Analytical Customer Relationship Management

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Presenter Background

  - Professor, University of Minnesota – academic experience
- Oct 1999 – April 2000
  - Chief Data Mining Architect, Amazon.com – e-commerce experience
- May 2000 – April 2001
  - Director of Data Analytics, Yodlee – e-finance experience
- May 2001 – August 2001
  - Chief Technology Officer, Chingari – entrepreneurship experience
- September 2001
  - Professor, University of Minnesota
  - Technical advisor to two Venture Capital firms in the Silicon Valley
Outline

• Technology trends
• Shift in marketing approach
• Amazon.com case study: personalized consumer marketing
• Yodlee case study: web business intelligence
• Analytics behind e-marketing
• Privacy issues
• Concluding remarks
Technology Trends

• Internet growth
  – Faster than any other infrastructure

• Data collection
  – Rapid drop in storage costs
  – Dramatic improvement in resolution and rate of data collection ‘probes’

• Data analytics
  – Increasing deployment of warehouses
  – Major leap forward in data mining technologies and tools

* Becoming possible to really understand what your customers want – even at the individual level!!
Infrastructure Adoption in the US

Millions of users

Radio  TV  Cable  Internet

Marketing – 75 years ago

- Production – a la Adam Smith
- You can have any color as long as it’s black – Ford Motor Co.
Add the spice of flexibility, courtesy of robotics, computers ...
New approach to marketing

FROM: Finding customers that are right for each product

TO: Finding products that are right for each customer

TURN the process through 90 degrees

To achieve this we need to align around:

- Organization and culture
- Business processes and skill
- Measurement and incentives
- Information management
- Technology
“Mass Customization” — B. Joseph Pine

- Mass production
  - Cheap to produce
  - Efficient to produce
  - Uniform features/quality
  - ‘one size fits all’ approach
  - Optimize production cost

- Customization
  - Expensive to produce
  - Inefficient to produce
  - Customized features
  - ‘tailor made’ approach
  - Optimize customer satisfaction

- Mass customization
  - Cheap & efficient to produce
  - Customized features
  - ‘tailor made’ approach
  - Optimize production cost & customer satisfaction
We have indeed come a long way ...
CRM Functions - 1

• Customer care & support functionality
  – Incident assignment/escalation/tracking/reporting
  – Problem management/resolution
  – Order management/promise fulfillment
  – Warranty/contract management

• Marketing functionality
  – Campaign management
  – Opportunity management
  – Web-based encyclopedia, configurator
  – Market segmentation
  – Lead generation/enhancement/tracking
CRM Functions - 2

- Executive information functionality
  - Extensive & easy-to-use reporting
- ERP integration functionality
  - Legacy systems
  - Web data sources
  - 3rd party information – data overlays
- Excellent data synchronization functionality
  - Mobile synchronization with multiple field devices
  - Enterprise synchronization with multiple database/application servers
CRM Functions - 3

- **Sales functionality**
  - Contact management profiles and history
  - Account management including activities
  - Order entry
  - Proposal generation

- **Sales management functionality**
  - Pipeline analysis, e.g. forecasting
  - Sales cycle analysis
  - Territory alignment
  - Roll-up and drill-down reporting
CRM Functions - 4

- Telemarketing/telesales functionality
  - Call list assembly
  - Auto dialing
  - Scripting
  - Order taking
- Time management functionality
  - Single user and group calendar/scheduling
  - E-mail
- Field service support functionality
  - Work orders, dispatching
  - Real time information transfer to field personnel via mobile technologies
Traditional Growth of CRM Functions in an Organization

The Present: Multiple Channels & Data Stores / Impersonal Service

Impact!

- Impersonal
- Low Quality
- Uninformed
- Inconsistent
Vision for Customer Driven CRM

THE NEAR FUTURE
MULTIPLE CHANNELS & DATA STORES / PERSONALISED SERVICE

Impact!

• PERSONALISED
• HIGH QUALITY
• INFORMED
• CONSISTENT
Where Does CRM Fit?

