Chapter 6.
Business Operations

Outline/ Learning Objectives
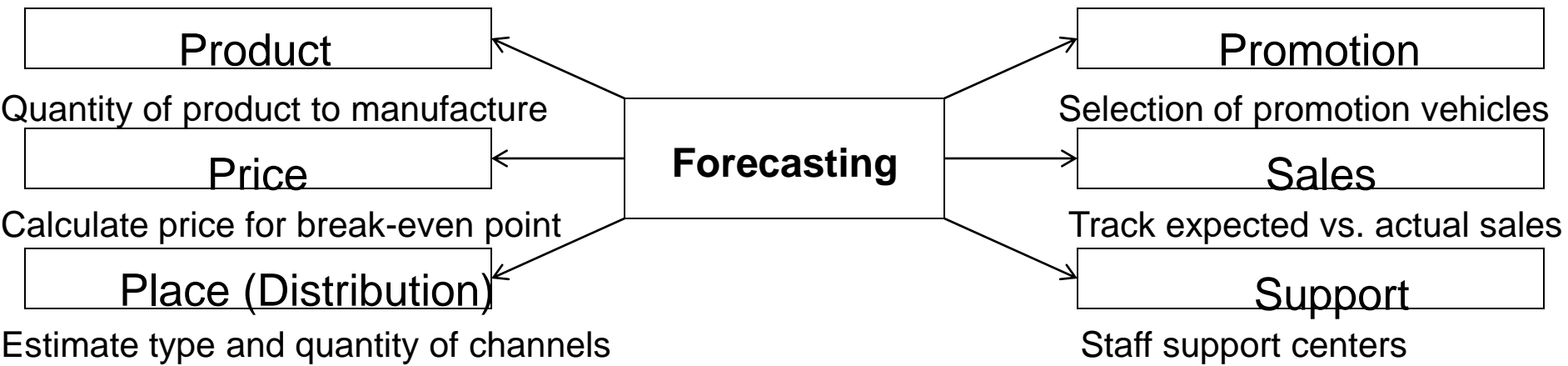
Topic	Description
Forecast	Learn how to forecast future sales
Predictive	Describe how to use predictive analytics
Data Mining	Describe how to use data mining to gain insight
Scorecards	Utilize balanced scorecards
Success	Identify critical success factors for supporting KPIs

Business Operations
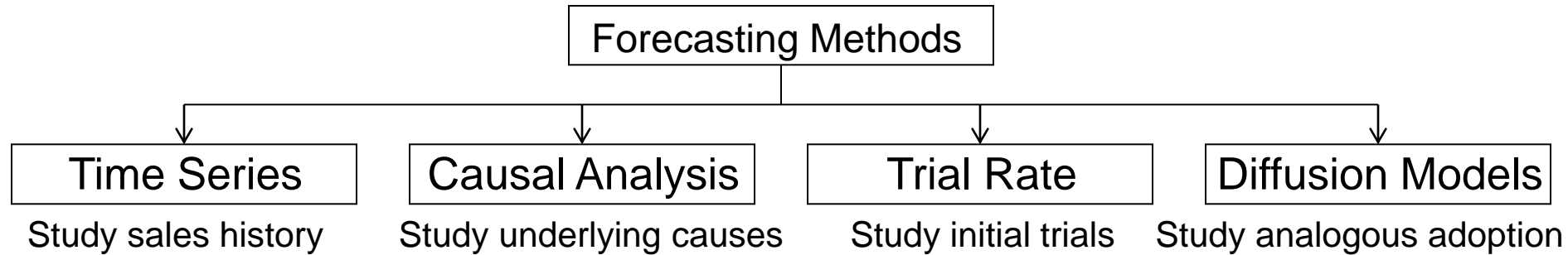
Topic	Description
Operations	Processes, actions, decisions to enable tactics from strategy
Wide Impact	Can affect multiple disciplines: Products, Price, and so on
Responsibility	Often done by the Marketing department

Strategy →**Business Operations**→ Tactics

Enabler of tactics
- Forecasting
- Predictive analytics
-Data mining
-Critical success factors
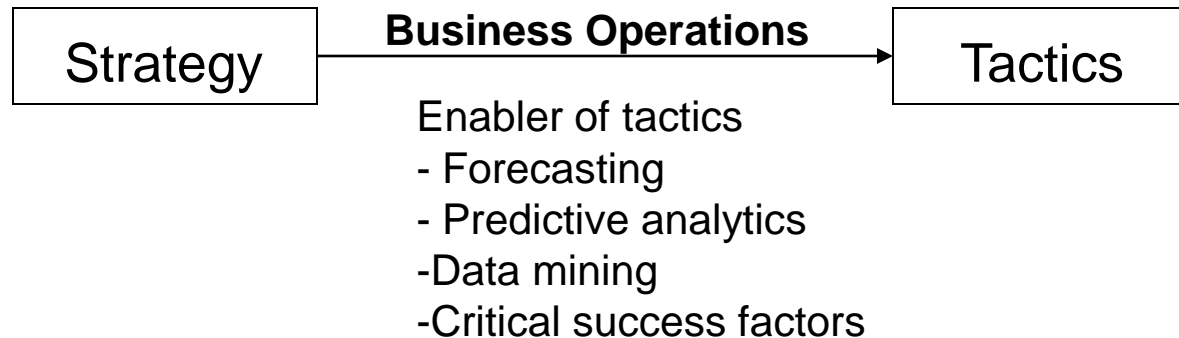
Forecasting Applications

Product

Quantity of product to manufacture

Price

Calculate price for break-even point

Place (Distribution)

Estimate type and quantity of channels

Forecasting

Promotion

Selection of promotion vehicles

Sales

Track expected vs. actual sales

Support

Staff support centers

Forecasting Methods

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                    ┌─────────────────────┐
                    │ Forecasting Methods │
                    └─────────────────────┘
        ┌───────────────┬──────┴──────┬───────────────┐
        ▼               ▼             ▼               ▼
┌──────────────┐ ┌──────────────┐ ┌──────────┐ ┌──────────────────┐
│ Time Series  │ │Causal Analysis│ │Trial Rate│ │ Diffusion Models │
└──────────────┘ └──────────────┘ └──────────┘ └──────────────────┘
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Study sales history · Study underlying causes · Study initial trials · Study analogous adoption
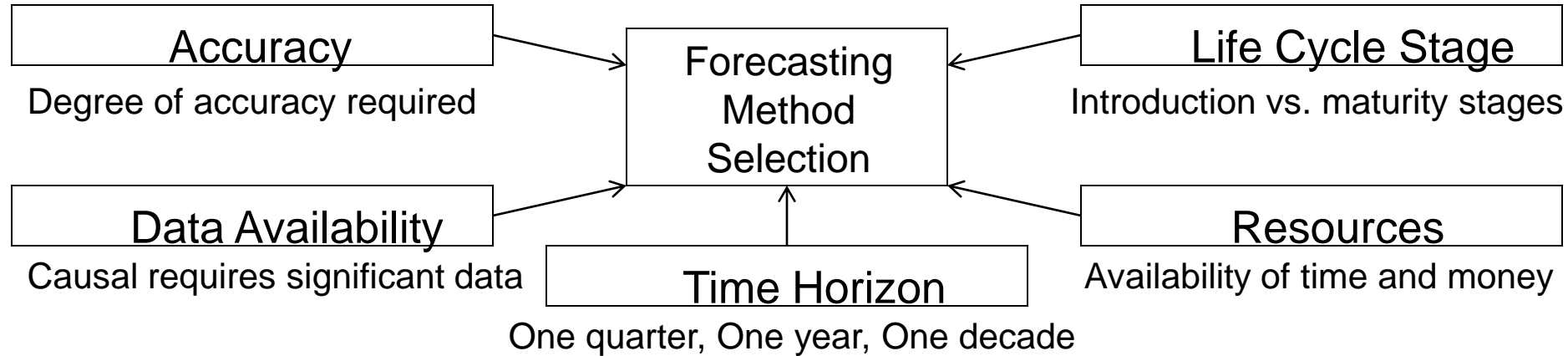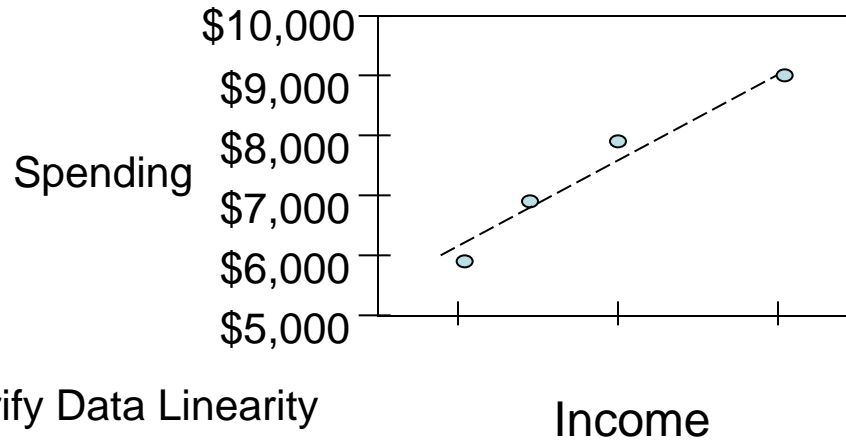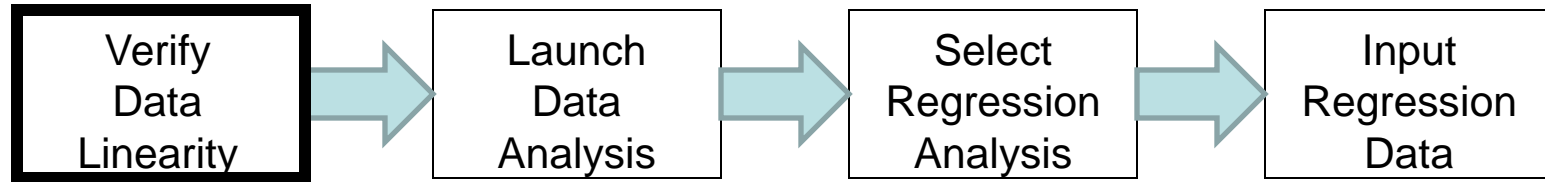
Forecasting Methods

