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PM: Product Management and Development
Week 6 – Concept Development and Testing

Module Overview

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Module Overview

Learning Objectives

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Learning Objectives

Importance of Concept Testing in the new product development process

The Long Tail Effect
How digital technologies are changing new product development

Ways to estimate market potential and forecast sales

Different types of Concept Tests
How to conduct the most common type of concept test

Understand potential and forecast

Metrics to evaluate model forecasts and compare models

Product Concept and Product Testing

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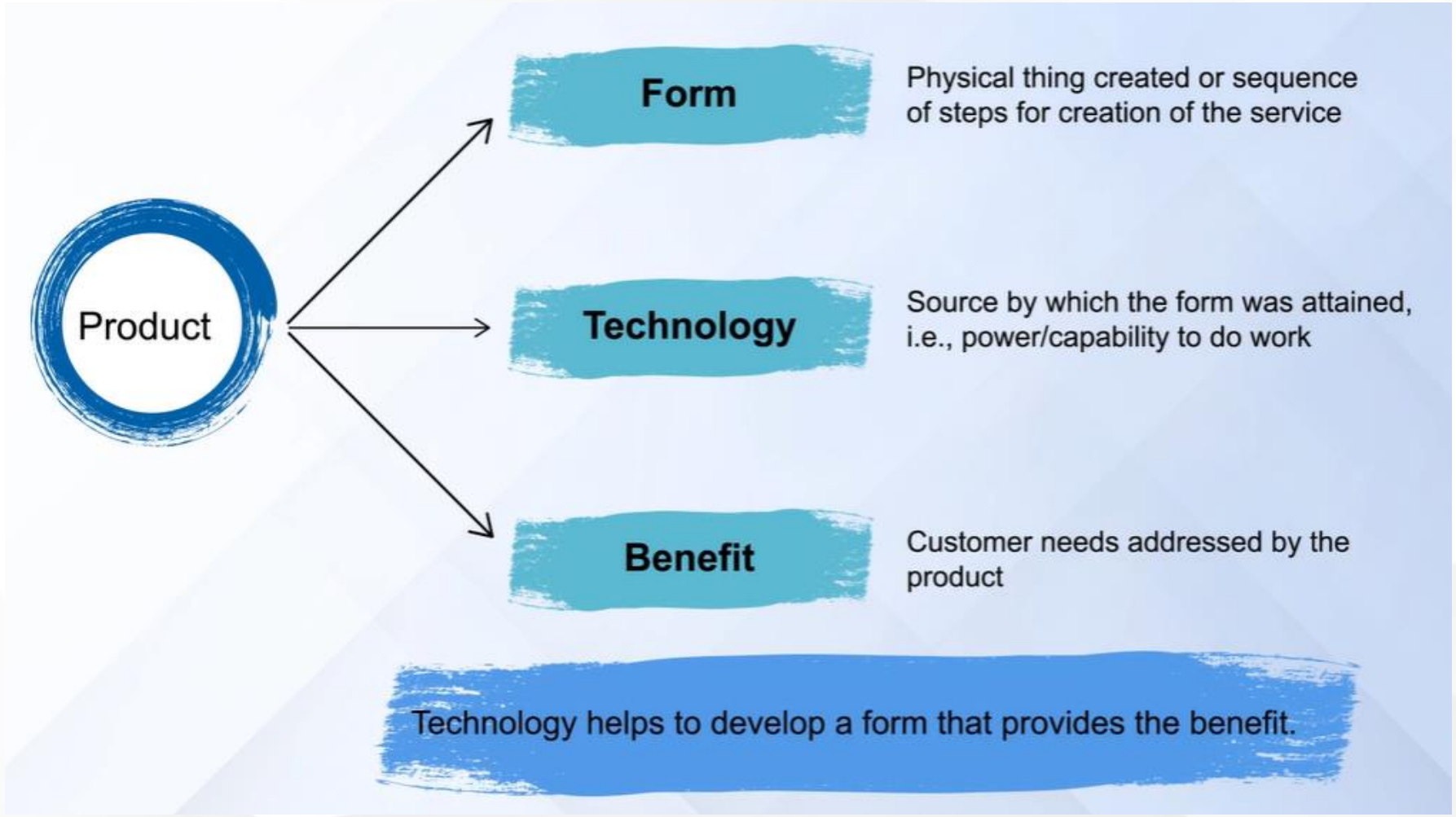
Concept Generation



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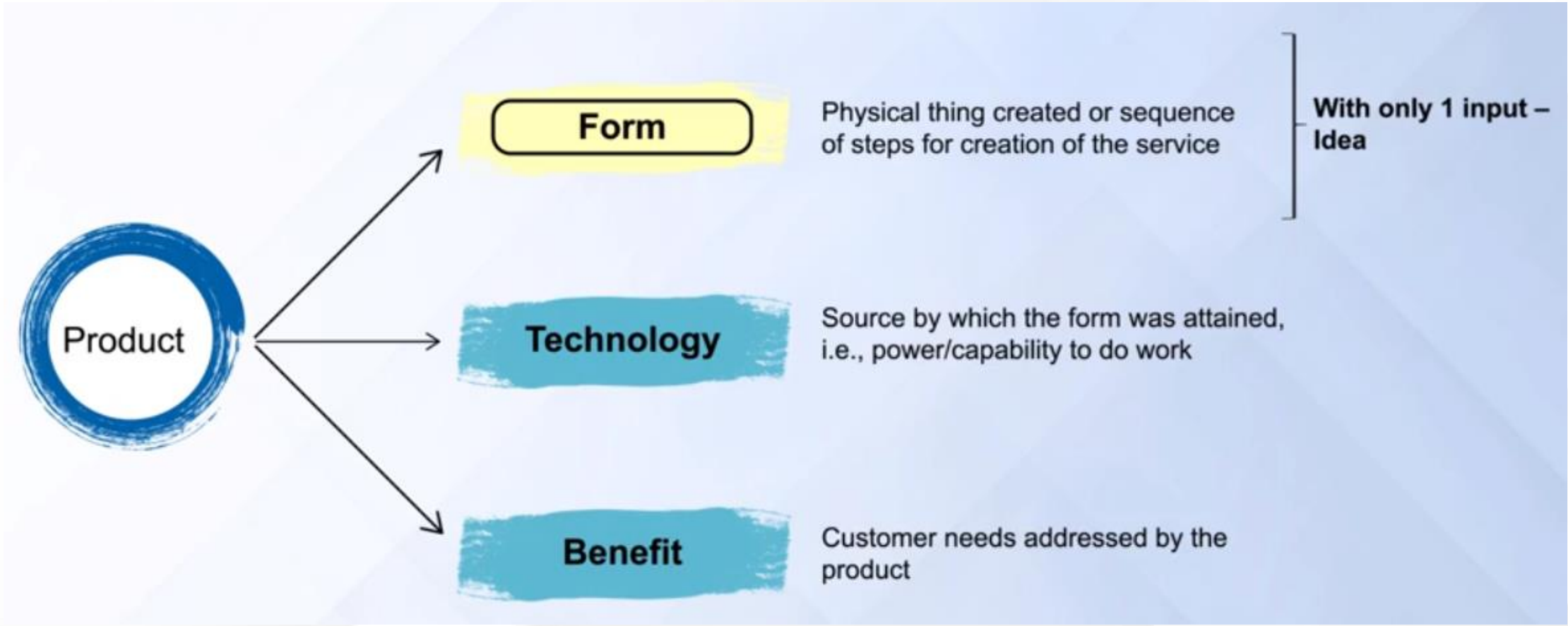

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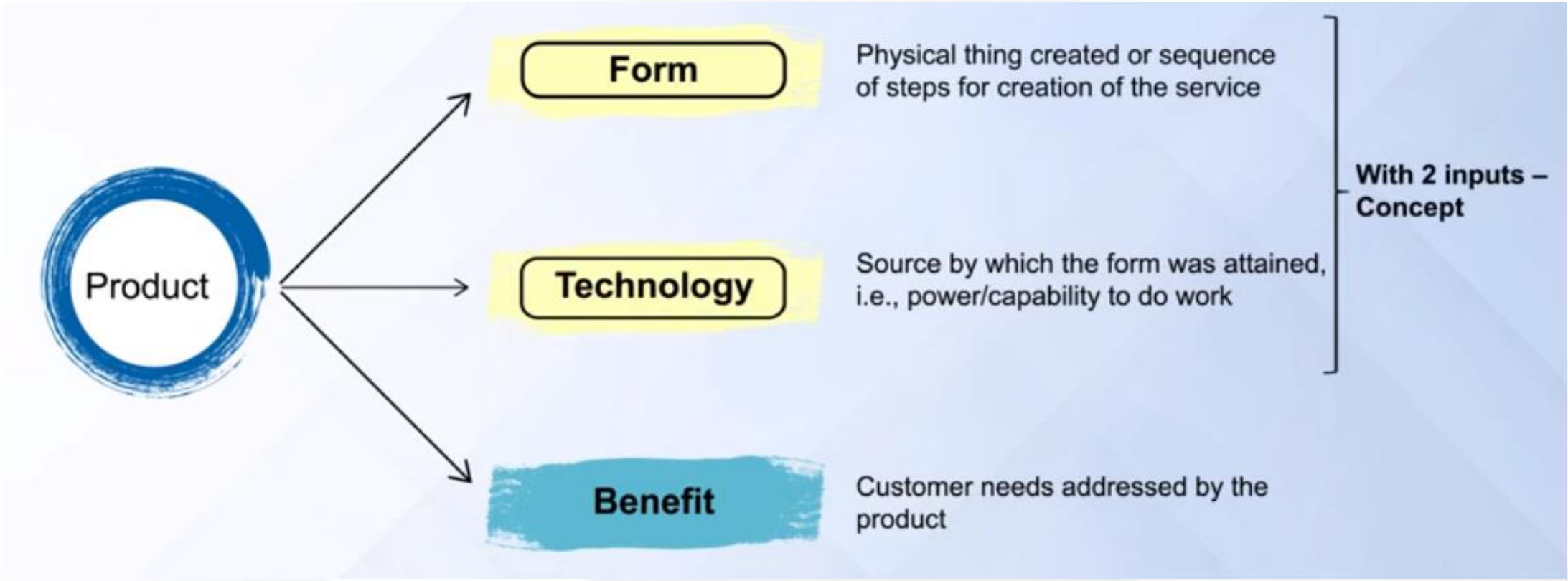

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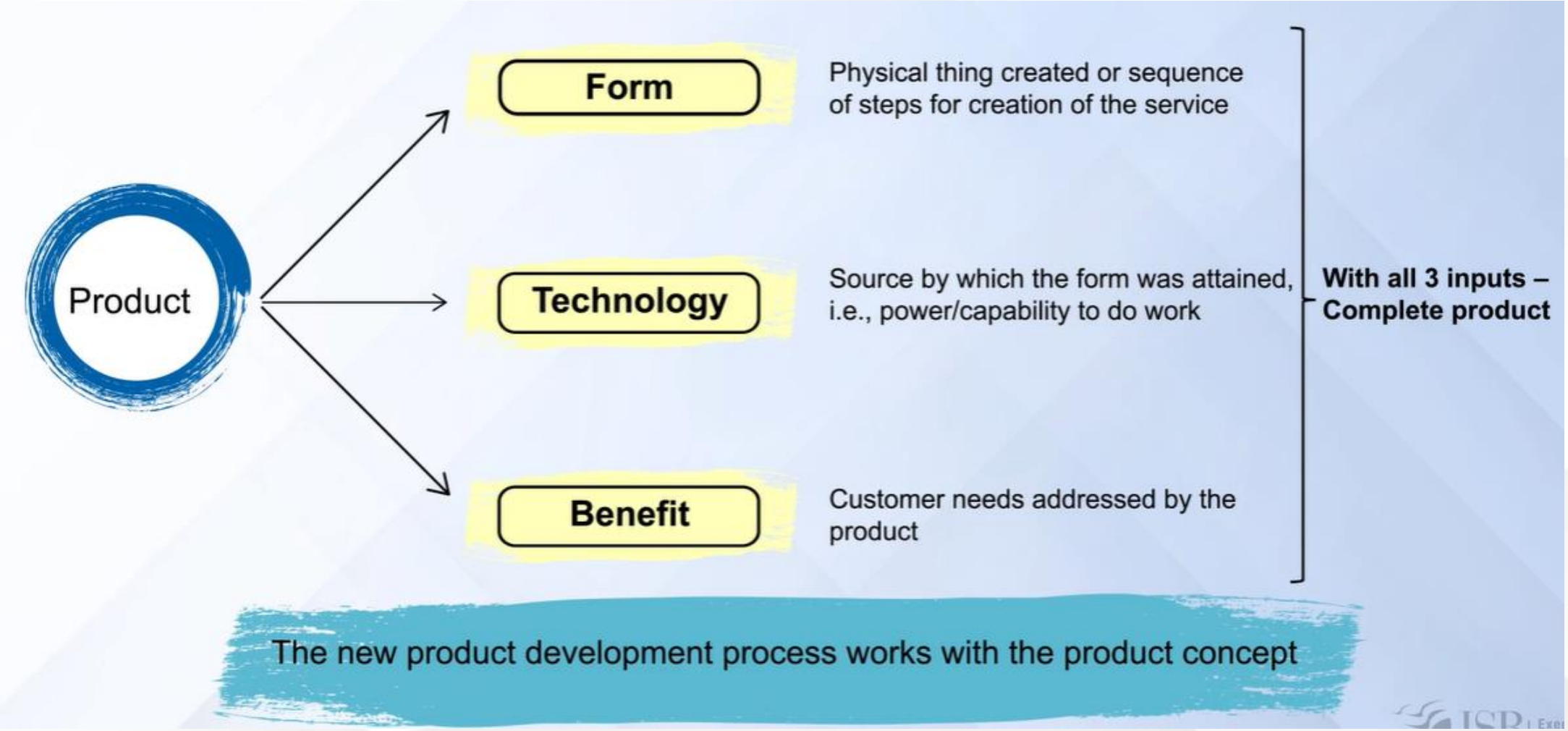

Concept Testing by Firms (2002 – 2004 & 1987 – 1989

Frequently used models and methods in NPD process:

Model/method	Percent of Companies	Percent in Mahajan and Wind
Concept tests	77	26
Focus groups	66	68
Limited rollout	53	42
Product life-cycle models	38	8
Show tests and clinics	36	22
Attitude and usage studies	36	19
Stated choice/preference models	28	NA
Quality function development (QFD)	26	9
Ethnographic/observation usage research	23	NA
Traditional conjoint analysis	19	15
Home usage test	19	9
Delphi	6	9
Advanced product quality planning	2	NA
Synectics	0	8

Source: Concept testing: the state of contemporary practice, Peng and Finn, 2008

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Concept Testing by Firms (2002 – 2004 & 1987 – 1989

Level of satisfaction with various models and methods

		Level of Satisfaction (percent of users)		
Model/method	Number of users	Satisfied	Neutral	Dissatisfied
Concept tests	37	92	3	5
Show tests and clinics	17	88	12	0
Focus groups	31	87	3	9
Limited rollout	25	84	12	4
Attitude and usage studies	17	83	18	0
Ethnographic/observation usage research	11	82	18	0
Quality function development (QFD)	12	67	25	8
Traditional conjoint analysis	9	67	33	0
Home usage test	9	55	44	0
Stated choice/prfrence models	13	54	46	0
Product life-cycle models	18	45	39	17
Delphi	3	33	67	0
Advanced product quality planning	1	0	100	0