Database Companies
For Example: Oracle

Data mining Companies
For Example: NCR

TRUE CRM SPACE
Utilising CRM Support systems

Customers

Customer Interaction Channels

MIS

Analysis

Segmentation

Customer Profile

Market Information

Products & Services

Customer Data

Organisation Strategy

Treatment Strategy

Customer Care

Product Maintenance

Business Acquisition
CRM Success Factors

- Determine functions to automate
- Automate what needs automating
- Gain top management support and commitment
- Employ technology smartly
- Secure user ownership
- Prototype the system
- Train users
- Motivate personnel
- Administrate the system
- Keep management committed
Analytical CRM
Analytical CRM - Outline

- Definition
- The Analytical CRM loop
- Customer segmentation & analysis
- Customer targeting
- Customer loyalty & its impact
- Customer retention
Analytical CRM Definition

The CRM Equation:

Customer Relationship Management = Customer Understanding + Relationship Management

**Customer Understanding:** Analysis of customer data to gain deep understanding down to the level of individual customer

**Relationship Management:** Interaction with the customer through various channels for various purposes

**Analytical CRM:** Use customer understanding to perform effective relationship management
CRM Analytics Loop

- Hypothesis generation
- Results
- Analysis
- Action
Amazon.com’s Case Study: Personalized Consumer Marketing
The continuing relationship ...

*Amazon.com “Loyalty” model*

- **Need Creation**: anticipate/stimulate
- **Information search**: provide/assist
- **Evaluate alternatives**: assist/negate
- **Purchase transaction**: optimise/reward
- **Post purchase experience**: add value
Need Creation (attract to website)

From: Amazon.com [music-store-news@amazon.com]
To: dick@dickstr.demon.co.uk
Cc: 
Subject: Anne-Sophie Mutter's "The Four Seasons"

Dear Amazon.com Customer,

We've noticed that many of our customers who've purchased CDs by Yo-Yo Ma also enjoy music by violinist Anne-Sophie Mutter. For this reason, you may like to know that Mutter's new recording of Vivaldi's "The Four Seasons" has just hit the shelves. For the next few days, you can order your copy at a savings of 30% by following the link below:

http://www.amazon.com/exec/obidos/ASIN/B00002DE2L
Further Need Creation (upon reaching website)

Browse Purchase Circles

- **Geography**
  Countries, States, Cities...
- **Government**
  Independent, Military...
- **Organizations**
  Nonprofit, Professional...
- **Companies A-Z**
  Business, Entertainment...
- **Education A-Z**
  Colleges, Universities...
Information Search

Information search

provide / assist

All Products
Popular Music
Classical Music
DVD & Video
Toys & Games
Electronics
Software
Home Improv.
Auctions
zShops
sothebys.amazon
Evaluation of Alternatives

Evaluate alternatives assist / negate
Purchase Optimisation/Reward

Purchase transaction → optimise / reward

- 1-click purchase
- ‘slippery check out counter’ vs. ‘sticky aisles’
Post-purchase experience

Post purchase experience → add value

Wish List

Your 1-Click and Gift-Click Settings
Account Management

Your Account

Your Orders
- View or change your open orders only
- See the status of all your orders
- Cancel orders that have not entered the shipping process
- Edit the shipping options and addresses on unshipped orders

Your Items
- View items ordered in the last three months

Community & Services
- Manage Your Wish List
- Manage Your Member Page
- View/Edit Only for Friends
- Manage Your Subscriptions
- Manage Your Reminders
- Refer a Friend

Your Account Settings
- Access or change your 1-Click settings
- Manage your Address Book
- Change your e-mail address or password
Why is loyalty important

- Amazon’s ‘customer lifetime value’ model (for book buyers)
  - Average $50 for first time purchase
  - Average $40 per visit thereafter
  - Average of one visit per 2 months
  - Assume customer will be active for 10 years – not validated yet 😊
- ‘4 buys and you are hooked’ empirical law
- Use Alexa data to bring back ‘prodigal sons’ (and daughters)
Build more loyalty faster

LTV

Time
The ‘Virtuous Cycle’

Purchase response → Buying decision/process

Customer knowledge
Role of
- Advertisement – get customer to the store
- Customer experience – get customer to buy

Brick & mortar stores
- Getting customer to store is the hard part
- Shopping cart abandonment is not common, since the overhead of going to another store is very high – especially in Minnesota winters!