Method	Description and Usage
Time Series	Leverage known sales history to extrapolate future sales Best for rapid predictions of short-term future sales Resources required: Low; Accuracy: Low
Causal Analysis	Examines underlying causes to predict future conditions Best for in-depth analyses of sales Resources required: High; Accuracy: Medium - High
Trial Rate	Uses market surveys of initial trials to predict future sales Best for introduction phase of new product or service Resources required: High; Accuracy: Medium
Diffusion Model	Uses analogous situations to predict adoption rate Best for introduction of new product or service Resources required: Low; Accuracy: Medium

Forecasting: How to Select a Method

Accuracy		Life Cycle Stage
Degree of accuracy required	Forecasting Method Selection	Introduction vs. maturity stages

Data Availability		Resources
Causal requires significant data	Time Horizon	Availability of time and money
	One quarter, One year, One decade	

Regression Analysis to Support Forecasting

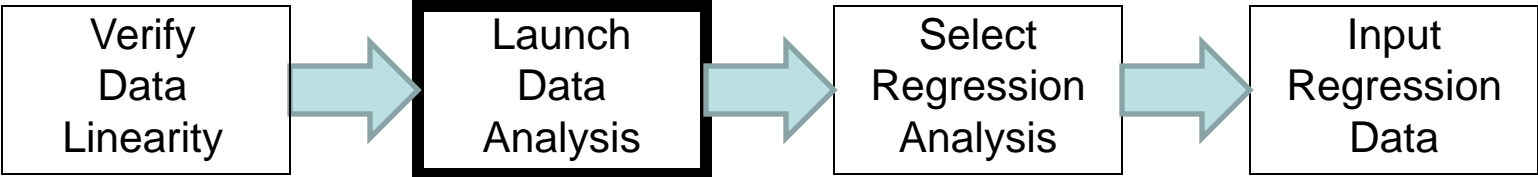| Verify Data Linearity	→	Launch Data Analysis	→	Select Regression Analysis	→	Input Regression Data

A. Verify Data Linearity
Microsoft Excel: Least Squares Algorithm
Good to plot out data to check if linear

Regression Analysis to Support Forecasting

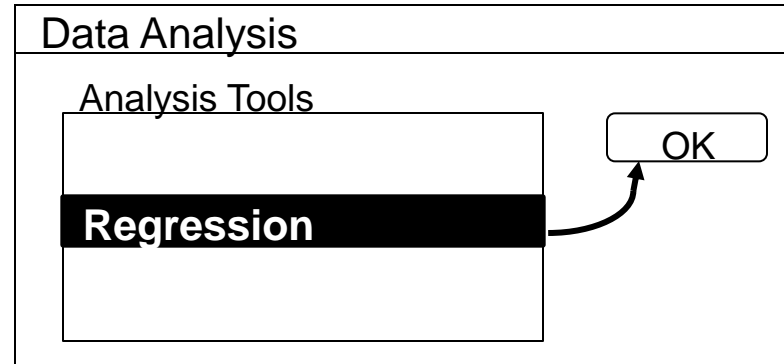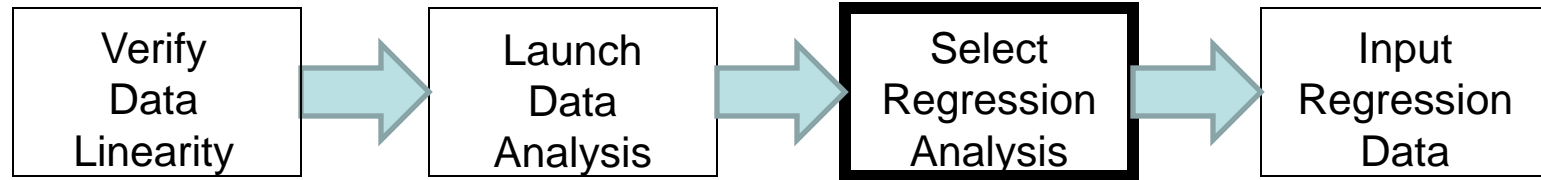| Verify Data Linearity	→	**Launch Data Analysis**	→	Select Regression Analysis	→	Input Regression Data

Excel Home		...		Data		
				Data Analysis		
A	B	C	D	E	F	G

B. Launch Data Analysis

Regression Analysis to Support Forecasting

Verify Data Linearity	→	Launch Data Analysis	→	**Select Regression Analysis**	→	Input Regression Data

Data Analysis

Analysis Tools

Regression

OK

C. Select "Regression" from Analysis Tools

Regression Analysis to Support Forecasting

Verify Data Linearity	→	Launch Data Analysis	→	Select Regression Analysis	→	**Input Regression Data**
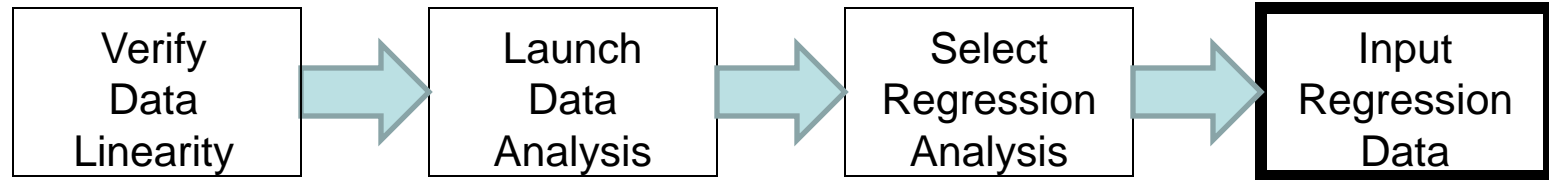
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Regression

Input Y Range  [_____]        ( OK )

Input X Range  [_____]