Source: Concept testing: the state of contemporary practice, Peng and Finn, 2008

Concept Testing by Firms (2002 – 2004 & 1987 – 1989

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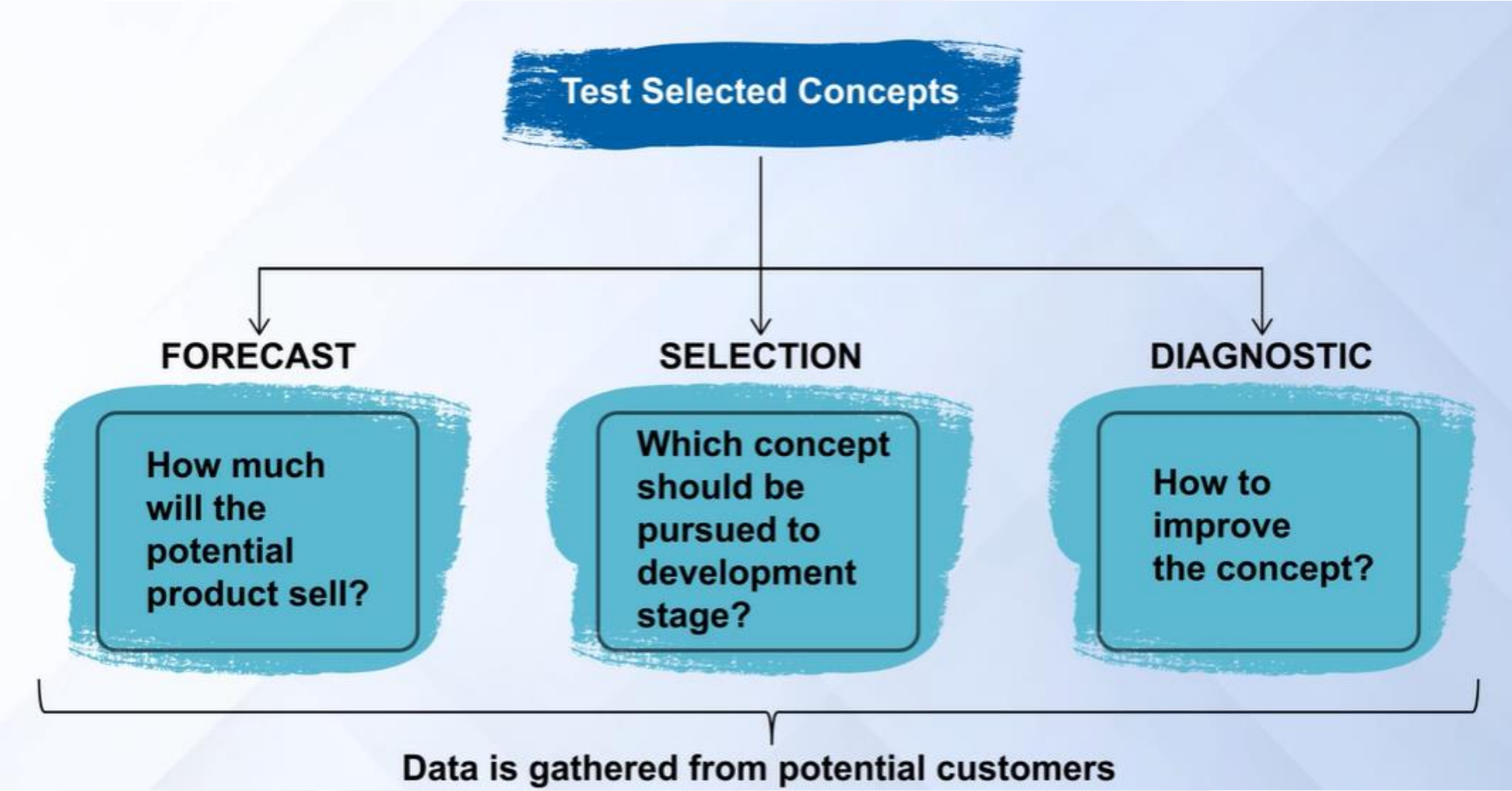
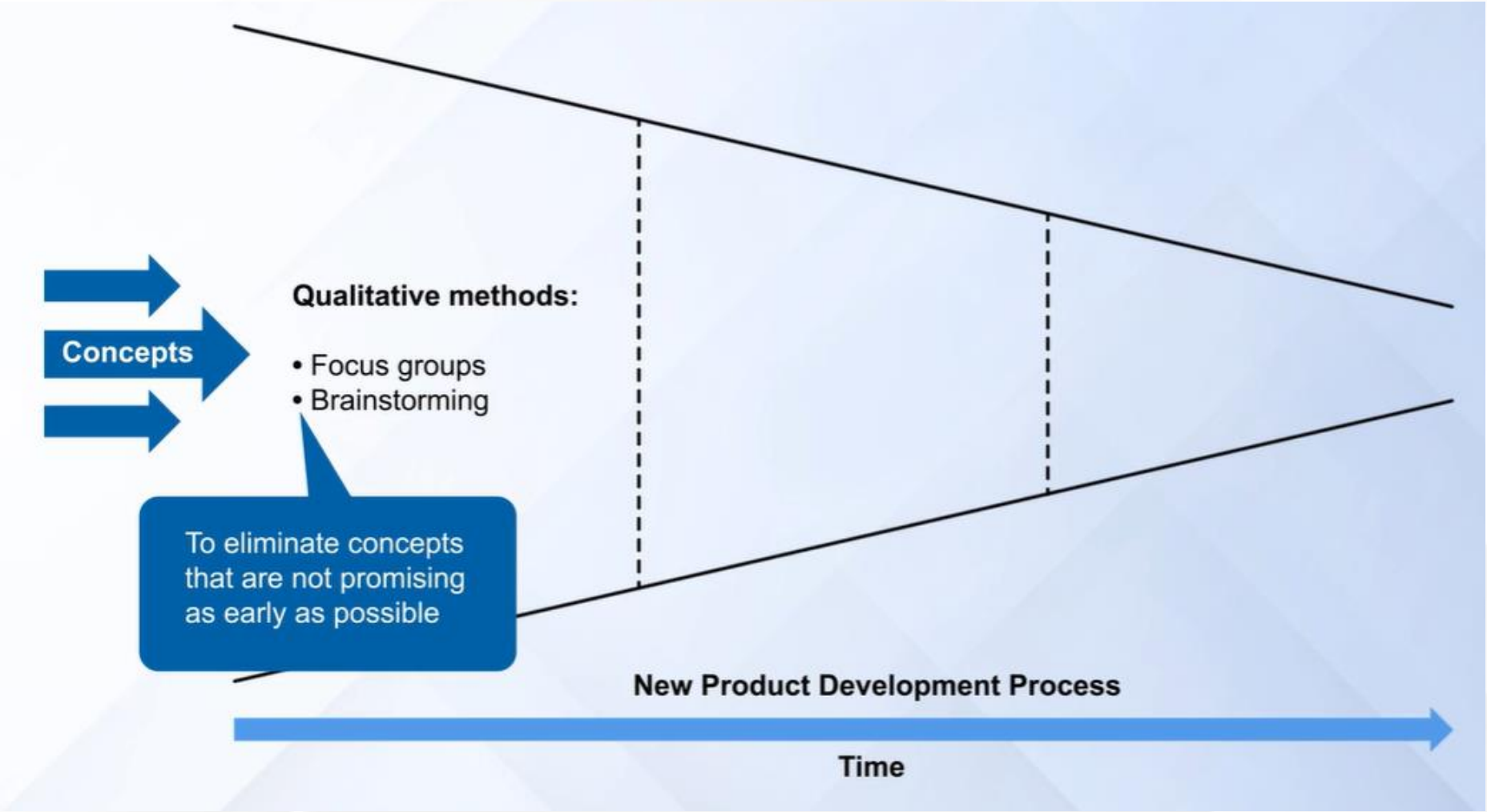
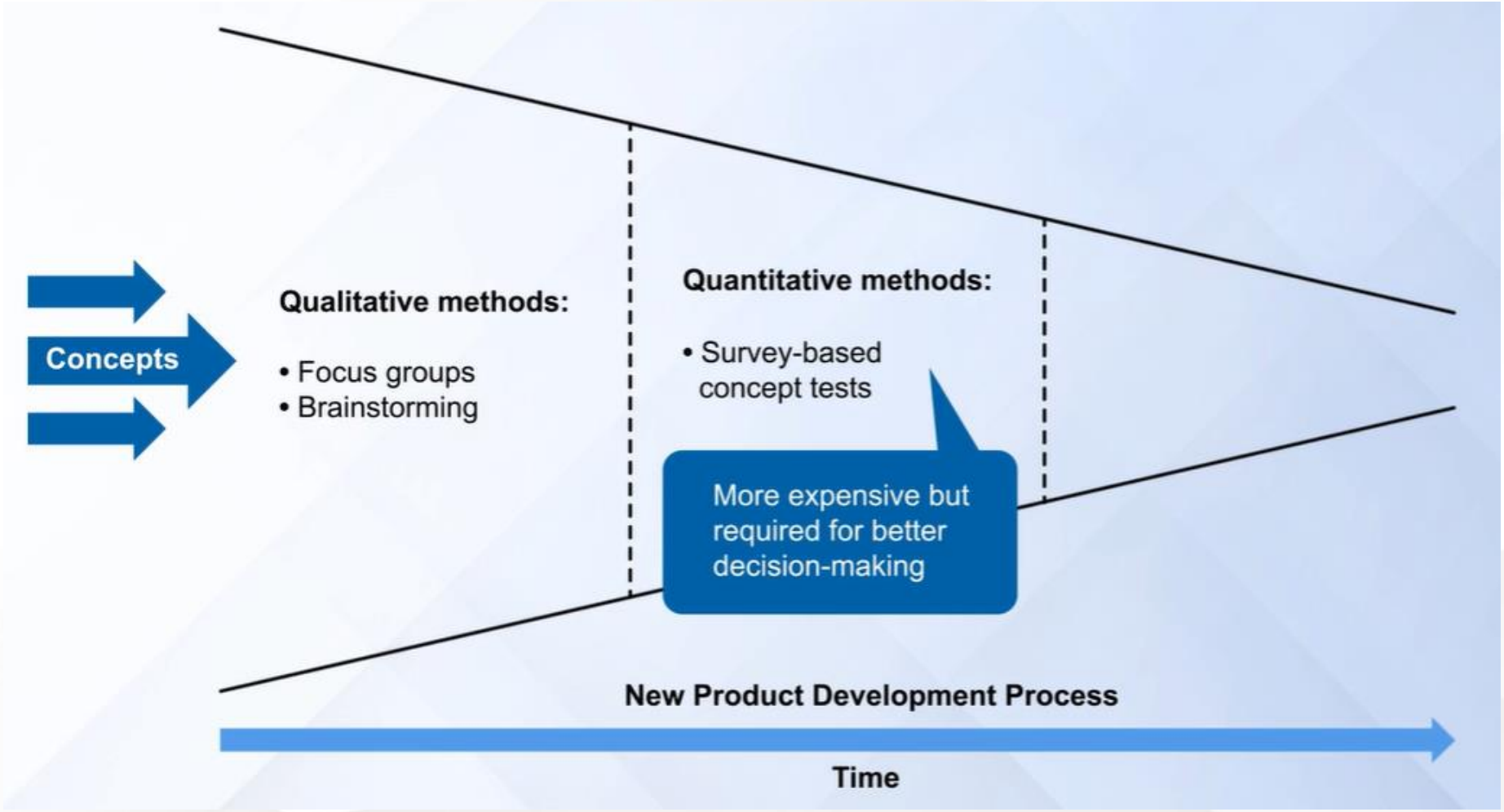
Concept Testing Objectives: Selection and Diagnostics



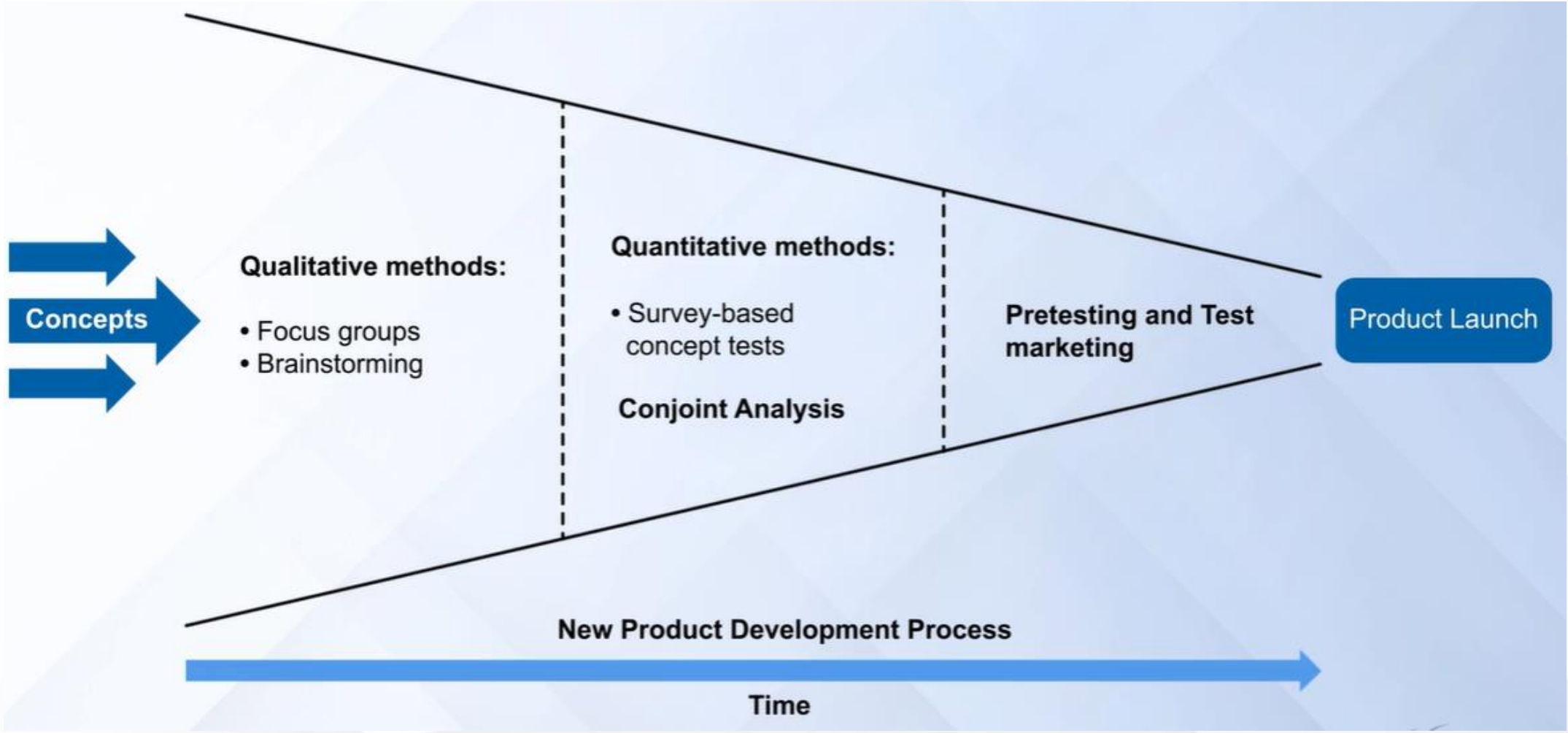
The NPD Process: Concept Testing



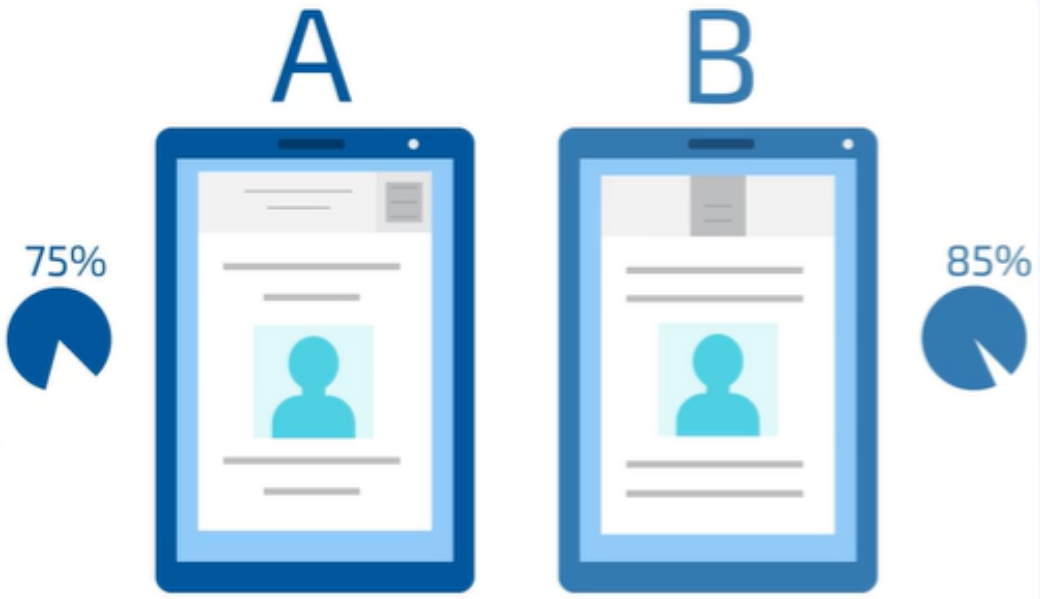
The NPD Process: Concept Testing



The NPD Process: Concept Testing



Concept Testing Alternatives



Concept testing is not necessary for products where the cost of testing is large relative to launching the product.

Concept Testing Issues

- A concept test faces all the issues that are faced by surveys.
- A concept test is an application of a survey in the process of new product development.

Surveys

Considerations in a survey:

- Is the respondent willing and able to answer the questions in the survey?
- Do all the respondents have the same or very similar understanding of the survey question?

Concept Testing Example: Perfumes

- Perception may change from one context to another
- The reactions from consumers may not be reliable

It would be better for the company to hire experts to test their fragrances to produce promising alternatives.

Concept Testing Example: Movies

- Products where past is not a good predictor of the future, concept testing is unlikely to work.
- The success of a new movie is not guaranteed because of the success of a past movie.

