Service Innovation Using Design Patterns

ROBERT J. GLUSHKO

University of California, Berkeley

School of Information

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Outline for the Talk

A Taxonomy of Service Design Patterns
Front Stage / Back Stage, Line of Visibility, and Point of View
Service Intensity and Touchpoints
Componentization, Aggregation and Disaggregation
Seven Contexts as Building Blocks for Service Systems
About the Speaker

Academic training in experimental psychology, software engineering, and cognitive science

10 years in industry research and development (mostly at Bell Laboratories)

10 years as an entrepreneur, founder or co-founder of 4 companies (electronic publishing and e-business)

8 years as an adjunct full professor at Berkeley; teach "intellectual foundations of information organization" and "information systems and service design"

Motivation for Service Design Patterns

Because services are often less tangible or more abstract than products, service descriptions are more amenable to conceptual manipulation

As "service" moves beyond traditional person-to-person services to self-service, web services, computer-to-computer service we are induced to take a more abstract perspective to emphasize what they have in common

There have been many efforts to devise abstract frameworks or patterns that describe business models or service systems, or "families" of related business models or service systems

Many of these are centered around the increasing role of information and communication technologies in enabling new patterns of business architecture

In this talk I will review some design patterns or models for services and show how they can be exploited systematically to invent new or improved services
What Are Patterns?

A Pattern is a model that is sufficiently general, adaptable, and worthy of imitation that it can be reused

It must be general so that it can apply to a meaningfully large set of possible instances or contexts

It must be adaptable because the instances or contexts to which it might apply will differ in details

It must be worthy because the instances or contexts to which it might apply are supposed to benefit by following the pattern rather than being impaired

Why We Use Patterns

Assist in analysis
Expose inefficiencies
Encourage best practices
Simplify / consolidate / remove redundancies
Enable transparent substitution
Facilitate generalization and specialization
The "Service System"

Defined as “Value co-creation configurations of people, technology, and value propositions that interconnect service systems, and shared information” (Maglio et al 2006)

Has rapidly become the conventional unit of analysis in services research and design

But its comprehensiveness, abstractness, and recursiveness poses some challenges in scoping and boundary-setting

How natural is it as a way to describe a configuration of services?

Models and Patterns for Service Systems

Many academic fields – management, operations research, informatics, etc. – provide models for describing service systems and design patterns

These models distinguish and highlight different aspects of the same service system

Can be thought of as different perspectives or points of view
A Taxonomy of Models [1]

Physical Models - emphasize the physical / spatial / topological arrangement of services

IE/OR models - emphasize operational behavior or performance

- Queuing models
- System dynamics models

Physical Model
Physical Model

Queue Models
Queue Models - Configurations

Queue configuration

- Take a number
  - Finite
  - Unlimited
- Single queue
  - Finite or unlimited
- Multiple queues
  - Jockeying permitted or not
  - Express lane

Queue Models - Disciplines

Queue discipline

- Static (FCFS rule)
  - Selection based on status of queue
    - Number of customers waiting
    - Round robin
- Dynamic
  - Selection based on individual customer attributes
    - Priority
    - Preemptive
    - Processing time of customers (SPT rule)
System Dynamics Models

Descriptive models that depict dimensions or stores of value creation and their dependencies using feedback links

Widely applicable but arbitrary types and number of parameters makes each model very context-specific

"Cutting Corners and Working Overtime" - Model

Cutting Corners and Working Overtime: Quality Erosion in the Service Industry
Feedback Structure in Dynamical Model

A Taxonomy of Models [2]

Value Creation Focused Models - emphasize how customer value is created
- Blueprint or touchpoint models
- Value chain models

Functional Models - emphasize what the services do, how they are combined or interconnected
- Business Model / Organizational Perspective
- Process Perspective
- Information Flow / Document Exchange Perspective
"Blueprint" or "Touchpoint" Models

