End User Development of Information Artefacts

A Design Challenge for Enterprise Systems

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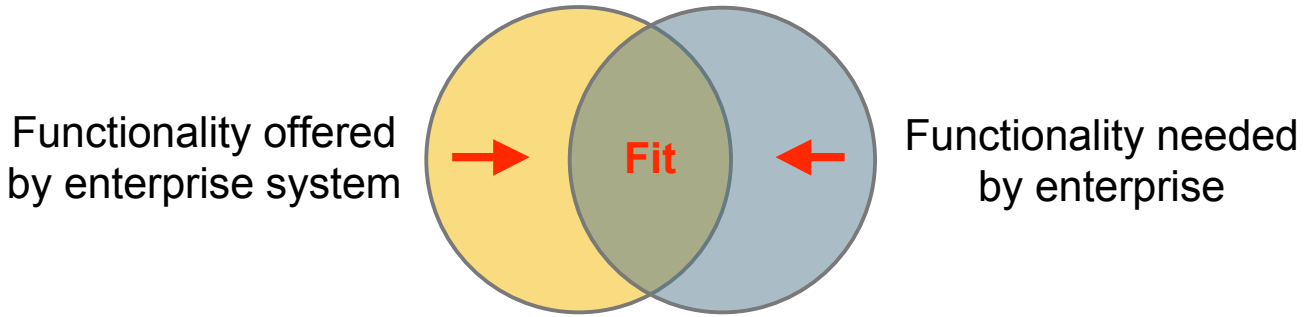
Agenda

- Introduction
- End User Development (EUD)
- Empirical studies
  - Problem areas
  - Design behaviour
- Conclusions
- Outlook

Introduction

Basic problem

- Lacking adaptability of enterprise software systems (e.g. ERP) by end users
  - Impossible to capture all requirements at design time
  - Requirements change; adaptations are needed
  - Especially SMEs: lack of expertise, resources and budget
  - Adaptations have to be delegated to experts (costly); often abandoned
  - Consequences
    - Limited fit between existing and needed functionality
    - Time, cost and quality of realized business processes suffer
    - Limited ability to innovate, differentiate and gain competitive advantages



Introduction

User-centred perspective

- End User Development (EUD)

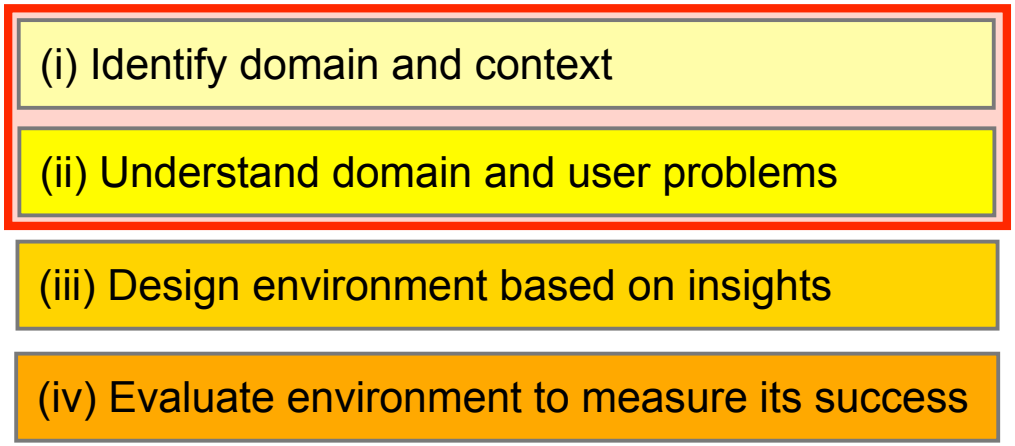
> “[…] a set of methods, techniques, and tools that allow users of software systems, who are acting as non-professional software developers, at some point to create or modify a software artifact.“
>
> **Lieberman, H., Paternò, F. and Wulf, V. (2006). End User Development. Springer, Dordrecht**

- Basic approach
  - Empower end users as domain experts to adapt the systems to their needs
  - EUD environments
    - Adapt system or create tools suitable for individual working tasks
    - Tradeoff: simplicity vs. power

EUD Environments

EUD Environment

- Addresses specific context in which complexity reduction should be achieved
- Basic phases of developing an EUD environment