[X] Labels
[ ] Constant is Zero
[X] Confidence Level:  [95]  %
```

D. Input Regression Data
Y Range: Dependent Variable (Response Variable, such as Spending)
X Range: Independent Variables (could have multiple X variables)

Regression Analysis to Support Forecasting

| Scenario	R-Squared
No Relationship	0.0
Social Science Studies	0.3
Marketing Research	0.6
Scientific Applications	0.9
Perfect Relationship	1.0

R-Squared, the Coefficient of Determination
Also known as "Goodness of Fit", from 0 (no fit) to 1 (perfect fit)

Regression Analysis to Support Forecasting

| Statistic	Description
Standard Error	Estimate of standard deviation of the coefficient
t-Stat	Coefficient divided by the Standard Error
P-value	Probability of encountering equal t value in random data P-value should be 5% or lower

Regression Analysis to Support Forecasting
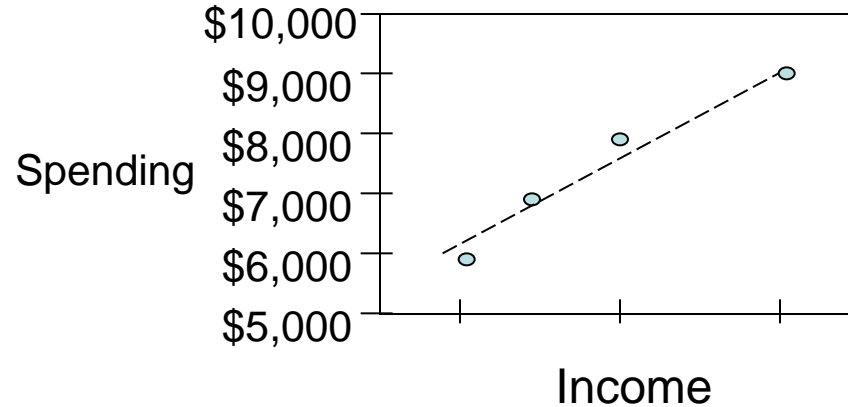
Parameter	Coefficient	Standard Error	t-Stat	P-value
Intercept	449.339	1036.95	0.433329	0.707034
Income Coeff.	0.290749	0.042254	6.880976	0.020474

Results: Spending = (Y-Intercept) + (Income Coefficient) * Income
Spending = 449.339 + (0.290749) * Income
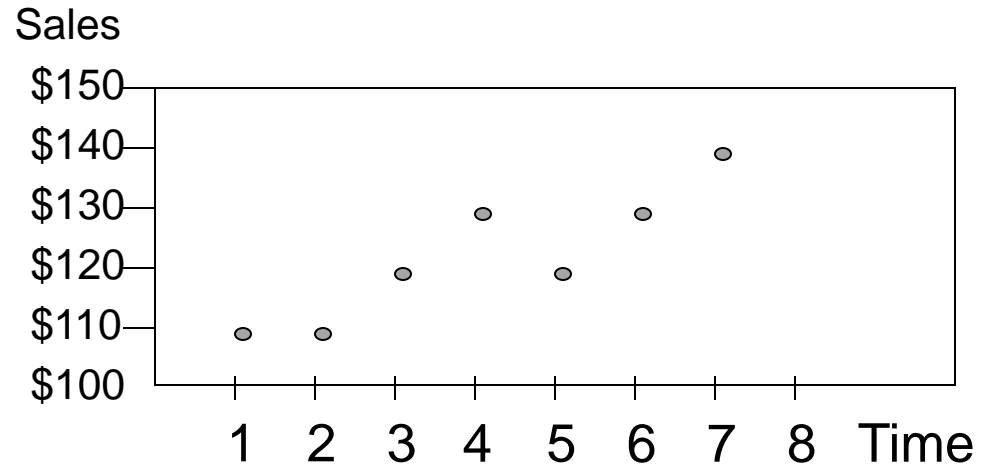
Forecasting: Time Series Methods

Stock Price
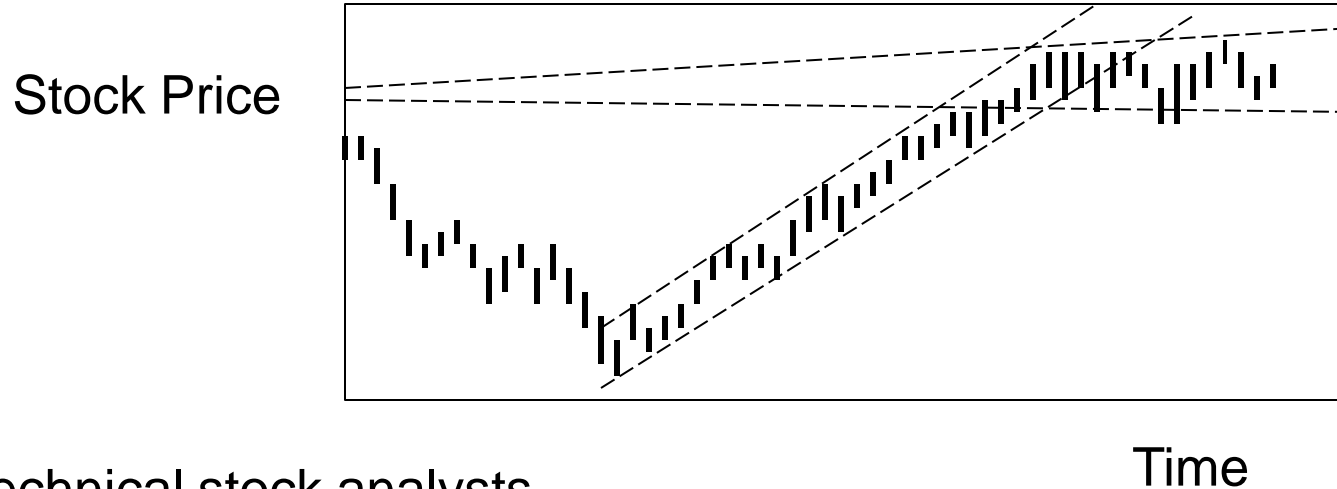
Time

Technical stock analysts
study stock trends over time
to predict future direction

Forecasting: Time-Series

Raw data

Plot out sales data

Period	Sales
Period 1	110
Period 2	110
Period 3	120
Period 4	130
Period 5	120
Period 6	130
Period 7	140
Period 8	???

Forecasting: Trend Line

Output	Description	Value in Our Example
R-Square	Goodness of fit of line with data	0.75
Intercept	Point where line crosses Y-axis	103.1
Slope	Coefficient for time variable	4.85

Sales = (Intercept) + (Slope) * (Time, in Periods)

Sales = (103.1) + (4.85) * (8) = 142.0
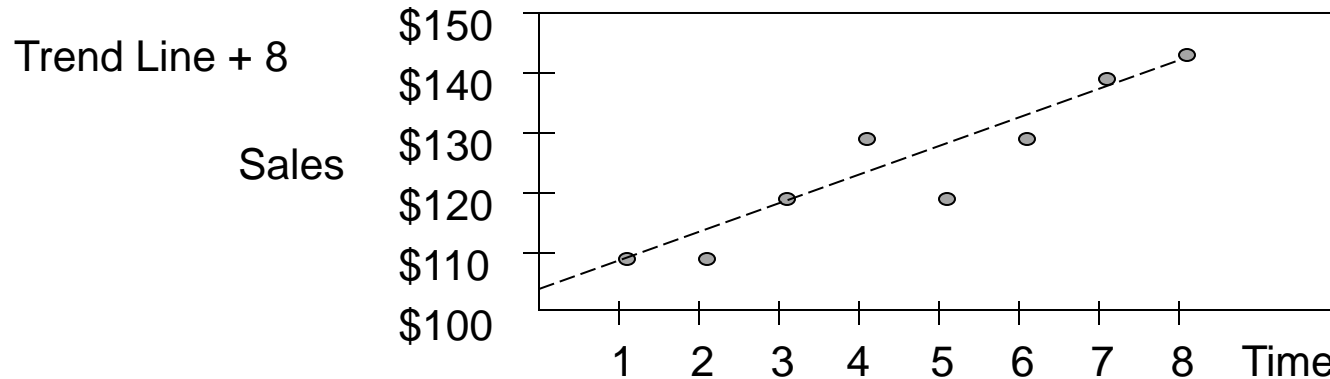
Forecasting: Time Series: Smoothing

Calculations

Period	Sales	3PMA*
1	110	--
2	110	113**
3	120	120
4	130	123
5	120	127
6	130	130
7	140	137
8	142	--

*3 Period Moving Ave
**(110+110+120) / 3 = 113

3 Period Moving Average

Chart after 3PMA Smoothing

Sales

Smoothed; 3PMA

Exponential Smoothing

Similar to 3PMA, but weights recent data higher than past data
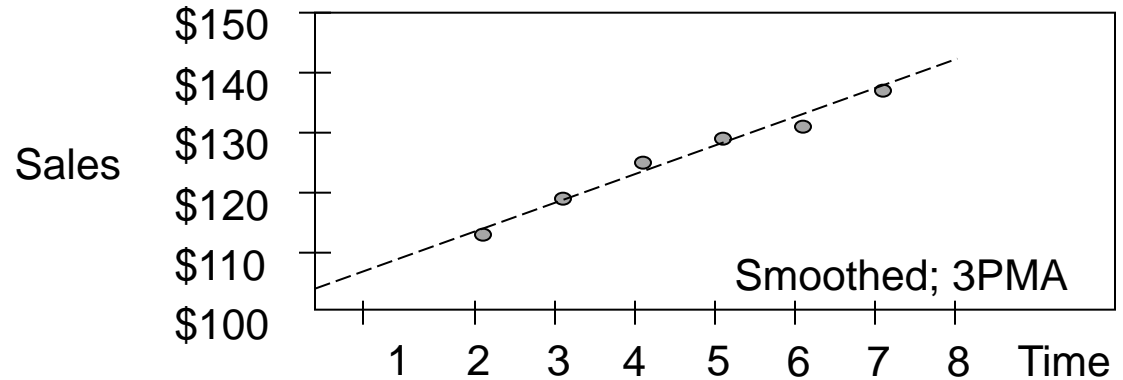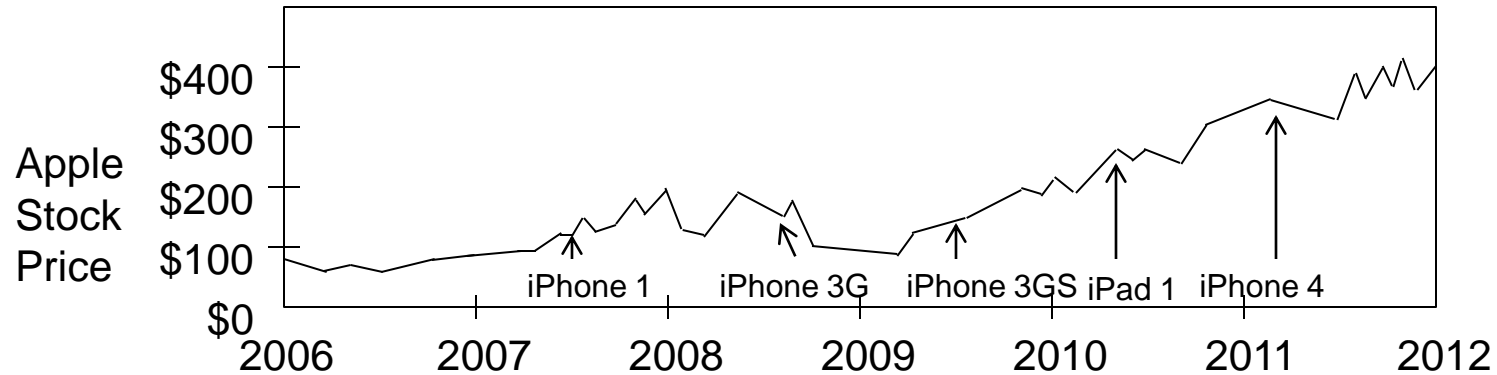
Forecasting: Causal Analysis

Value Investors: Seeks to find intrinsic characteristics of companies which can cause significant stock growth

Causal Analysis examines root causes of marketing phenomena

Forecasting: Candidate Causal Factors

Market Conditions

Sales decline in recessions
Example: Consumer goods

Competitive Environment

Airline fare wars
Example: United Airlines

Product/ Service

New products can drive sales
Example: Apple

Brand

Strong brands can drive sales
Example: Audi

Factors
Driving
Sales

Distribution

Promotion

Sales Experience

Support

Pricing

