INTELLIGENT CONTENT:
The Foundation for Information-Intensive Service Systems

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Who is this guy?

- Adjunct professor at the UC Berkeley School of Information since 2002
- Came to Berkeley from Silicon Valley; founded or co-founded 4 companies that deal with SGML/XML for content management, electronic publishing, e-business
- Member of the Board of Directors for
  - OASIS
  - Open Data Foundation

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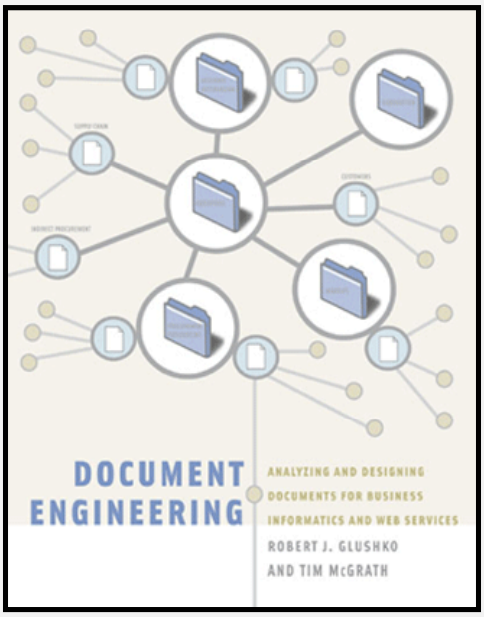
The last time (DocTrain ’08)…

- Bridging the front-stage and back-stage of information-intensive service systems
  - “Front stage” user experience often depends on the quality of the information provided to and captured in user interactions
  - User interface designers get credit that rightfully belongs to information designers and creators

  => Document engineering (and intelligent content) are critical for user experience design

The last time …



Document Engineering

Analyzing and Designing Documents for Business Informatics and Web Services

Robert J. Glushko and Tim McGrath

This time…

- The paradigm shift – Products vs. Services
- Service Systems
- Intelligent Content in Services
  - Increasing complexity of service systems
  - Increasing variety in service inputs
  - Mass Customization of services
- Key Takeaways

"Service" – traditional view

a residual category, defined as any economic activity that does not involve agriculture or manufacturing

Usually face-to-face interpersonal interactions

The Service Continuum

Experience-intensive ***Information-intensive***

Entertainment

Personal Services

Hotels & Restaurants

Healthcare

Classroom Education

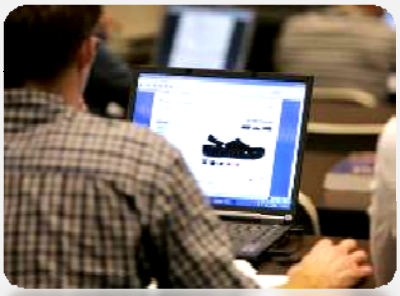
Web Services

Accounting

Programming

Is "Service" a Homonym?

Personal Service **Self-Service** **Web Service**



If these are all "services," are there any design concepts and methods apply to all of them?

"Service" – more abstract view

- The value in a service is created/co-created by the ***interactions*** and ***information interchanges*** between a provider and consumer
- "Provider" and "customer" are roles that can be performed by human or computational agents
- The service provider (role) has an *interface* through which the service consumer (role) interacts to request or obtain the service

Motivating "Service Systems"

- What services are involved when you check into a hotel?
- What determines the quality of your hotel check-in experience?

