Customer Analytics

- **Customer Value Management** rests on the idea of allocating resources differently to different customers
- The basis of differential resource allocation is the economic value of the customer to the firm
- Thus, before we can start to manage customers, we must have thorough understanding of how to compute value contribution of each customer to the firm
- **Customer analytics** based on customer data will be our guide throughout this process

Traditional and Customer Based Marketing Metrics

Traditional Marketing Metrics	• Market share • Sales growth
Customer Acquisition Metrics	• Acquisition rate • Acquisiton cost
Customer Activity Metrics	• Average Inter-Purchase Time • Retention & Defection Rate • Survival Rate • Lifetime Duration • P (Active)
Popular Customer-based Value Metrics	• Size of Wallet • Share of Category Requirement • Share of Wallet • (Transition Matrix)
Strategic Customer-based Value Metrics	• RFM Value • Past Customer Value • Lifetime Value Metrics • Customer Equity

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management

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Market Share

- **Share of a firm**'s sales relative to the **sales of all firms** – across all customers in the given market
- Measured in percentage
- Calculated either on a monetary or volumetric basis
  - Market Share (%) of a firm (*j*) in a category = $100 * \left[S_j / \sum_{i=1}^{I} S_i\right]$
  - Where: j = firm,
    S_j = sales of firm j,
    $\sum_{i=1}^{I} S_i$ = sum of sales across all firms in the market
- Information source
  - Numerator: Sales of the local firm available from internal records
  - Denominator: Category sales from market research reports or competitive intelligence
- Evaluation
  - Common measure of **marketing performance**, readily computed
  - A product-focused marketing metric
  - Does not provide any information about how sales are distributed across customers

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management

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Sales Growth

- Compares changes in sales volume or sales value in a given period to sales volume or value in the previous period
- Measured in percentage
  - Indicates the **degree of improvement in sales performance** between two or more time periods
  - Sales growth in period t (%) = $100 * \left[\Delta S_{jt} / S_{jt-1}\right]$
  - Where: j = firm,
    ΔS_{jt} = change in sales in period t from period *t-1*, $\Delta S_{jt} = S_{jt} - S_{jt-1}$
    S_{jt-1} = sales in period *t-1*
- Information source
  - Numerator and denominator: from internal records
- Evaluation
  - Quick **indicator of current health** of a firm
  - Does not provide any information about changes in customer size
  - If compared with growth of competitors, it also provides a relative measure of performance

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management

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Acquisition rate

- Acquisition = first purchase or **purchasing in the first predefined period**
  - **Level of acquisition**: Credit card ex: Level-1 issuing a card; Level-2 issuing a statement
- Acquisition rate (%) = 100* (# of prospects acquired / # of prospects targeted)
- Denotes average probability of acquiring a customer from a population
- Always calculated for a **group of customers**
  - For individuals, we talk about acqusition *probabilities* not acquisition *rates*
- Typically computed on a campaign-by-campaign basis
- Information source
  - Numerator: From internal records
  - Denominator: Prospect database and / or market research data
- Evaluation
  - Important metric
  - Gives a first indication of the **success of a marketing campaign**
  - But cannot be considered in isolation

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management

Example: Acquisition rate calculations for segments

- Untargeted Mailing

Number of offers mailed:	1,000,000
Profit contribution per response:	\$80
Cost per mailing:	\$0.70
Response rate:	1%

$$\begin{aligned}\text{Profit} &= 1{,}000{,}000 \times 0.01 \times \$80 - 1{,}000{,}000 \times \$0.70 \\ &= \$800{,}000 - \$700{,}000 \\ &= \$100{,}000\end{aligned}$$

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Example: Acquisition rate calculations for segments

- Targeted mailing

Decile	Number of prospects	Response rate (%)	Profit (\$)	Cumulative Profit (\$)
1	100,000	3.00%	170,000	170,000
2	100,000	2.00	90,000	260,000
3	100,000	1.40	42,000	302,000
4	100,000	1.15	22,000	324,000
5	100,000	1.00	10,000	334,000
6	100,000	0.60	−22,000	312,000
7	100,000	0.40	−38,000	274,000
8	100,000	0.30	−46,000	228,000
9	100,000	0.10	−62,000	166,000
10	100,000	0.05	−66,000	100,000
Total	1,000,000	1.00%	\$100,000	