Forecasting: Candidate Causal Factors

Market Conditions

Competitive Environment

Product/ Service

Brand

Factors Driving Sales

Distribution

New outlet store can drive sales
Example: H&R Block expansion

Promotion

Social media can drive sales
Example: GEICO

Sales Experience

Skilled salespeople drive sales
Example: Nordstrom

Support

Disgruntled customers hurt sales
Example: Dell Computers

Pricing

Price drops can drive sales
Example: Walmart

Forecasting: Causal Factors: Multivariate

Period	Sales Level	Market Awareness	Number of Locations
Q1 2012	$1.0 million	80%	5
Q2 2012	$1.1 million	80%	5
Q3 2012	$1.3 million	85%	6
Q4 2012	$1.2 million	85%	6
Q1 2013	$1.3 million	85%	7
Q2 2013	$1.5 million	90%	8
Q3 2013	$1.5 million	90%	8
Q4 2013	$1.4 million	90%	8

Forecasting: Causal Factors: Multivariate

Output	Description	Values in Our Sales Example
R-Square	Goodness of fit of model to data	0.93
Intercept	Point where line crosses Y axis	-1.44
Coefficient 1	Coefficient for Market Awareness	0.028
Coefficient 2	Coefficient for Number of Locations	0.043

Sales = (Intercept) + (Coefficient 1) * (Market Awareness) + (Coefficient 2) * (Number of Locations)

= (- 1.44) + (0.028) * (Market Awareness) + (0.043) * (Number of Locations)

Example: Maintain brand awareness at 90%; Open two new retail stores (10 total)

= (-1.44) + (0.028) * (90) + (0.043) * (10) = $1.56 million

Forecasting: Trial Rate Forecasting

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┌──────────┐     ┌──────────┐
│  Survey  │ ──→ │ Trial Rate │──┐
└──────────┘     └──────────┘  │   ┌──────────┐
                               ├─→ │ Forecast │
┌──────────┐     ┌──────────┐  │   └──────────┘
│  Sales   │ ──→ │Repeat Rate│──┘
└──────────┘     └──────────┘
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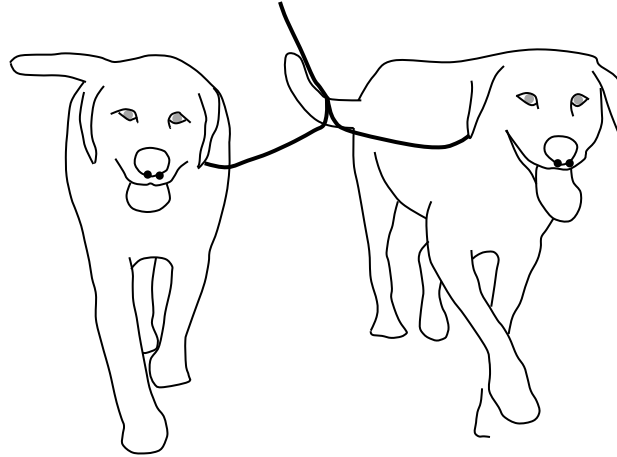
Trial Rate =(Number of First-Time Purchasers or Users in Period t) / (Population)

Repeat Rate = <u>(Number of Repeat Purchasers or Users in Period t)</u>
                   (Number of First-Time Purchasers or Users in Period t-1)

Penetration in Period t = [Penetration in Period (t – 1)] * (Repeat Rate in Period t)
    + (Number of First-Time Purchasers or Users in Period t)

Projection of Sales in Period t = (Penetration in Period t) *
    (Average Frequency of Purchase) * (Average Units per Purchase)

Forecasting: Trial Rate Forecasting

Example: Acme Dog Walking Service

Provides dog walking services for town of population 5000; Repeat rate of 90%.
Trial of new dog grooming service with 100 people during 1 month test period
Acme expects to gain 80 new purchases in next period.

Trial Rate = (Number of First-Time Purchasers or Users in Period t) / (Population)

Trial Rate = (100 first-time purchasers) / (5,000 inhabitants) = 2.0%

Forecasting: Trial Rate Forecasting

Example: Acme Dog Walking Service

