
Customer Efficiency and the Management of Multi-Channel Service Delivery Systems

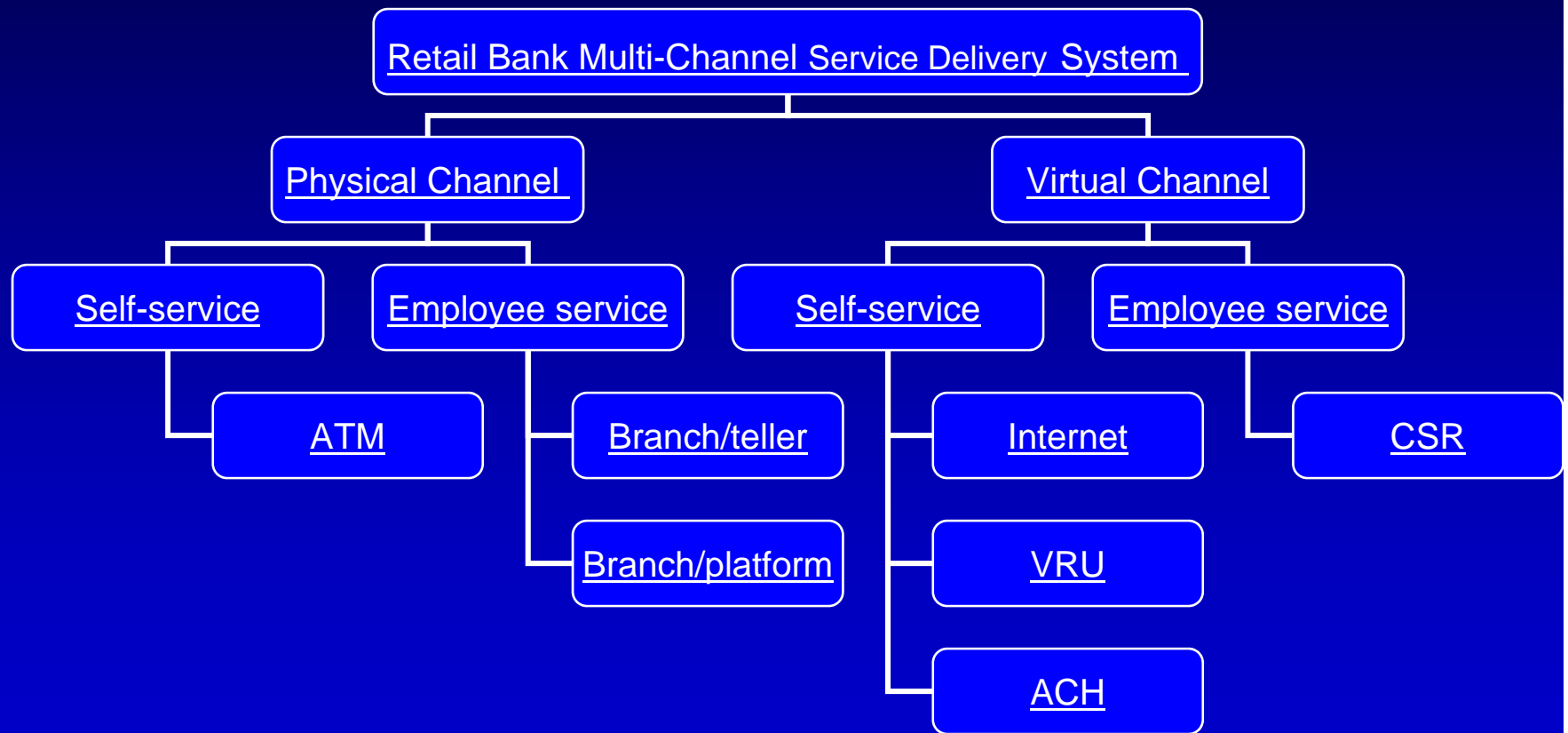
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Outline

- Project Background
- Project Overview
- Research Results and Major Findings
 - Customer efficiency: concept and its impact on E-business Management (Xue and Harker (2002) *Journal of Service Research*)
 - Customer efficiency, channel use and firm performance in retail banking (Xue, Hitt and Harker (2007), Forthcoming *Manufacturing & Service Operations Management.*)
 - The Determinants and outcome of Internet banking adoption (Hitt, Xue, and Chen (2007), under review *Management Science*)
- Summary and Discussion

