Organizing and Managing Grassroots Enterprise Mashup Environments

Doctorial Thesis, 24th June, 2010

Volker Hoyer
Motivation and Research Questions
Research Design
Results
Conclusion
Motivation and Research Questions

Research Design

Results

Conclusion
Motivation
From Automating Transactions ...

Automating Transactions
- Compliance
- Stability
- Business Collaboration

Service-Oriented Architecture
Business Process Management
Business Software (ERP, CRM, ...)

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Motivation
... to Peer Production

Automating Transactions
- Compliance
- Stability
- Business Collaboration

Productivity

Enterprise Mashups

Enabling Collaboration and Participation
- Unpredictable
- Unstructured
- People Collaboration

Time

Cloud Computing

(Mobile) Apps

Mashup
An enterprise mashup is a Web-based resource that combines existing resources, be they content, data or application functionality, from more than one resource by empowering the actual end users to create individual information centric and situational applications.
Motivation
Research Questions and Contributions

How to organize and manage grassroots enterprise mashup environments in order to transfer the consumer-driven mashup paradigm into corporate environments?

Q1 How can enterprises structure and design grassroots enterprise mashup environments?

Q2 How to guide enterprises with a governance model for balancing between organization concerns such as manageability and fostering user involvement?

Q3 How can enterprises integrate and leverage existing IT-enabled functionalities in mashup environments?

Q4 What are the business values for introducing the mashup paradigm in corporate environments?

Research Contributions
- Multi-view scientific reference model
- Governance model
- Application of design science research methodology

Practical Contributions
- Practical guidelines for future mashup platforms
- Scenarios demonstrating the business value
- Business case
<table>
<thead>
<tr>
<th>Motivation and Research Questions</th>
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<td>Conclusion</td>
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Research Approach
Design Science Applied* & Structure of the Thesis

Chapter 1
Objectives of the Solution
Artificial Design
Artifact Demonstration
Artifact Evaluation

Preliminary study on the practical need for organizing and managing grassroots enterprise mashups environments

Enterprise Mashups
Related Concepts
Solution Framework
User Orientation
Operational Excellence
Future Orientation
Financials

Multi-View Scientific Reference Model

SAP Research RoofTop Marketplace
FAST Platform

Automation of Unstructured Decision Processes
Cross-Organizational Promotion Crew Request

Research Methods
Literature Review
Literature Review, Interview
Literature Review, Reference Modeling
Prototyping, Action Research
Case Study Laboratory
Experiment, Business Case

Motivation and Research Questions

Research Design

Results
  Design (Multi-View Reference Model)
  Demonstration
  Evaluation

Conclusion
Design: Multi-View Scientific Reference Model

Research Process*

- Reference model for fostering understanding and communications
- Leveraging similarities to communities and electronic markets

Design: Multi-View Scientific Reference Model

Overview (Views)

Community Layer
- Relationship between the agents (provider, intermediary and consumer)
- Seamless integration of corporate internal and external sources

Interaction Layer
- Simple and quick processes
- Interactions and rules (governance)

Service Layer
- Adaptation of content (integration into the existing IT landscape)
- Technical standards and frameworks

Infrastructure Layer

Operations View
- Community Structure
- Information Flow
- Generic Interaction/ Communication Services
- Enterprise Mashup Infrastructure/ Platform

Organizational View
- Knowledge
- Intentions
- Contract (Design)
- Settlement

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Design: Multi-View Scientific Reference Model
Architectural View: Enterprise Mashup Stack

- **Compostion of Widgets**
  (Wiring) to enterprise-class applications

- **User-friendly Building Blocks**
  - Provide graphical and simple user interaction mechanism
  - **Abstracting** from the complexity of the underlying resources

- **Core Building Blocks**
  - Represent actual content, data or application functionality
  - Encapsulated via **well-defined interfaces** (APIs)

Organizational User Roles

**End users run mashups**
- Consume mashup
- Personalize mashup (e.g., change background color)

**Key users create mashups**
- Add pre-build widgets (from the catalogue)
- Connecting widgets by wiring their in-/out- ports