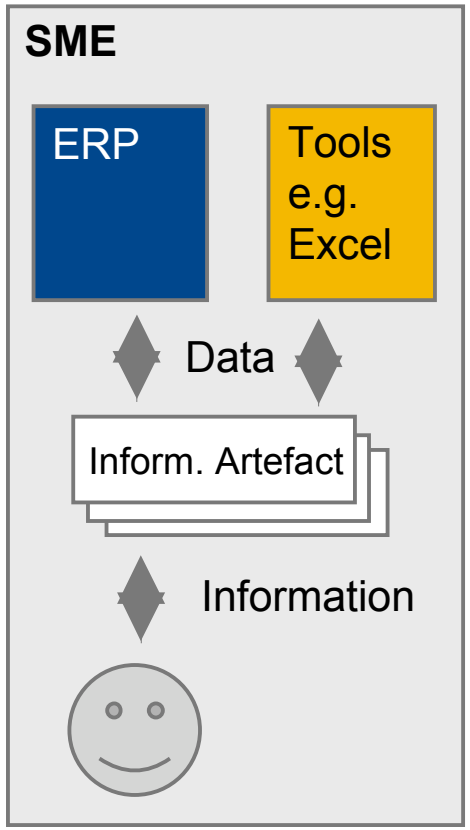
Domain and Context addressed

Domain

- Small and medium sized enterprises (SMEs)
- Enterprise resource planning (ERP) systems

Context

- Using ERP as central data storage of business data for
  - information self-service
  - creation of individual tools to facilitate working tasks
- Main adapting and developing task
  - Create and modify information artefacts
  - Information artefacts are data-centric artefacts like
    - Queries
    - Reports
    - Spreadsheets
    - Databases



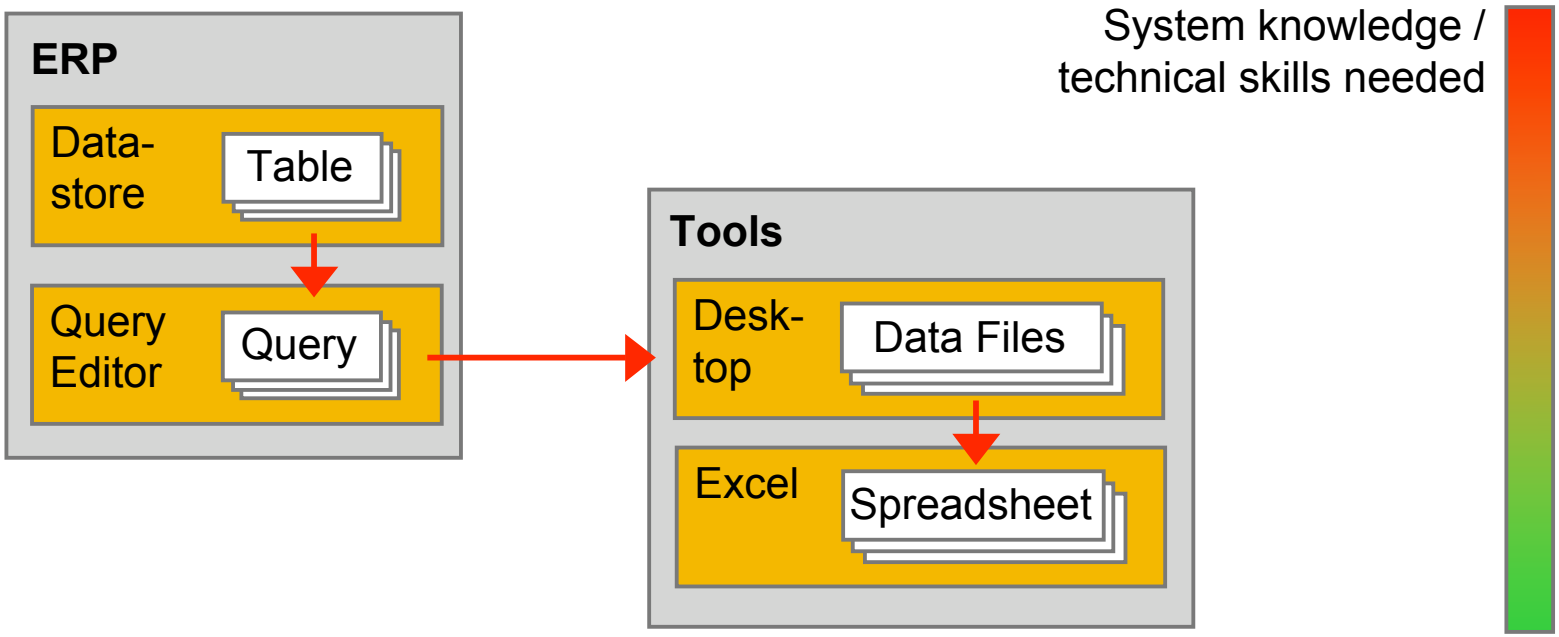
Understand Domain and User Problems

Empirical Study - Phase I

- Intent
  - Understand domain and identify real-life problems of business users
  - Derive first requirements for simplified EUD tools
- Type of study
  - Series of semi-structured interviews
- Interviews
  - Conducted interviews: 14 (60 to 120 min. each)
  - Selection criteria: interviewees, who consume, modify or create information artefacts
- Participating companies: 5 German SME