Emphasize the interactions between an human employee and a human customer

In traditional service methods these "service encounters" are a critical focus

- Every encounter is an opportunity for the firm to satisfy the customer, to reinforce the value of its offerings, and to sell the customer on the benefits of a long-term relationship
- Encounters immediately impact customer satisfaction and also shape longer-term factors like intention to return, likelihood of communicating positively about the service, and customer loyalty

Service == Service Encounter

"Service encounters are critical moments of truth in which customers often develop indelible impressions of a firm... From the customer's point of view, these encounters ARE the service" (Bitner, Brown & Meuter, 2000)

"In most services, quality occurs during service delivery, usually in an interaction between the customer and contact personnel of the service firm" (Zeithaml, Berry, & Parasuraman, 1988)
The Front Stage / Back Stage Distinction

This focus on the "last" encounter implies a sharp distinction between the visible interactions and invisible activities that precede it to make it possible.

Front Stage: Where interactions with the service customer/consumer happen.

Back Stage: Produces information and "stuff" needed in the front stage.

Placement of the "Line of Visibility" is a design parameter: how many services to expose in the front stage.

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McDonald's Restaurant

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The McDonald’s Experience

Front Stage

Back Stage
Gourmet Restaurant

The Gourmet Restaurant Experience

Front Stage  Back Stage

Benihana Restaurant

The Benihana Experience

Front Stage  Back Stage
The Front Stage Designer's Mindset

Strive to create service experiences that people find enjoyable, unique, and responsive to their needs and preferences

Use techniques and tools from the disciplines of human-computer interaction, anthropology, and sociology such as ethnographic research and the user-centered design

Capture and communicate designs using modeling artifacts that include personas, scenarios, service blueprints, and interactive prototypes

The Back Stage Designer's Mindset

Identify and analyze information requirements, information flows and dependencies, and feedback loops

Use concepts and techniques from document engineering, data and process modeling, industrial engineering, and software development

Typical artifacts include use cases, process models, class diagrams, XML schemas, queuing and simulation models, and working software
### Contrasting Design Goals

<table>
<thead>
<tr>
<th>Front Stage Designers</th>
<th>Back Stage Designers</th>
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<tbody>
<tr>
<td>Usability</td>
<td>Efficiency / Productivity</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>Robustness</td>
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<tr>
<td>Flexibility / Customization / Uniqueness</td>
<td>Standardization / Reuse</td>
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<tr>
<td>Transparency</td>
<td>Scaleability</td>
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<tr>
<td>Enjoyment</td>
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### Tensions and Tradeoffs: Front Stage Perspective

"Those software developers build systems that constrain our ability to deliver the services the customer wants"

"Sure, standards are good... but users have different capabilities and preferences and they need different user interfaces"

"My client wants me to make the SYSTEM more usable... but all I can change is the user interface"
Tensions and Tradeoffs: Back Stage Perspective

"Those interaction designers always propose services that the back end can't support"

"They should just study the service interfaces to the ERP system... can't they all read XML schemas?"

"If every experience has to be different, how can our implementation be robust and scaleable?"

Front Stage, Back Stage, and Point of View

The front stage / back stage distinction designates some actor or service as the focal / primary consumer or customers

This is typically the end of the value chain or information flow, or where “users” are

But this is often arbitrary, and other actors or stakeholders or services could be alternative POVs
A New Yorker's Map

An Australian's Map
POV in a Teaching Hospital - Who's the Customer?

In a teaching hospital

No, I am.

I am.

POV in a Cooking School - Who's the Customer?

In a cooking school
Service Blueprints - Front and Back Stages of Touchpoints

Service Blueprints - Hotel
Service Intensity and Quality

Chase (1978) proposed a distinction between "low contact" and "high contact" services according to the extent of customer interaction.

The notion of service intensity measured according to the number or duration of service encounters seems intuitive and is taken for granted in service experience design.

Intensity in this sense is correlated with "attentiveness," "responsiveness," and other characteristics of the interactions between the provider and the customer.

Service Intensity as a Design Pattern

The traditional P2P service design philosophy assumes that customers prefer services with high intensity (the number of actions initiated by the service provider, or the number of touch points).

