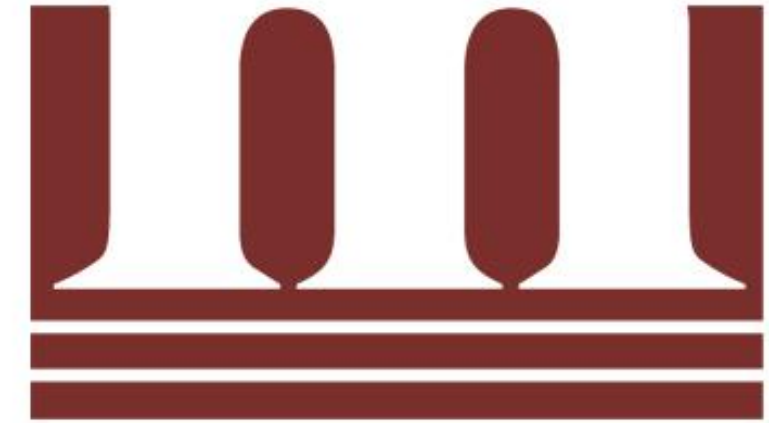

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# The Value to the Customer of RFID: A Taxonomy of RFID-Enhanced Service

William Wentworth, Deloitte
Gregory Heim, Mays Business School at Texas A&M University

Baylor/Sloan Industry Centers Workshop on RFID
Baylor University, Waco, TX
9/27/2007-9/28/2007

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# Agenda

- Background
- Taxonomy
- Data Collection and Methodology
- Findings
- Conclusions

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# Motivation

- RFID adoption is coming; many firms have been testing service applications in proof-of-concept environments for several years

- Much of the focus on RFID has centered around
  - Inventory management
  - Supply chain management

- Less focus on service management and impact on service experience

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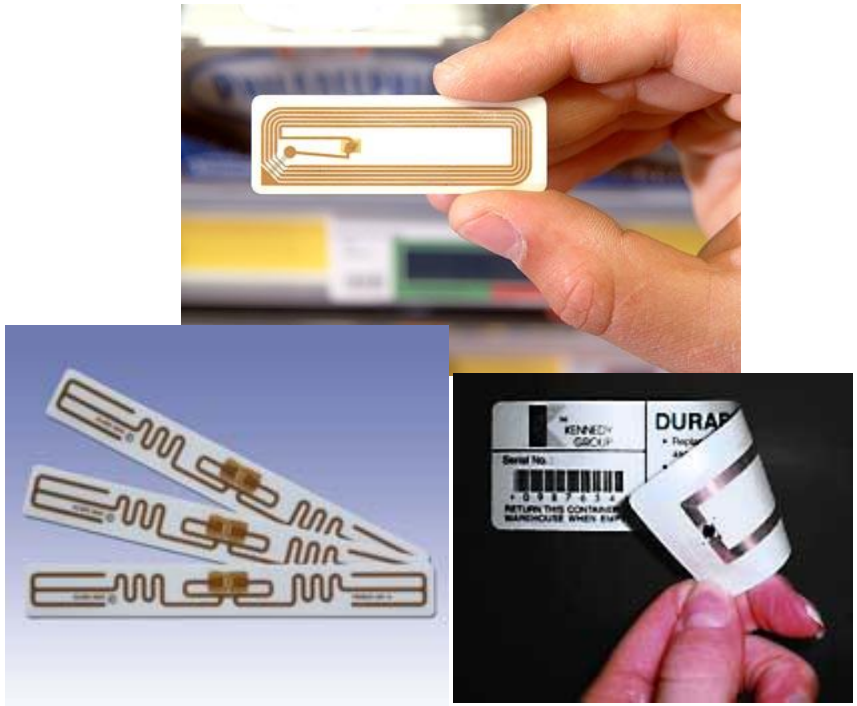
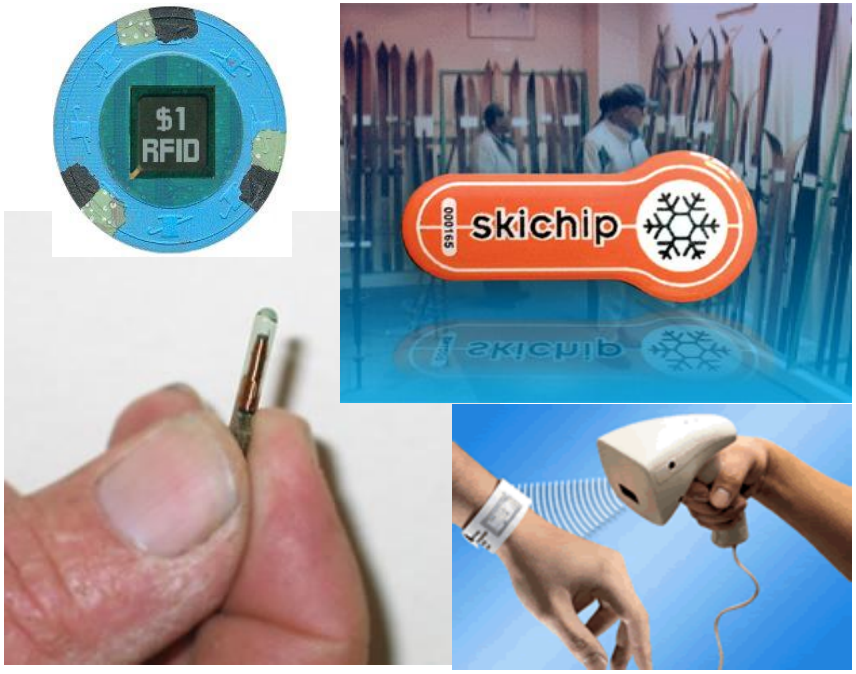
# What is RFID? How is it Used in Service Operations?