Understand Domain and User Problems

Common types of information artefacts and creation

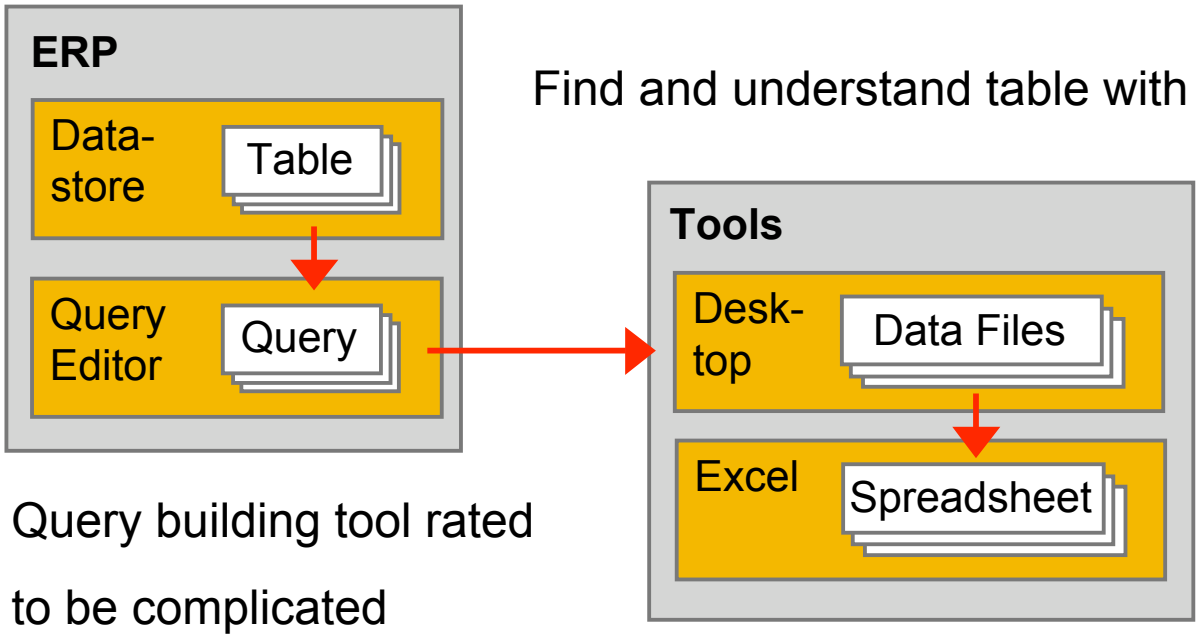


2 layers of composition

- 1. layer: orchestrate queries of tables (select individually needed data)
- 2. layer: orchestrate spreadsheets (individual solutions) of query data

Understand Domain and User Problems

Common problems of business users acting as end user developers



Find and understand table with relevant data

Query building tool rated to be complicated

Inability to create simple, interactive tools to facilitate working tasks

Empirical Study – Problem Areas

Conclusions

- Complexity of tools and ERP data model limit EUD possibilities of business users
- EUD tools should improve the following aspects
  - Data abstraction to conceptual level using business terms
  - Data searching and browsing
  - Orchestrating data
  - Creation of interactive tools