But it is more robust to treat intensity as a design parameter to differentiate service offerings of the same type or industry domain.

We can define a "generic" service offering as a design pattern that can be increased or reduced in intensity by changing the number of touch points.
Hotel "Value Creation Cycle"

Hotel Value Creation Cycle

Budget Hotel "Value Creation Cycle"
EXERCISE 1: SERVICE INTENSITY, LOV, & POV AS DESIGN PATTERNS

Describe a service generically in terms of touch points or encounters like the "generic" hotel service (be careful about the point of view; more than one might be possible)

Design a "simple" or "low intensity" service by eliminating some touch points or moving them to the back stage behind the "Line of Visibility"

Design an "enhanced" or "high intensity" service by adding some touch points or moving what had been implicit back stage ones in the generic service to the front stage
Discussion Points for Exercise 1

In businesses with complex services (hospitals, airlines, hotels...) there may be dozens of potential touch points or service encounters.

The service provider needs to distinguish between the simple or minor touch points that don't have the potential for creating a "value-creating" bond with the customer and those that do.

Some services and touch points are standardized and never customized to specific customer.

Others can be adapted if the customer requests and participates in the adaptation by providing information or preferences.

"Substituting Information for Interaction" as a Design Pattern

Capturing, managing, integrating and retrieving information allows service providers to substitute information for interaction.

You don't need high intensity or many touch points 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 "Touchpoint Window" as a Design Pattern

Service providers can also distinguish themselves by extending the scope or duration of the experience; the scope extends before and after the "core" touch points to an extent that is itself an important design decision.

Time is a primary dimension of scope but not the only one.

Service Journey - Airline Travel

When does an "airline travel" experience begin from the customer's point of view?
When does an "airline travel" experience begin from the airline's point of view?
What are the consequences if the customer's starting and ending points for the service journey are earlier and later than the airline's?
The Virgin "Upper Class" Experience

The Touchpoint Window - Gourmet Restaurant

A “customer-oriented” perspective on a gourmet restaurant suggests a narrow service system scope
The Touchpoint Window - "Locavore" Restaurant

But it might be essential to extend the design scope to ensure the desired experience in the “touchpoint window”

The Touchpoint Window - Massage
The Touchpoint Window - Physical Therapy

The Touchpoint Window - Drop Shipment
There are service providers and service consumers… but these are roles, not intrinsic properties.

A service provider (role) has an interface through which the service consumer (role) interacts to request or obtain the service.

Value or quality is created/co-created by the interactions and information interchanges between the provider and consumer.

Because many of these interactions and information exchanges reflect or result from "back stage" services, the service encounter can’t fully determine quality, only preserve or reveal it.

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An Abstract View of Services and Service Encounters

The service design and innovation process you just followed is easier to do if we take a more abstract view of services and service encounters:

- There are service providers and service consumers… but these are roles, not intrinsic properties.
- A service provider (role) has an interface through which the service consumer (role) interacts to request or obtain the service.
- Value or quality is created/co-created by the interactions and information interchanges between the provider and consumer.
- Because many of these interactions and information exchanges reflect or result from "back stage" services, the service encounter can’t fully determine quality, only preserve or reveal it.
Business Components and "Service Oriented Architecture"

So we need to think of "what a business does" in more granular terms

Business functions or services are "components"

A business model or service system is a composition or assembly of components

These business components can be a mix of core, internal ones that a business does itself and outsourced ones provided by other businesses

Modeling a Business or Service System as a Set of Components

Business processes are typically "factored" into components according to the "best practice" patterns in each industry

An emphasis on business model / business process / information exchange patterns facilitates component reuse / reassembly into new combinations - virtual enterprise, composite services

"What components do" is defined in abstract, technology-independent terms so we don't have to care about the computer, operating system, or software application that performs each business process

This level of abstraction reduces integration and communication costs between components and is the essence of service orientation
### Component Business Map -- Generic

#### Directing
- Business Administration
- New Business Development
- Relationship Management
- Servicing and Sales
- Product Fulfillment
- Financial Control and Accounting