Concept Testing the Seven Step Method Part-1

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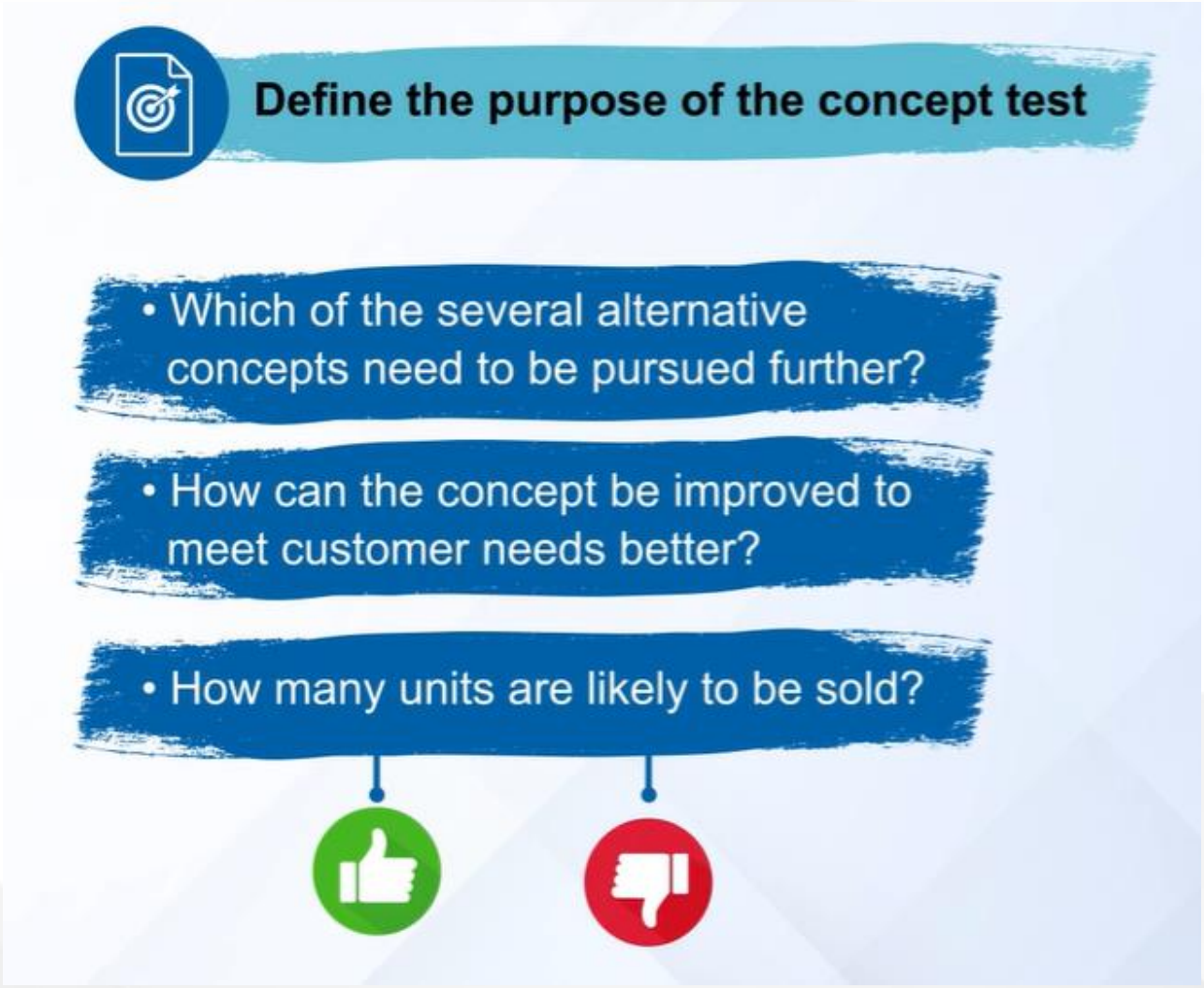
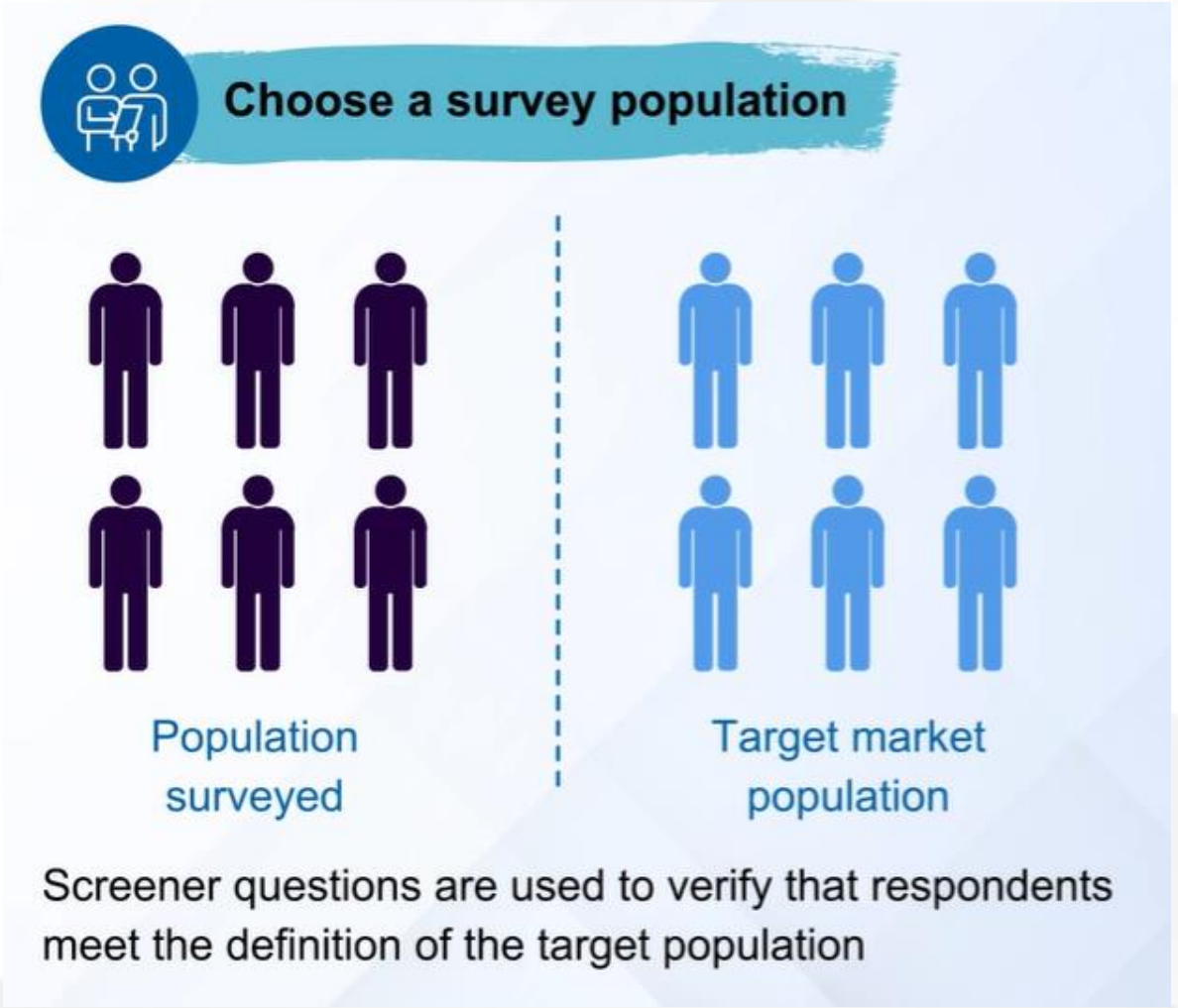
Concept Test: Step 1



Concept Test: Step 2



Concept Test: Step 3

Choose a survey format

Face-to-face interactions

- Mall intercept
- Prearranged interviews
- Trade show booth interviews
- Focus groups

Telephone Interview

- Pre-arranged for specific individuals
- Cold calls to consumers

Postal Mail

- Useful in evaluating physical material
- Takes time
- Poor response rate

Email

- Similar to postal mail
- Better response rate
- Selection bias may be an issue
- Unsolicited mail increasingly becoming a problem

Internet

- Create a virtual concept-testing site
- Email used to recruit respondents
- Selection bias may be an issue

Concept Test: Step 4

Verbal description

Concept Test: Step 4

Communicate the concept

Sketch of the concept

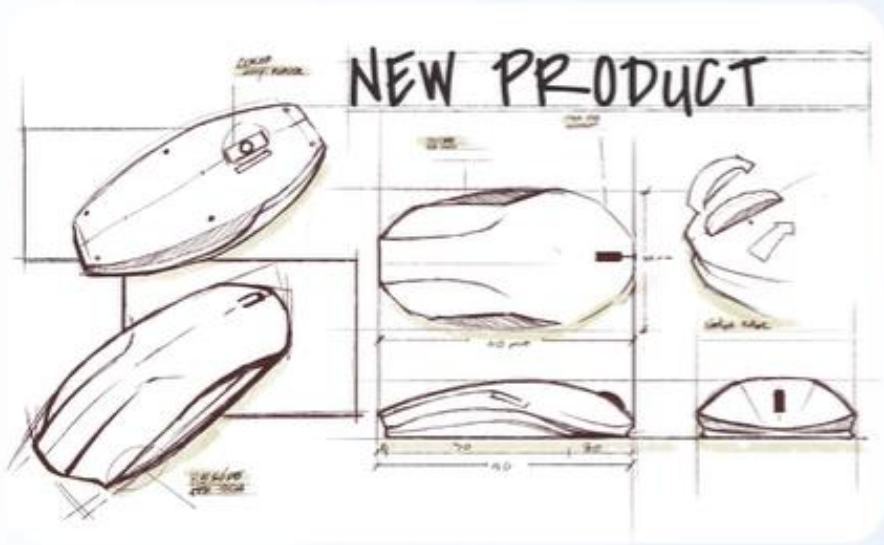
Concept Test: Step 4

Communicate the concept

Photos and renderings

Concept Test: Step 4

Communicate the concept



Storyboard

Concept Test: Step 4

Communicate the concept

Video

Concept Test: Step 4

Communicate the concept

Simulation

Concept Test: Step 4

Communicate the concept

Interactive multimedia

Concept Test: Step 4

Communicate the concept

Physical appearance model

Concept Testing the Seven Step Method Part- 2

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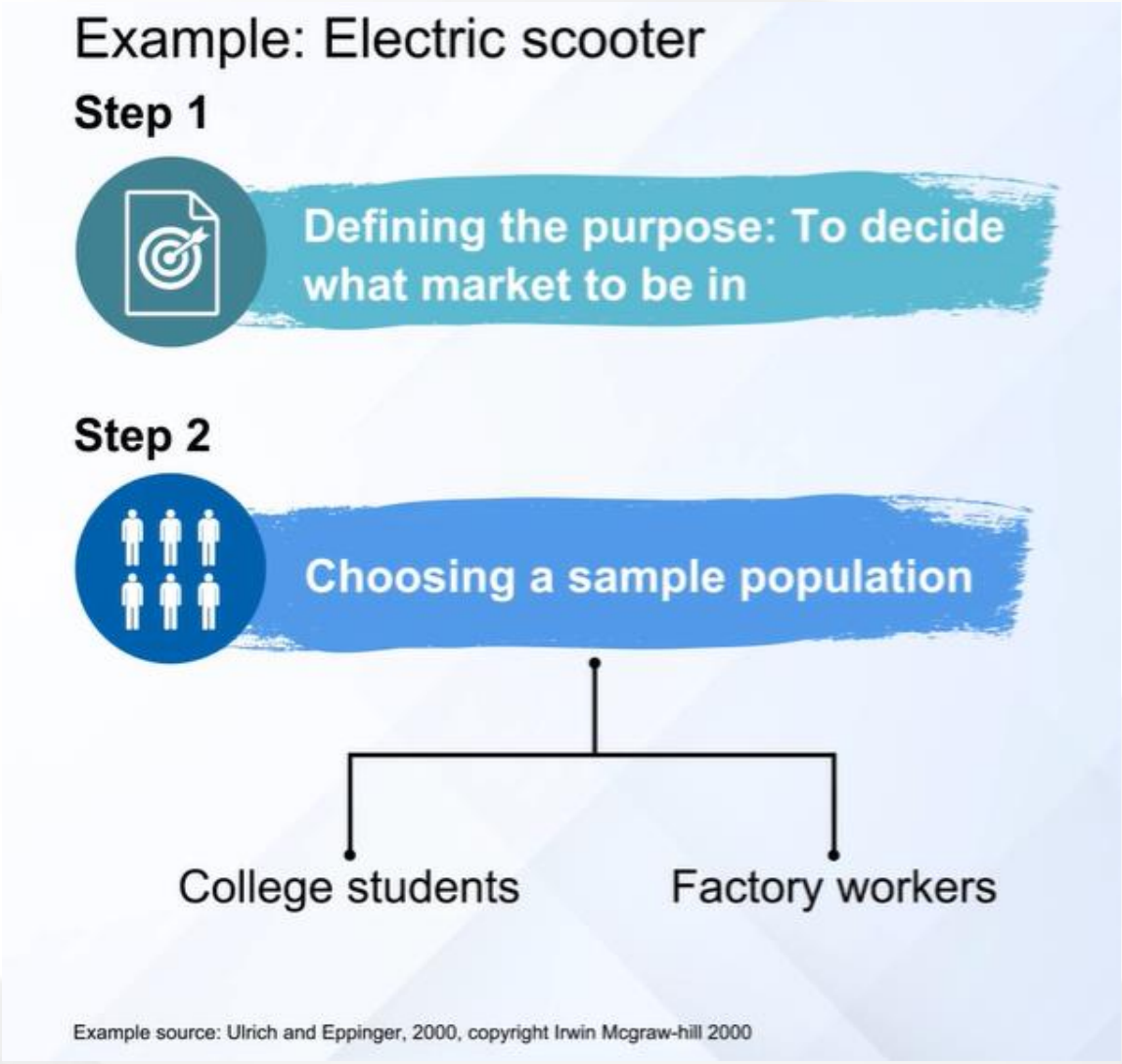
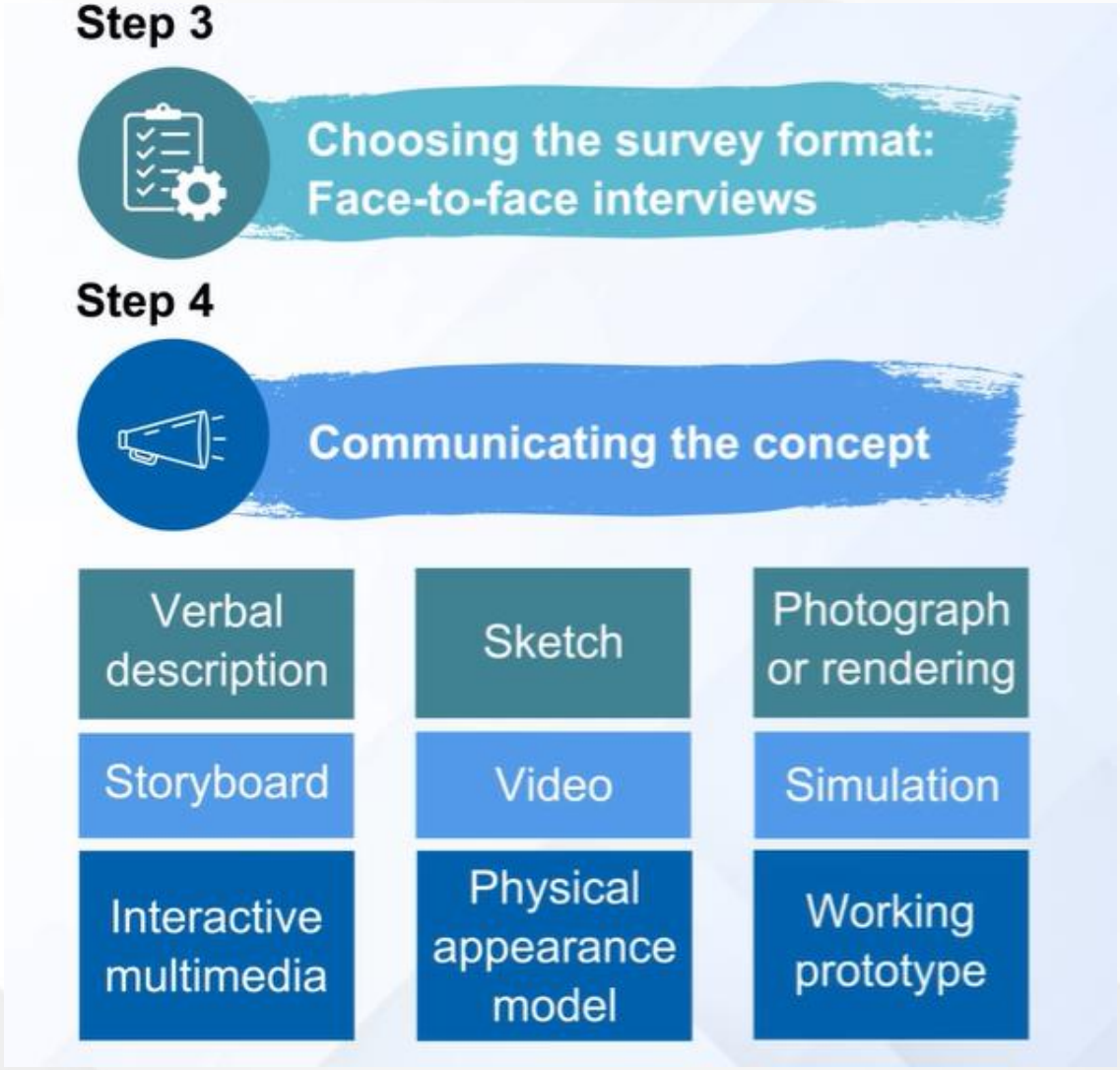
Concept Testing



Example: Electric Scooter



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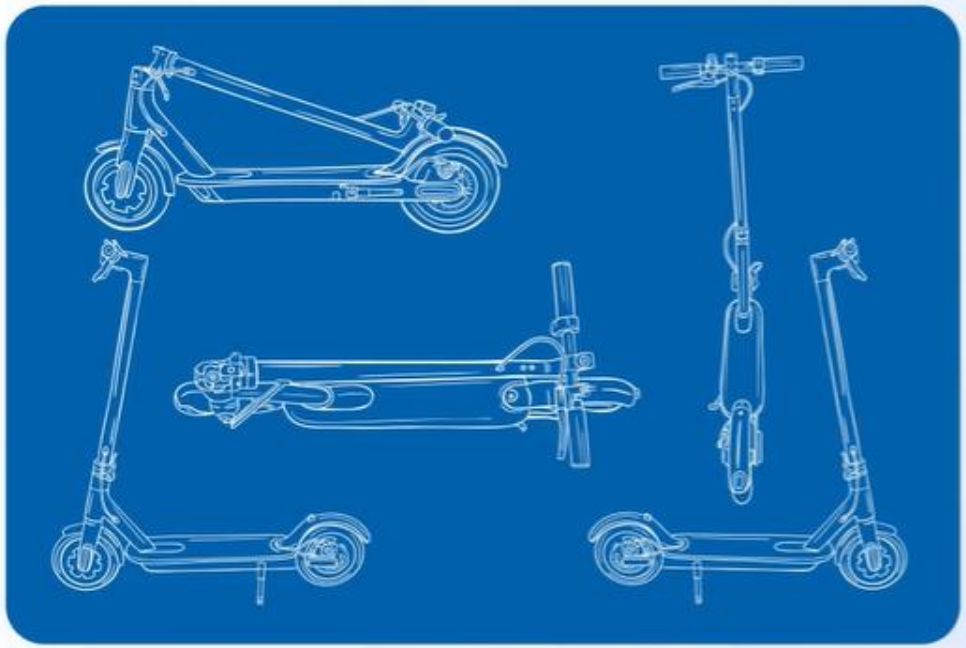
Electric Scooter: Communicating the Concept

Verbal description

- The product is a lightweight electric scooter that can be easily folded and taken anywhere.
- It weighs about 25 pounds.
- It travels at speeds of up to 15 miles per hour and can go about 12 miles on a single charge.
- The scooter can be recharged in about two hours.
- The scooter is easy to ride and has simple controls, an accelerator button and a break.

Electric Scooter: Communicating the Concept

Sketch



Electric Scooter: Communicating the Concept

Rendering

Electric Scooter: Communicating the Concept

Storyboard

Electric Scooter: Communicating the Concept

Survey format is closely linked to the means of communicating the concept.

	Telephone	Electronic Mail	Postal Mail	Internet	Face-to-Face
Verbal Description	X	X	X	X	X
Sketch		X	X	X	X
Photo		X	X	X	X
Storyboard		X	X	X	X
Video				X	X
Simulation				X	X
Interactive multimedia				X	X
Physical appearance model					X
Working prototype					X

Issues in Communicating the Concept

Description of the concept should match the information users are likely to consider when making a purchase decision.