RFID for Service Back Office and Front Office



RFID for Service Front Office

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# Many Early Experimenters & Adopters

- Manufacturers
  - The Gillette Co., Procter & Gamble, Johnson & Johnson
- Logistics Service Providers
  - UPS, DHL
- Retail
  - Wal*Mart, Target ,Marks & Spencer, Tesco, Metro, Prada
- Airports
- Universities
- Amusement parks
- Museums
- Libraries
- Hospitals
- Nightclubs
- Coffee shops
  - Starbucks

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# Metro's Proof-of-Concept "Future Store"


RFID Portal for Receiving Inventory

RFID Loyalty Card


RFID Enabled Tools for Counting Inventory


Labels for Dynamic Pricing


Information Kiosks and Terminals to Find/Advertise


RFID Tagged Items

Portal for Automatic Checkout

# Literature

- Many industry white papers, articles, online news articles

- Academic Literature
  - Research agenda (Curtin et al. 2006)
  - SCM/Inventory (Angeles 2005, Asif & Mandviwalla 2005, Michael & McCathie 2005)
  - Technology adoption of RFID (Yang & Jarvenpaa 2005, Riggins & Slaughter 2006)

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# Literature

- Service Literature
  - Classification of application types (Giaglis et al. 2002)
  - Examine reliability of RFID within service environment (Mumby 2003)
  - Describe RFID-enabled services: grocery (Loebbecke 2004), medical (Nagy et al. 2006, Wang et al. 2006)
  - Customer reactions to proof of concept service environments (Kourouthanassis & Roussos 2003, Gunther & Spiekermann 2005)

# Literature

- Practitioners often skeptical about potential for RFID in services
- Many parties are involved in RFID-based ubiquitous computing oriented services; each has own perspective on value (Fleisch & Tellkamp 2003)
- Companies should focus on delivering value to customers (Eckfeldt 2005)
- Delivering value involves (Weinberg et al. 2005)
  - Identifying value dimensions contributed by an application
  - Envisioning how to deliver value
  - Developing system infrastructure for delivering value
  - Ensuring alignment with firm's strategy

# Research Question

- What is the value provided to customers by RFID?
- What do customers value in RFID-enhanced service?

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# Customer Value Literature

- Technologies do not possess innate value, but rather value in application (Keeney 1999, Squire et al. 2004, Hanson 2006)

- Growing importance for managers to identify value for customers (Anderson et al. 2006)

- Methods for identifying value (Keeney 1992, 1999, Squire et al. 2004)

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# Methodology

- Theory-building study
- Generate taxonomy of RFID application types
- Associate value dimensions with cells of taxonomy
  - Inductively (alternative-focused thinking)
  - Collect data from actual/future customers using Keeney (1992) value-focused thinking approach