#### Controlling
- Business Planning
- Sector Planning
- Account Planning
- Sales Planning
- Fulfillment Planning
- Portfolio Planning

#### Executing
- Business Unit Tracking
- Sector Management
- Relationship Management
- Sales Management
- Fulfillment Planning
- Compliance
- Reconciliation

#### Staff Appraisals
- Product Management
- Credit Assessment
- Sales
- Product Fulfillment
- Customer Accounts

#### Marketing Campaigns
- Staff Administration
- Product Directory
- Credit Administration
- Customer Dialog
- Document Management
- General Ledger

### Componentized Bank

#### Enterprise Planning and Management
- Financial Management
- Human Resources
- Project Management
- Property and Advisory
- Treasury

#### Collaboration Management
- Collaboration Planning
- Service Concept and Planning
- Supply Planning
- Demand Planning
- Policy Management

#### Product Development
- Develop Product
- Refine Product
- Manage Processes
- Service Management

#### Processing
- Advanced Planning
- Produce Product
- Credit Check
- Procurement

#### Distribution
- Marketing
- Multichannel Management
- Partner Relationship Management
- Call Center

Legend:
- Outsourced capability
- In-house capability
- Insourced capability for third parties
Business models / occupations can be characterized by their intensity on three dimensions.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Information Intensity</th>
<th>Customer Contact Need</th>
<th>Physical Presence Need</th>
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</thead>
<tbody>
<tr>
<td>Actuary</td>
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<tr>
<td>Marketing Manager</td>
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<td>M</td>
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<tr>
<td>Civil Engineer</td>
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<tr>
<td>Comm. Eqpt. Operator</td>
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<tr>
<td>Cleaning</td>
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<tr>
<td>Food Service Manager</td>
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<tr>
<td>Secretary</td>
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<td>H</td>
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<tr>
<td>Registered Nurse</td>
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Apte & Mason - Before Disaggregation

A. Original Activity

Physical Object Manipulation

Symbolic Manipulation

Customer Contact

Non-Value-Added Actions
Apte & Mason -- After Disaggregation

B. Reengineered Activity

Non-Value-Added Actions

Underestimating the Impact of Technology?

Reduced by logging & tracking?

Robotics, remote manipulation?

Telepresence?
Telerobotics

Telepresence
Betancourt and Gautschi - Patterns of Economic Activity

Production, Distribution, and Consumption are the three economic activities

What are their spatial relationships? What are their temporal relationships? nominally 25 possibilities

How does technology change the feasible combinations?

How does technology change the preferred combinations?

| Time | \( P, D, C \) | \( D | [P, C] \) | \( C | [P, D] \) | \( P | [C, D] \) | \( P | D | C \) |
|------|---------------|----------------|----------------|----------------|----------------|
| Space|
| \( P, D, C \) | 1  | 2  | 3  | 4  | 5  |
| \( D | [P, C] \) | 6  | 7  | 8  | 9  | 10 |
| \( C | [P, D] \) | 11 | 12 | 13 | 14 | 15 |
| \( P | [C, D] \) | 16 | 17 | 18 | 19 | 20 |
| \( P | D | C \) | 21 | 22 | 23 | 24 | 25 |

EXERCISE 2: AGGREGATION / DISAGGREGATION AS DESIGN PATTERNS

Deconstruct an existing service system into the three phases of production, distribution and consumption and locate this combination in one of the 25 cells in the Betancourt and Gautschi framework (retailing? education? ...)

Analyze other cells in the B & G framework, especially those that are near the "as is" service, and assess their feasibility or desirability

Identify the changes in the service concept and value proposition that would be required for the service to be offered in one of these new configurations

(If you have time... consider the possibility of extending the "touchpoint window" before and after the "as is" service or for one of the new configurations. What services would be added to the service system. How would the overall value proposition change?)
Discussion Points for Exercise 2

What services did you deconstruct into the B & G framework?

Are some "as-is" configurations of production, distribution, and consumption more common or natural than others?

Are some new configurations of production, distribution, and consumption more feasible or desirable than others? Why?