New category

- Measure the purchase intention

Existing category

- Measure the purchase intention
- Ask the respondents to choose from alternatives including concept and other existing products

When to Include Price

Inclusion

If price expected to be unusually high or low

Example: If product provides benefit at low price

Exclusion

- Can ask respondents their price expectation
- If the respondent's price differs from expected price
  - Modify concept
  - Repeat testing including price as an attribute

Concept Testing the Seven Step Method Part- 3

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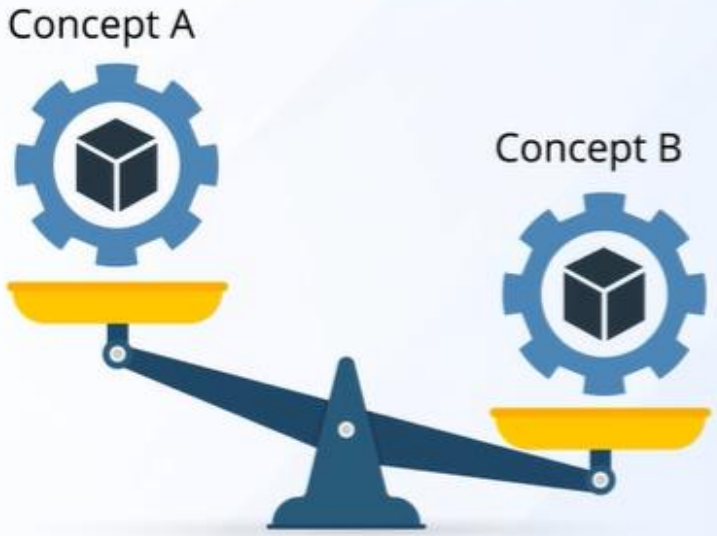
Step 5: Measure Customer Response

- Purchase intent
- Uniqueness of concept
- Believability of concept
- Questions about product attributes
- Problems they see in use
- Reaction to price
- Information about respondents

Step 6: Interpret the Results

While comparing two concepts, if one concept dominates, then **choose the dominating one.**



Result: Inconclusive

Choose based on other criteria or offer multiple versions of the product.

Step 5: Measure Customer Response – Puchase Intent

[Product picture/sketch and description]

1. How interested would you be in buying the product described above if it were available at a store near you?

	Check one	**Responses** in sample(%)
I would definitely buy	_____	5%
I would probably buy	_____	35%
I might or might not buy	_____	33%
I would probably not buy	_____	15%
I would definitely not buy	_____	12%

Step 5: Measure Customer Response – Puchase Intent

[Product picture/sketch and description]

1. How interested would you be in buying the product described above if it were available at a store near you?

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I might or might not buy	_____	33%
I would probably not buy	_____	15%
I would definitely not buy	_____	12%

Top box score

Second box score

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Step 5: Measure Customer Response – Puchase Intent

Measure expected frequency of usage of a consumable product to obtain an **estimate of annual or monthly sales.**

Assuming you tried the product described above and liked it, how often do you think you would buy it?
More than once a week
About once a week
About twice a month
About once a month
Less often
Would never buy it

Step 6: Interpret the Results

- Demand estimation in period following launch (usually one year)
- Model for durables that last several years, i.e., negligible repeat purchase rate

Q = quantity of product expected to be sold during a time period

$$Q = N \times A \times P$$

N = number of potential customers expected to make purchases during the time period.

Step 6: Interpret the Results

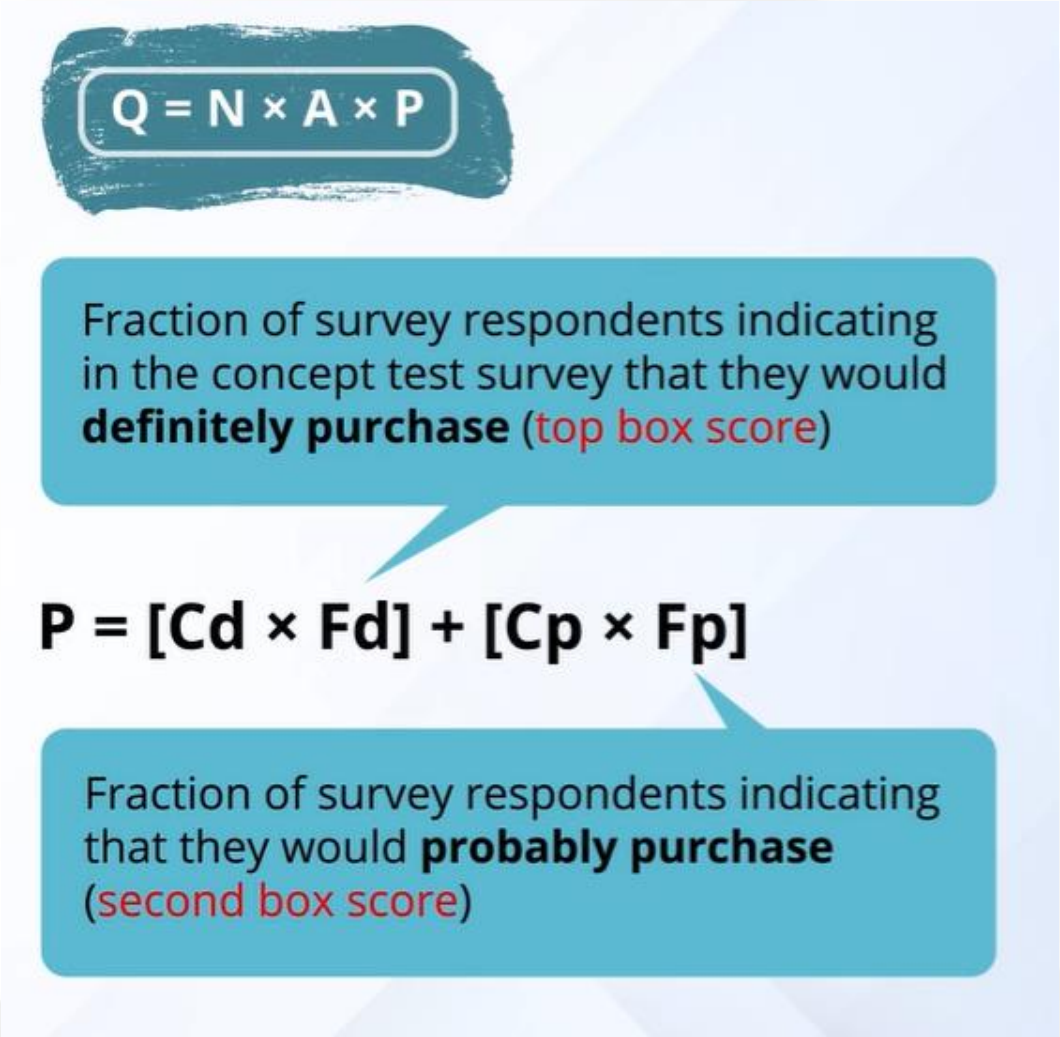
Existing product category: N is the expected number of purchases to be made of existing products in the category over the time period.

New product category: N is the number of customers in the target market for new product.

A = Fraction of these potential customers or purchases for which the **product is available**, and **the customer is aware** of the product

P = Probability that the **product is purchased** if available and if **the customer is aware** of it

Step 6: Interpret the Results



Step 6: Interpret the Results

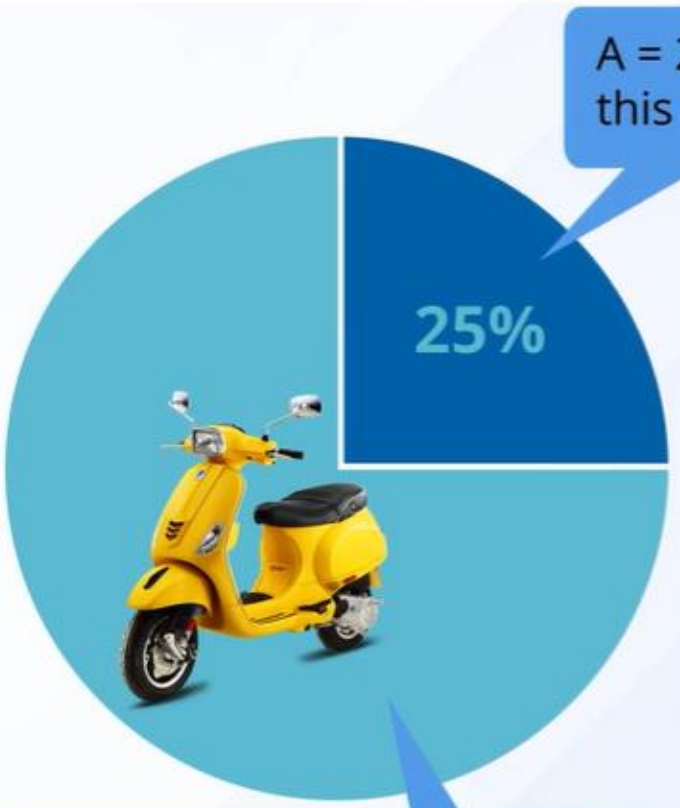
Constants usually based on company experience with similar products in the past.

$$P = [Cd \times Fd] + [Cp \times Fp]$$

$0.10 < Cd < 0.50$

$0 < Cp < 0.25$

Concept Testing Example 1: Sales Forecast



A = 25% sales in this category

N = 150,000 units per year

The **'definitely would buy'** fraction = 0.30

The **'probably would buy'** fraction = 0.20

Cd = 0.4

Cp = 0.2

Concept Testing Example 1: Sales Forecast

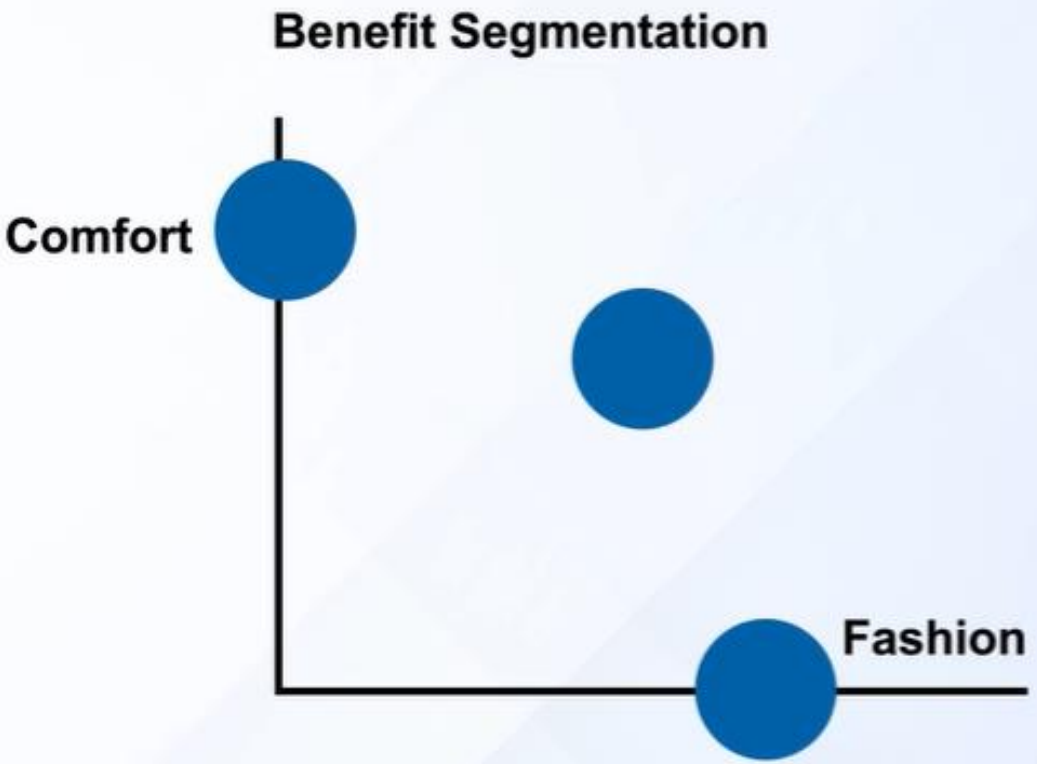
N = 150,000
A = 0.25

P = (0.4 x 0.3) + (0.2 x 0.2)
= 0.16

Q = N × A × P
= 150,000 x 0.25 x 0.16
= 6000 units per year

Concept Testing Example 2: Segmentation

Target all 3 segments and develop different solutions for each one of them



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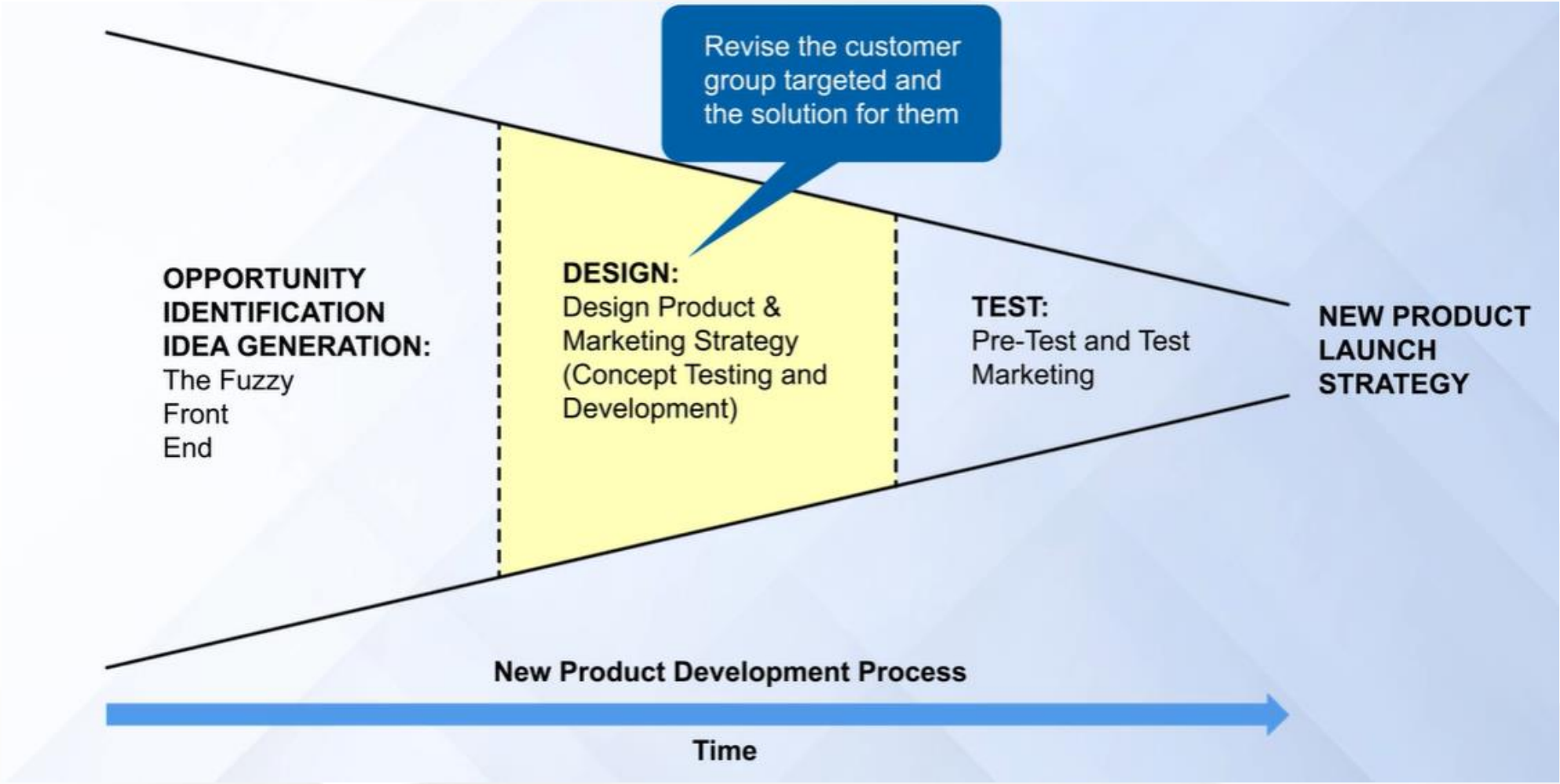

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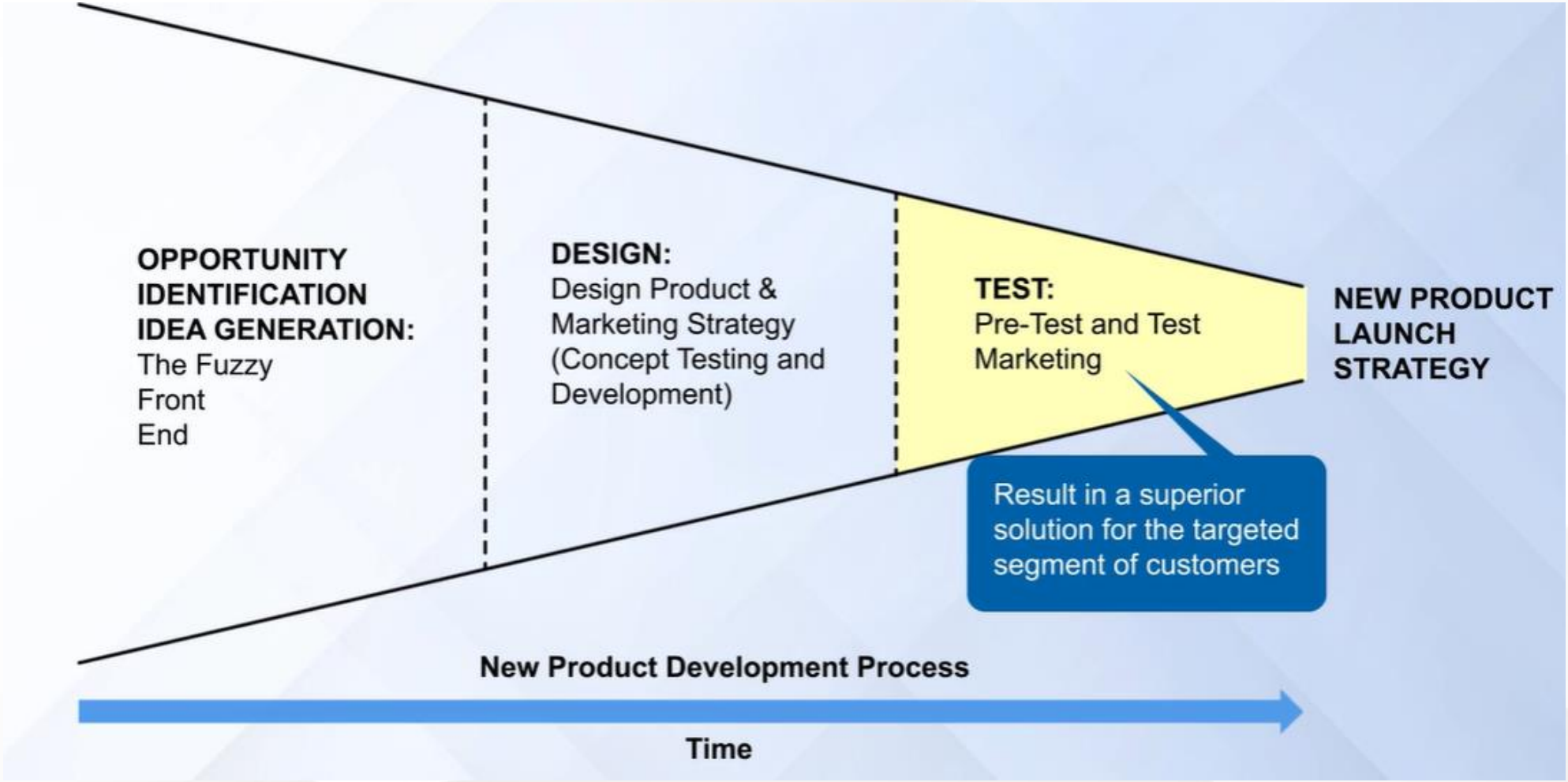

Step 7: Reflecting on Results and Process

Primary benefit of concept testing:

- Feedback from real potential customers
- Qualitative insights gathered through open minded discussions for refining the concept

Step 7: Reflecting on Results and Process

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Two diagnostic questions:

- Was the concept communicated properly to elicit true intent?
- Is the resulting forecast consistent with observed sales rates of similar products?