The Multi-channel Service Delivery System



Project Overview: Background

Project “ Customer Efficiency and the Management of Multi-Channel Service Delivery Systems”*

(Co- PI: Lorin M. Hitt, the Wharton School, University of Pennsylvania)

- **A large scale study of service delivery in retail banking**
- **Industry Participants and Data Set**
 - **Large and medium sized banks**
 - **over 4 million *households’ monthly transaction, account and demographics information for a year* (July 2002~June 2003).**

***Supported by the National Science Foundation (NSF), the Marketing Science Institute (MSI), and the Wharton E-business Initiative (WeBI).**

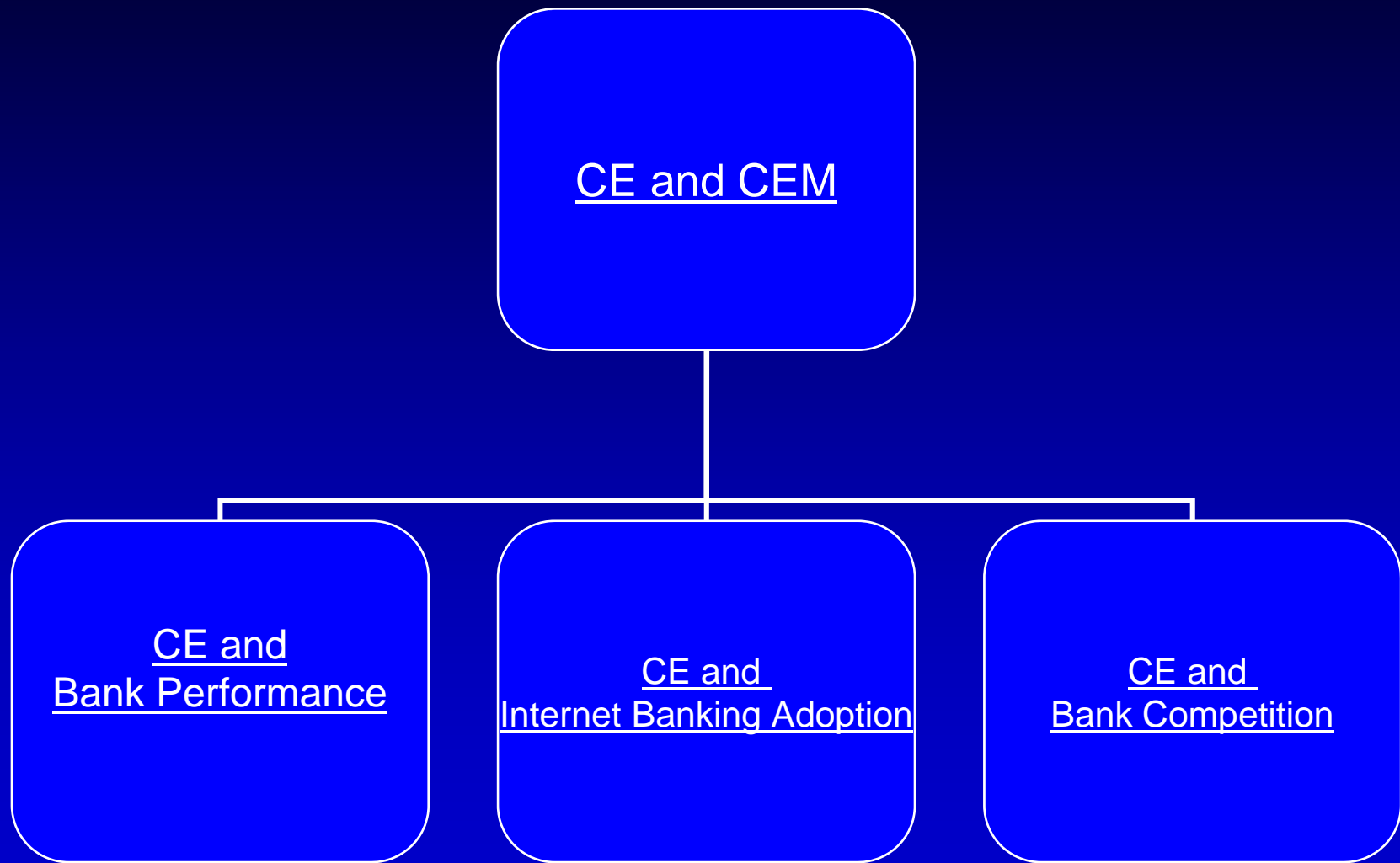
Project Overview: Topics

- What factors influence customer choice of delivery channel in a multi-channel service delivery system and what is the impact on customer-bank relationship and bank performance?
- What determines a customer's decision to adopt Internet banking and what are the outcomes of Internet banking adoption?
- How does the availability of self-serve channels influence competition among banks?