Retailing in Betancourt & Gautschi #1
Motivating "Seven Contexts" as a Design Pattern

We've now seen several design patterns for service system design and innovation. In "Seven Contexts for Service System Design" I try to bring them together into a common framework.

The design patterns facilitate a perspective in which service systems can be analyzed as configurations of design contexts, each with characteristic design issues and methods.

Derivational and compositional relationships among the contexts define design patterns for innovation and evolution of service systems.
The Seven Contexts

- Person-to-person
- Multiple Devices
- Computational or Backstage-Intensive
- Technology-enhanced P2P
- Self-Service
- Location-based and Context-aware
- Multi-Channel

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
P2P, Technology-enhanced P2P, and Self-Service Contexts define a Continuum

"Flavors" of Technology Enhancement

"Assisted" encounters - technology used by the "frontline" provider to enhance capabilities

"Facilitated" encounters - technology used jointly by provider and customer

"Customer-improvised" - technology introduced by customer and not expected by provider
Too Much Self-Service?

Multichannel Context

Stores with both physical and web presence (mostly for tangible goods)
In-store kiosks or self-service terminals
Firms that use downloadable store coupons, RSS, Twitter, or email to inform and make offers to customers
Online stores that provide inventory information for local stores to enable online purchase with local pick-up
Government agencies that provide web options for face to face service transactions like DMV
"Embedded" Online Retailer

Gas Station TV
Design Issues for Multichannel Services [1]

What are the (actual or potential) benefits of multichannel services for providers?
How much technical integration is possible/desirable?
How much business integration is possible/desirable?

Design Issues for Multichannel Services [2]

What are the (actual or potential) benefits of multichannel services for customers?
What do customers expect or understand about the "user experience" in multichannel environments?
What are the implications for technical and business integration?
Multiple Devices / Platforms Proliferation

Designing for Multiple Devices / Platforms

Device-independent Service

Technology 1

Technology 2

Technology 3

\[ \ldots \]

Technology n

Customer

Customer

Customer

Customer
Multi-platform Services

Why do some applications or services need to run on multiple platforms?

How can user interfaces be developed for multiple platforms? What are the costs and benefits of separate designs for each one vs a "design once and adapt" approach?

Can We Achieve Consistency or Continuity of User Experience?

"Users expect to be able to reuse their knowledge of a given version of the system when using the same service on another platform"

Alternatively, if "capabilities vary so greatly...it makes sense for users to expect varying functionality on the different devices"
"Mother App" for Smart Phones

No Mother is Possible
Location-based / Context-aware Services

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
Augmented Reality Application

Strolling with information
Augmented reality is coming to life, thanks to GPS and compass-equipped smart phones, which let users see a localized layer of Web data superimposed over their camera view of the world.

The corner of Geary and Powell streets
Mike Kepka / The Chronicle

San Francisco Nearest Transit
Floating signs can direct you to the nearest bus line or subway station.

Wikitude
Tags for Wikipedia entries and locations of interest float on screen.

Layer
Layer lets you set a radius and filter your search by establishments.

Context Attributes

Location is the most obvious context attribute, but if context is "any information that characterizes a situation related to the interactions between users, applications, and the surrounding environment" context is very open-ended.

Many technologies for sensing context information can make devices and services "smart"
New "Smart Service" Concepts with "Connected Devices"

"Virtually any product that uses electricity -- toys, coffeemakers, cars, medical diagnostic machines -- possesses inherent data processing capabilities. Each has a wealth of information about its current status, usage history, and performance"

Remote monitoring (of environments or products)
Vendor-managed inventory ("remote monitoring" of retail shelf space)
Monitoring + capability upgrading
Location information as a service
Remote monitoring + Location Information
Remote monitoring + Interactive control

Otis Remote Elevator Monitoring

A Diagnostic software monitors elevators continuously and sends data to the REM unit located in the machine room.

B The REM unit sends this information to the OTISLINE center.

C Data is categorized by urgency and reviewed by OTISLINE representatives.