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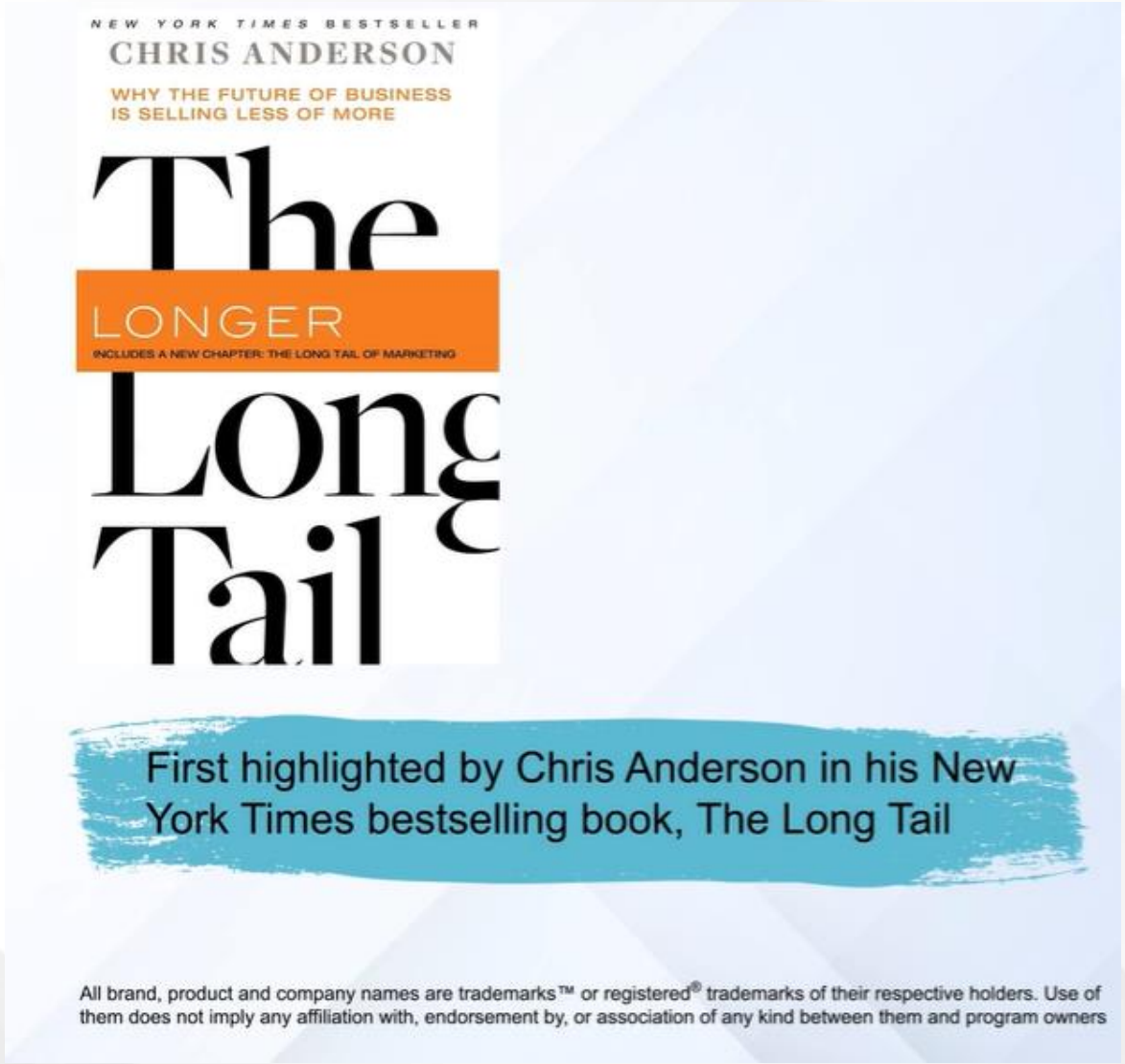
Impact on Product: The Long Tail Effect

The Long Tail Effect



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Leveraging the Long Tail Effect

- Shorten product development process
- Directly test new offerings in the market
- Experiment with many types of offerings
- Decide what types of products to offer based on the response

Limitations of Physical Stores

- Physical stores did not allow vendors to keep stock of niche products.
- Consumers of niche products did not form a profitable segment for the store.

Opportunities Created by Digital Technologies

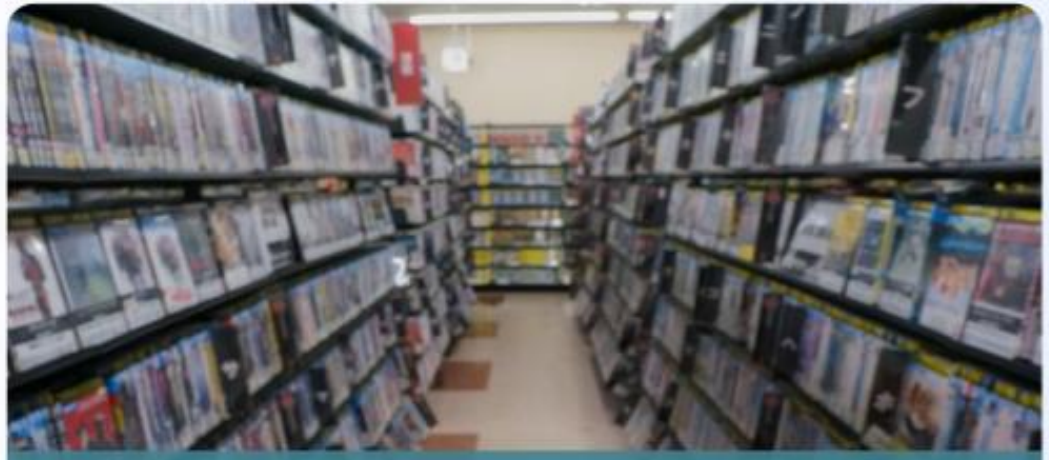
Digital technologies have opened opportunities for physical products.

Example 1: Aggregate Demand for Hot Sauce

Demand is limited making it unviable for store to carry significant variety

Aggregate demand enables business to be economically viable

Example 2: Limitations DVD Stores



Only popular titles kept on shelves for maximising rentals

- Producers spend time analysing movie success rate
- Artists played a dominant role

Aggregate Demand for Movies

- Can keep all kinds of titles, even niche titles with low demand.
- Aggregated demand across a large region is significant
- Could experiment with many types of movie content and create new offerings
- Propelled Netflix to be one of the largest media companies

Market Potential and Forecasting for New Products

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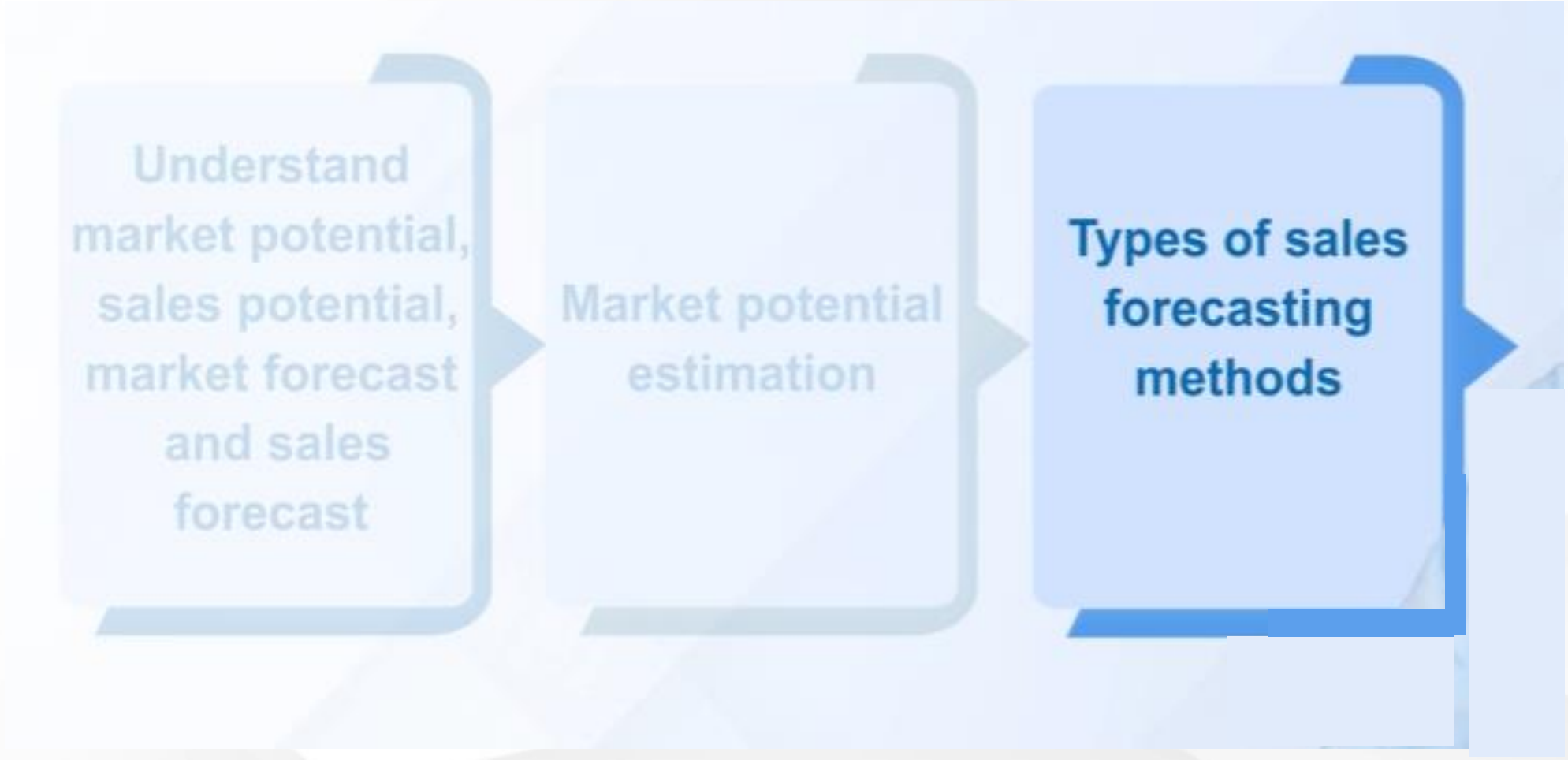
Objectives

Understand market potential, sales potential, market forecast and sales forecast

Objectives


Understand market potential, sales potential, market forecast and sales forecast
Market potential estimation

Objectives



Objectives

Understand market potential, sales potential, market forecast, and sales forecast

Market potential estimation

Types of sales forecasting methods

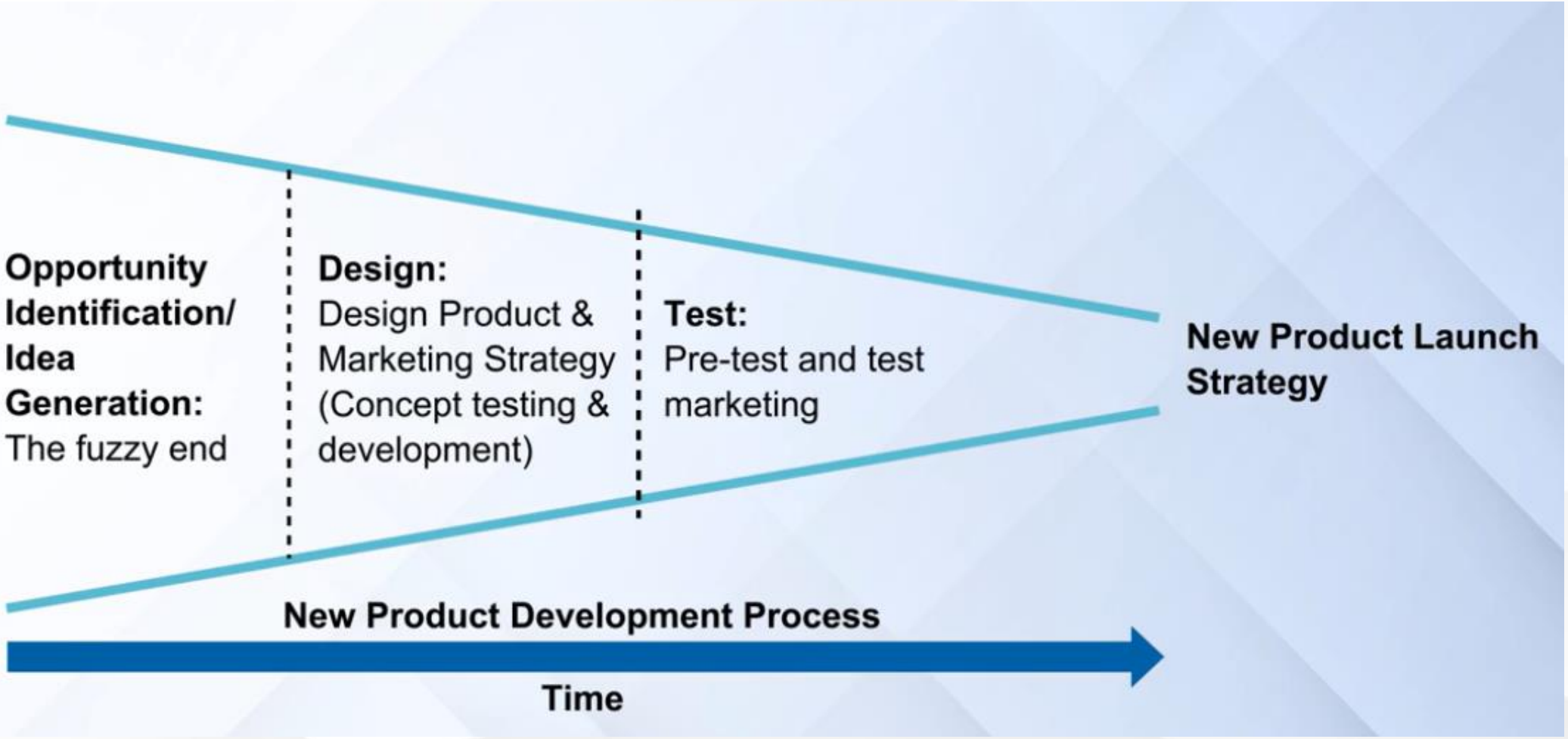
Understand the use of the following models for forecasting sales:

- **Moving average**
- **Exponential smoothing**

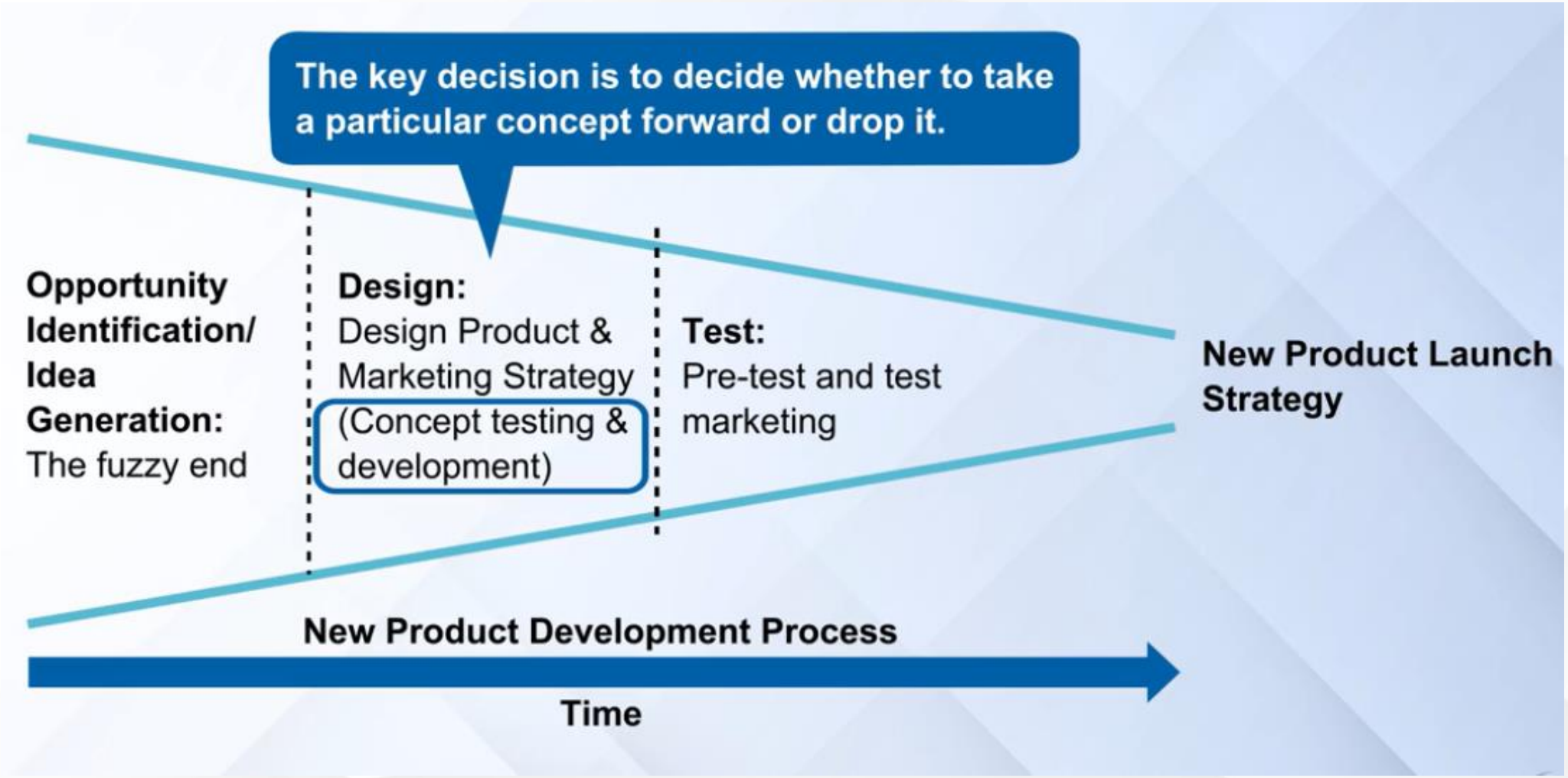
Objectives

Potential versus Forecast

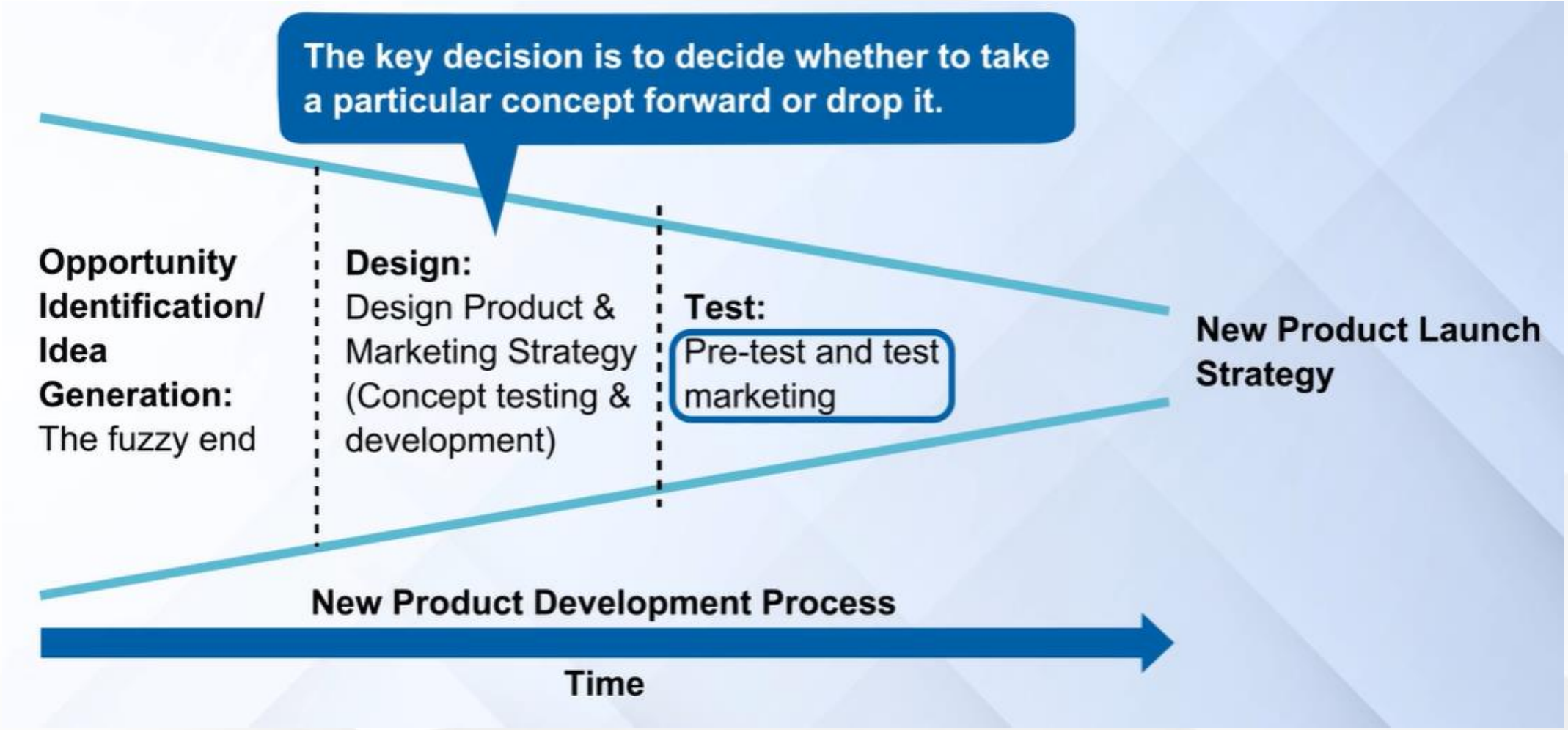
New Product Development Process



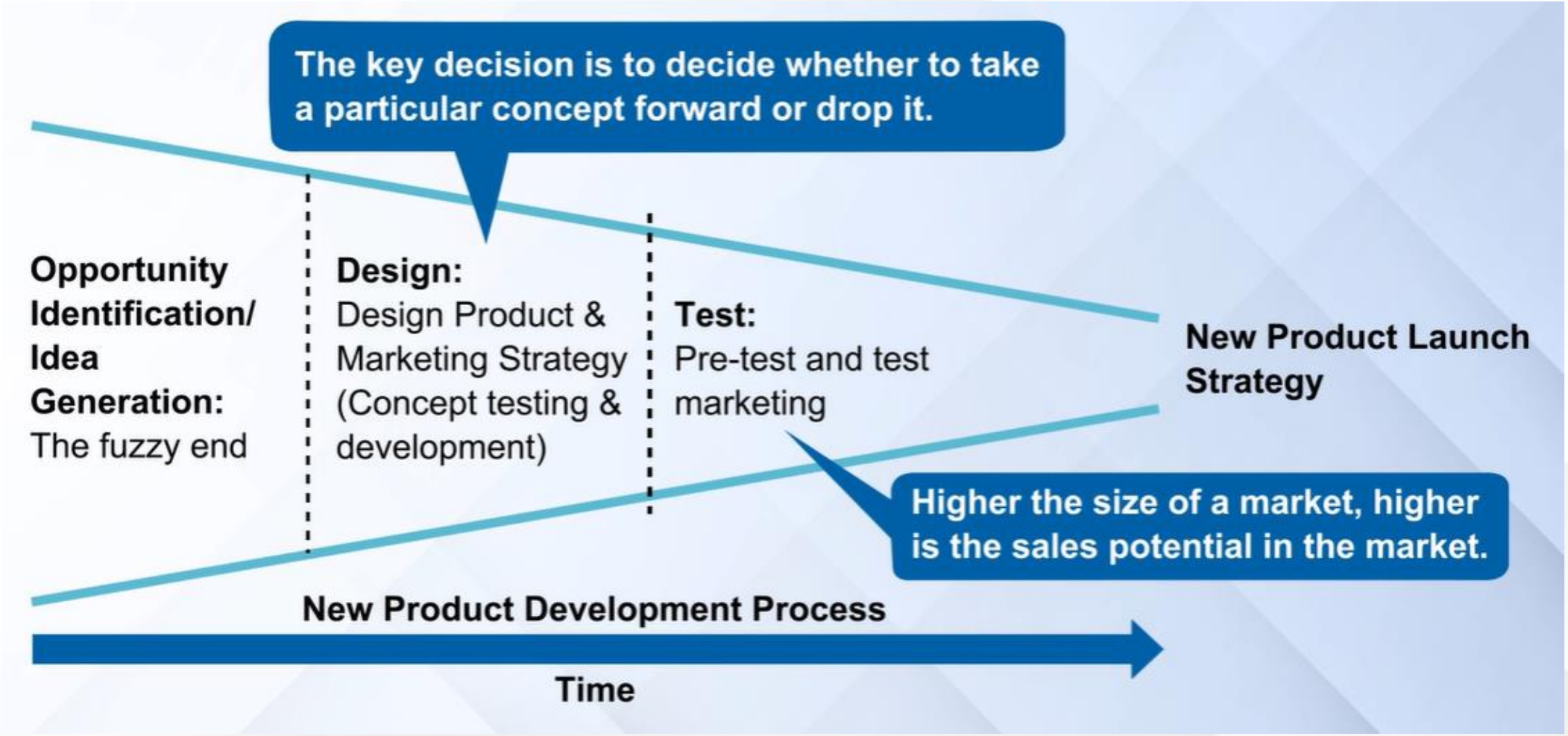
New Product Development Process



New Product Development Process



New Product Development Process



Potential versus Forecast

Potential

The maximum sales **reasonably attainable** under a given set of conditions within a specified period of time.

Forecast

The amount of sales **expected** to be achieved under a set of conditions within a specified period of time.

Potential versus Forecast Matrix

	Expectations	Possibilities
Firm/Brand	Sales Forecast	
Category		

Potential versus Forecast Matrix

Potential versus Forecast Matrix

	Expectations	Possibilities
Firm/Brand	Sales Forecast	
Category	Market Forecast	

Potential versus Forecast Matrix

	Expectations	Possibilities
Firm/Brand	Sales Forecast	
Category	Market Forecast	

Potential versus Forecast Matrix

Potential versus Forecast Matrix

	Expectations	Possibilities
Firm/Brand	Sales Forecast	Sales Potential
Category	Market Forecast	

Potential versus Forecast Matrix

	Expectations	Possibilities
Firm/Brand	Sales Forecast	Sales Potential
Category	Market Forecast	

Potential versus Forecast Matrix

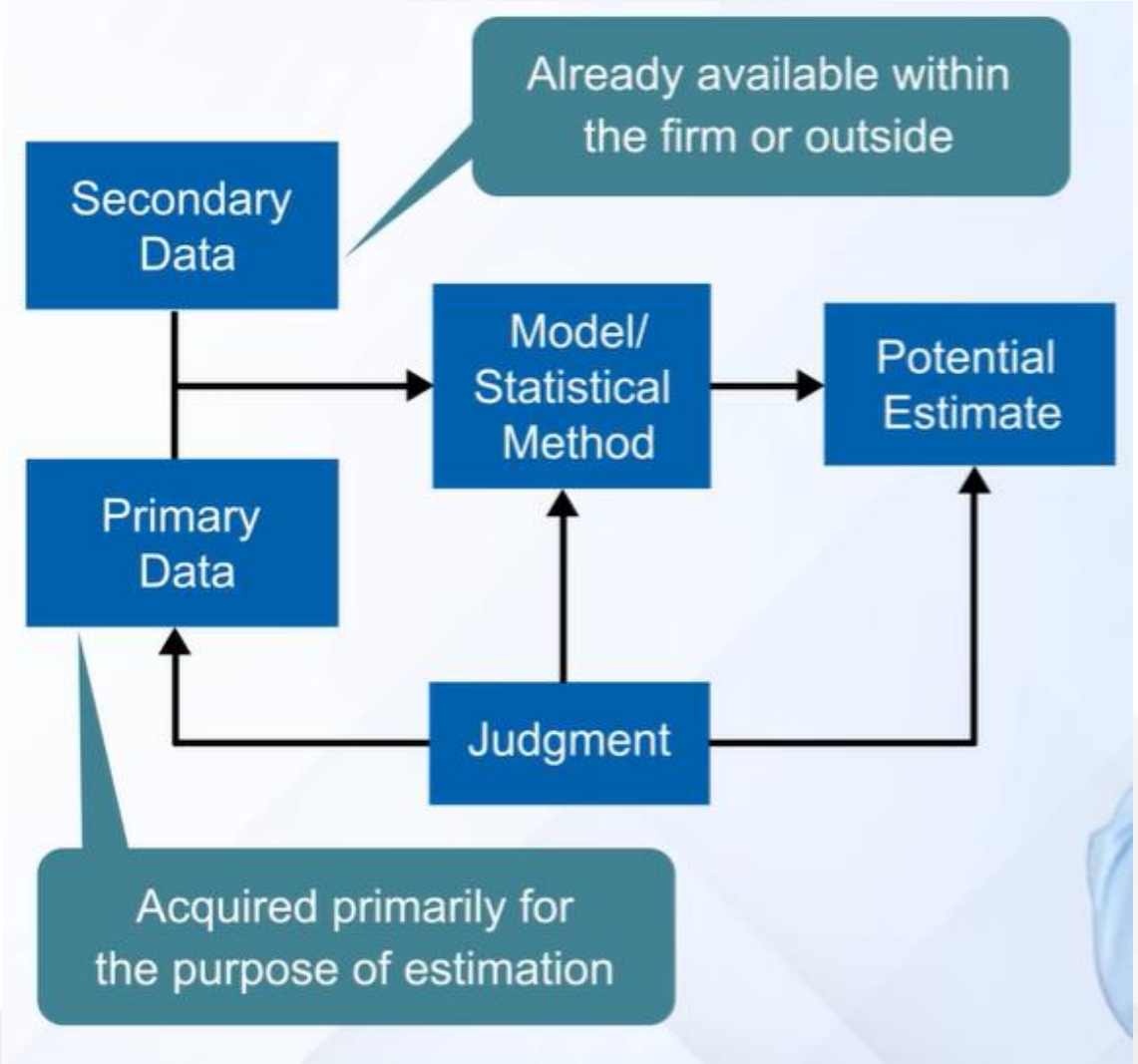
	Expectations	Possibilities
Firm/Brand	Sales Forecast	Sales Potential
Category	Market Forecast	Market Potential

Potential versus Forecast Matrix

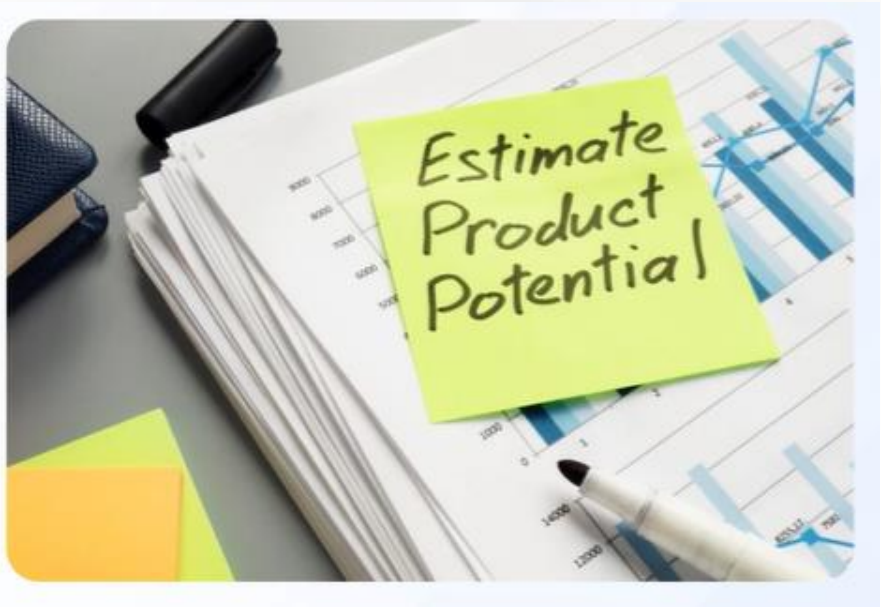
	Expectations	Possibilities
Firm/Brand	Sales Forecast	Sales Potential
Category	Market Forecast	Market Potential

Potential Estimation

Potential Estimation Process



Accuracy and Good Estimation

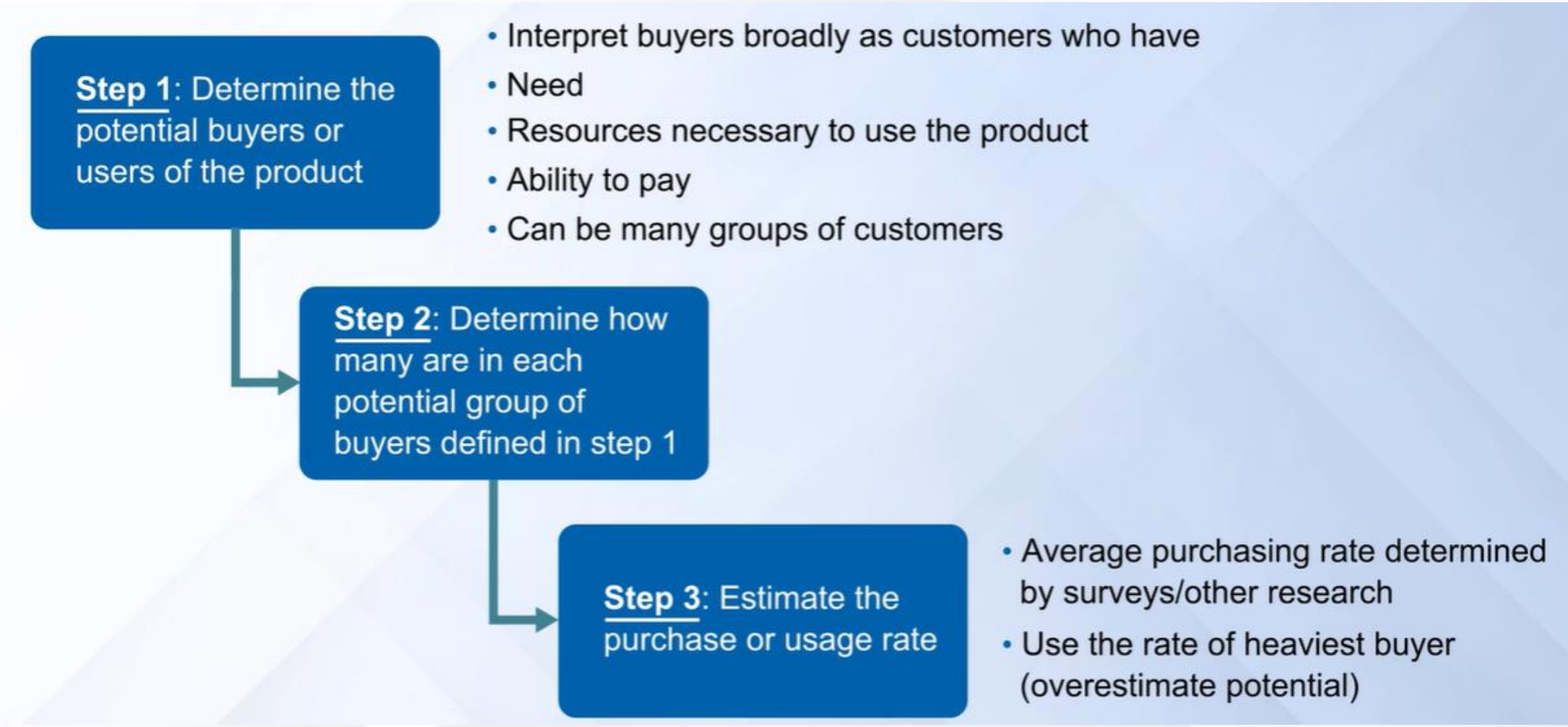


- Cost and opportunity cost increase with accuracy
- Good forecast does not guarantee accuracy
- Estimation of potential should satisfy the purpose and done withing the constraints of time and resources