Project Overview: Goals

- **Developing Customer Efficiency Management as a theory for service management**
- **Developing empirically testable models on how the introduction and promotion of self-service channels affect firms' operations, performance and strategies and examining the benefits customers receive from the utilization of these channels.**
- **Offering new empirical methods for analyzing customer product usage and transaction data**

Research Overview



Service Co-Production

- Physical or virtual presence and labor
- Facilitating the information flow through interactions with the firm and other customers
- Making indispensable intellectual efforts such as choice evaluation and decision-making

Examples:

Haircutting, Healthcare, Legal/financial consulting,
Education, E-shopping, E-financial service, and etc.

Customer Efficiency: Concept

An efficient customer
is a customer who
uses *less* of resources (time, etc.)
while accomplishing
more in service co-production.

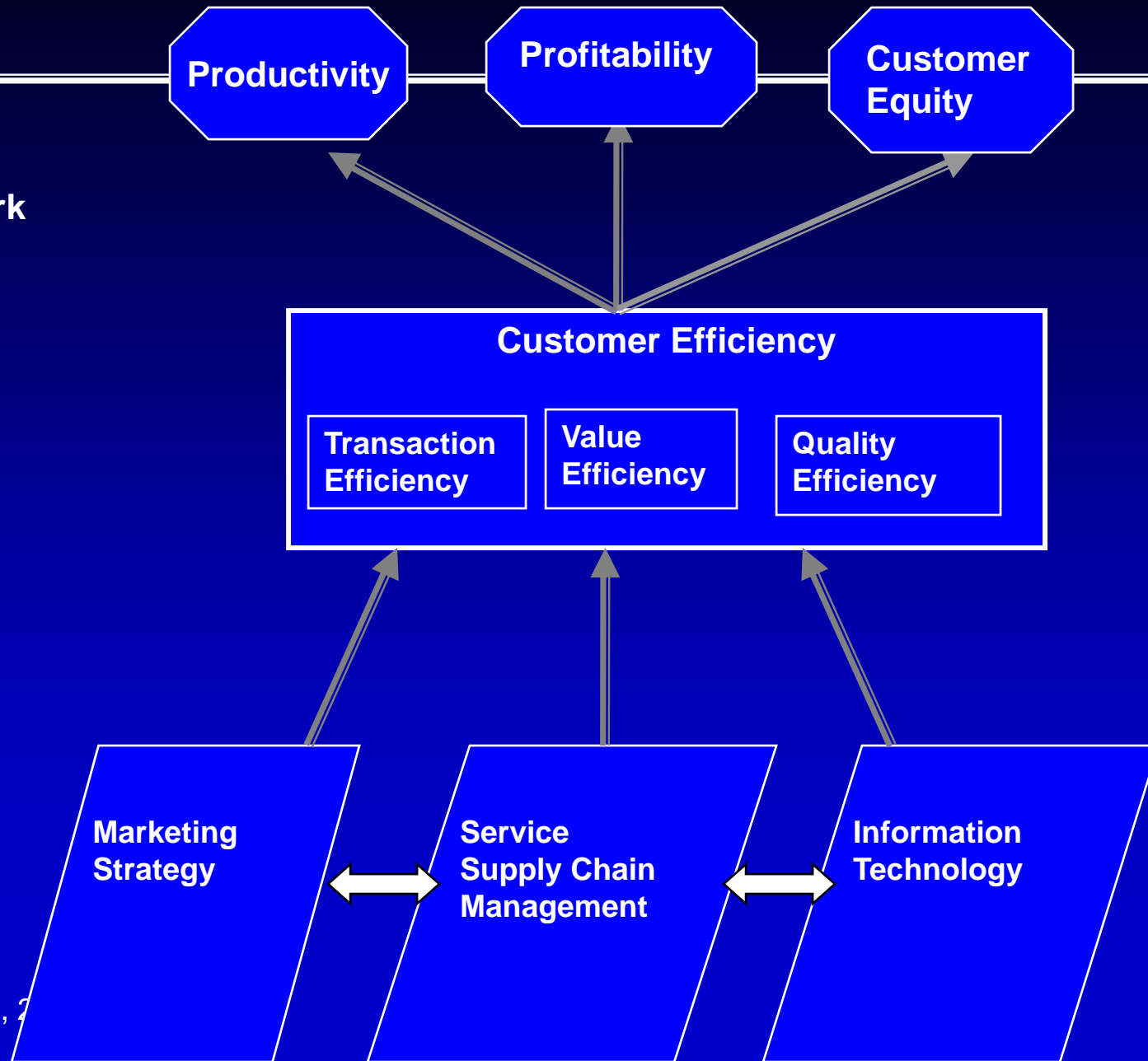
--- (Xue and Harker (2002) "Customer Efficiency: Concept and Its Impact on E-business Management" *Journal of Service Research*)