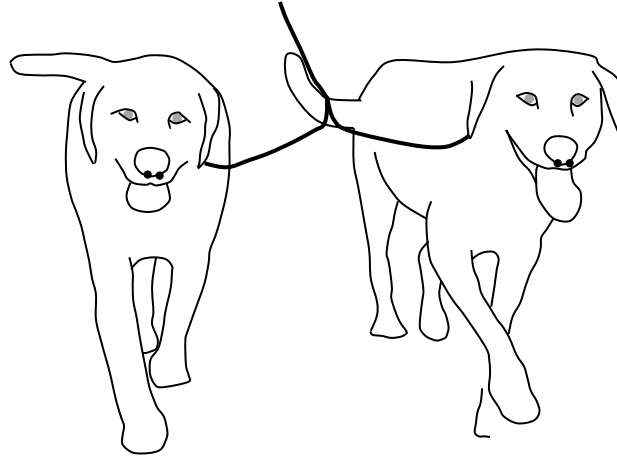Provides dog walking services for town of population 5000; Repeat rate of 90%.
Trial of new dog grooming service with 100 people during 1 month test period
Acme expects to gain 80 new purchases in next period.

Penetration in Period t = [Penetration in Period (t – 1)] * (Repeat Rate in Period t)
+ (Number of First-Time Purchasers or Users in Period t)
Penetration in Period t = (100 customers in previous period) * (90% repeat rate)
+ (80 customers in current period) = 170 customers

Forecasting: Trial Rate Forecasting
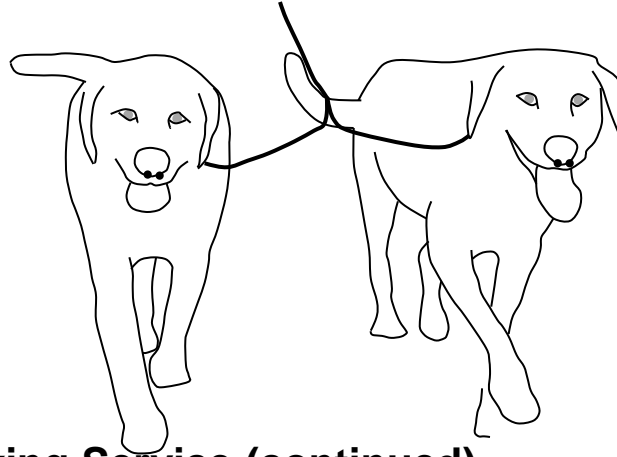
Example: Acme Dog Walking Service (continued)

Acme finds out that the average customer owns 1.5 dogs and gets them groomed once/ month
Acme charges $50 for grooming services

Projection of Sales in Period t = (Penetration in Period t) * (Average Frequency of Purchase)
•(Average Units per Purchase)

Projection of Sales in Period t = (170 customers) * (1 per month) * (1.5 units per purchase)
= 255 units expected to be purchased → Sales amount = units sold * price/unit = $255*$50=$12,750

Forecasting: Trial Rate: Market Survey

Acme conducts market surveys to estimate trial volume
Trial volume = number of units we expect to sell to the population over a given time
3 Principal sections in survey: Qualification; Body; Classification

Survey	
Qualification Questions	Determines if respondent is relevant to our study
Body Questions	Asks the main information we want to know
Classification Questions	Classifies the respondent into segments

Intention to Buy scale

Definitely Will Not Buy	Probably Will Not Buy	May or May Not Buy	Probably Will Buy	Definitely Will Buy
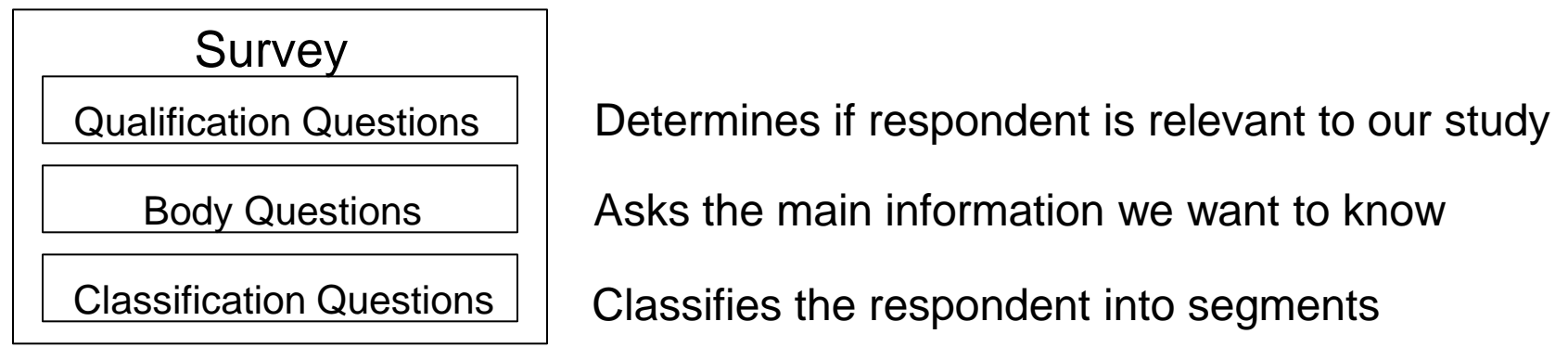
Forecasting: Trial Rate: Market Survey

Acme Dog Grooming Services Survey: Qualification

Do you own a dog?
____ **Yes: Please proceed with the survey**
____ **No: Please stop the survey; Thank you for your interest**

Acme Dog Grooming Services Survey: Body

How many dogs do you own?
____ **1** ____ **2** ____ **3** ____ **4 or more**

How often do you have your dogs groomed?
____ **Every 4 weeks** ____ **Every 8 weeks** ____ **Every 12 weeks or more**

How likely would you be to purchase dog grooming services from Acme?
____ **Definitely will buy**
____ **Probably will buy**
____ **May or may not buy**
____ **Probably will not buy**
____ **Definitely will not buy**

Of which dog grooming services are you aware?
____ **Acme** ____ **Groomer 2** ____ **Groomer 3**

Which pet store do you visit the most?
____ **Store 1** ____ **Store 2** ____ **Store 3**

Acme Dog Grooming Services Survey: Classification

What is your gender?
____ **Female** ____ **Male**

What is your age?
____ **0 – 17 years** ____ **18 – 34 years** ____ **35 – 49 years** ____ **50 and over**

What is your annual household income?
____ **0 - $49,000** ____ **$50,000 - $99,000** ____ **$100,000 and over**

Forecasting: Trial Rate: Market Survey