==> There is a need for an EUD environment

Empirical Study – Design Paradigm

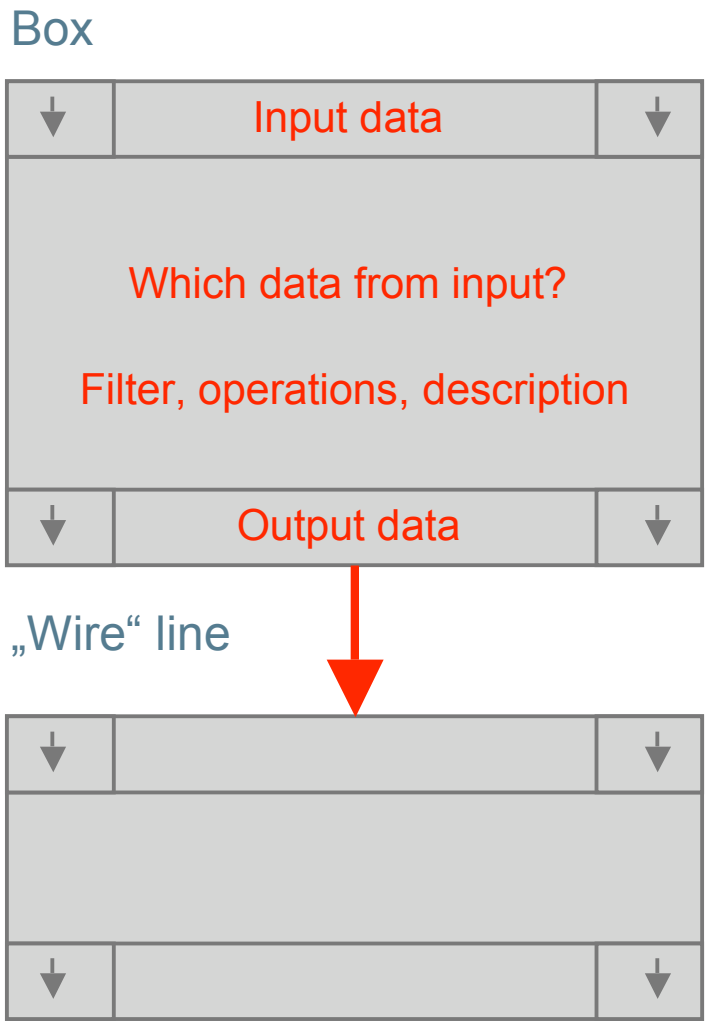
Empirical Study Part II

- Intent
  - Test how business users intuitively use a simple box and wires design paradigm for information artefact creation
  - Derive first requirements for a suitable design paradigm usable in a visual, lightweight EUD composition environment
- Type of study
  - Participatory design workshop (1 day)
- Participants
  - 3 employees of midsized company
- Problem to solve
  - Create information artefact supporting the stock forecast
  - Refine stock forecast by combining data from different SAP ERP modules and manually entered data

Empirical Study – Design Paradigm

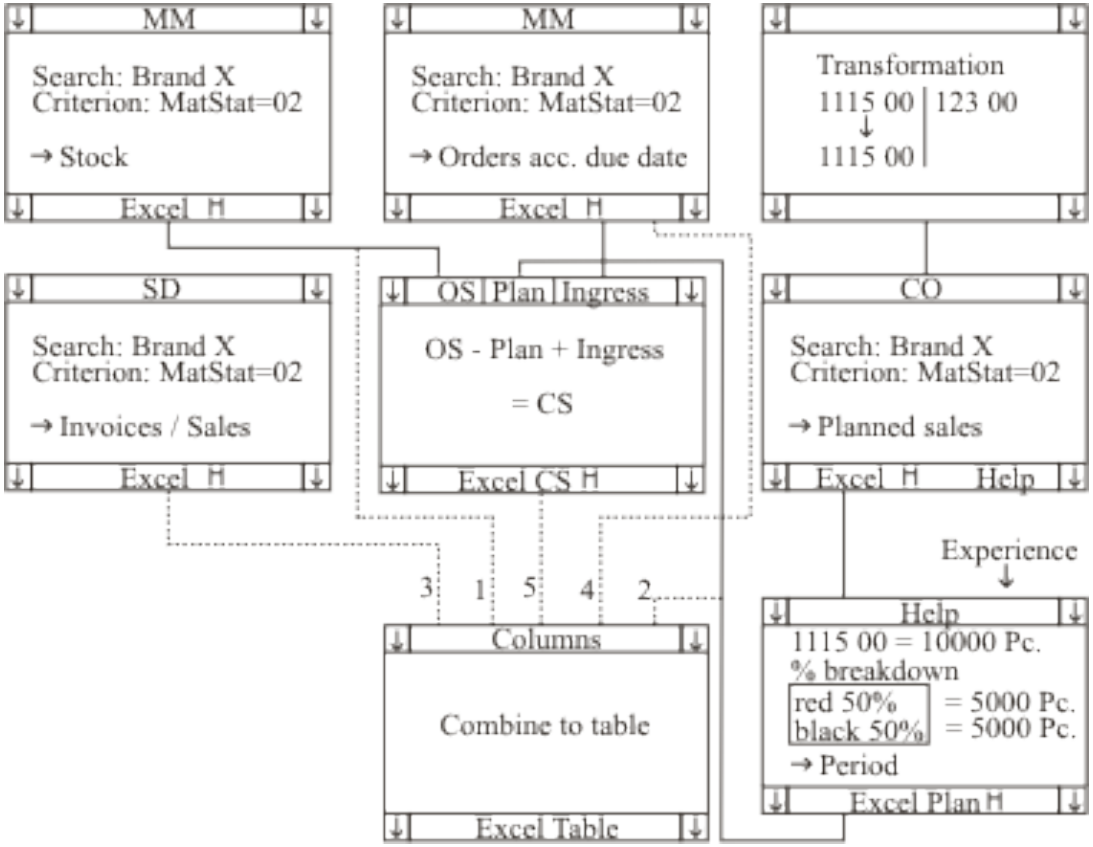
Design elements “box & wires”