**Consultants create widgets**
- Binding generic user interfaces to resources
- Transforming and aggregating data (piping)

**Developers implement the services**
- Create and deploy services
- Make resources available (e.g., RSS Feeds, SAP Enterprise Services)
Agent Roles well known from Electronic Markets and SOAs

- **Provider** implements and hosts a mashable component (mashup, widget, resource)
- **Intermediary** mediates between providers and consumers (improving navigation, transparency and governance)
- **Consumer** is able to retrieve and compose mashup components according to his individual needs
Characteristics of the interactions between the three agent roles

- Market transaction phases
- Permanent loops between the converging design and run time phases
- Real data sources
Design: Multi-View Scientific Reference Model

Enterprise Mashup Governance (Organization Structure)

- Third Parties
  - Suppliers
  - External providers of mashable components
  - SAP, Google, Amazon, etc.
  - Intermediary
    - IT Service Management for Enterprise Mashups
      - Content Management
      - Infrastructure Management
  - Business Units
    - Customers (Users)

- People
  - Suppliers
  - Customers (Users)

- Infrastructure
  - Enterprise Mashup Platform
  - IT Service Management
  - Content Management
  - Infrastructure Management

- Content
  - Apps
  - Provide central channel to the internal customers and external suppliers
  - Align and control IT governance
  - Hide complexity from the users for the composition of mashable components

- Applications
  - Apps
  - Users in the business units
  - Marketing, sales, product development, accounting, etc.
Motivation and Research Questions

Research Design

Results
- Design (Multi-View Reference Model)
- Demonstration
- Evaluation

Conclusion
Demonstration
Research Process

SAP Research Rooftop Marketplace

Horizontal Prototype
- Features: Organizational view of the multi-view scientific reference model [...]
- Enterprise mashup ontology [...]

Vertical Prototype
- Context-aware enterprise mashups supporting the ad-hoc composition of enterprise-class applications [...]

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FAST Platform

Horizontal Prototype
- Features: Architectural view of the multi-view scientific reference model [...]
- Enterprise mashup life cycle [...]

Vertical Prototype
- Enterprise mashup composition patterns [...]

Knowledge Intentions Contract Settlement

Resource Widget Mashup

Functionalities

Functionalities
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Evaluation
Research Process

Multi-Case (embedded) Studies

**Context: Promotion Industry**

Case: Cross-Organizational Promotion Crew Request

**Organization**

**Information Technology**

**People**

*FAST Platform*

**Context: Aerospace and Defense Industry**

Case: Automation of Unstructured Decision Processes

**Organization**

**Information Technology**

**People**

*SAP Research RoofTop Marketplace*

Laboratory Experiment

**Management Students**

**Technical Students**

**Open for all**

- Creating an Enterprise Mashup
- Online Questionnaire
- Focus Group

Business Case

Investment Decision

- Costs
- Benefits
### Scenario Background

- **Observe your environment**
- **Seamless composition of company internal and external resources**
- **Combine structured (table) and unstructured content (e.g., map)**

#### OODA Loop

<table>
<thead>
<tr>
<th>Observe</th>
<th>Orient</th>
<th>Decide</th>
<th>Act</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Army</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Air</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marine</strong></td>
<td></td>
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- **Orientation**
  - Guide the user to identify the source of an unexpected event/alert
  - Providing information related to the individual context of the knowledge worker
- **Real-time decision**
  - Development and evaluation of decision alternatives
  - Real-time collaboration across different (external) organizational roles
- **Action**
  - Perform the action based on the made decision
Evaluation: Unstructured Decision Processes
Enterprise Mashup Solution
Evaluation: Unstructured Decision Processes

Business Values*

<table>
<thead>
<tr>
<th>Effect Type</th>
<th>Observe</th>
<th>Orient</th>
<th>Decide</th>
<th>Act</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Automational</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing time</td>
<td>6 → 1 min (-83%)</td>
<td>12 → 3 min (-75%)</td>
<td>6 → 4 min (-33%)</td>
<td>2 → 1:20 min (-38%)</td>
</tr>
<tr>
<td>Collaboration &amp; sharing</td>
<td>++</td>
<td>+++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Informational</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process breaks</td>
<td>5 → 0</td>
<td>3 → 0</td>
<td>3 → 0</td>
<td>1 → 0</td>
</tr>
<tr>
<td>Decision quality</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>0</td>
</tr>
<tr>
<td><strong>Transformational</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competitiveness</td>
<td>++</td>
<td>+++</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Results