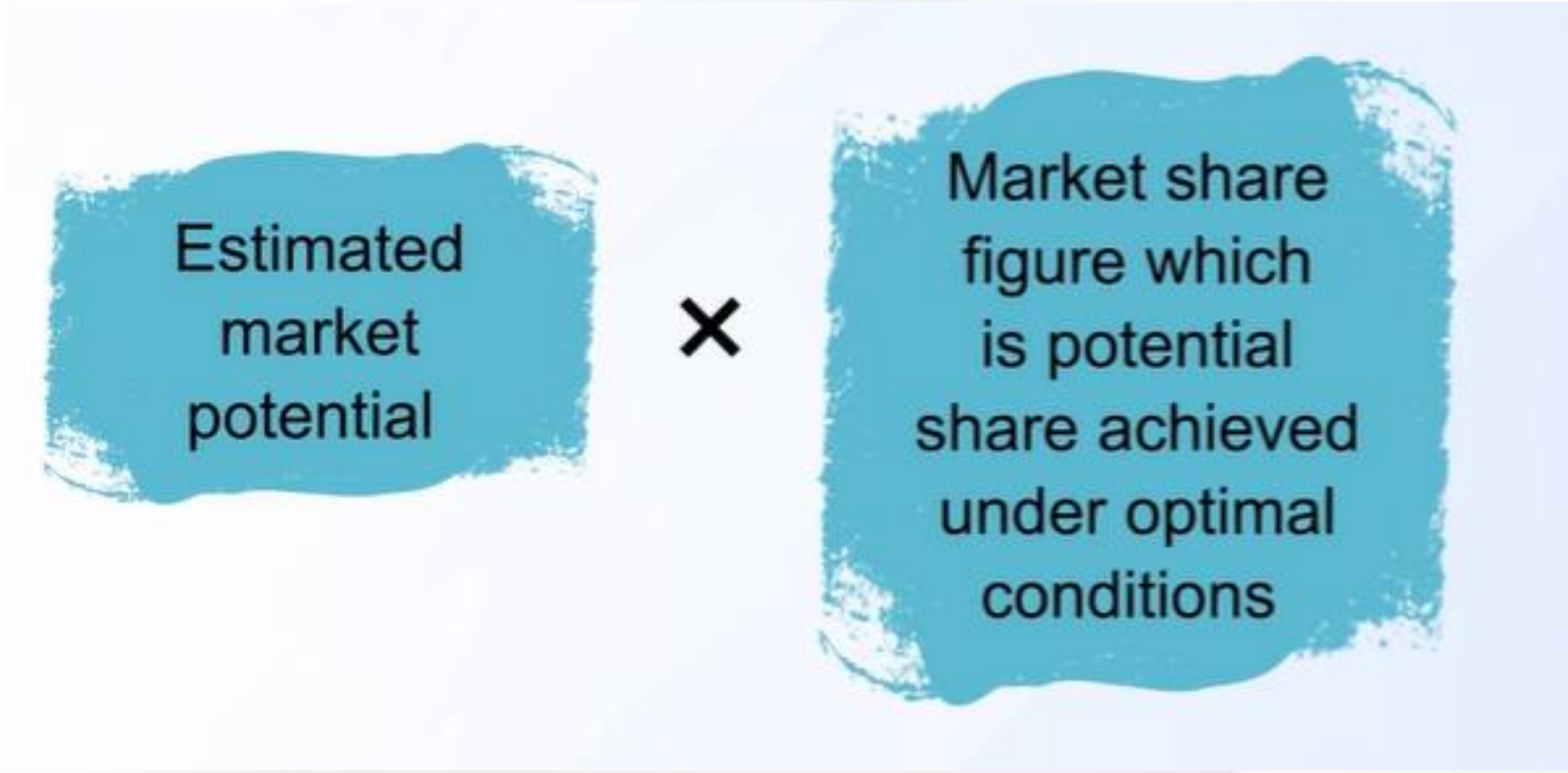
Estimating Market Potential – Example

- Market potential → 250 million diapers/year
- Would you spend resources to get a more accurate estimate of the market potential? No →
- Estimate changes by 50 million diapers per year
  - ➢ No difference in the decision
  - ➢ Don’t conduct any marketing research.

Market Potential Estimation



Sales Potential Estimation



Sales Forecasting Methods

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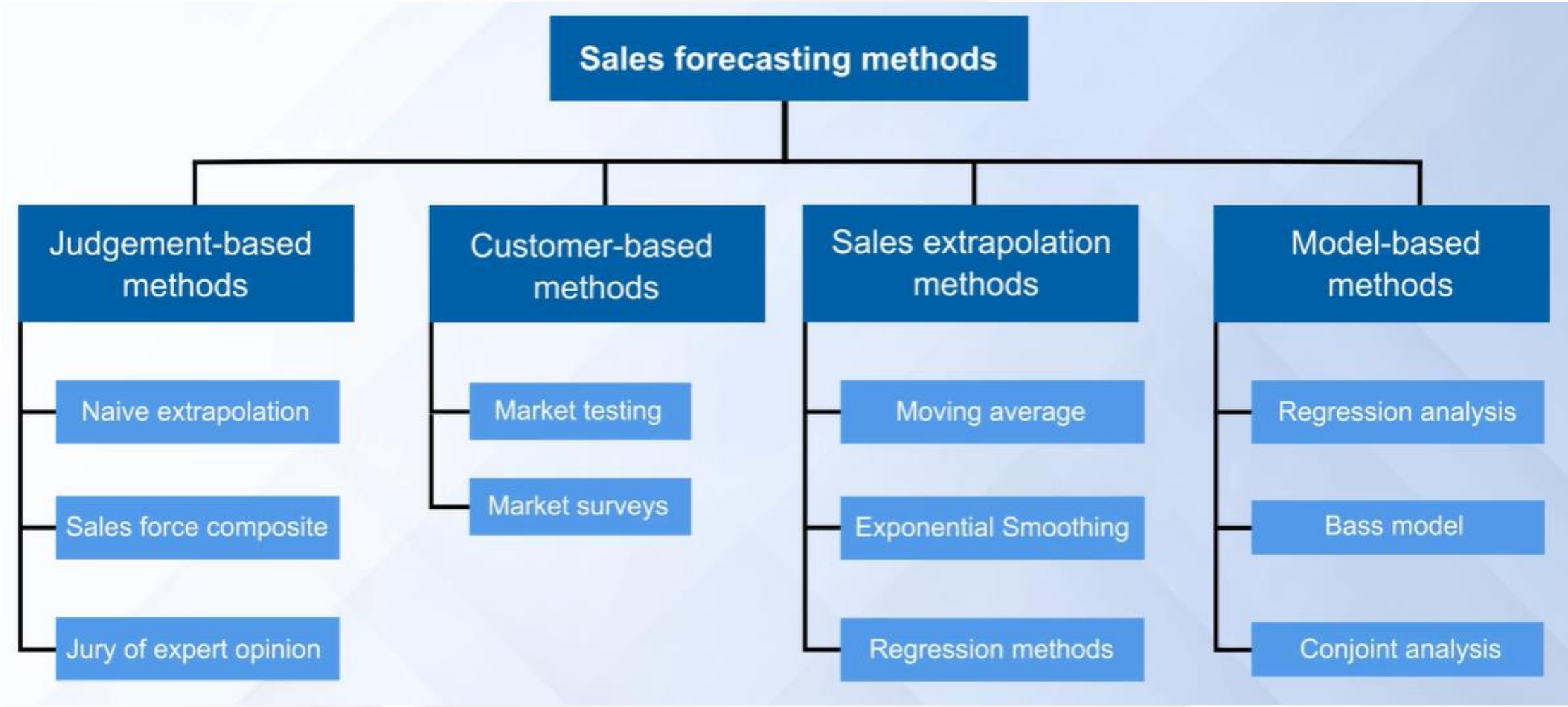
Overview: Sales Forecasting Methods



Usage of Forecasting Methods

Methods	Forecast Period			
	Immediate (<1 month)	Short (1 month – <6 months)	Medium (6 months – 1 year)	Long (>1 year)
Judgmental				
Manager's opinion	27.90	39.8	37.1	9.3
Jury of expert opinion	17.5	28.9	40.1	26.2
Sales force composite	28.6	17.5	33.1	8.7
Quantitative				
Moving average	17.7	33.5	28.3	8.7
Straight-line projection	7.6	13.2	12.5	8.2
Naive	16	18.5	13.8	0
Exponential smoothing	12.9	19.6	16.8	4.2
Regression	13.4	25.1	26.4	16.5

Source: Research study on forecasting practices in US corporations published in *Interfaces*

Naive Extrapolation

Stable growth rate

Last period sales level + x% = Next period sales

↓

Estimated change

Alternative: Using actual sales

F = Forecast

A = Actual sales

T = Time

Forecast is the same as the last actual observation

$F(t) = A(t-1)$

Features:

- Simple method with virtually no cost
- Data analysis absent

Naive Extrapolation

Seasonal variations

- Forecast is the same as the last actual observation in the same point in the cycle.
- A cycle lasts **n** periods

Symbolic Representation: $\boxed{F(t) = A(t-n)}$

Example: $\text{Forecast}_{\text{Jan}} = \text{Actual sales}_{\text{Last Jan}}$

Naive Extrapolation

Data with trends

If there is a constant trend, the change from (t-2) to (t-1) will be exactly like the change from (t-1) to (t)

Symbolic Representation:

$$F(t) = A(t-1) + [A(t-1) - A(t-2)]$$

Sales Force Composite

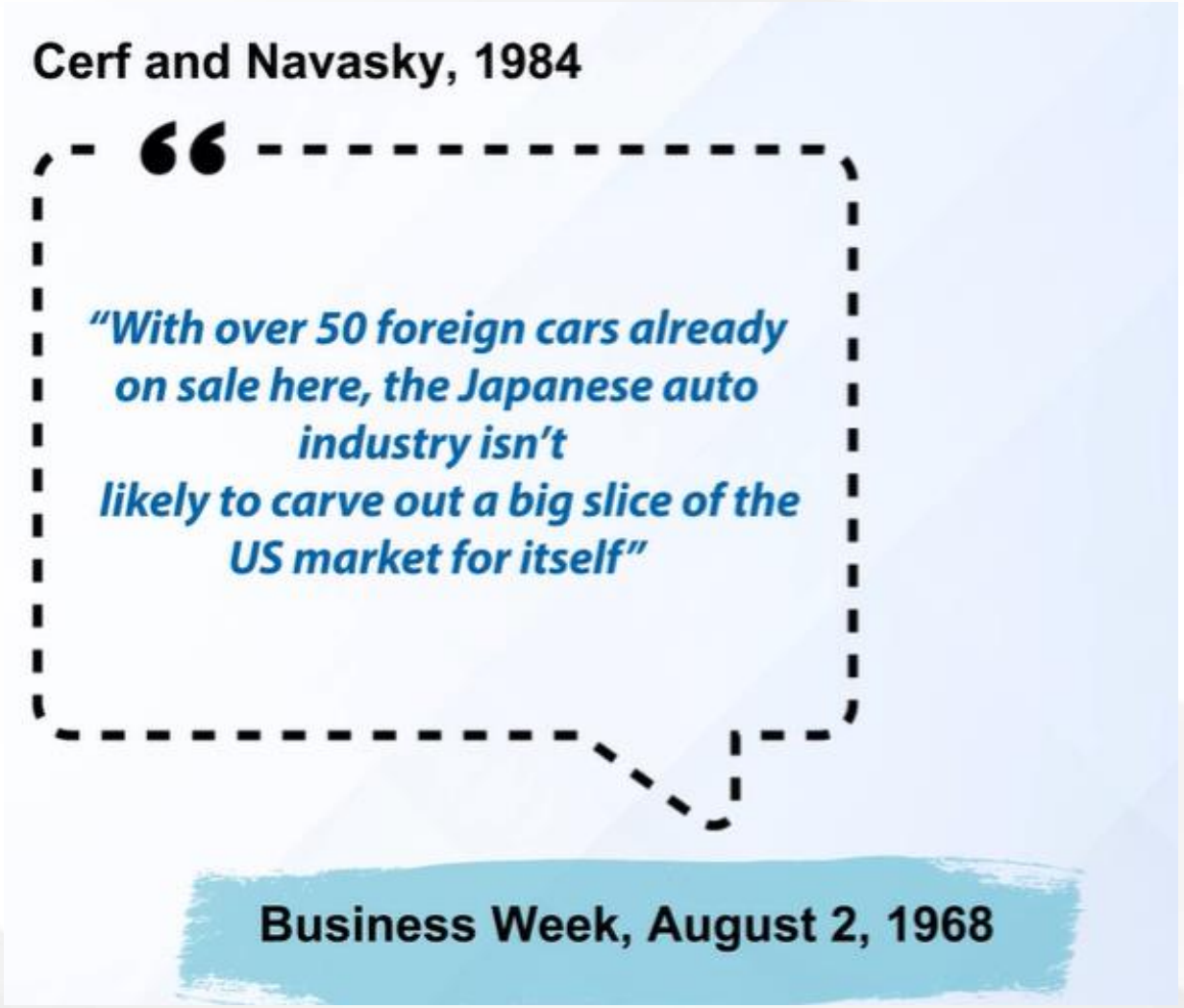
Ask salespeople to make forecasts.

Aggregate these forecasts to get a forecast for the product.

Jury of Expert Opinion

- Uses expert opinion to arrive at the forecast
- Supplements other methods
- Overcomes some limitation of quantitative techniques

Expert Predictions



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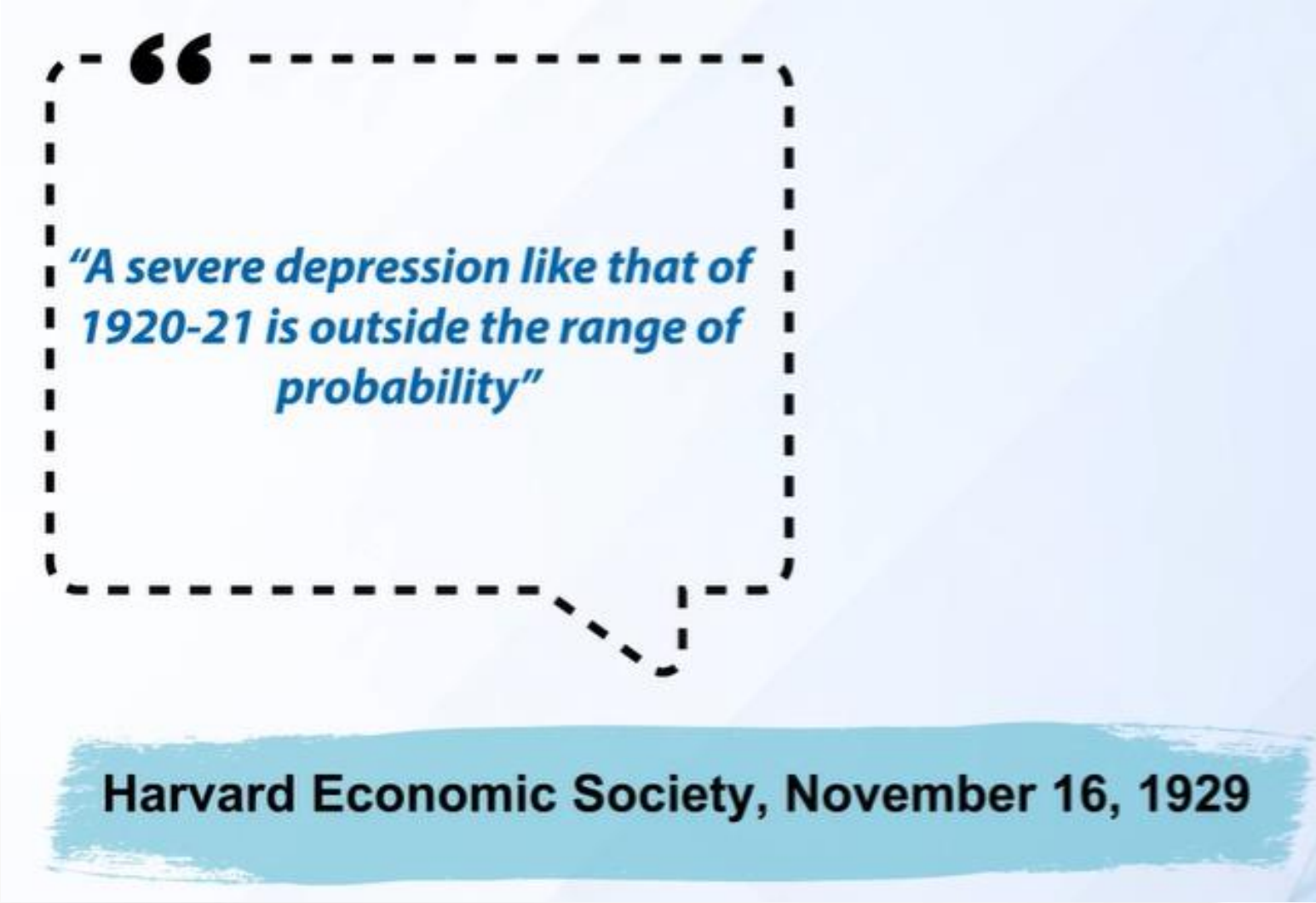
Expert Predictions



Expert Predictions

Thomas Edison, 1880

Moving Average

Quantitative Technique: Moving Average

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Quantitative Technique: Moving Average

Moving Average forecast:

- Considers the sales achieved in the latest time periods
- Averages them to get a forecast for the next time period