- Box
  - Definition of data sets and operations
  - Definition by user annotations
- Wire
  - “Wire” line defining information flow between boxes



Empirical Study – Design Paradigm

Artefact designed by participants (simplified)



Conclusions

- Design paradigm itself usable by business users
- Formal specification of data should try to avoid need of system knowledge

Overall Conclusions

Current situation in SMEs

- Creation of individual information artefacts still too complex
- Need for highly simplified tools usable by business users
- Main problem areas
  - Data abstraction to conceptual level using business terms
  - Data searching and browsing
  - Orchestrating data
  - Creation of interactive tools
- Simple visual design paradigms (like box & wire) can be understood and applied fast

Outlook

Development of the EUD Environment

(i) Identify domain and context

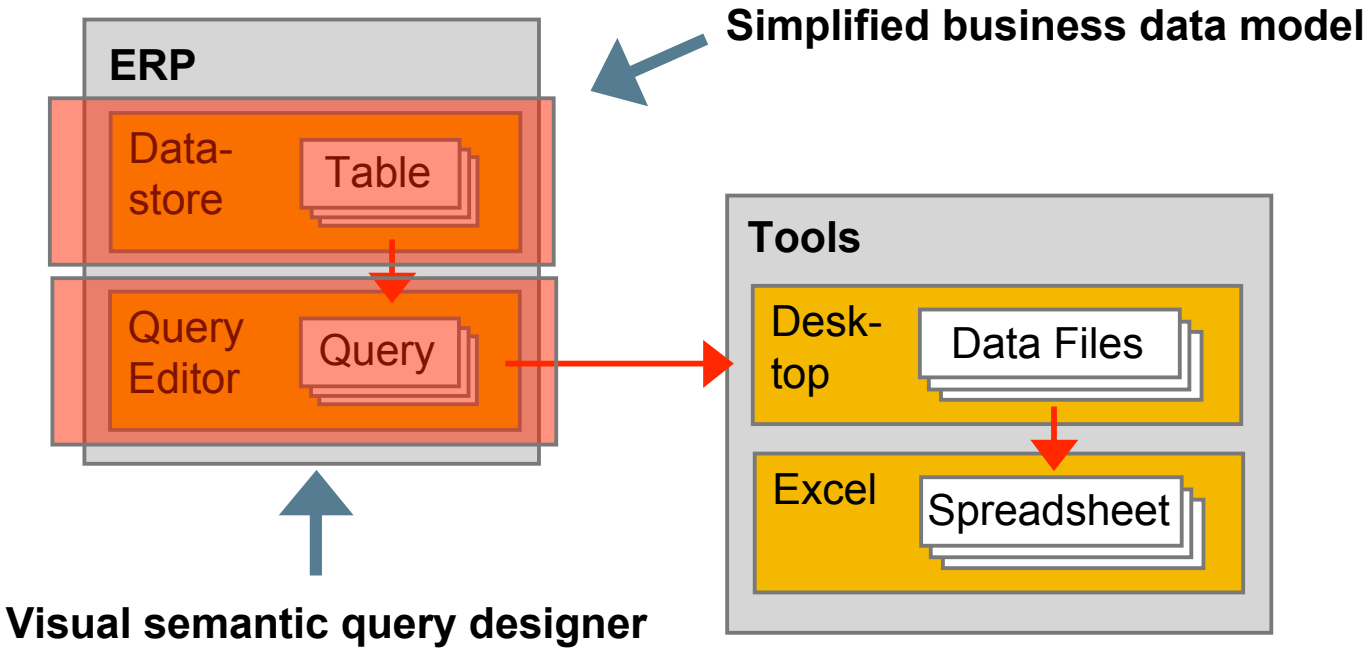
(ii) Understand domain and user problems