Customer Efficiency Management (CEM)

A business strategy based on developing an efficient customer base in order to simultaneously improve firm productivity, profitability, and customer equity. This goal is achieved through the seamless integration of service supply chain management, marketing strategy, and information technology designed to actively engage customers in the co-production of service in order to stimulate or facilitate the improvement of customer efficiency.

--- (Xue and Harker (2002) "Customer Efficiency: Concept and Its Impact on E-business Management" *Journal of Service Research*)

Figure 1
The CEM
Framework



*“Customer Efficiency, Channel Usage and Firm Performance in Retail Banking” **

Research Questions:

- What drives a customer’s demand for services delivered via different channels in a multi-channel service delivery system?
- How to measure customer efficiency when a direct measure is not feasible?
- What is the relationship between customer efficiency and firm performance?

* Xue, Hitt and Harker (2006) forthcoming *Manufacturing & Service Operations Management (M&SOM)*

Literature

■ **Service Co-production and Customer Contact Theory:**

Fuchs (1968), Chase, 1978, 1981), Lovelock and Young (1979) ,
Karmarkar and Pitbladdo (1995), Kellogg and Chase (1995);
Soteriou and Chase (1998), Xue and Harker (2002), Froehle and
Roth (2004)

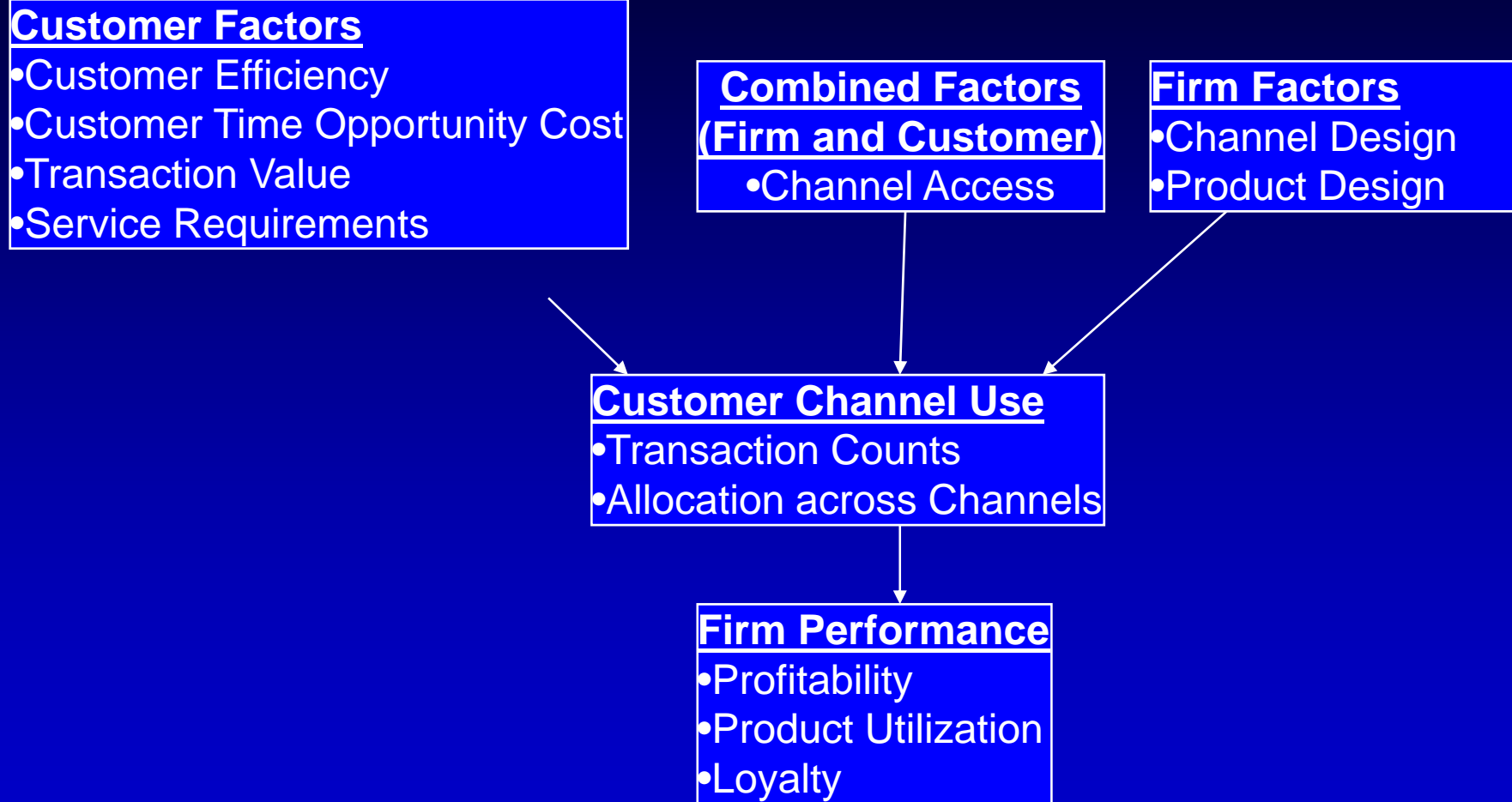
■ **Service Design Strategy:**

Huete and Roth (1988), Heskett et al. (1997), Roth (2001), Boyer et
al. (2002)

■ **Financial Service Delivery**

Apte and Vepsalainen (1993) , Menor, Roth, and Mason (2001) ,
Chen and Hitt (2005) , Choi, Karmarkar, and Rhim (2005)

A Conceptual Framework



Research Design

- **Stage 1: Customer Channel Demand Analysis**
- **Stage 2: Develop a Residual-based Measure for Customer Efficiency**