Marketing expenses
- 80% for advertisement; 20% for customer experience

The 80-20 rule is reversed for on-line stores

– Jeff Bezos
Remarks on Amazon.com

- A very innovative company – the poster child for e-commerce
- Is pushing the envelope in personalization
- Customers love it
- Will it make money – we’re all waiting to see

A company of the future, with a product of the past, in a market of the present
Yodlee.com Case Study: Web Business Intelligence
Current Situation: Consumer Confusion

“It takes me two hours to get to all my accounts”

“I can’t look at my assets across accounts”

“I can’t remember all my user IDs and passwords”

“I want the web to work for me, not the other way around”

“This is overwhelming......I need some help”

“Make it easier for me!”
Solution – Personal Information Aggregation
Aggregation Service Model

- Communication Site (content partner)
- Finance Site
- Travel Site
- Aggregation Service Provider
- AOLfinance
- MyCiti
- Citibank
- Connected User
- Mobile User
- Applications
- Presentation & Interaction
- Capabilities
  - Content Acquisition
  - Aggregation, Analysis, Personalization
Business Intelligence Benefits to Corporation

- ‘Tip-of-the-iceberg’ analysis for a brokerage house
- Lifestyle preference analysis of banking customers for a survey
- ‘True-wallet-share’ analysis for a credit card organization
- Dynamic targeting for banner advertisements, e-mail campaigns, etc.
‘Tip-of-the-Iceberg’ Analysis for a Brokerage House

<table>
<thead>
<tr>
<th>Asset Based Tiers</th>
<th>Number of Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; $20K</td>
<td>7579</td>
</tr>
<tr>
<td>$20K - $100K</td>
<td>2539</td>
</tr>
<tr>
<td>$100K - $500K</td>
<td>1994</td>
</tr>
<tr>
<td>$500K - $1M</td>
<td>525</td>
</tr>
<tr>
<td>$1M - $5M</td>
<td>547</td>
</tr>
<tr>
<td>$5M - $25M</td>
<td>106</td>
</tr>
<tr>
<td>&gt; $25M</td>
<td>9</td>
</tr>
</tbody>
</table>

- This brokerage house treated customers with net worth > $1M as ‘high net worth’ (HNW) customers with specialized services.
- Almost none of the customers in the green region had > $1M with this brokerage.
# Household Lifestyle Preference Analysis for a Survey

## Financial Preferences
- 53% have at least one online banking account
- 51% have an online credit card account -- higher than Yodlee users as a whole
- 31% also have an E*Trade account, and 11% also have a Schwab account
- Have a preference for FirstUSA over Citibank, the opposite preference for users as a whole
- The most popular credit card is American Express

## Lifestyle Preferences
25% make travel reservations online -- fewer than users as a whole
- Expedia is more popular as an online travel site than Travelocity
- 49% have a frequent flier account -- higher than users as a whole
- The favorite frequent flier programs are United, Delta, American, in that order
- Half as many of co-brand users shop on Ebay than users as a whole
‘True-Wallet-Share’ Analysis for a Credit Card Organization

<table>
<thead>
<tr>
<th>Range</th>
<th>Total Users</th>
<th>Discover</th>
<th>American Express</th>
<th>Mastercard</th>
<th>Visa</th>
<th>Other</th>
<th>Average</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; $100</td>
<td>462</td>
<td>4.13</td>
<td>-4741 (152)</td>
<td>0</td>
<td>-29.76 (87)</td>
<td>-60.29 (272)</td>
<td>-100.54</td>
<td></td>
</tr>
<tr>
<td>$100 - $200</td>
<td>232</td>
<td>-1268 (39)</td>
<td>120.17 (66)</td>
<td>0</td>
<td>89.95</td>
<td>167.10 (156)</td>
<td>149.44</td>
<td></td>
</tr>
<tr>
<td>$200 - $500</td>
<td>643</td>
<td>36.97 (107)</td>
<td>253.77 (207)</td>
<td>0</td>
<td>218.00 (135)</td>
<td>272.42 (421)</td>
<td>342.99</td>
<td></td>
</tr>
<tr>
<td>$500 - $1000</td>
<td>968</td>
<td>75.57 (182)</td>
<td>571.09 (378)</td>
<td>0</td>
<td>597.83 (217)</td>
<td>623.36 (593)</td>
<td>893.47</td>
<td></td>
</tr>
<tr>
<td>$1000 - $2000</td>
<td>1386</td>
<td>174.55 (292)</td>
<td>988.97 (540)</td>
<td>837.25</td>
<td>1018.50 (323)</td>
<td>1078.01 (866)</td>
<td>1471.38</td>
<td></td>
</tr>
<tr>
<td>$2000 - $5000</td>
<td>2422</td>
<td>263.27 (432)</td>
<td>2156.30 (1099)</td>
<td>957.69</td>
<td>2087.75 (601)</td>
<td>2358.22 (1579)</td>
<td>3297.58</td>
<td></td>
</tr>
<tr>
<td>$5000 - $10000</td>
<td>1732</td>
<td>620.80 (354)</td>
<td>4091.64 (814)</td>
<td>36840</td>
<td>3976.93 (483)</td>
<td>4966.61 (1200)</td>
<td>7100.20</td>
<td></td>
</tr>
<tr>
<td>$10000+</td>
<td>1696</td>
<td>1332.48 (452)</td>
<td>10111.75 (1010)</td>
<td>192116</td>
<td>8934.39 (642)</td>
<td>14649.52 (1341)</td>
<td>22329.56</td>
<td></td>
</tr>
</tbody>
</table>