Making a Reservation

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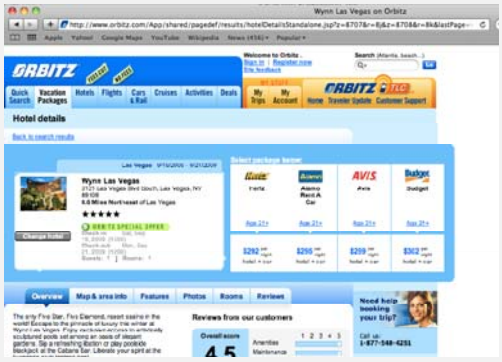
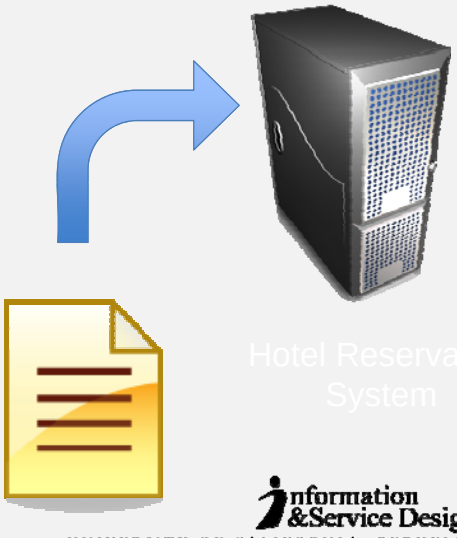
“Back end” B2B Processing





Hotel Reservation System

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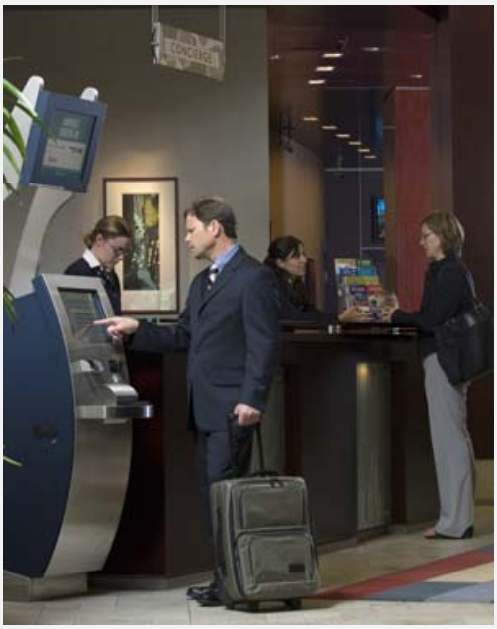
Check-in with Hotel Employee

Employee Confirms Reservation

Self-service Check-in



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The Service System

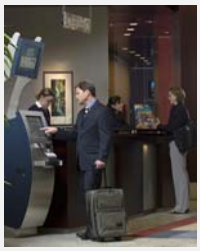
Hotel Website

Check-in Counter

Hotel Reservation System

Travel Website (Orbitz, etc)

Self-Service



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Describing & Designing Service Systems

- Treating services abstractly emphasizes what they have in common rather than how they differ
- This enables us to see "Service Systems" as the (more complex) scope of what we are designing (and describing)
- But we need to ***simplify the description of service systems*** to be able to provide ***prescriptive design guidance***

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Seven Contexts for Service Systems

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Seven Contexts for Service Systems

- A framework for designing service systems from “building blocks”
- Each context has characteristic design concerns and methods
- Derivational and compositional relationships among the contexts define design patterns
- These patterns enable the incremental design of service systems

The Mandate for Intelligent Content

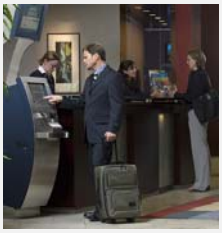
- Increasing complexity of service systems
- Increasing variety in service inputs
- Mass customization of services

The "Technology-Infusion Continuum

7 CONTEXTS OF SERVICE

Person-to-person

Self-Service



Technology-enhanced P2P

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The "Technology-Infusion" Continuum

7 CONTEXTS OF SERVICE

Person-to-person

Technology-enhanced Person-to-Person

Self-Service

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Substituting Information for Interaction

- Technology for capturing, managing, integrating and retrieving information allows service providers to ***substitute information for interaction***
- You don't need high intensity P2P services if stored information makes interaction unnecessary
- A hotel clerk with a database doesn't need to ask for your room preferences; Amazon doesn't need to ask you about what type of books you like
- Design implication: ***hidden computational services are interchangeable with customer-facing "touch points"***

The Multi-channel Context

Combines P2P and Self-Service Context:
What content is exchanged between channels?

The Multi-platform context

7 CONTEXTS OF SERVICE

Extends the self-service context (the same service) to multiple devices or platforms: *How is content adapted to each device or platform?*

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Backstage-intensive Context

7 CONTEXTS OF SERVICE

How is content transformed and combined?