- **Stage 3: Examine the relationship between customer efficiency and firm performance**

Data and Method

- The data set includes the information of a random sample of 25,000 customers (primary account holders) of one of the largest retail banks in the US that covers monthly transaction counts, product utilizations, profitability and demographics.
- Panel Data Analysis

Analysis Stage 1: Channel Use Analysis

$$O_{cj} = g_c(R_c, L_{cj}) f_c(K_c, H_c)$$

$$g_c(R_c, L_{cj}) = R_c^{\alpha_c} (A_c L_{cj})^{\beta_c}$$

$$\log O_c^* = \frac{1}{1-\beta_c} \log f_c(K_c, H_c) + \frac{\alpha_c}{1-\beta_c} \log R_c + \frac{\beta_c}{1-\beta_c} \log A_c + \frac{\beta_c}{\beta_c-1} \log w + \log \left(\sum_{j=1}^{J^c} v_j^{\frac{1}{1-\beta_c}} \right)$$

$$\begin{aligned} \log(1+T_c) = & \beta_0 + \sum_{j \in J} \delta_j \log(1+T_j) + \beta_{age} age + \beta_{age^2} age^2 + \beta_{comp} comp + \beta_{college} college + \beta_{graduate} graduate + \\ & + \beta_{tenure} tenure + \beta_{tenure^2} tenure^2 + \beta_{eb-tenure} eb-tenure + \beta_{eb-tenure^2} eb-tenure^2 + \beta_{atm} atm + \beta_{branch} branch \\ & + \beta_{has_eb} web + \beta_{med-income} med-income + \beta_{high-income} high-income + \beta_{gender} gender + \beta_{children} children \\ & + \beta_{married} married + state_dummies + time_dummies + \varepsilon \end{aligned} \quad (11)$$

Independent variables:

- Transaction type controls
- Customer Efficiency Correlates: age, interest in computer, education, tenure with bank, Internet banking tenure,
- Channel Access: ATM and branch density, access to Internet banking
- Other Customer Characters: income, gender, marital status, children, residence state
- Seasonality controls

Analysis Stage 2: Measure Customer Efficiency

- **A residual based customer efficiency measure**

- Why residual-based measure?