Analysis of credit card balance habits of user base

- There are 1386 people, each of which carries a total balance between $1000 and $2000 on all credit cards that (s)he owns
- 292 of these 1386 people own discover cards, and carry an average balance of $174.55
- 540 of these 1386 people own AmEx cards, with an average balance of $988.97
- 323 of these 1386 people carry one or more Visa, with an average Visa network balance of $1018.50
Business Implications of True Wallet Share Analysis

• A credit card offeror knows exactly how much money customers holding its cards spend (every month) on its card vs. that on the competition’s cards
• Offeror can target users falling within various segments for specific customer acquisition, retention, etc. purposes
• Detailed profile and history information of these users can be used for precision targeting and customer messaging through various channels including ad serving, e-mail campaigns, promotions, etc.
• If transaction level detail information of these users is analyzed, it can be determined exactly which credit cards are being used by aggregation users as a whole for what kind of lifestyle activity, e.g. travel, entertainment, shopping, groceries, etc; this can help partner decide which market segments to focus on
Business Implications (contd.)

- The analysis above, if carried out at an individual user level detail, can be used to target individual customers with specific promotions, etc.
- Transaction level detail can be classified into charges to specific organizations, department stores, airlines, etc. This will identify the top organizations that aggregation users spend money at, either on the partner’s card or on a competing network. This would be useful in determining which organizations to partner with for customer retention, and acquisition, respectively.
- All of these analyses if performed periodically, and tracked over time, can provide valuable insight into the evolving credit balance distribution and usage behavior at the user population or individual user level.
Targeted Ad Serving (contd.)
The Analytics Behind e-CRM
Web Logs – Record of consumer behavior

Access Log Format

<table>
<thead>
<tr>
<th>IP address</th>
<th>userid</th>
<th>time</th>
<th>method</th>
<th>url</th>
<th>protocol</th>
<th>status</th>
<th>size</th>
</tr>
</thead>
</table>

Other Server Logs: referrer logs, agent logs

Application server logs: business event logging
Shopping Pipeline Analysis

- Overall goal:
  - Maximize probability of reaching final state
  - Maximize expected sales from each visit

- Shopping pipeline modeled as state transition diagram
- Sensitivity analysis of state transition probabilities
- Promotion opportunities identified
- E-metrics and ROI used to measure effectiveness
Original Amazon Model for Customer Segmentation

- Light buyers
- Medium buyers
- Heavy buyers
- Super heavy buyers

Customer M - medium
Customer H - heavy
Data Driven Customer Segmentation Model

- modeled customers in a 4-dim space
- used PCA to determine relative weights of each dimension
- Composite Score = \( w_1 \times \text{recency} + w_2 \times \text{frequency} + w_3 \times \text{monetary} + w_4 \times \text{tenure} \)
### Customer Score Interpretation

<table>
<thead>
<tr>
<th>Recency</th>
<th>Frequency</th>
<th>Monetary</th>
<th>Tenure</th>
<th>Composite Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>10 days</td>
<td>4 times</td>
<td>$480</td>
<td>3 months</td>
<td>80%</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>30 days</td>
<td>2 times</td>
<td>$900</td>
<td>10 months</td>
<td>72%</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
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<td>...</td>
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<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

- **Cust M** => frequent visitor but low spender
  => potential for acquiring higher wallet share
  => focus on improving relationship

- **Cust H** => infrequent visitor but heavy spender
  => focus on sustaining relationship
Customer Segmentation & Segment Analysis
Customer segmentation

• Purpose of segmentation is to identify groups of customers with similar needs and behavior patterns, so that they be offered more tightly focused
  - Products
  - Services
  - Communications
• Segments should be
  - Identifiable
  - Quantifiable
  - Addressable
  - Of sufficient size to be worth addressing
• Two approaches to segmentation
  - Cluster common characteristics, and then map out behavior patterns
  - Separate out behavior patterns, then identify segment characteristics
Imagine if customer base were segmented as follows:

- Potential business:
  - High: Develop
  - Low: Observe & Incentivize

- Actual business:
  - High: Retain
  - Low: Care & Maintenance

Targeted communication to each segment.
Express profits as deciles, and ask questions

Who are these customers; what do they look like?