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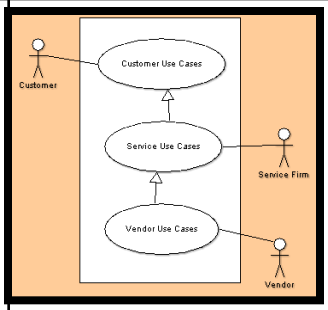
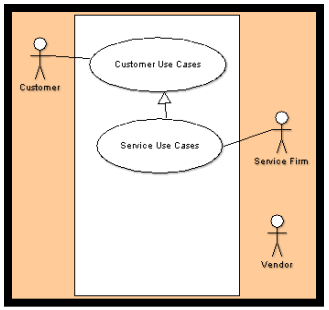
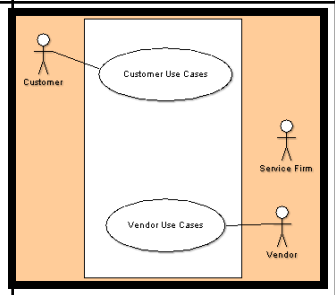
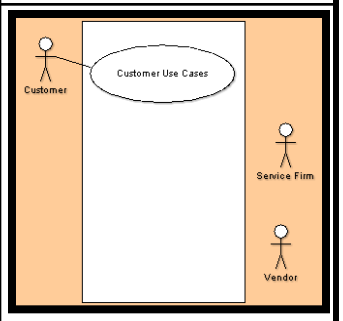
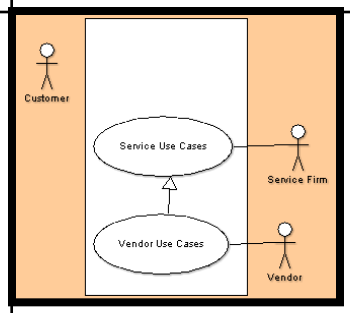
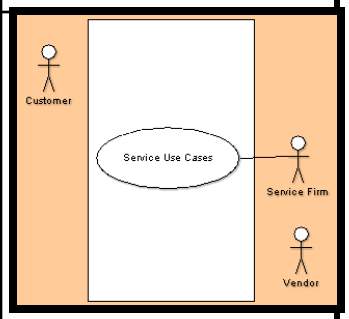
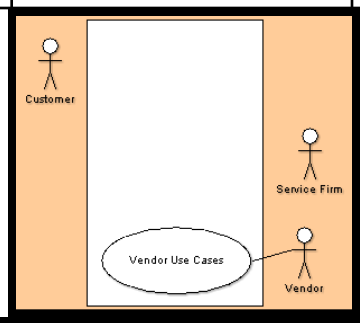
# Taxonomy Based on RFID Use Cases

| | Vendor Integrated | Vendor Not Integrated |
|---|---|---|
| Service Firm Integrated |  |  |
| Service Firm Not Integrated |  |  |

Customer Integrated

| | Vendor Integrated | Vendor Not Integrated |
|---|---|---|
| Service Firm Integrated |  |  |
| Service Firm Not Integrated |  | Traditional Non-RFID Service |

Customer Not Integrated

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# Research Propositions

- ***Proposition 1:*** *The extent to which customers are integrated into the RFID system will increase the set of important customer value dimensions. Customers detached from RFID touchpoints will recognize fewer types of value.*

- ***Proposition 2:*** *Customer value dimensions will differ in importance across cells of the taxonomy.*

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# Data Collection

- Adapted Keeney's (1992) value-focused thinking approach to a paper-based survey related to RFID use in service operations

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# Customer Value Dimensions

| | Keeney's Online Service Value Dimensions | | |
|---|---|---|---|
| **Objectives** | **Included** | **Omitted** | **Added in RFID Service** |
| **Fundamental** | Maximize Product Quality<br>Minimize Cost<br>Maximize Convenience<br>Minimize Time Spent<br>Maximize Privacy<br>Maximize Enjoyment<br>Maximize Safety<br>Minimize Environmental Damage | Minimize Time to Receive Product | |
| **Means** | Minimize Fraud<br>Assure System Security<br>Maximize Access to Information<br>Minimize Misuse of Personal Info<br>Limit Impulsive Buying<br>Maximize Transaction Accuracy<br>Make Better Purchase Choices<br>Maximize Product Variety<br>Maximize Product Availability<br>Minimize Personal Travel<br>Maximize Ease of Use<br>Offer Personal Interaction | Maximize Product Information<br>Minimize Misuse of Credit Card<br>Assure Reliable Delivery<br>Enhance Comparison Shopping | Enhance Location Ability<br>Provide Education About Use<br>Maximize Personal Freedom<br>Maximize Fairness of Use<br>Minimize Complexity<br>Know Customer<br>Maximize Information Quality<br>Minimize Device Misuse<br>Maximize Personal Device Control<br>Maximize Device Reliability<br>Improve Recommendations<br>Prevent Errors<br>Maximize Service Availability<br>Maximize Personalization<br>Provide VIP Treatment |