The difficulty/infeasibility of obtaining a direct measure in practical settings, e.g. the direct observation of customer inputs

Empirical Model:

$$\log O_c^* = \frac{1}{1-\beta_c} \log f_c(K_c, H_c) + \frac{\alpha_c}{1-\beta_c} \log R_c + \frac{\beta_c}{\beta_c-1} \log w + \log\left(\sum_{j=1}^{J^c} v_j^{\frac{1}{1-\beta_c}}\right) + \varepsilon_c$$

$$CE = \sum_{c \in C'} \theta_c \varepsilon_c - \sum_{c \in C''} \theta_c \varepsilon_c$$

- We construct an overall efficiency measure as a weighted difference between the residuals in full service (C'') versus self-service (C') channels to control for unobserved cross-channel heterogeneity. The residual term of the reduced model with CE correlates excluded that offers a measure of customer efficiency per channel.

Key Findings

- **CE vs. Profit: More efficient customers are more profitable**
 - a customer that is one standard deviation above the mean in efficiency contributes \$4.76 of additional monthly profit
- **CE vs. Attrition Rate: a convex relationship**
 - the general relationship between efficiency and departure is negative,
 - the very lowest and highest efficiency customers show greater attrition.
- **CE vs. Product Use: a concave relationship**
 - Balances (aggregate account balances for deposit, assets and investment accounts) are maximized around or above the sample mean of customer efficiency.
 - The very lowest and highest efficiency customers keep lower account balances.

*“The Determinants and Outcomes of Internet Banking Adoption”**

Research Questions:

- What are the factors that influence the adoption of Internet banking by individual consumers?
- What is the impact of Internet adoption on customers' product and service demand, loyalty and profitability?

*Hitt, Xue and Chen (2007) under review *Management Science*

Literature

- Consumer adoption of technology (e.g., Bass, 1969; Davis, 1989; Davis, Bagozzi, and Warsha, 1989; Forman and Goldfarb, 2005), especially research related to the adoption of self-service technology (Bitner, Brown, and Meuter. 2000, Curran, Meuter, and Surprenant, 2003).
- Service Co-production, customer contact and service delivery channel
- Financial Service Delivery

Research Design

Stage 1: Internet Banking Adoption Analysis

Method:

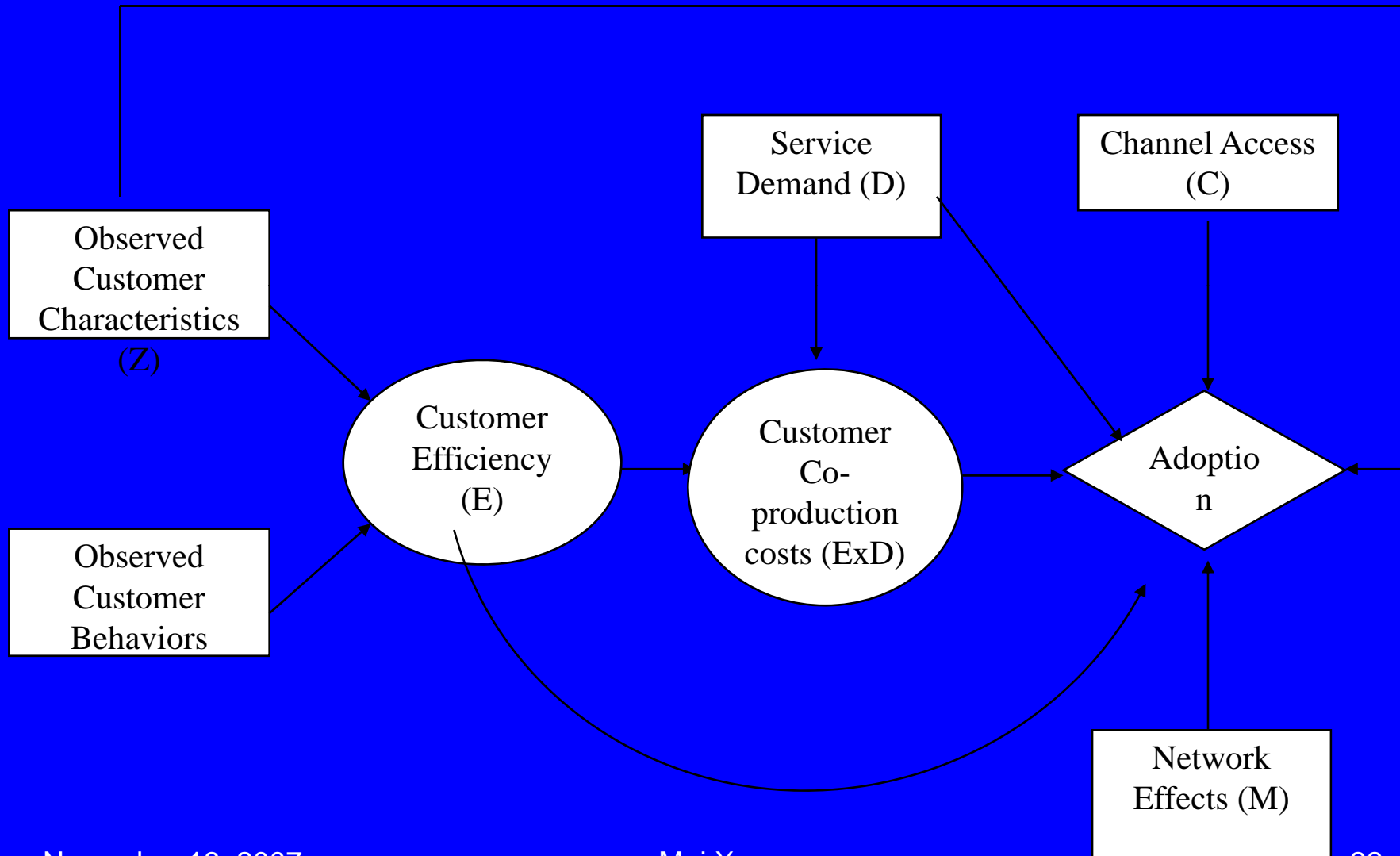
Survival Analysis of Adoption (AFT and PH models)

Stage 2: Post –adoption Change Analysis

Methods:

- a) Difference-in-difference matching estimator analysis
- b) Survival Analysis of Customer Attrition (AFT and PH models)

Figure The Conceptual Model of Internet Banking Adoption



Internet Banking Adoption Model

$$\text{Prob}(Y_{it} = 1) = C^{it}\alpha + D^{it}\phi + E^{it}\gamma + D^{it}E^{it}\chi + M^{t-1}\beta + Z^{it}\delta + \varepsilon^{it}$$

- C: Channel Access
- D: Service Demand
- E: Customer Efficiency
- M: Number of existing adopters (network effects)
- Z: Customer characteristics (e.g. education, income, age, etc.)

