to **comply**
with medical advices
while shopping, cooking, eating

He wants **timely updates**
on specific health topics

He needs **daily memos**
for drug taking,
vital signs/weight monitoring,
physical exercising

He needs to **set periodically**
medical check ups &
lab tests

Mr. John Doe
wants (or needs!) to follow an healthier lifestyle

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Personalized Services for Life & Health …
…to assist the Individual in his/her daily life

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Personalized Services for Life & Health …
…to assist the Individual in his/her daily life: the Virtual Ego

Pharma Industry

Hospital

Gym & Spa

Supermarket

Home

Food Industry

Medical Doctor

Restaurant

The Person

Pharma Industry

Mobility

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Personalized Services for Life & Health …
…and the PIPS Individual’s Profile

Medical Profile

Personal Preferences Profile

Needs

Preferences

Choices

Behaviour Profile

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Personalized Services for Life & Health …
… to assist in making informed choices in daily life
Personalized Services for Life & Health …
…the *technological* challenges

- Trust & Security
- User Interaction
- Sensor Interaction & Data Capture
- Decision Support Systems
- Knowledge Management
- Distributed Knowledge Sources
Personalized Services for Life & Health …
…knowledge mgmt from fragmented, heterogeneous sources

Technical Solutions

- Domain Ontologies → ROME, NutriPIPS
- Ontology Based Reasoning → KAON2, KaSeA
- Semantic Query Languages → DIGUT, OWL, SPARQL
- Dialoguing Systems → GATE, Haptek
Personalized Services for Life & Health …
…to support the Individual’s decision in a trusted framework

Technical Solutions

- Profiling → Virtual Ego, HL7 RIM
- Rule Engine → JESS, RULEML
- Multi-Agent Platform → JADE
- Workflows → JBPM, LAP
- Trust & Security → Trust Case, P3P

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Personalized Services for Life & Health …
…the medical challenges

Medical-Scientific Domain

Healthier Lifestyle
Diabetes
Cardiology
Allergology

Nutrition
Physical Exercise
Pharma Therapies
SelfCare Monitoring

Pharma & Medical Device
Hospital
Gym & Spa
Supermarket
Home

Food Industry
Pharmacy
Medical Doctor
Restaurant
The Person

Mobility

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Personalized Services for Life & Health …
… to assist in making informed choices in daily life: at the supermarket
Personalized Services for Life & Health ...

...to assist in making informed choices in daily life: at home

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Personalized Services for Life & Health ...

...to assist in making informed choices in daily life: at home
Personalized Services for Life & Health …
…to assist in making informed choices in daily life

Pharma & Med. Industry
Hospital
Gym & Spa
Supermarket
Home
Food Industry
Pharmacy
Medical Doctor
Restaurant
The Person
Mobility

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Personalized Services for Life & Health …
…to assist in making informed choices in daily life: physical activity
Personalized Services for Life & Health …
…to assist in making informed choices in daily life: \textit{physical activity}

Why Diabetes?
Worldwide prevalence of diabetes in 2030 (projected)

Number of persons

- < 5,000
- 5,000–74,000
- 75,000–349,000
- 350,000–1,499,000
- 1,500,000–4,999,000
- > 5,000,000
- No data available

Total cases > 300 million adults


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Prevalence of Diabetes*: Europe

Europe 2003: 48 million

Nationwide Diabetes Prevalence Categories

<table>
<thead>
<tr>
<th>Country</th>
<th>No. (Millions) with Diabetes 20- to 79-Year Age Group (% of population)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>9.7 (9.2%)</td>
</tr>
<tr>
<td>Germany</td>
<td>6.3 (10.2%)</td>
</tr>
<tr>
<td>Ukraine</td>
<td>3.5 (9.7%)</td>
</tr>
<tr>
<td>Spain</td>
<td>3.0 (9.9%)</td>
</tr>
<tr>
<td>Switzerland</td>
<td>0.22 (8.0%)</td>
</tr>
<tr>
<td>Turkey</td>
<td>2.9 (7.0%)</td>
</tr>
<tr>
<td>Italy</td>
<td>2.9 (6.6%)</td>
</tr>
<tr>
<td>France</td>
<td>2.6 (6.2%)</td>
</tr>
<tr>
<td>Poland</td>
<td>2.5 (9.0%)</td>
</tr>
<tr>
<td>UK</td>
<td>1.7 (3.9%)</td>
</tr>
</tbody>
</table>


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Why Diabetes is exploding worldwide?