# Data Collection

- Qualitative (open-ended) questions responding to scenarios about services using RFID

  1. What do you expect when you consume a _____ service?

  [ Scenario About Service With RFID]

  2. Compared to present-day service experience, what do you find of value from adding RFID? What matters to you?
  3. Do you have any concerns or worries about the use of RFID in this service?

- Scenarios
  - Coffee shop, Retailing, Airport, Nightclub, Museum, Others

- Study Sample
  - Convenience sample of 100 students in two sections of a business course at a major northeastern university; extra credit offered as incentive
  - 70 surveys completed, 6 scenarios per survey
  - 424 observations

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# Data Collection

| | |
|---|---|
| **Enhance Location Ability**<br>Maximize ability to locate; Minimize intrusive location events | **Provide Education About Use**<br>Provide education; Minimize learning curve; System information |
| **Maximize Personal Freedom**<br>Min. restrictions; Retain ease of switching; Device dependence | **Maximize Fairness of Use**<br>Do not take advantage; No opportunism; Do not manipulate me |
| **Minimize Complexity**<br>Simplify process; Eliminate unneeded steps/human touch points | **Know Customer**<br>Collect data on me; Know my likes and needs |
| **Maximize Information Quality**<br>Enhance my information; Improve information accuracy | **Minimize Device Misuse**<br>Minimize third party misuse; Prevent fraud if device stolen |
| **Maximize Personal Device Control**<br>Will I control device; Turn on/off; Can I remove device | **Maximize Device Reliability**<br>Minimize glitches; Minimize breakdowns |
| **Improve Recommendations**<br>Provide better recommendations | **Prevention of Human Mistakes/Errors**<br>Prevent my mistakes/absent-mindedness; Prevent service delivery personnel errors; Prevent non-user errors |
| **Maximize Service Availability**<br>Maximize service uptime; Minimize service process failure | **Maximize Personalization**<br>Personally recognize me in an appropriate amount; Customize service experience |
| **Provide VIP Treatment** | |

# Data Collection

- Scored open-ended responses along set of value dimensions
  - Number of times mentioned
  - Dichotomous (0/1) … mentioned or not

# Research Findings

- ***Proposition 1:*** *The extent to which customers are integrated into the RFID system will increase the set of important customer value dimensions. Customers detached from RFID touchpoints will recognize fewer types of value.*

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# Findings

## ***Proposition 1***: Impact of Customer Use Cases

| | Customer RFID Use Case = Yes | Service Operations RFID Use Case = Yes | Service Supplier Use Case = Yes |
|---|---|---|---|
| Maximize Quality | **Less** | **More** | **More** |
| Minimize Cost | **Less** | **More** | **More** |
| Maximize Convenience | **Less** | **More** | **Less** |
| Minimize Time | **More** | **More** | **Less** |
| Maximize Privacy | **More** | **Less** | **More** |
| Maximize Enjoyment | **More** | **More** | **Less** |
| Maximize Safety | **More** | **More** | **Less** |

Green = Mentioned significantly more frequently

Red = Mentioned significantly less frequently

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# Findings

***Proposition 1***: Significant Impact of Customer Use Cases (ANOVA)

| Service Objectives | Value Dimensions Commented on More Frequently | Value Dimensions Commented on Less Frequently | Insignificant Value Dimensions |
|---|---|---|---|
| **Fundamental** | Minimize Time (139)<br>Maximize Privacy (79)<br>Maximize Enjoyment (97)<br>Maximize Safety (49) | Minimize Cost (142) | Maximize Quality (79)<br>Maximize Convenience (40) |
| **Means** | Minimize Complexity (30)<br>Maximize Payment Ease (64)<br>Minimize Fraud (10)<br>Maximize Security (38)<br>Maximize Knowing Customer (29)<br>Minimize Info. Misuse (25)<br>Minimize Device Misuse (39)<br>Maximize Device Control (14)<br>Improve Recommendations (11)<br>Minimize Impulsive Behavior (42)<br>Maximize Variety (7)<br>Maximize Personalization (53)<br>Provide Social Interaction (32)<br>VIP Treatment (58) | Maximize Info. Quality (39)<br>Make Better Choices (25)<br>Maximize Product Availability (18) | Maximize Location Ability (45)<br>Provide Education (13)<br>Maximize Freedom (12)<br>Maximize Fairness (16)<br>Maximize Info. Access (32)<br>Maximize Reliability (58)<br>Maximize Accuracy (50)<br>Maximize Prevention (32)<br>Maximize Service Availability (9)<br>Minimize Travel (10)<br>Maximize Ease of Use (22) |