=> Target first five deciles (Profit = \$334,000)

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Concept of Lift

Database marketing allows firms to segment their customers according to "lift tables" and then deliver the marketing effort to the customers whom the analysis predicts will be profitable

The ratio of response rate in a decile to the average response rate is known as "lift"

- Targeted mailing

Decile	Number of prospects	Response rate (%)	Profit ($)	Cumulative Profit ($)
1	100,000	3.00%	170,000	170,000
2	100,000	2.00	90,000	260,000
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10	100,000	0.05	−66,000	100,000
Total	1,000,000	1.00%	$100,000	

=> Target first five deciles (Profit = $334,000)

Lift of first-decile: 3

Lift of top 5 deciles: 1.71

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Return on Investment (ROI) Perspective

As any other costs, marketing expenditures needed to be justified by the firms.

- Untargeted Mailing
  - Number of offers mailed: 1,000,000
  - Profit contribution per response: $80
  - Cost per mailing: $0.70
  - Response rate: 1%

$$\text{Profit} = 1{,}000{,}000 \times 0.01 \times \$80 - 1{,}000{,}000 \times \$0.70$$
$$= \$800{,}000 - \$700{,}000$$
$$= \$100{,}000$$

Spending: $700,000
Profit: $100,000
ROI: 15%

- Targeted mailing

Decile	Number of prospects	Response rate (%)	Profit ($)	Cumulative Profit ($)
1	100,000	3.00%	170,000	170,000
2	100,000	2.00	90,000	260,000
3	100,000	1.40	42,000	302,000
4	100,000	1.15	22,000	324,000
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9	100,000	0.10	−62,000	166,000
10	100,000	0.05	−66,000	100,000
Total	1,000,000	1.00%	$100,000	

=> Target first five deciles (Profit = $334,000)

Spending: $350,000
Profit: $334,000
ROI: 95%

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Return on Investment (ROI) Perspective

The entire customer analytics mentality is based on **measuring results**

- Costs are almost always easy to measure
- However, incremental revenues are sometimes difficult to measure, because it is not clear what response would have been without the marketing campaign
  → **Need of experimentation and learning**

Example:

- Assume it was possible that consumers could buy the product even without a direct mail campaign
- Then, an experiment with control groups would be required
- Rather than mailing to all 100,000 prospects in Decile 1, mail to just 90,000 and hold 10,000 aside as controls
- The incremental gain from the campaign could then be calculated as the response rate for the 90,000 minus the "response" rate for the 10,000

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Power of Lift Tables/Charts

Analysts use predictive models to separate customers in segments (deciles) in prioritized order of their partaking in some behavior – be it response to an e-mail, giving up a credit card, or adopting a new product

Note this is not the traditional form of segmentation used in marketing text books. It is **segmentation based on the likelihood** of buying determined from statistical models

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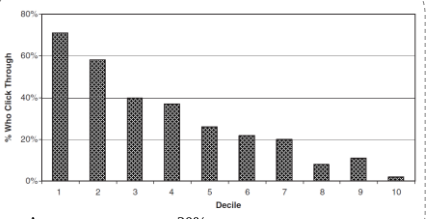
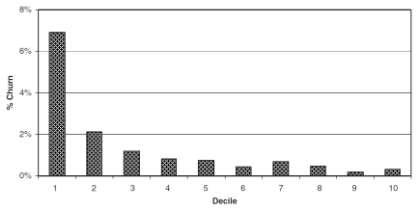
Power of Lift Tables/Charts

Lift chart for an e-mail campaign



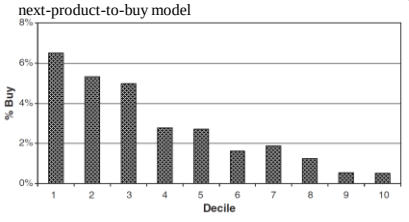
Average response rate: 30%
Average response rate of first 3 deciles: 55%