Middle 60%, either side of break even. What can we do about these?

Should the focus be on retaining wallet share from segments 8 – 10? Or, on gaining from segments 1 – 4?

Are these worth keeping? Can we service them with a lower cost channel? What can we do to make this segment profitable?

Middle 60%, either side of break even. What can we do about these?
Dig deeper – larger product catalog may not necessarily mean more profit!
Privacy Issues
let’s begin with some real examples ...
Problem: Shopping for spouse’s anniversary – too much clutter
Solution: Focused and relevant advertisement
Problem: Tired of mistreatment by financial institutions ...

• You have tons of money in your investment portfolio
• But you are over-worked and slipped a couple of credit card payment deadlines – after all you are busy managing your investment portfolio 😊
• Credit card institution treats you like a deadbeat 😞
Solution

• Why not let the credit card institution know what your investment portfolio balance is? Impress them 😊

• Perhaps even authorize credit card company to transfer funds from your investment account to cover the payment? Or maybe not 😊
So, what’s the catch...

- **Shopping example**
  - Allow the vendor to collect detailed information about you and build an accurate profile
  - Junk mail is only a nuisance for the receiver, but an expense for the sender! – the sender wants to avoid it more than the receiver!!

- **Credit card example**
  - Allow the credit card company and investment company to share your information

- **Multiple online accounts example**
  - Hand over your account names and passwords to aggregation service
  - Sounds scary – but over 1.5 million people have done this in about 18 months’ time!!
let’s now talk about privacy …

• Merriam Webster definition
  – **a:** the quality or state of being apart from company or observation **b:** freedom from unauthorized intrusion

• Justice Oliver Wendell Holmes
  – “the right to be left alone”

• Operational definition
  – Collection and analysis of personal data beyond some limit
Public Attitude Towards Privacy

- A (self-professed) non scientific study carried out by a USA Today reporter
- Asked 10 people the following two questions
  - Are you concerned about privacy? 8 said YES
  - If I buy you a Big Mac, can I keep the wrapper (to get fingerprints)? 8 said YES
- ACM E-Commerce 2001 paper [Spiekermann et al]
- Most people willing to answer fairly personal questions to anthropomorphic web-bot, even though not relevant to the task at hand
- Different privacy policies had no impact on behavior
- Study carried out in Europe, where privacy consciousness is (presumably) higher
Public Attitude (contd.)

- Amazon.com (and practically every commercial site) uses cookies to identify and track visitors
  - 97.6% of Amazon.com customers accepted cookies
- Airline frequent flier programs with cross promotions
  - We willingly agree to be tracked
  - Get upset if the tracking fails!
- Over 1.5 million people have trusted the aggregation service (called Yodlee) with the names and passwords of their financial accounts in less than 18 months
- Adoption rate has been over 3 times the most optimistic projections

Medical data is (perhaps) an exception to this
What people really want

- Some people will not share any kind of private data at any cost – the ‘paranoids’
- Some people will share any data for returns – the ‘Jerry Springerites’
- The vast majority in the middle wants
  - a reasonable level of comfort that private data about them will NOT be misused
  - Tangible and compelling benefits in return for sharing their private data – Big Mac example, frequent flier programs
Remarks on Privacy

• Is it ‘much ado about nothing’?
  – If indeed data collection was outlawed, and thus personalization impossible, wouldn’t the public lose – faced with generic, undifferentiated products/services?
  – Given the public’s attitude about privacy (as shown in their actions), are privacy advocates barking up the wrong tree?
  – Is it just a matter of time or generational issue, e.g. adoption of credit cards

• Where do we stand?
  – Current position - loss of your privacy may be beneficial for you
  – Emerging position (post September 11th) - loss of your privacy will be beneficial for everyone
  – Critical emerging debate - is privacy a right or a privilege?
Concluding Remarks

• Internet is a high bandwidth, low latency, negligible cost, interactive channel to the customer
• Very high adoption rates for this channel
• Processing speeds and storage capacities continuing to increase while costs continue to fall
• Data analytics technology has grown rapidly
• Consumer marketing is ready for a paradigm shift
• Innovative companies have moved ahead
• Privacy is an issue, but not much of a concern
That’s all folks!!

Questions?
Comments?