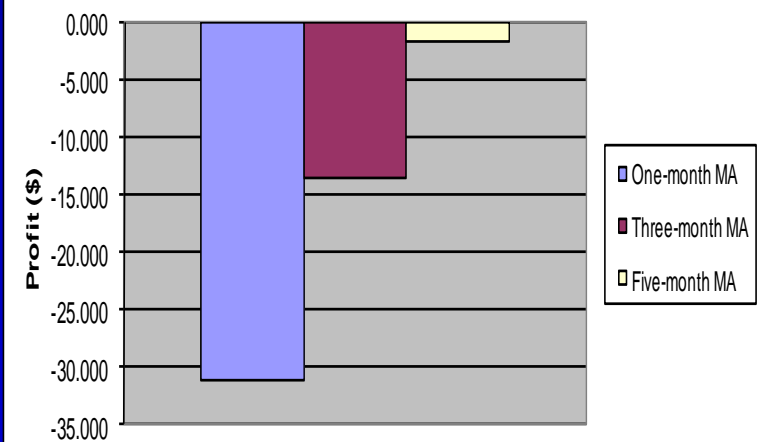
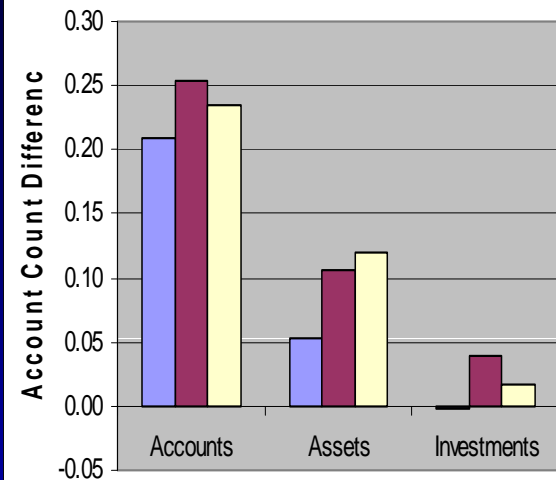
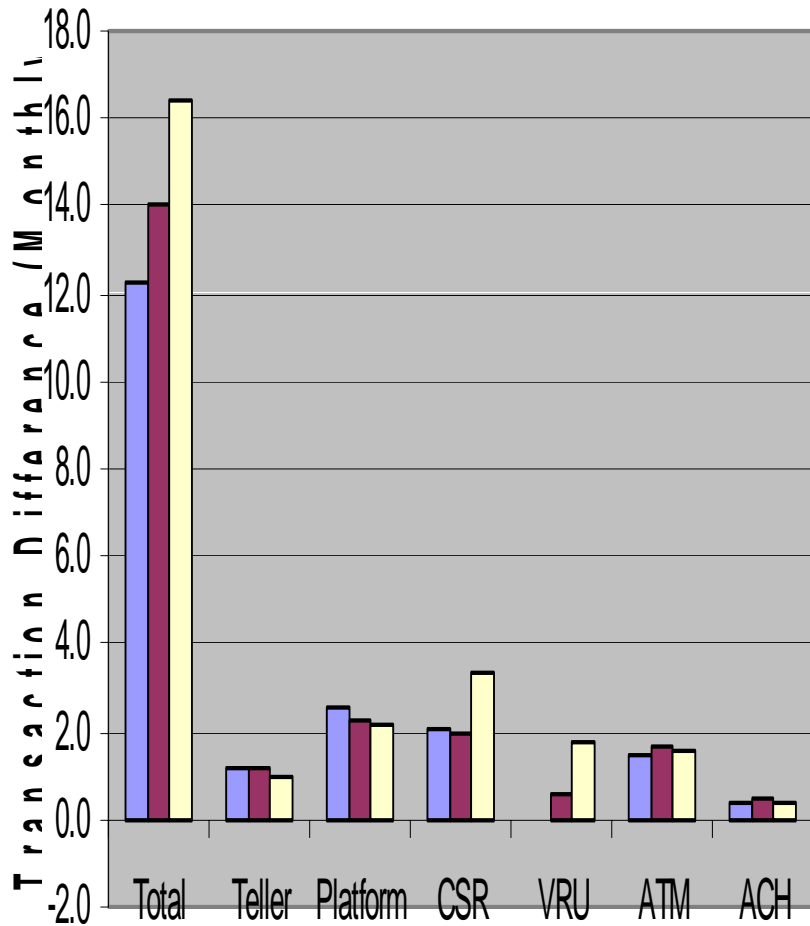
Key Findings I: The Determinants of Internet banking Adoption

- Transaction demand and CE:
 - The more transaction active and/or more efficient, the faster to adopt Internet banking.
- Network effects:
 - Significant network effects both locally and overall
 - Local network effects having a stronger impact.
- Alternative physical channel access:
 - No statistically significant effect of ATM access
 - More bank branches, faster adoption
 - Higher income, less sensitive to branch accessibility

Key Findings II: The Outcomes of Internet Banking Adoption

- Higher demand for transaction services
- No short-run profitability benefits
- Increased product utilization
- Greater relationship length (lower attrition rate: 30% less)

Figures Difference-in-Difference Estimate of Post Adoption Service Demand, Product Adoption and Profit Changes



Summary

CE and CEM

(Xue and Harker 2002)

- Concepts of CE and CEM
- Direct CE Measure
- Positive Link between CE and Desired Customer Character

CE, Channel Use and Firm Performance

(Xue, Hitt and Harker 2007)

- Conceptual framework linking CE, channel use and firm performance
- An indirect CE measure
- Empirically testing the relationships of CE, channel use, and firm performance

CE and Internet Banking Adoption

(Hitt, Xue and Chen 2007)

- CE and other determinants of Internet banking adoption
- Post adoption customer behavior changes and their implications

CE and Firm Competition

- CE and capacity competition
- CE and price competition