Survey Question	Results
Number of dogs owned	1.5, on average
Frequency of dog grooming	Every 8 weeks, or 0.5 purchases/ month
Likelihood to buy	Definitely will buy: 10% Probably will buy: 20%
Awareness of Acme	20%
Availability of Pet Store 1	30%

Trial Volume = (Population) * (Awareness) * (Availability) *
	[(80% * Definitely Buy) + (30% * Probably Buy)] * (Units per Purchase)

Trial Volume = (5,000) * (20% Awareness) * (30% Availability) *
	[(80% * 10% Definitely Buy) + (30% * 20% Probably Buy)] * (1.5 units/ purchase)
	= 63 units

Forecasting: Trial Rate: Market Survey

Repeat Volume = [(Trial Population) * (Repeat Rate)] *
               (Repeat Unit Volume per Customer) * (Repeat Occasions)

Trial Population = (Population) * (Awareness) * (Availability)

Trial Population = (5,000) * (20% Awareness) * (30% Availability)
= 300 people

Repeat Volume = [(300 people) * (90% Repeat Rate)]
               * (1.5 units per purchase) * (0.5 purchase per month)

= 202.5 units per month * 12 months per year
= 2,430 units/ year

Total Volume = (Trial Volume) + (Repeat Volume)

= (63 units) + (2,430 units)
= 2,493 units in first year

Forecasting: Diffusion Models: Adopter Categories

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│             │   │   Early     │   │   Early     │   │   Late      │   │             │
│ Innovators  │──▶│  Adopters   │──▶│  Majority   │──▶│  Majority   │──▶│  Laggards   │
│             │   │             │   │             │   │             │   │             │
└─────────────┘   └─────────────┘   └─────────────┘   └─────────────┘   └─────────────┘
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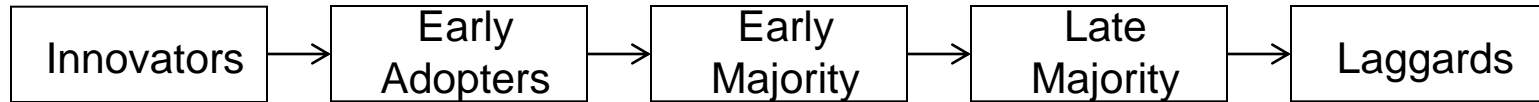
Forecasting: Diffusion Models: 2 Contributors

Innovation Diffusion

Innovators

Imitators

Innovators seek new ideas with little concern if others have adopted.
Drives less than 20% of sales

Imitators adopt new innovations through the influence of others.
Imitators wait until others have tried.
Drives more than 80% of sales
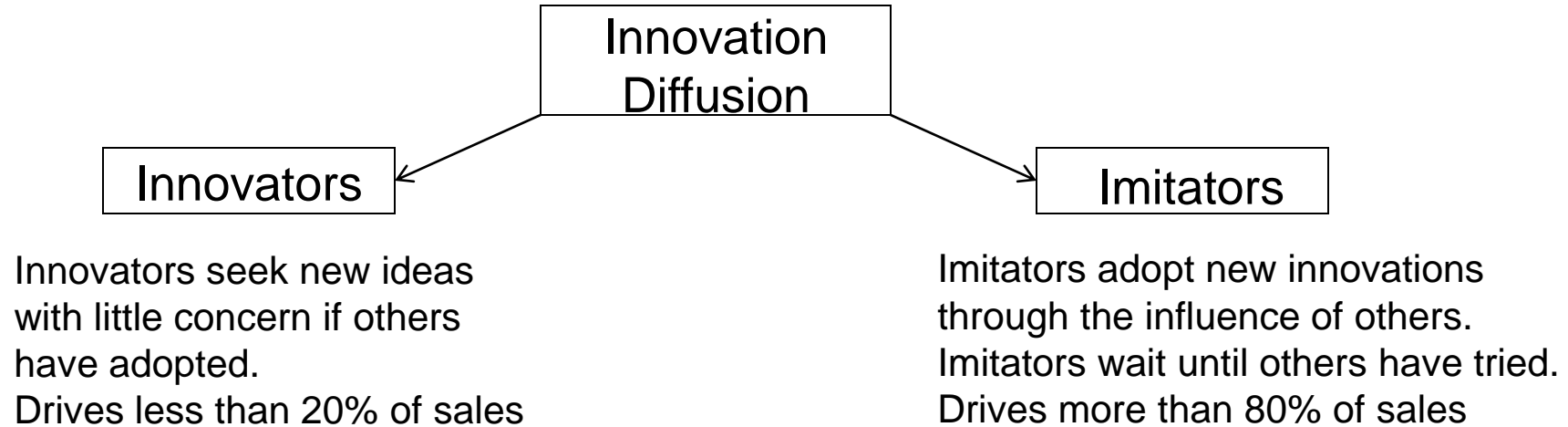
Forecasting: Diffusion Models: Imitator-Based

Vast majority of innovations follow this profile

100%

Adoption

Quick adoption rate,
once others have adopted

Waiting for others to try first

Time

Examples:
Smartphones
Movies (most)
Resorts
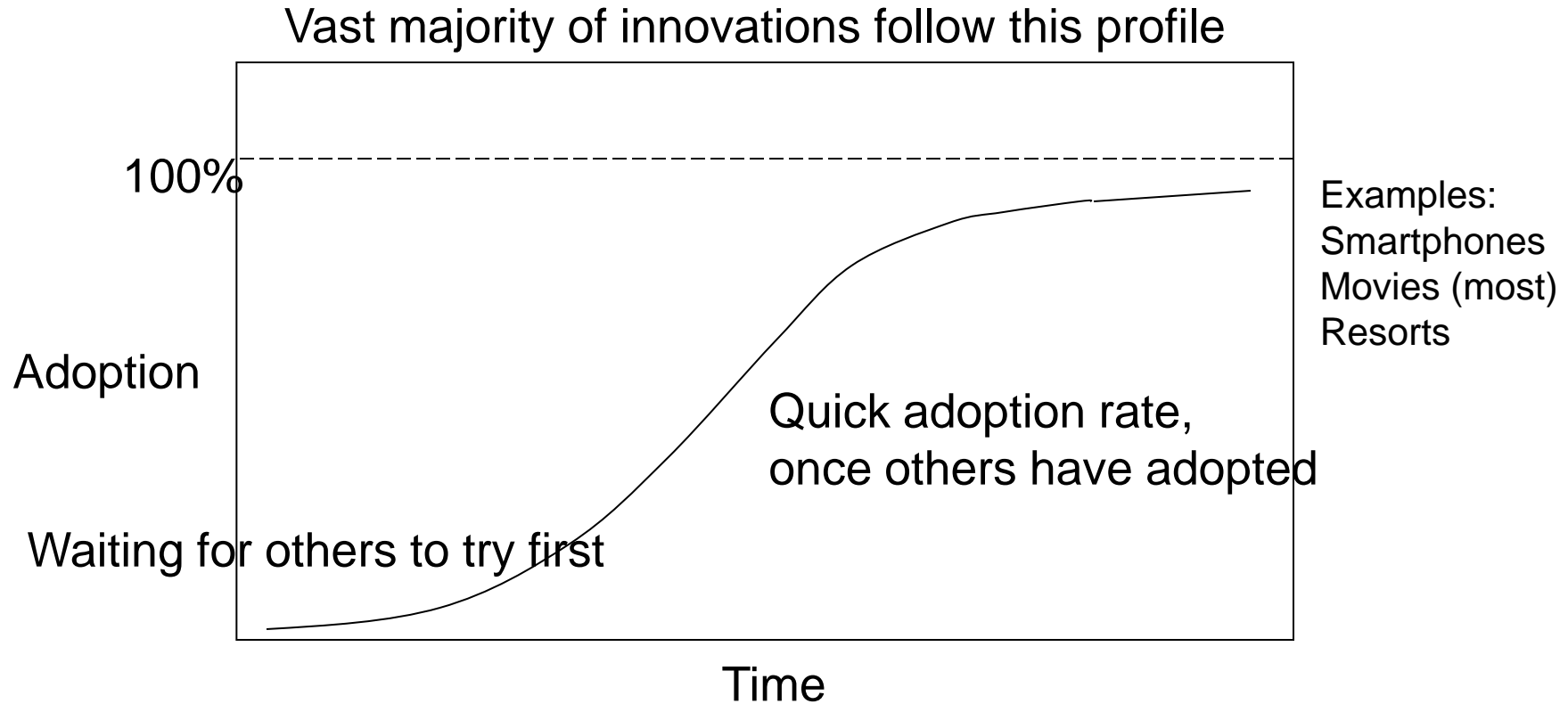
Forecasting: Diffusion Models: Innovator-Based

Rapid initial adoption; Minority of adoptions

Examples:
Early HD TVs
Early washers
Early automobiles
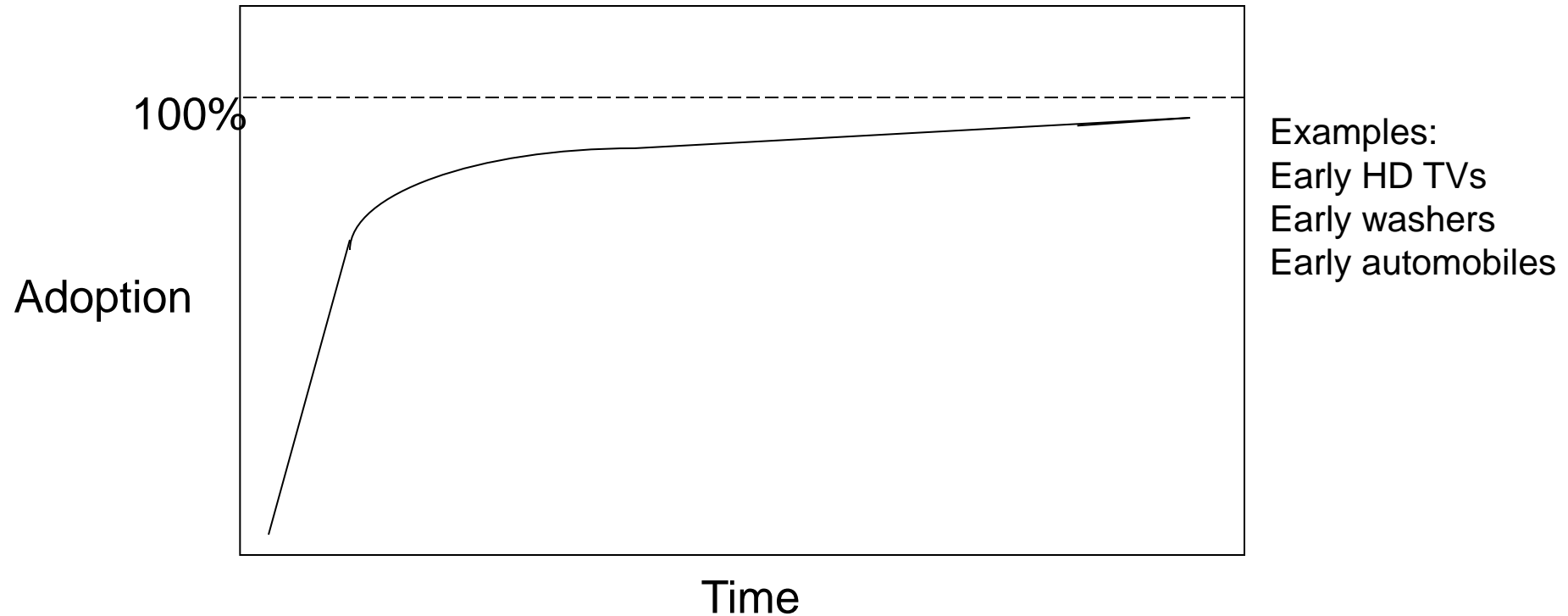
Forecasting: Diffusion Models: Bass

f(t)/ [1 − F(t)] = p + q/M [A(t)]

The equation includes the following variables:

f(t): Portion of the potential market that adopts a new innovation at a certain time (t)

F(t): Portion of the potential market that has adopted the innovation at a certain time (t)
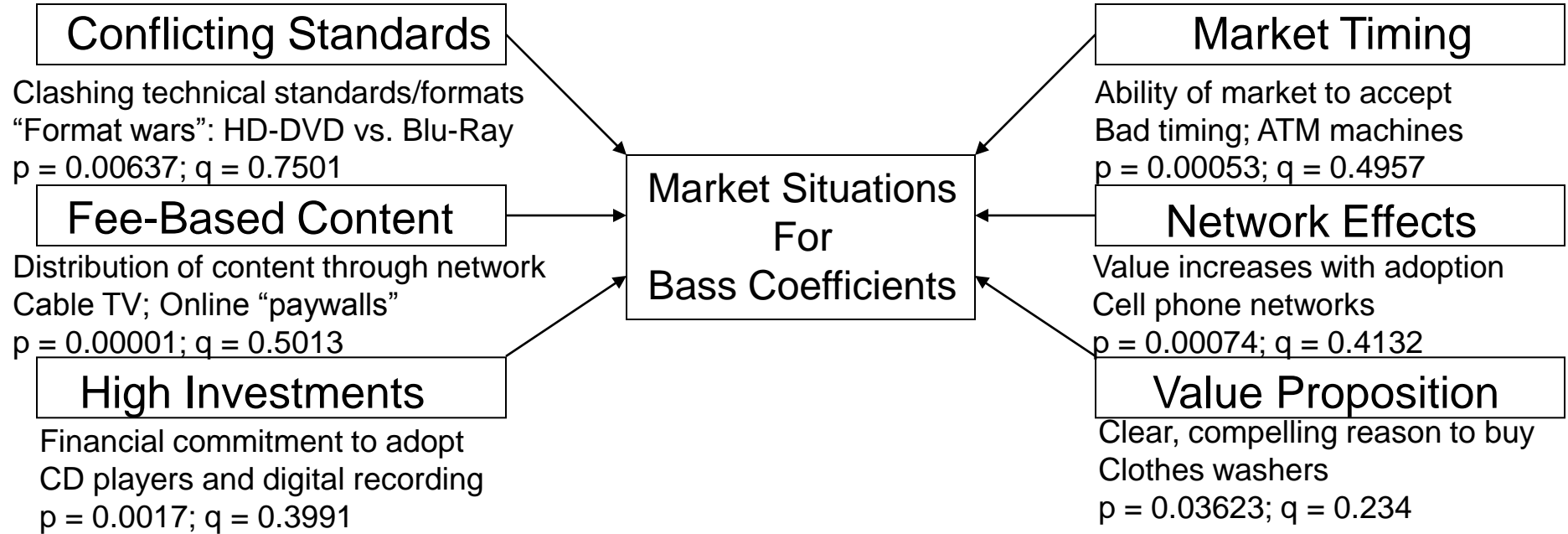
