Mobile Personalisation Enabled by Semantic Web Technology
- Ensuring Quality in Ontology Building and Ontology Reuse

Lillian Hella
June 10, 2014
Outline

• Introduction and Background
  – Motivation
  – The problem
  – Research questions
  – Objectives
  – Approach and Research Methods

• Contributions (theoretical and practical)
  – Proposed personalisation
  – Implementation

• Evaluations
  – Of Implementation
  – Of Personalisation Concept

• Concluding Remarks
  – Future work
  – Conclusion
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Motivation

• New types of networks and devices give new possibilities
• Services delivered to a user should be relevant and appropriate
• Relevant services depends on information about the users
• A relevant service is a service that:
  – is targeted towards an individual
  – matches the users’ needs in a particular situation
  – does not compromise with the personal information available
The Problem
Successful Personalisation

• Benefits and positive effects
  – Personalised services for users
  – Reach the right customers
  – Customer satisfaction
  – Satisfied service providers

• Our focus in the work:
  Food shopping domain
Objectives (1)

• How can Semantic Web technology be used for personalisation?
  – Ontologies representing persons and their interests
    • Personal information
    • Stable interests
    • Temporary interests
  – Structuring information in a machine readable way
  – Reasoning possibilities
Objectives (2)

• Enable personalisation for push and pull services by combining personal and contextual information

Oh, Hervik strawberry jam is on my shopping list, but they are sold out. What should I replace it with? There are so many to choose from.

I solve this by posing a request on my mobile device; I want an alternative product.

I choose the jam that is second on the list.
Approach and Research Methods (1)

• Design science research methodology
• Evaluation frameworks for ontology building methodologies and ontology reuse based on SEQUAL (SEmiotic QUALity) quality framework for evaluation of models and modelling languages
• Developed case descriptions including persona and personalisation scenarios
Approach and Research Methods (2)

- Problem definition and literature analysis
- Theoretical framework for methodologies
- Ontology building methodology evaluations
- Theoretical framework for ontology reuse
- Ontology reuse evaluation
- Development of personalisation architecture
- Ontology development
- Prototype implementation
- TAM experiments and evaluation
- Analysis and deliberation
Research Questions

• **RQ1** How can personal profiles be used in adaptation of services to personal needs?
  – The personal profile is an important source for mediator to decide on relevance and irrelevance
  – Ontology building process for quality
  – Challenges with reuse

• **RQ2** Can a prototype supporting personalised service provisioning be built using Semantic Web technology?
  – Personalisation architecture proposed and parts implemented
  – Profile and domain information usable for personalised result

• **RQ3** How is the proposed personalisation perceived by potential users?
  – Technology Acceptance Model (TAM) was shown to fit the data, measured values reliable and valid
  – Perceived usefulness strongest predictor for intention to use
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Contributions (1)

• Theoretical contributions
  – Frameworks for evaluation of methodologies –
    Specialised classification and specialised SEQUAL
  – Methodology evaluation
  – Specialised SEQUAL framework for evaluation of reuse of ontologies
  – Evaluation of reuse of ontologies
Contributions (2)

• Practical contributions
  – Persona and scenarios
  – Personalisation concept evaluation
  – Profile and Food Ontology
  – Personalisation Architecture
  – Implementation and evaluation of approach
Proposed Personalisation
Prototype Implementation

- Java - OWL, Jena and Pellet APIs
- Test-driven development

- Personalisation matching process that depends on
  - Type of request (push or pull)
  - Goal
  - Profile information
  - Domain information
  - Search for match (using the profile and domain information)
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Evaluation - Implementation

• In addition to functional tests we have tested prototype results compared to expected results based on scenarios
  – Compare results with a solution without personalisation
  – Compare results with someone with other preferences
  – How close is the result to the expected result?
  – How useful is the profile in the process?

• Results:
  – Well aligned result compared to expected for first scenario (pull)
  – Targets the right person for the second scenario (push)
Evaluation – Personalisation concept (1)

• Using the traditional Technology Acceptance Model (TAM)
  – Perceived ease of use (PEOU)
  – Perceived usefulness (PU)
  – Intention to use (IU)

• Survey of 200 persons between 20-40 years – 50/50 males/females

• Two videos based on developed persona and scenarios in the food shopping domain

• Collected opinions on a set of background questions in addition to TAM questionnaire
## Evaluations – Personalisation concept (2)

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Pull</th>
<th>Push</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: PU will have a significant influence on IU</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>H2: PEOU will have a significant influence on IU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3: PEOU will have a significant influence on PU</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>H4: Those familiar with the use of mobile internet interpret the services to be more useful</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>H5: Those familiar with the use of mobile internet interpret the services to be easier to use</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>H6: Those familiar with the use of mobile internet have higher intention to use such services</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
## Evaluations – Personalisation concept (3)

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Pull</th>
<th>Push</th>
</tr>
</thead>
<tbody>
<tr>
<td>H7: Those interested in healthy food regard the service to have higher perceived usefulness</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>H8: Those interested in healthy food have higher intention to use the service</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>H9: Those interested in ecological food regard the service to have higher perceived usefulness</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>H10: Those interested in ecological food have higher intention to use the service</td>
<td>x</td>
<td>x</td>
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Future work

• Complete personal profile
• Ownership of profile, identity management, security, privacy etc.
• Relationship between mediator, service providers and users
• Sharing of profile information and shared information
• User feedback and social settings
• Changing context
• More domains and sources of information
Conclusions

• Structured evaluations for methodologies in general and for identifying requirements was useful
• Challenges regarding reuse of ontologies and approach
• Prototype evaluation results were comparable with the expected results
• Profile and domain information useful in the personalisation process to retrieve a personalised result
• Survey participants were positive towards the proposed personalisation
• Promising result with the use of ontologies and Semantic Web technology for a personal profile
Thank you for your attention!

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