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Context / location-based Context

7 CONTEXTS OF SERVICE

Location-based Service

Context-Aware Service

- **No need for service consumer to provide location and context information that the service provider has already obtained from sensors**
- **No need for service provider to give information to consumer that isn't relevant to his location and context**
- ***How does context substitute for or imply content?***

Contexts as Building Blocks

- Describing and designing service systems in terms of the seven contexts makes it much easier to consider ***alternative service system designs***:
  - replacing or augmenting a person-to-person service with self-service
  - substituting one service provider for another in the same role (e.g, through outsourcing)
  - eliminating a person-to-person interaction with automation or stored information

Composing Service Systems

7 CONTEXTS OF SERVICE

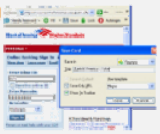
An Example - Banking

(1) Pure P2P
Private banking / VIP financial advisory service

(2) Tech-enhanced P2P
Tellers at bank windows

(3) Self-service
ATM

(4) Multi-channel
Online banking



(5) Multi-device
Mobile banking

(6) Back stage / computational
Wire transfer

(7) LBS / Context-aware service
Fraud detection / alert
(If card usage is abnormal such as overseas, alert is sent to customer and bank.)

Design Challenges in Service Systems

1. Value creation is more complex than in simple person-to-person interactions

2. Combining and integrating information from multiple contexts to create a complete and consistent model of the customer

Creating a Unified View of the Customer

1. Information Model-related challenges

- Structural issues – differing levels of granularity, inconsistent hierarchies, etc
- Semantic issues – incompatibility in definitions of metadata and terminology
- Syntactic issues – differences in languages, protocols and data formats

Creating a Unified View of the Customer

2. Non model-related challenges

- Anonymity (paying in cash)
- Bogus identities
- Customers take steps to make personal data unusable by provider due to privacy concerns
- Regulations that prevent provider from using customer information

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Coping with the Challenges

Make content intelligent!

- Use XML tools to encourage intelligent content creation
- Adopt standards
- Exploit asymmetry in economic and political power to dictate common models
- Use NLP and semantic enhancement technologies to raise "Information IQ"

Content Complexity

<u>Increasing variety of information types</u>

Old World	New World = Old World +

Non-text Content

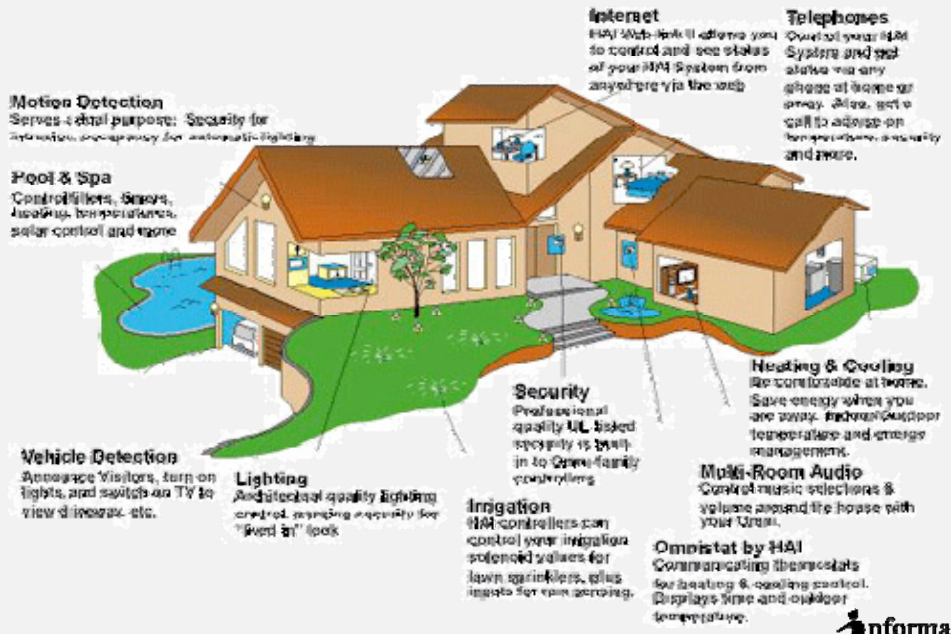
- The semantic gap – do we need non-textual descriptors?
- But how do we manage and search for them in a content management system?