D An OTISLINE representative alerts the field mechanic, if necessary.

E The mechanic arrives at the job site with specific information, tools and parts to work on the elevator.
"Back-stage Intensive" or "Computational" Context

Many enterprise applications, transactional systems, or devices generate information that is not usually exposed in customer-facing interfaces.

Many of these back-stage services involve information exchanges or computations with no human involvement.

Providers and consumers interact by exchanging information through "service interfaces" that specify the inputs and outputs of each service.
Transparent Substitutability

Providers and consumers interact by exchanging information through “service interfaces” that specify the inputs and outputs of each service.

These interfaces are implicit in P2P encounters, but always explicit for non-human actors in computational service contexts.

In the purest vision of “service oriented architecture,” the interfaces are abstract, enabling transparent substitution of one provider for another to optimize service quality for each consumer.

"Transparent Substitution" in Shipping Service

- The same abstract Shipping Request is sent to many delivery services and one is selected to provide the service.
- It probably doesn’t matter to the customer which delivery service handles his package.
- It might not even matter to the retailer.
The Supply Chain Pattern

A supply chain is an aggregated and end-to-end view of the buy-side and sell-side relationships of an enterprise.

A supply chain is the network of facilities and distribution capabilities an enterprise uses to:

- "Source" (or "procure") raw materials (chemicals, ores, grains, ...) or components
- Transform the materials or assemble the components into products
- Deliver the products to customers (indirectly through distributors or stores or directly to the purchaser)

Supply Chain - Conceptual Model
The Information Supply Chain

The flow of materials and goods in a supply chain is accompanied by information about it.

But information about supply chain activities and processes is increasingly separated from the physical flow of materials and goods, and for information-based services there is no physical stuff.

Information also flows in the opposite direction from the customer, retailers, and distributors back into the supply chain – this is also called the DEMAND CHAIN.

The information supply chain has become especially important because increased global competition and better informed customers are forcing forms to shift from forecast to demand (i.e. customer) driven business models.

Design Issues for the Information Supply Chain

What information is exchanged?

Which entities in the supply chain are able to exchange information?

What is the frequency of this information exchange?
Scanning RFID Tags on Vegetable Boxes

GPS Farming
Open Table Availability

A "Seven Contexts" Design Example

ISchool Project - students acting as consultants to bookstore chain
Successfully designed-in all seven contexts
"Core" services can provide value to multiple stakeholders in different functions
"Smart Bookstore" [1]

Customer browses "Bookland" bookstore site, looks at several books but doesn't purchase them.

While walking in town a few days later, text message alert on mobile phone tells him he is near a Bookland store, offering him a discount on the books he browsed online that are in stock at that store.

Customer identifies himself with RFID-enabled loyalty card at self-service kiosk, gets printed store map with book locations highlighted.

"Smart Bookstore" [2]

His purchases update his customer profile and store inventory, triggering new recommendations and reordering.

Books that are removed from shelves but left in coffee shop, rest room, etc. are "zombies" that are detected by RFID tracking, with alerts sent to employee dashboard.
Information Flow in "Bookland"

Customer Self-Service Interface
EXERCISE 3: SEVEN CONTEXTS DESIGN PATTERNS

Analyze an existing service system using the Seven Contexts design pattern.

If the service system doesn't involve all seven contexts, consider incorporating those that are missing.

What new value would these new contexts provide in the service system?

What information from the new contexts could be exploited in the existing contexts?
Retail Banking - Seven Contexts

Summary: Today's Big Ideas

Design patterns have a central place in engineering, architecture and computing but haven’t been a focus of service system design.

The more abstract conception of services and service interfaces embodied in design patterns assists in analysis, encourages best practice, and facilitates innovation.

These design patterns can be taught to and used successfully by university students and practitioners.
For More Information

www.ischool.berkeley.edu/~glushko // glushko@berkeley.edu


Glushko, R.J. Information System and Service Design:Strategy, Models, and Methods. Graduate course taught at University of California, Berkeley (http://www.ischool.berkeley.edu/courses/228)