(iii) Design environment based on insights

(iv) Evaluate environment to measure its success

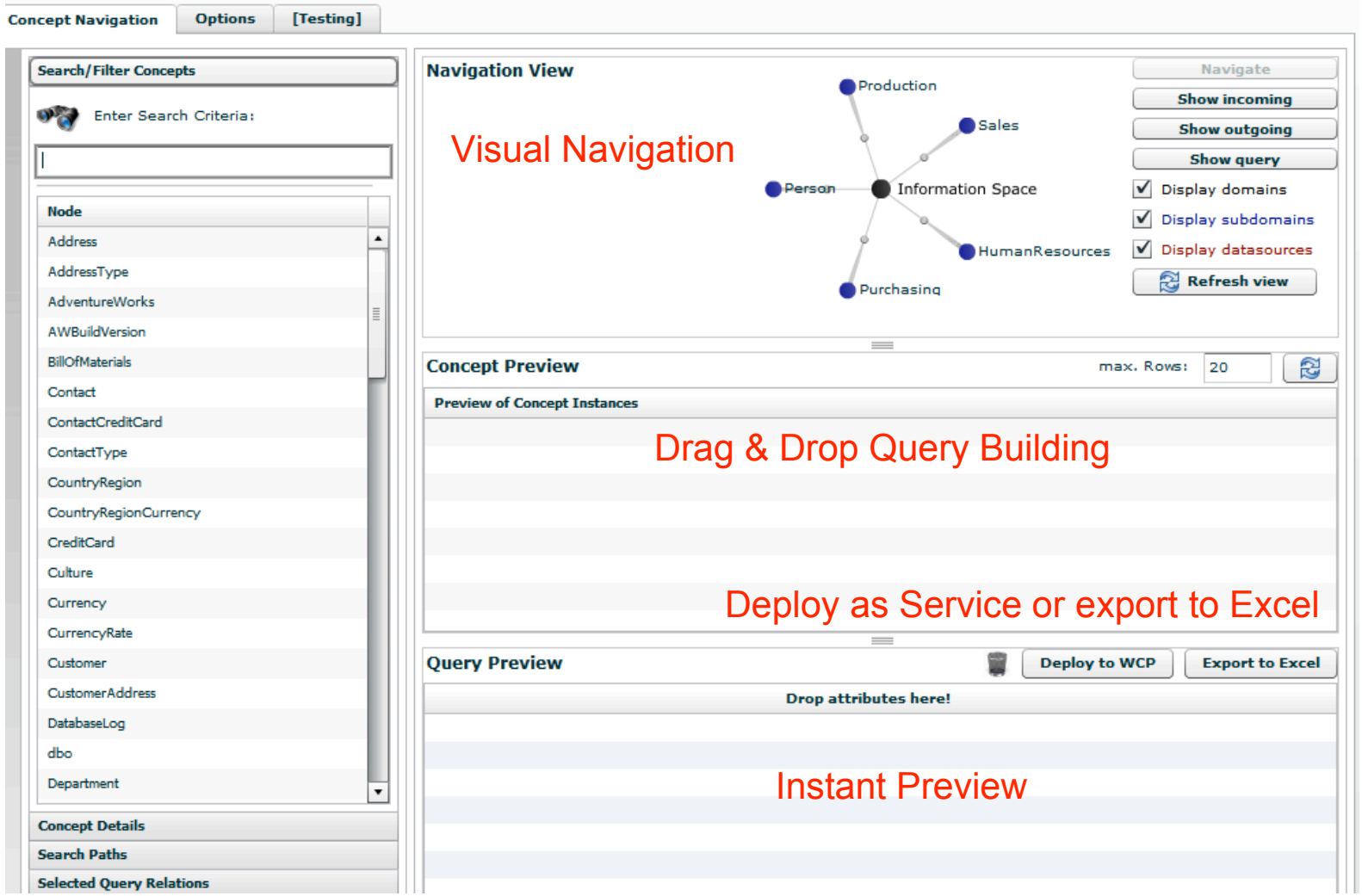
Outlook

Approach



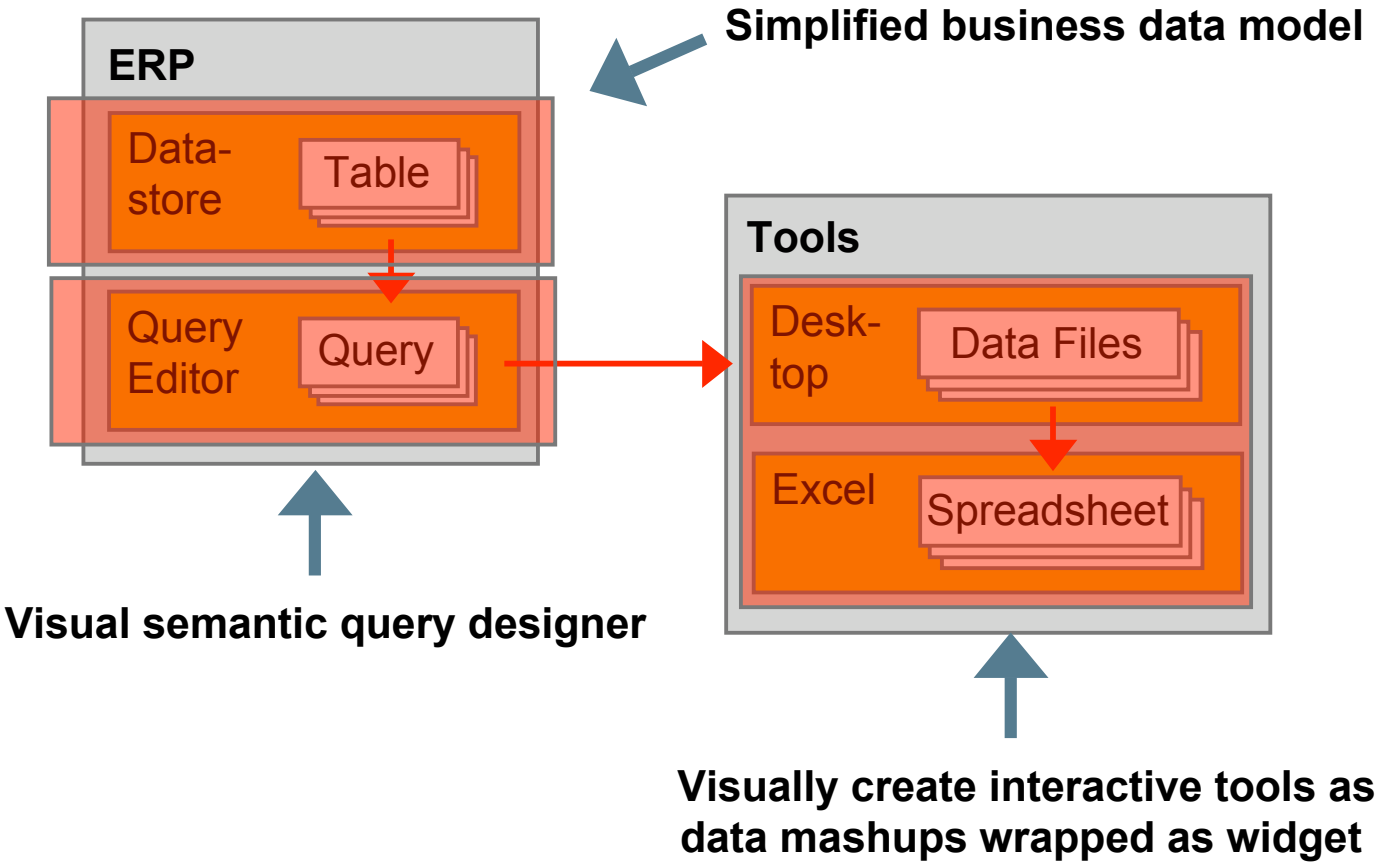
Outlook

Visual Semantic Query Designer



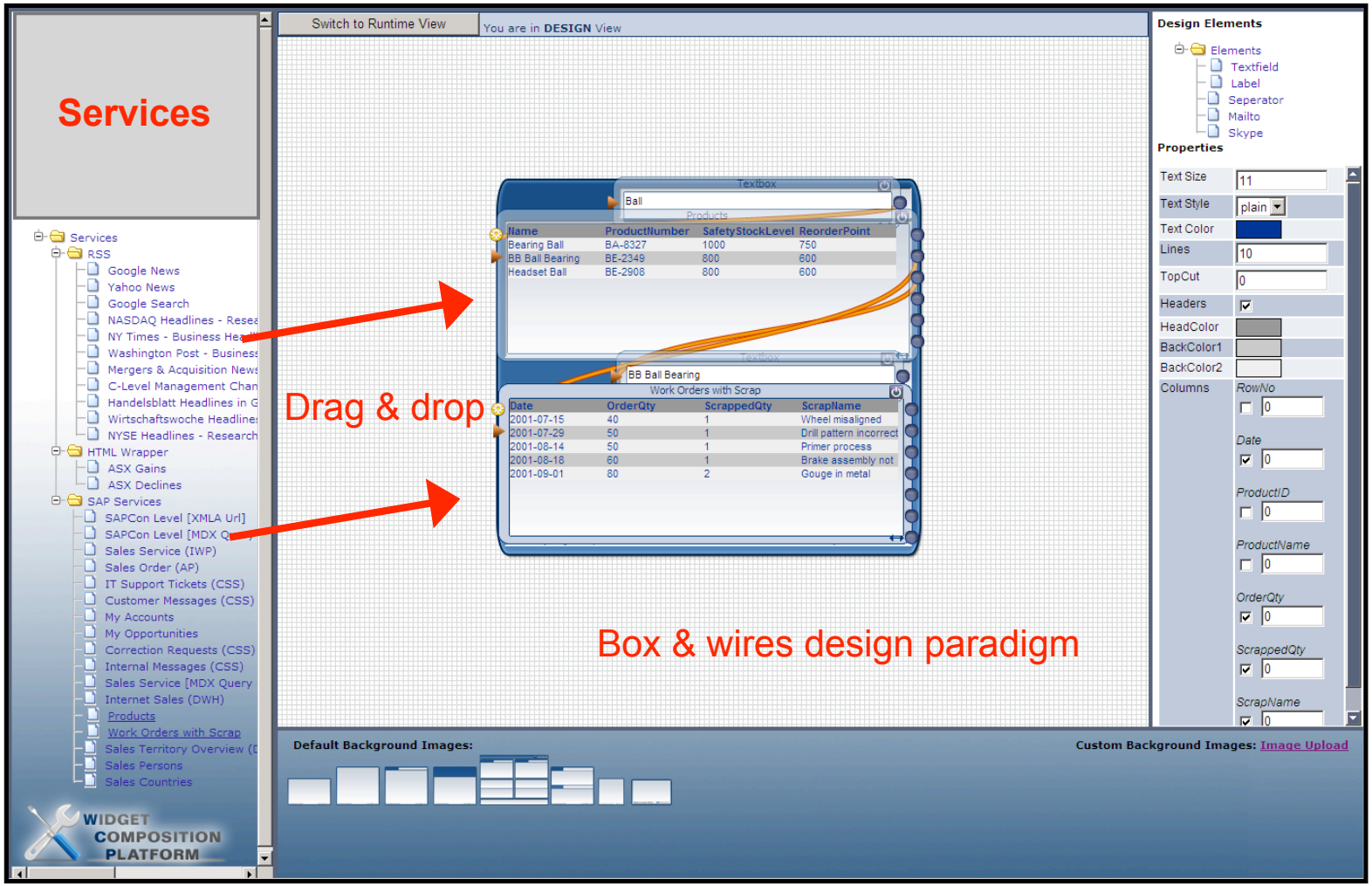
Outlook

Approach



Outlook

Widget Composition Platform



Questions

Thank you!

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Understand Domain and User Problems

Results

- Common IT infrastructure
  - SAP ERP and Microsoft Office
  - Microsoft Excel main “composition environment” for information artefacts
  - Advanced users use SAP Query Editor to create individual data sources
  - No business intelligence (BI) or data warehousing (DWH) solutions
  - IT departments avoid developing individual solutions
    - Reasons: limited expertise, high costs, requires maintenance
    - Consequences: user mainly have to arrange with just SAP and Office
  - No support technology for knowledge management
    - Users do not document and share EUD related knowledge (e.g. using wiki)

Outlook

Future work

- Development of EUD tools in accordance to identified problem areas
- Validation of tools in real enterprise environments

Current state

- Lightweight composition approach
  - Reduced and simplified business data model