# Research Findings

- ***Proposition 2:*** *Customer value dimensions will differ in importance across cells of the taxonomy.*

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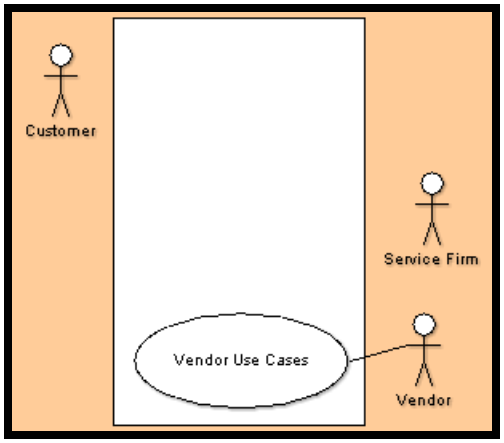
# Findings

## ***Proposition 2***: Cell-by-Cell Value Dimensions




Intelligent Service Supply Vendor

| | |
|---|---|
| Fundamental Objectives | Minimize cost<br>Maximize privacy |
| Means Objectives | Maximize product availability |

**Value Analysis Scenarios:** consumer goods store

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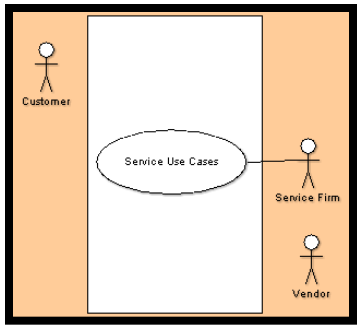
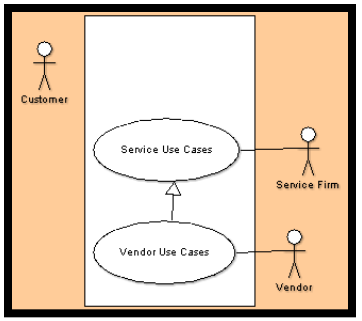
# Findings

## ***Proposition 2***: Cell-by-Cell Value Dimensions




Enhanced Service Back Office




Intelligent Service Supply Chain

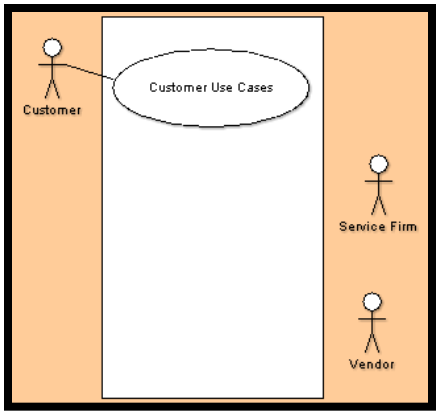
| | | |
|---|---|---|
| Fundamental Objectives | Maximize quality<br>Minimize cost<br>Maximize convenience<br>Minimize time spent<br>Maximize enjoyment | Maximize quality<br>Minimize cost |
| Means Objectives | Maximize location ability<br>Maximize payment ease<br>Maximize information quality<br>Maximize accuracy<br>Make better choices | Maximize safety<br>Minimize complexity<br>Maximize information quality<br>Maximize error prevention<br>Make better choices |

**Scenarios:** toll booth, airport

**Scenarios:** grocery store

# Findings

## ***Proposition 2***: Cell-by-Cell Value Dimensions




Real Time Service Product

| | |
|---|---|
| Fundamental Objectives | Maximize safety |
| Means Objectives | Minimize complexity<br>Maximize security<br>Minimize device misuse<br>Maximize personal device control<br>Maximize reliability<br>Maximize error prevention |