Lift chart for predicting credit card customer attrition



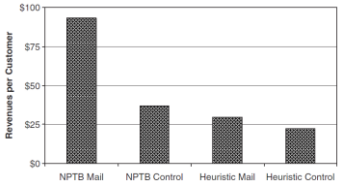
Top decile churning probability: 7%
Average churning probability: <1%

Lift chart for predicting adoption of web banking using next-product-to-buy model



Adoption rate of top 3 deciles: 5.3%
Average adoption rate: 2.5%

Revenues from field-tested cross-selling campaign



1-Predictive models produce higher revenues
2-Revenues are incremental over existing marketing efforts
3-Model outperforms a non-statistical heuristic

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Acquisition cost

- Measured in monetary terms
- Acquisition cost ($) = Acquisition spending ($) / Number of prospects acquired
  - Cost can also be computed for different acquisition levels
- Precise values for companies targeting prospects through direct mail
- Less precise for broadcasted communication
- Information source
  - Numerator: from internal records
  - Denominator: from internal records
- Evaluation
  - **Difficult to monitor** on a **customer by customer basis**

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management

Contents

Objectives

- Managing marketing interventions
- Aligning resource allocation with actual customer behavior
- Providing key input for customer valuation models such as the net-present value (NPV)

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management 21

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Inter-purchase time and number of purchases

- Inter-purchase time of a customer = Number of purchase incidences from the first purchase till the current time period / time interval length
- Average interpurchasetime = 1/Number of purchases over specific period of time
- Number of purchases = Number of purchase incidences from the first purchase till the current time period
- Above metrics are especially important for industries where customers buy on a frequent basis (i.e. grocery stores, prepaid telco customers)
- Information source
  - Sales records
- Evaluation
  - Easy to calculate
  - Useful for industries where customers make frequent purchases
  - Firm intervention might be warranted anytime customers fall considerably below their AIT
- Can you name a probability distribution that could be used to model IAT?
- What about number of purchases? (check the «Seeing Patterns».pdf)

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management

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Retention and defection (churn) rate

- Rr_t (%) = 100* [# of customers in cohort buying in (*t*) | customer in (*t-1*) / Total # of customers in cohort buying in (*t-1*)]
  - It might be useful to compute retention for each customer group (i.e. segment)
  - Retention rates might be different for different time periods (a *tenure*-based analysis is needed)
- Rr_t (%) = 100 – Avg. defection rate (%)
- The effect for a cohort of customers over time – out of 100 customers starting in year 1, about 32 are left at the end of the 4th year
  - Customers starting at the beginning of year 1: 100
  - Customers remaining at the end of year 1: 75 (0.75*100)
  - Customers remaining at the end of year 2: 56.25 (0.75*75)
  - Customers remaining at the end of year 3: 42.18 (0.75*56.25)
  - Customers remaining at the end of year 4: 31.64 (0.75*42.18)
- # of retained customers in period (*t*+*n*) = (# of acquired customers in cohort at time *t*)*$(R_r)^n$
- Avg. defection rate in *t* (%) = 100 – Rr_t
  - Where: Rr_t = Retention rate in period *t*, *n* = Number of elapsed periods

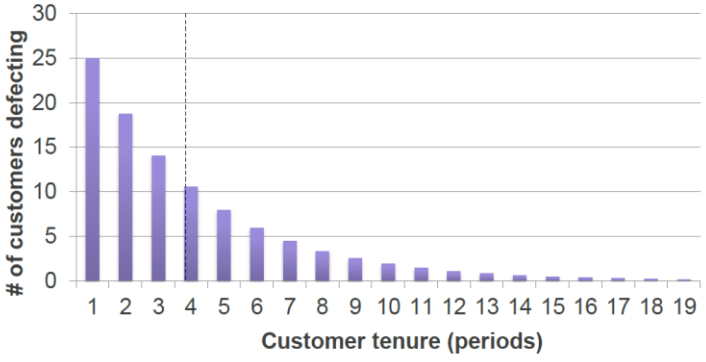
SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management 25