A(t): Cumulative adopters of the new innovation at a certain time (t)

M: Potential market (the ultimate number of people likely to adopt the new innovation)

p: Coefficient of innovation (the degree to which Innovators drive adoption)

q: Coefficient of imitation (the degree to which Imitators drive adoption)

Forecasting: Diffusion Models

Conflicting Standards

Clashing technical standards/formats
"Format wars": HD-DVD vs. Blu-Ray
$p = 0.00637$; $q = 0.7501$

Fee-Based Content

Distribution of content through network
Cable TV; Online "paywalls"
$p = 0.00001$; $q = 0.5013$

High Investments

Financial commitment to adopt
CD players and digital recording
$p = 0.0017$; $q = 0.3991$

Market Situations
For
Bass Coefficients

Market Timing

Ability of market to accept
Bad timing; ATM machines
$p = 0.00053$; $q = 0.4957$

Network Effects

Value increases with adoption
Cell phone networks
$p = 0.00074$; $q = 0.4132$

Value Proposition

Clear, compelling reason to buy
Clothes washers
$p = 0.03623$; $q = 0.234$

Forecasting: Diffusion Models: Bass Approach

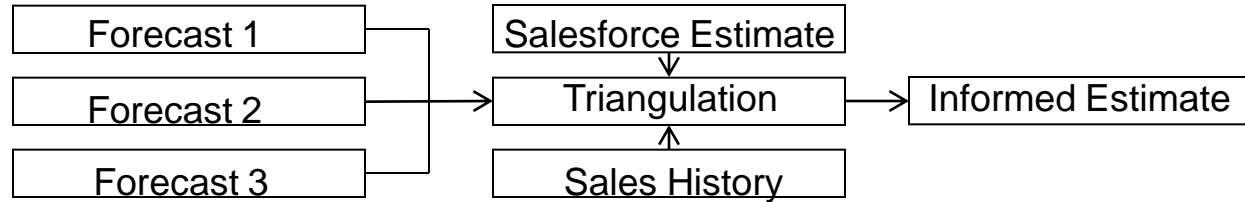| Understand Market Situation | → | Look up Values for p and q | → | Determine M (Size of Market) | → | Execute Bass Model | → | Interpret Bass Results |
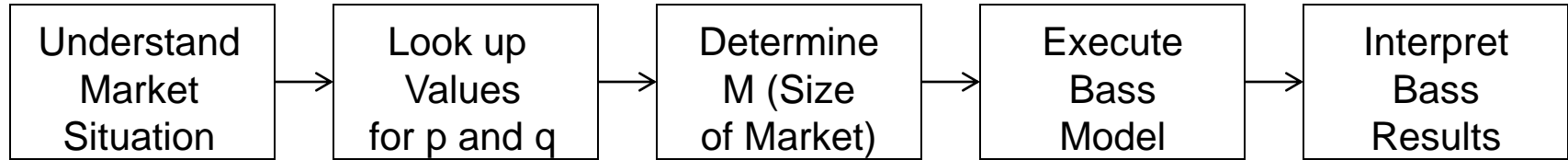
Internet search: "Bass Model Excel" → Many free Excel models available
Internet search: "Bass Coefficients" → Tables of p and q for different innovations

Forecasting: Diffusion Models
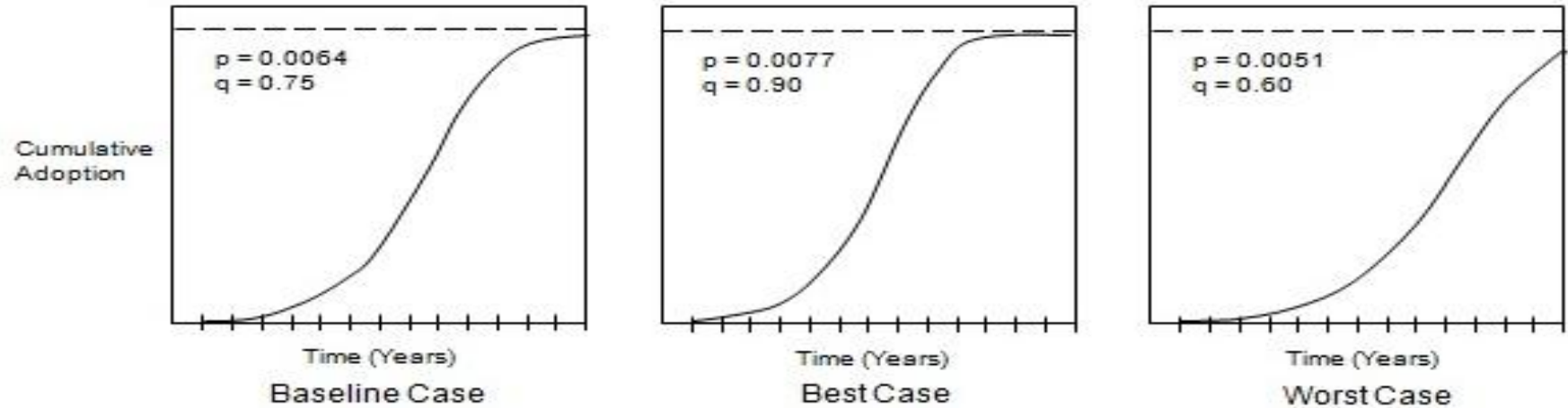
Forecasting: Triangulation of Multiple Forecasts

Forecast = (W1 * Forecast 1) + (W2 * Forecast 2) + (W3 * Forecast 3)

Predictive Analytics: Trends

Technology

Cloud computing, Cheap storage

Data Availability

Terabytes of customer data

Trends Driving Predictive Analytics

Growth Demands

Looking for growth opportunities

Competitive Advantage

Powerful tool to target niches

Predictive Analytics: Applications

Airlines

Predict maintenance before failure

Banking

FICO scores

Collections

Predict which customers will pay

Cross-Selling

"Customers who bought X bought Y"

Predictive Analytics Applications

Customer Profitability

Identify profitable customers

Fraud Detection

Predict fraudulent claims

Healthcare

Predict at-risk patients

Insurance

Assign prices to policies
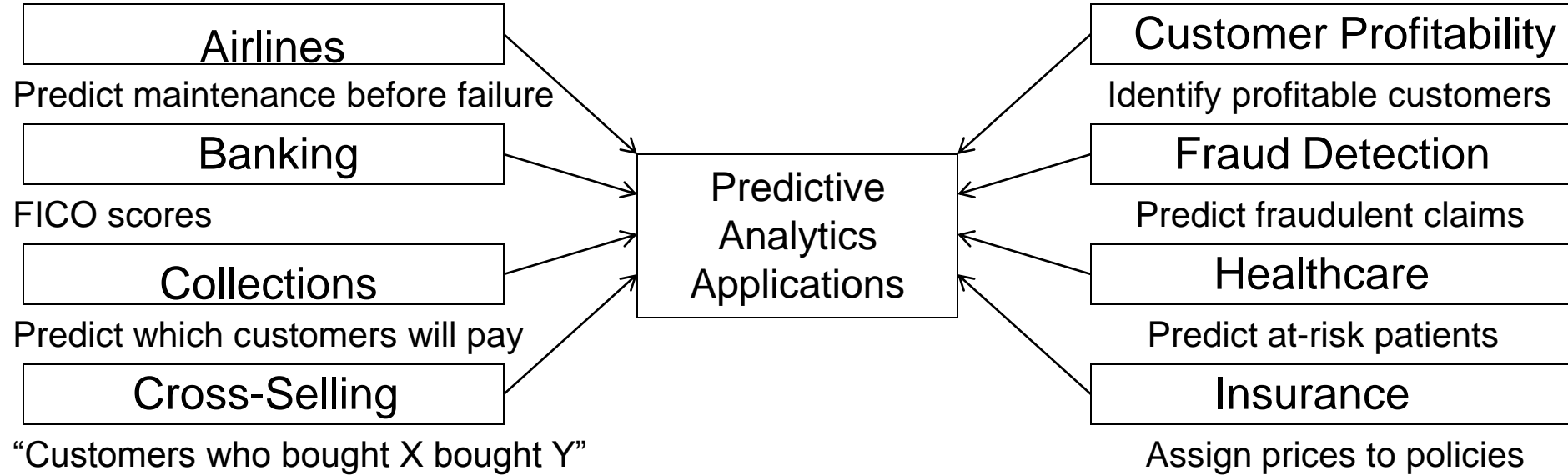
Data Mining: Process

Step	Description
Selection	Select portion of data to target
Pre-Processing	Data cleansing; Removing duplicate records
Transformation	Sorting; Pivoting; Aggregation; Merging
Data Mining	Find patterns in data
Interpretation	Form judgments based on the patterns

Selection   Pre-Processing   Transformation   **Data Mining**   Interpretation

Data → Target Data → Pre-Processed Data → Transformed Data → Patterns → Actionable Information
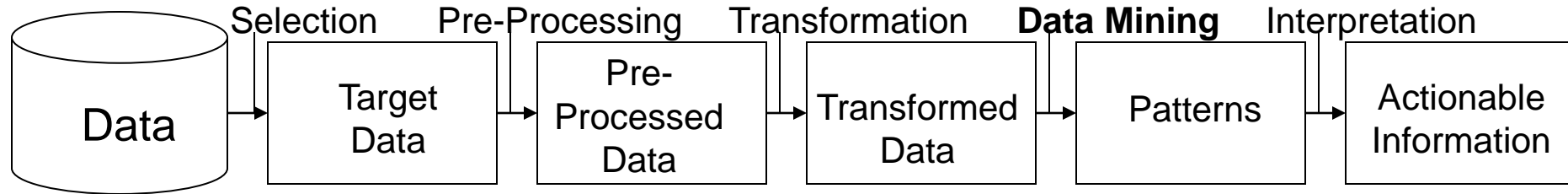
Data Mining: Approaches

Association Rule Learning

Search for associations in data