Coping with Content Type Complexity

Make content intelligent!

- Add more metadata that can be used for organization, search and retrieval
- Use technology (such as voice-to-text) to convert content into more manageable formats

Sensors as Information Sources



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Sensors as Information Sources

Sensors for supply chain efficiency

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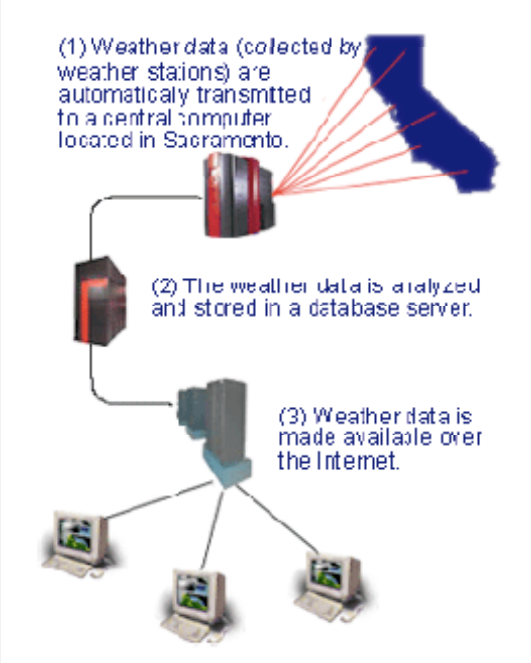
Challenges with Sensor Information



- data overload
- interoperability
- data aggregation

2009 Student project on
California Irrigation Management System

Coping with Sensor Information

Make content intelligent!

- "Filter" the "information torrent" as soon as possible to remove information that adds no business value
- Use standards like the Open Geospatial Consortium schemas to communicate sensor information
- Aggregate data and communicate it in an intelligent way for third-party services to improve on the current service (i.e. mashups and composite websites)

Mass Customization

- Cheaper and more complete storage, exchange and processing of information → industrialization of services
- Greater need to differentiate services to remain competitive
- Achieve differentiation through personalization

Information Enables Mass Customization

- Three types of relevant information:
  - information about the user
    - demographics, etc
  - interface used
    - P2P? Mobile? Online?
  - context of use
    - on the go? at home? at work?

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Acquiring Information Needed to Customize

- Ways of getting the information
  - explicitly ask the user (P2P or fill out forms)
  - automatically tracking user behavior through sensors, gps, or other web tools like cookies
  - data mining and semantic data analysis of historical data

Implementing Mass Customization

Make content intelligent!

- Create user profiles from the different types of information gathered about the user
- Use intelligent metadata to quickly assemble information when needed
- Componentize information services to more flexibly allow individualized service offerings

Summary: Intelligent Content in Service Systems

- Intelligent content creates value in services by allowing easier organization, manipulation and exchange of information.
- Having a consistent view of information and well-defined (information) interfaces ensures the successful delivery of services

Summary: Intelligent Content in Service Systems

- Information creators must design for "appropriate" and "consistent" intelligence
- Every stakeholder in the service system must understand the costs and benefits of this level of intelligence
- Raising the "Information IQ" involves both technical and non-technical challenges

=> Document engineering is a key skillset for service system design

For More Information

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▪Glushko, RJ. Seven Contexts for Service System Design. To be published in Maglio, P. P., Kieliszewski, C, & Spohrer, J., *Handbook of Service Science*, (2010)

▪Glushko, RJ and Tabas, L. Designing Service Systems by Bridging the "Front Stage" and "Back Stage." *Information Systems and E-Business Management*, (2009).

▪Glushko, RJ. *Information System and Service Design: Strategy, Models, and Methods.* Graduate course taught at University of California, Berkeley
(http://www.ischool.berkeley.edu/programs/courses/290-ISaSDSMaM**)**

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