Retention and defection (churn) example

- Avg. lifetime duration = [1 / (1- *Rr*)] (if Rr_t for all periods are same, i.e. Rr_t = *Rr*)
  - Analogous to which probability distribution?
- Given a retention rate of 75%, variation in defection rate with respect to customer tenure results in an average lifetime duration of four years
- If the average customer lifetime duration of a group of customers is 4 years, the **average retention rate** is 1*(1/4) = 0.75 or 75% per year, i.e., on an average, 75% of the customers remain customers in the next period
- Assuming constant retention rates, the **number of retained customers** at the end of year 4 is $100*0.75^4 = 31.64$. (Number of acquired customers in cohort * Retention $rate^{(t+n)}$)
- The **defection rate** is 100-75% = 25%

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management 26

Variation in defecting cohort size with respect to tenure



- Plotting the entire series of customers that defect each period demonstrates variation (or heterogeneity) around the average lifetime duration of 4 years

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management

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Retention

- Is retention only about Buying?
  - No. Think about e-mail providers...
- How is retention different from Loyalty?
  - Loyalty is emotional. People might continue purchasing but this may be due to convenience or inertia. This is not loyalty
- How to project retention rates?
  - Next two slides...
  - But before proceeding, try to plot retention rate over time for the previous example.
    - What do you think about the general structure of the curve?

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Projecting retention rates

- To forecast non-linear retention rates, $Rr_t = Rc*(1- e^{-rt})$
- Where: Rr_t = predicted retention rate for a given future period,
  Rc = retention (rate) ceiling, r = coefficient of retention
- $r = (1/t)*(\ln(Rc) - \ln(Rc - Rr_t))$

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management 29

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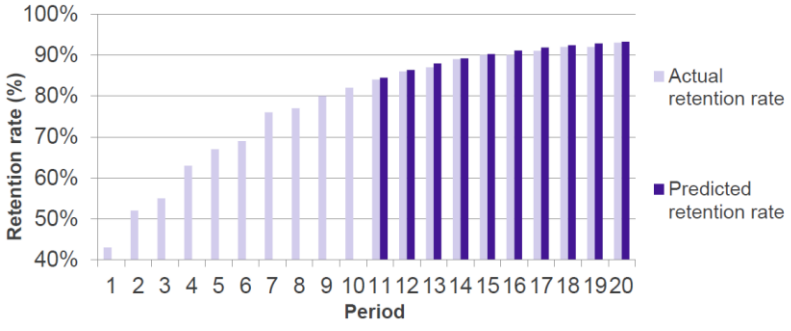
Actual and predicted retention rate for a credit card company



- Rc = 0.95 means that managers believe the **maximum** attainable retention rate is 95%
- The known retention rate in period 9 is 80% while it is 82% in period 10
- The parameter r for period 9 is (1/9)*(ln(0.95)-ln(0.95-0.8)) = 0.205. The r for period 10 is (1/10)*(ln(0.95)-ln(0.95-0.82)) = 0.198

→ for both periods r approximates the value 0.2

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management 30

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Contents

- Traditional marketing metrics
- Customer acquisition metrics
- Customer activity metrics
  - Average inter-purchase time
  - Retention and defection rate
  - Survival rate
  - Lifetime duration
  - P(Active)
- Popular customer-based value metrics
- Strategic customer-based value metrics

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Survival rate

- Measured for **cohorts of customers**
- Provides a summary measure of **how many customers survived** from the beginning of the formation of a cohort up to any point in time afterwards
- SR_t (%) = 100 * Rr_t * SR_{t-1}
  - where: SR = Survival Rate
- Number of survivors for period 1 = survival rate for period 1 * number of customers at the beginning
- If you plot the survival rates over time, what type of graph you would expect?

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management

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Survival rate computation example

- Number of customers starting at the beginning of year 1: 1,000

	Retention Rate	Survival Rate	Survivors
Period 1	0.55	0.55	550
Period 2	0.62	0.341	341
Period 3	0.68	0.231	231
Period 4	0.73	0.169	169

- Number of survivors for period 1 = 0.55*1000 = 550
- Survival rate for period 2 = retention rate of period 2*survival rate of period 1
- Survival rate for period 2 = 0.62*0.55 = 0.341 (=34.1%)

SOURCE: V. Kumar and W. Reinartz – Customer Relationship Management