Seek products purchased together

Classification

Sorts data into different categories
Have prior knowledge of patterns
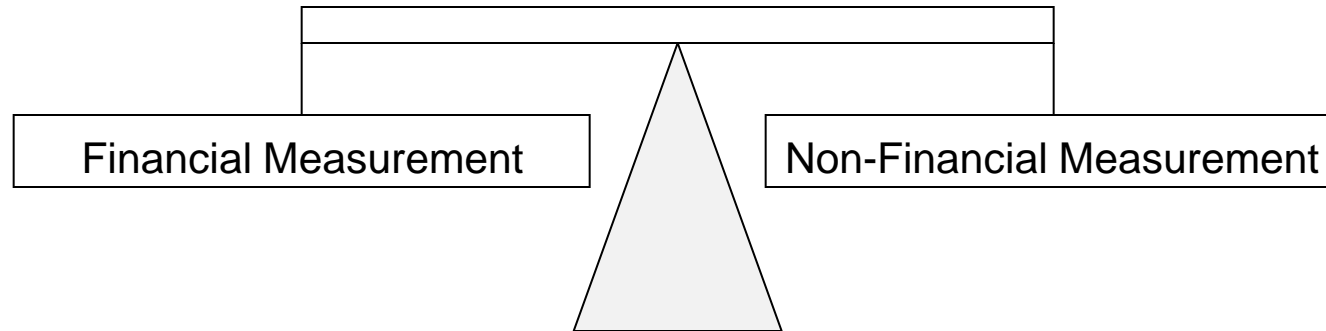Spam filtering

Data Mining Approaches

Clustering

Identify patterns in data
No prior knowledge of patterns

Regression

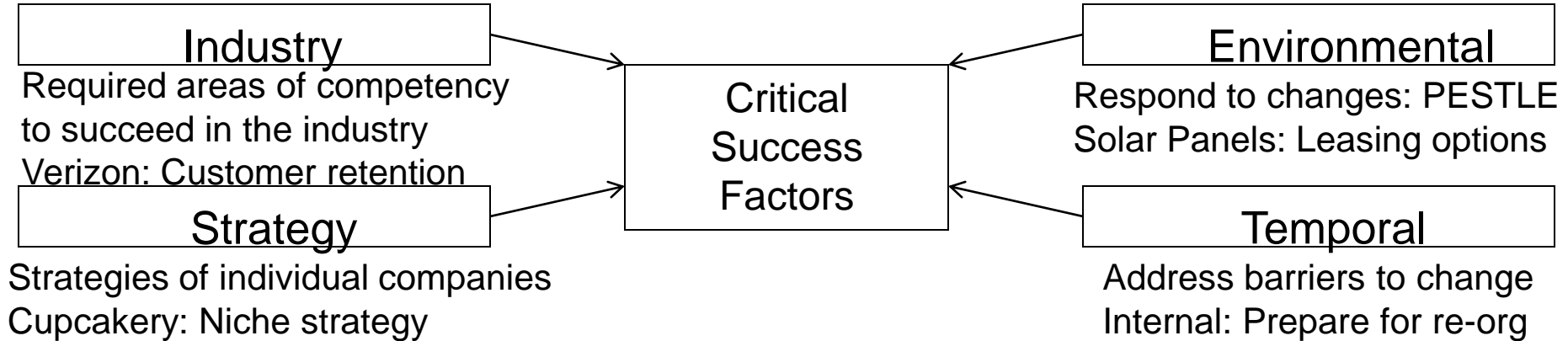Find relationships between variables

Balanced Scorecard: Balance

Topic	Description
Creators	Kaplan and Norton
Balanced	Considers financial, as well as non-financial, measures

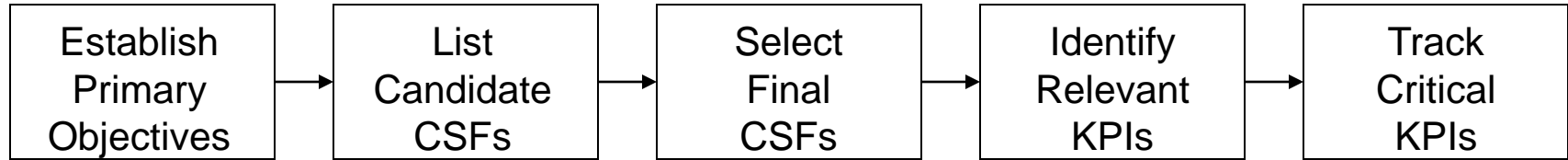Financial Measurement | Non-Financial Measurement

Balanced Scorecard: Perspectives

Perspective	Description and Example
Customers	Time; Quality; Service; Cost Example: Southwest: Delivering customer value
Financial	Profitability; Growth; Shareholder Value Example: L'Oreal: 5th in the world for value creation
Innovation & Learning	Ability to create value; Ability to improve efficiencies Example: Nvidia: Ability to efficiently launch products
Internal Processes	Core competencies for the market Example: Zynga: Competency in speed of development

Critical Success Factors: Types

Industry
Required areas of competency
to succeed in the industry
Verizon: Customer retention

Strategy
Strategies of individual companies
Cupcakery: Niche strategy

Critical Success Factors

Environmental
Respond to changes: PESTLE
Solar Panels: Leasing options

Temporal
Address barriers to change
Internal: Prepare for re-org

Critical Success Factors: Process

| Establish Primary Objectives	→	List Candidate CSFs	→	Select Final CSFs	→	Identify Relevant KPIs	→	Track Critical KPIs

Critical Success Factors: Process

Step	Description and Example
Establish Objectives	Establish primary objectives and strategy to achieve Market Development Example: Company decides on strategy of market development
List Candidate CSFs	Consider required competencies to achieve objectives Example: Create list of CSFs
Select Final CSFs	Identify top 3 – 5 CSFs Example: Focus on customer service

Establish Primary Objectives → List Candidate CSFs → Select Final CSFs → Identify Relevant KPIs → Track Critical KPIs
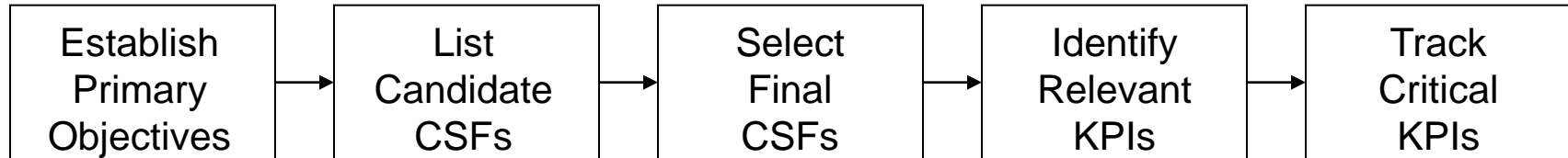
Critical Success Factors: Process

Step	Description and Example
Identify Relevant KPIs	Assign one or more KPIs for each CSF Example: Measure customer satisfaction rates
Track Critical KPIs	Monitor KPIs to evaluate execution of CSFs Example: Track customer satisfaction over time

Establish Primary Objectives	→	List Candidate CSFs	→	Select Final CSFs	→	Identify Relevant KPIs	→	Track Critical KPIs
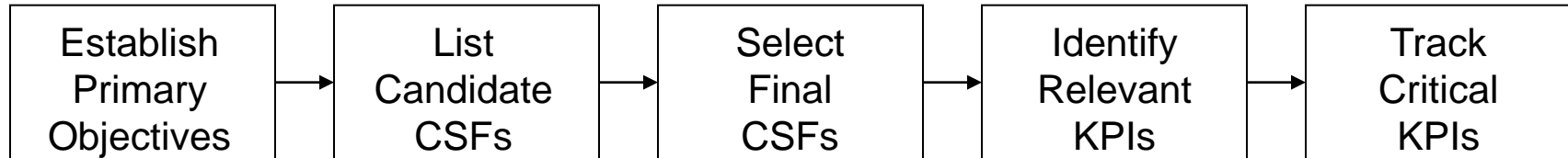
Check for Understanding

Topic	Description
Forecasting	Apply different techniques to forecast future sales
Predictive	Know the concepts behind predictive analytics & data mining
Scorecards	Identify the concepts behind balanced scorecards
Success	Review how to set up critical success factors