**Value Analysis Scenarios:** intelligent protection device

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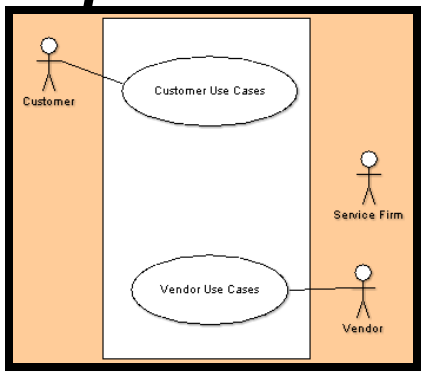
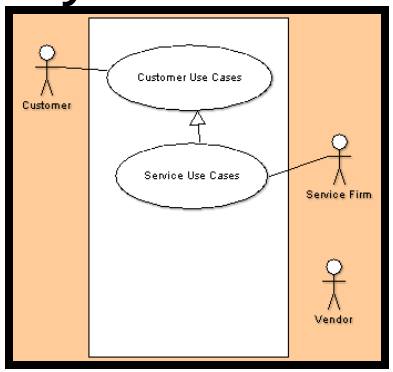
# Findings

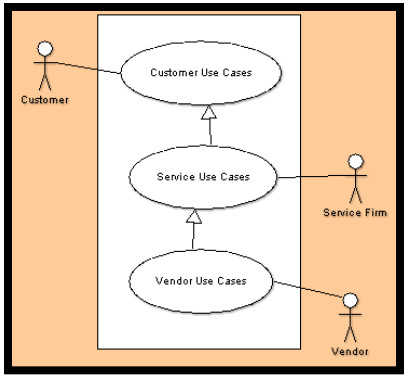
## ***Proposition 2***: Cell-by-Cell Value Dimensions




Disintermediated Intelligence




Enhanced Service




Fully Integrated Service Supply Chain

| | | | |
|---|---|---|---|
| Fundamental Objectives | Minimize cost<br>Maximize privacy<br>Maximize enjoyment | Maximize quality<br>Minimize cost<br>Maximize convenience<br>Minimize time spent<br>Maximize privacy<br>Maximize enjoyment<br>Maximize safety | Maximize quality<br>Minimize cost<br>Maximize privacy<br>Maximize enjoyment |
| Means Objectives | Maximize location ability<br>Maximize freedom<br>Maximize fairness<br>Minimize fraud<br>Maximize security<br>Have knowledge of customer<br>Minimize device misuse<br>Limit customer impulsiveness<br>Maximize personalization<br>VIP treatment | Minimize complexity<br>Maximize payment ease<br>Have knowledge of customer<br>Maximize information access<br>Maximize reliability<br>Limit customer impulsiveness<br>Maximize accuracy<br>Maximize personalization<br>Provide social contact<br>VIP treatment | Maximize location ability<br>Maximize fairness<br>Have knowledge of customer<br>Minimize information misuse<br>Limit customer impulsiveness<br>Maximize personalization<br>Provide social contact<br>VIP treatment |
| | **Scenarios:** casino | **Scenarios:** coffee shop, nightclub, zoo, amusement park | **Scenarios:** casino, grocery store |

# Summary of Findings

- ***Proposition 1:*** *Customers detached from RFID touchpoints will perceive fewer value dimensions.*
  - Cells involving customers have many more value dimensions
- ***Proposition 2:*** *Customer value dimensions will differ across cells of the taxonomy.*
  - Very different sets of value dimensions mentioned cell-by-cell
  - The more parties involved, the more things customers expect to find of value

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# Conclusions

- Findings
  - Customer value is a function of the manner in which RFID application changes the service process
  - Set of relevant value dimensions appears to increase with the number of parties viewed to be involved in the RFID process

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# Conclusions

- Implications
  - Be careful how the rollout of RFID is communicated to customers, as it may affect their expectations of what RFID will offer them
  - As RFID moves into direct interaction with customers …
    - customers start to focus on personalizing aspects, individual customer behaviors of self and others
    - customers may become more aware of frustrations and emotions within service environments

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# Conclusions

- Limitations
  - Value analysis methodology challenging to use when comparing multiple service environments
    - Challenging to position individual service scenarios within cells
    - Challenging to resolve different customer comments into generic dimensions spanning service contexts

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# Conclusions

- Directions for Research
  - Use identified value dimensions and respondent descriptions as constructs/items for survey-based research to formally test the relationships within controlled service contexts

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