The leading cause of diabetes pandemia are changes in lifestyle, i.e. more caloric intake and, even more important, less physical activity.
Underlying hypothesis

Can interactive communication technology be used to achieve and maintain sustained physical activity in patients with type 2 diabetes?
Clinical Trial:
Exercise Behavioral Changes in patients with type 2 diabetes using a PIPS Motivational Model

Emanuele Bosi, Luca Falqui
Diabetes & Endocrinology Unit,
San Raffaele Scientific Institute and Life-Health University
PIPS CLINICAL TRIAL on DIABETES

interactive and context-sensitive communication

Quality of walking

Real Time Response

Personalization

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Mary is a Diabetic person in Likelihood of Change her exercise habits. Target is set on N° steps and caloric consumption.

Yesterday you have reached the 80% of the target.
Strolling & Motivation
Motivational messages: comment

Mary is a Diabetic person in Likelihood of Change her exercise habits. Target is set on N° steps and caloric consumption.

COMMENT

Yesterday you have reached the 70% of the target
Not bad, but you didn't fully reached the goal.
Try to regain!
Mary is a Diabetic person in **Likelihood of Change** her exercise habits. Target is set on N° steps and caloric consumption.

**ENCOURAGEMENT**

'Yesterday you have reached the 80% of the target. Not bad, but you didn’t fully reached the goal. Try to regain! Start being more active is one of the most important things you could do for your health.
Mary is a Diabetic person in Likelihood of Change her exercise habits. Target is set on N° steps and caloric consumption.

SUGGESTION

'Yesterday you have reached the 80% of the target. Not bad, but you didn’t fully reached the goal. Try to regain!

Start being more active is one of the most important things you could do for your health. The weekend will be sunny: why don’t you go footing in the park near your home. Bring your dog with you!'
A personalized platform for life and health services

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The PIPS Architecture

The PIPS Architecture involves a multi-channel approach with the following components:

- **User**: The end user interacts with the system through various channels.
- **Multi-Channel**: Connects the user with the system through different interfaces.
- **Search Engine**: Provides search functionality.
- **Trusted Search Server**: Enhances search reliability.
- **SMS Provider**: Enables communication through SMS.
- **Virtual Ego Database**: Stores user-related data.
- **Knowledge Base**: Contains knowledge for decision-making.
- **Oracle Database Server**: Manages large-scale database operations.
- **Security Manager Platform**: Ensures security for the system.
- **JBoss Portal (JSF, JSP, Portlet)**: Facilitates user-friendly interface.
- **Portal Framework**: Supports portal functionality.
- **Agent Platform**: Includes Personal Advisory Agents, Specialized Decision-Making Agents, and Knowledge Discovery Agents.
- **Virtual Ego Profiler**: Provides personalized information.
- **Semantic Tools**: Tools for advanced reasoning.
- **Syntactic Tools**: Tools for basic data manipulation.
- **Knowledge Sources**: Supports various data formats (HTML, XML, TXT).

The system integrates these components to provide personalized information for life and health services.
Diabetes & Physical Activity

Regular Physical Activity/Exercise:

- has been shown to improve blood glucose control, reduce cardiovascular risk, contribute to weight loss and improve well-being in people with both type 1 and type 2 diabetes;

- reduces the risk of developing type 2 diabetes in predisposed individuals;

- is therefore strongly recommended in people with diabetes;

However, only a minor proportion (around 20%) of adults with type 2 diabetes fulfill the recommendations of minimal physical activity (60 min or more weekly)
Strolling and Motivation

The strategy: act on the likelihood of change

• Walking Target, i.e. a personalized path of incremental physical activity based on patient’s fitness status
• Monitoring, i.e. following the progression of the patient in a specified length of time
• PIPS messages to the patient, i.e. PIPS feedback to the walking data sent to the server by the patient through her/his pedometer
• Self Knowledge Improvement, i.e. the patients are stimulated to reason about themselves and their emotional status
• Failing strategy, i.e. the choice of the actions to be performed in case of failure in the target achievement (e.g. protract absence of data or low percentage of target achievement)
• Information delivery to the patients supporting them in the walking program follow up