- Automation of unstructured decision processes
- Speeding up the observe and orient phase
- Improve decision quality by providing real-time and aggregated information from various sources
- Structuring along the OODA loop allows generalizing of the results (defense processes)

Conclusion
Key Findings

How can enterprises structure and design grassroots enterprise mashup environments?

- Complementary to service-oriented architectures ("Putting a face on SOA")
- Determined by user-oriented objectives
- Sharing of knowledge and solutions within the community
- Multi-view scientific reference model
  - Three disjointed and comprehensive views (Architectural, organizational and operations)
  - Organization along market transaction phases (knowledge, intentions, contract/design and settlement)
  - Agent interaction phase model links between the three views
Conclusion
Key Findings

How to guide enterprises with a governance model for balancing between organization concerns such as manageability and fostering user involvement?

- Hybrid governance models defines boundaries of user freedom
  - IT department (intermediary) maintains the infrastructure
  - Content and people are organized in a decentral manner
- Governance services are aligned with the four organizational phases
  - Possibility of reuse existing ITIL and CobIT processes
  - High degree of automation
- New role of the IT department as a moderator and mediator of organic growing mashup platforms
Conclusion

Key Findings

How can enterprises integrate and leverage existing IT-enabled functionalities in mashup environments?

- Content is the driving factor and represents the greatest risk factor (business case)
- Gentle slope of complexity
  - Balance between adaptation power and complexity
  - Enterprise mashup composition patterns demonstrate integration roadmap
- Missing APIs (smallest building blocks of enterprise mashups)
  - Web-based resources are missing
  - Integration challenges are related to semantic issues (expert knowledge is required; e.g., for SAP enterprise services)
  - New service design of legacy systems is needed
Conclusion
Key Findings

What are the business values for introducing the mashup paradigm in corporate environments?

- User benefits (financial and non-financial benefits)
  - Aggregation of various sources
  - Improved decision quality
  - Community involvement
  - Customization of individual environment
- Business people are more enthusiastic than technical people
- Support of unstructured business processes (ad hoc processes)
  - Automation of unexpected situations in all decision phases
  - “Crisis situations”
Conclusion
Limitations of the Research

- Design Science
  - Method mix in design and evaluation activity
  - “Design as a search process”
- Contribution to (scientific) knowledge base
  - 30+ publications
  - 3 Best Paper Awards, IEEE 2nd Place

- Evaluation of the artifact in an indirect manner
  - Measurement against the objectives
  - Understanding and communications focus
- Application and evaluation of the governance aspects
  - Productive systems not available at this stage
- Limited number of cases
  - Early stage of technology adoption
  - Collected data build foundation of the business case
Conclusion
Generalization of the Reference Model

1. Reference Model Concept
   - Definition
     - What is a reference model?
   - Model
     - What are the general views (V)?
     - Which modeling language is applied?
     - Who are the target audiences?

2. Reference Model Types (Reference Model)
   - Taxonomy of reference model types
     - Different domains
     - Refinement of the views

3. Specific Model
   - Instances
     - Modeled instances
     - Concrete representation
     - Integration of required details
   - Real world environment

Reference Model Concept
- Conceptual Level
  - Modeling Language
  - V1
  - V2
  - V3

Reference Model Types
- Enterprise Mashups
  - V1
  - V2
  - V3
- Cloud Computing
  - V1
  - V2
  - V3

Specific Model
- RoofTop Marketplace
  - V1
  - V2
  - V3
- FAST
  - V1
  - V2
  - V3
- 4CaaSt
  - V1
  - V2
  - V3

Specific Models
- Aerospace & Defense
- Cross-Org Processes
- Unbundled Business Software
Discussion