  - Visual tool for navigating ERP information space and simple query creation
    - Sophisticated visualisation and search, drag & drop query creation
    - Wrap and deploy queries as services
  - Visual tool for orchestrating interactive tools (widgets) from services
    - Mix internal and external services to mashups and wrap in widget
    - Simple box and wires design paradigm
    - Absolutely no programming skills needed to create useful interactive tools

Empirical Study – Problem Areas

Common problems of business users acting as end user developers

- Inability to create simple, interactive tools to facilitate working tasks
  - Example: need to access different screens of ERP system and manually write down data in order to collect needed data related to a customer. Desirable: interactive tool returning needed data set after entering customer.
- Creating individual queries
  - Find and understand table with relevant data
    - Search capability not suitable for business users
    - Missing business terms (e.g. table ‘VBAK’ stores sales order header data)
    - No detailed description of table attributes
    - Incomprehensible help system
  - Query building tool rated to be complicated
    - Complex GUI
    - Need to understand some database concepts (e.g. foreign keys, joins)

Empirical Study – Design Paradigm

Empirical Study

- Setup
  - Collaborative specification of real problem to solve with information artefact
  - Introduction to design paradigm to use for information artefact creation
  - Collaborative development of information artefact

Problem to solve

- Create information artefact supporting the stock forecast
- Refine stock forecast by combining data from different SAP ERP modules and manually entered data

Empirical Study – Design Paradigm

Participatory design workshop

Empirical Study – Design Paradigm

Observations in design process

- No problems understanding and applying the box & wires design paradigm itself
- Users intuitively thought of data being organized as tables
- No problem to specify data using business terms
- Problems transforming specification in a way “understandable by the machine”
  - Specifications are short descriptions of how to access data in the ERP system
  - Inherently difficult for users with limited system knowledge
  - Operations and functions specified by formula or example

Conclusions

- Design paradigm itself usable by business users
- Formal specification of data should avoid problematic need of system knowledge

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