Moving Average

$$F(t) = MA(t,n) = \frac{\sum_{i=t-n}^{t-1} A(i)}{n}$$

Moving Average

$$F(t) = MA(t,n) = \frac{\sum_{i=t-n}^{t-1} A(i)}{n}$$

F (t) = MA Forecast for period *t*

MA (t,n) = MA forecast in period (*t-1*) for period *t*

Moving Average

$$F(t) = MA(t,n) = \frac{\sum_{i=t-n}^{t-1} A(i)}{n}$$

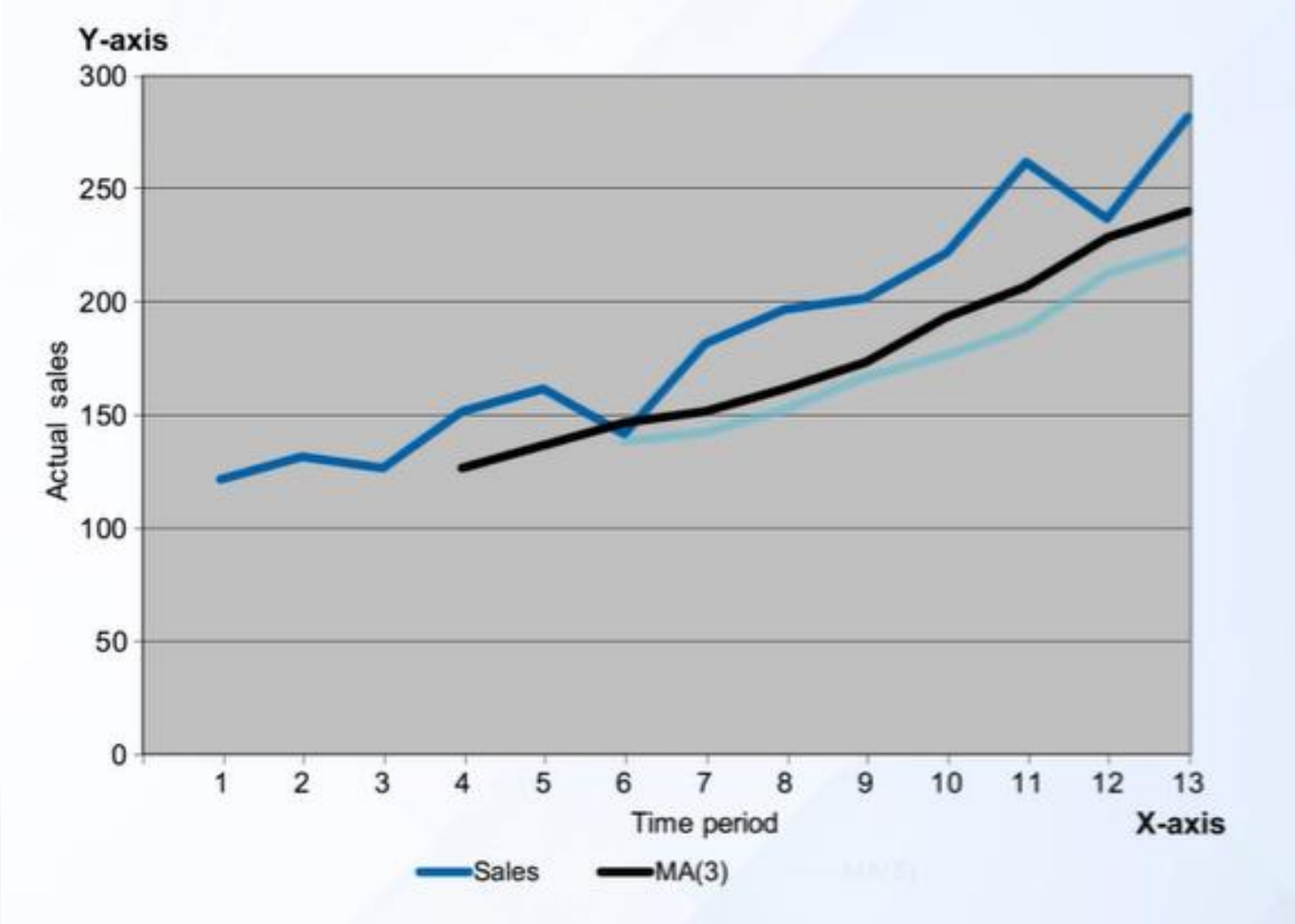
n = Number of past terms used in averaging

A(i) = Actual sales in period *i*

Example 1: Moving Average

Period	Sales	MA(3)	MA(5)	Row Change	Change MA(3)	Change MA(5)
1	100			-	-	-
2	110			10	-	-
3	105			-5	-	-
4	130	105		25	-	-
5	140	115		10	10	-
6	120	125	117	-20	10	-
7	160	130	121	40	5	4
8	175	140	131	15.00	10.00	10
9	180	151.6667	145	5.00	11.67	14
10	200	171.6667	155	20.00	20.00	10
11	240	185	167	40.00	13.33	12
12	215	206.6667	191	-25.00	21.67	24
13	260	218.3333	202	45.00	11.67	11

Example 1: Moving Average



Example 2: MA (3)

Month	Demand
1	42
2	40
3	44
4	41
5	40
6	39

MA (6,3) = (44 + 41 + 40) / 3
= 41.67

If A (6) = 39, then
MA (7,3) = (41 + 40 + 39) / 3
= 40.00

Weighted Moving Average

Weighted moving average:

- Similar to moving average
- Assigns more weight to the most recent values in a time series
- Recent observations are expected to be better indicators of the future

Weighted Moving Average

Month	Demand
1	42
2	40
3	43
4	40
5	41
6	39

Compute weighted average forecast weight:

0.4 for the most recent period
0.3 for the next most recent
0.2 for the next and
0.1 for the next

If the actual demand for period 5 is 41,

$$F(5) = .40(41) + .30(40) + .20(43) + .10(40) = 41.0$$

If the actual demand for period 6 is 39,

$$F(7) = .40(39) + .30(41) + .20(40) + .10(43) = 40.2$$

Exponential Smoothing and Comparing Predictions

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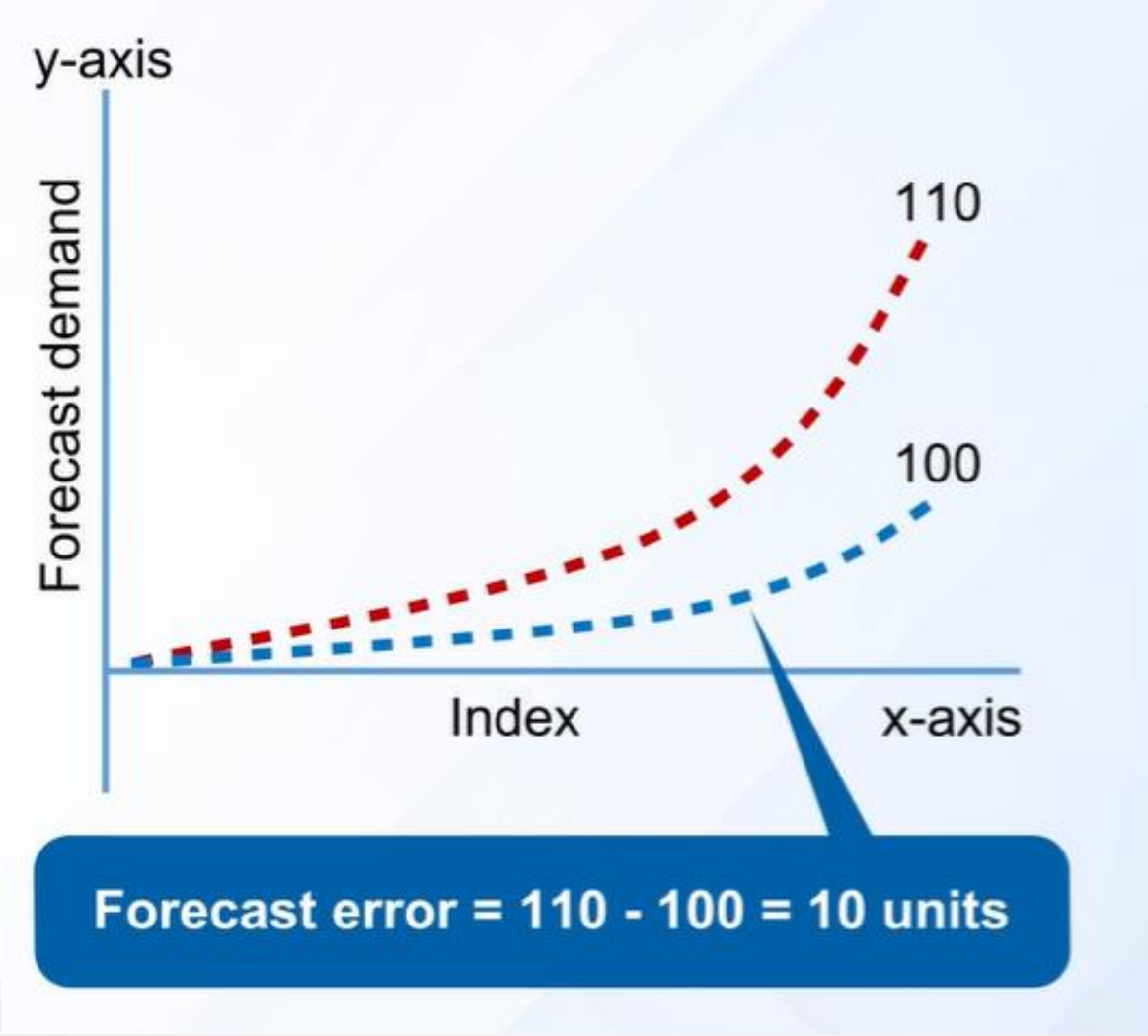
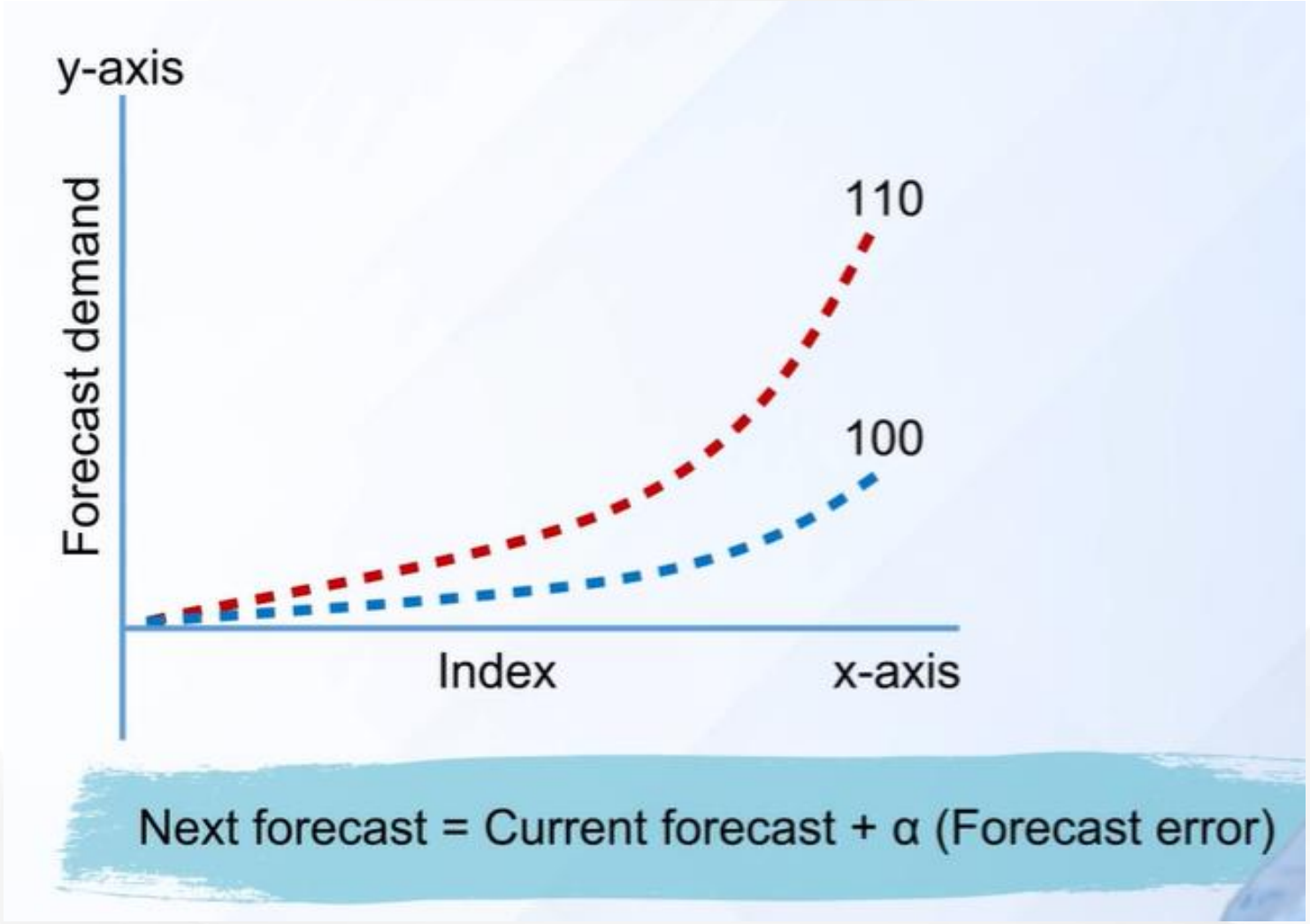
Exponential Smoothing Method



Exponential Smoothing Method: Dealing with Forecast Errors



Formula for Exponential Smoothing Forecast

α = smoothing constant, between 0 and 1

$$F(t) = F(t - 1) + \alpha [A (t - 1) - F(t - 1)]$$

- If demand is volatile, choose high value of alpha.
- If demand is stable, choose low value of alpha.

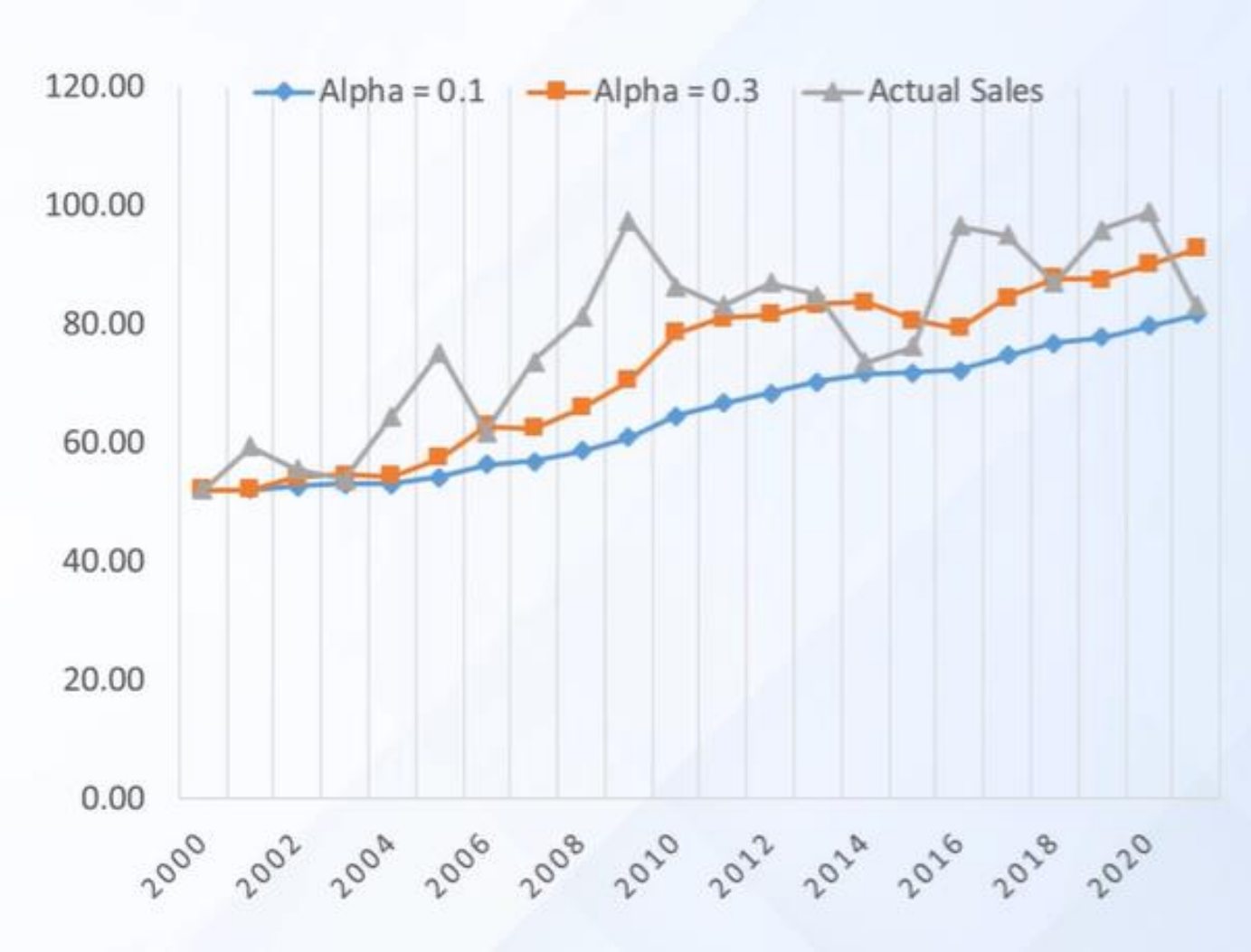
Implementing Exponential Smoothing Technique

- Forecast for the next period is made by revising old forecast
- First forecast is either the average of some historical data or the actual demand in the first period
- Can use optimal smoothing constant to increase forecast accuracy

Exponential Smoothing- Example 1

		Alpha=0.1		Alpha=0.3		Alpha=0.1
YEAR	SALES ($000)	Forecast 1	Error 1	Forecast 2	Error 2	Alpha=0.3
2000	52.04	52.04	0.00	52.04	0.00	
2001	59.42	52.04	7.38	52.04	7.38	
2002	55.66	52.78	2.88	54.25	1.41	
2003	53.86	53.07	0.79	54.68	-0.82	
2004	64.59	53.15	11.44	54.43	10.16	
2005	75.28	54.29	20.99	57.48	17.80	
2006	61.89	56.39	5.50	62.82	-0.93	
2007	73.74	56.94	16.80	62.54	11.20	
2008	81.19	58.62	22.57	65.90	15.29	
2009	97.52	60.88	36.64	70.49	27.03	
2010	86.50	64.54	21.96	78.60	7.90	
2011	83.18	66.74	16.44	80.97	2.21	
2012	87.05	68.38	18.67	81.63	5.42	
2013	84.79	70.25	14.54	83.26	1.53	
2014	73.49	71.70	1.79	83.72	-10.23	
2015	76.23	71.88	4.35	80.65	-4.42	
2016	96.54	72.32	24.22	79.32	17.22	
2017	95.08	74.74	20.34	84.49	10.59	
2018	87.05	76.77	10.28	87.67	-0.62	
2019	96.02	77.80	18.22	87.48	8.54	
2020	98.90	79.62	19.28	90.04	8.86	
2021	83.23	81.55	1.68	92.70	-9.47	
2022		81.72		89.86		

Exponential Smoothing- Example 2



Statistics to Measure Forecasting Accuracy

Mean Absolute Deviation (MAD)

- Arithmetic average of the absolute value of the forecast errors

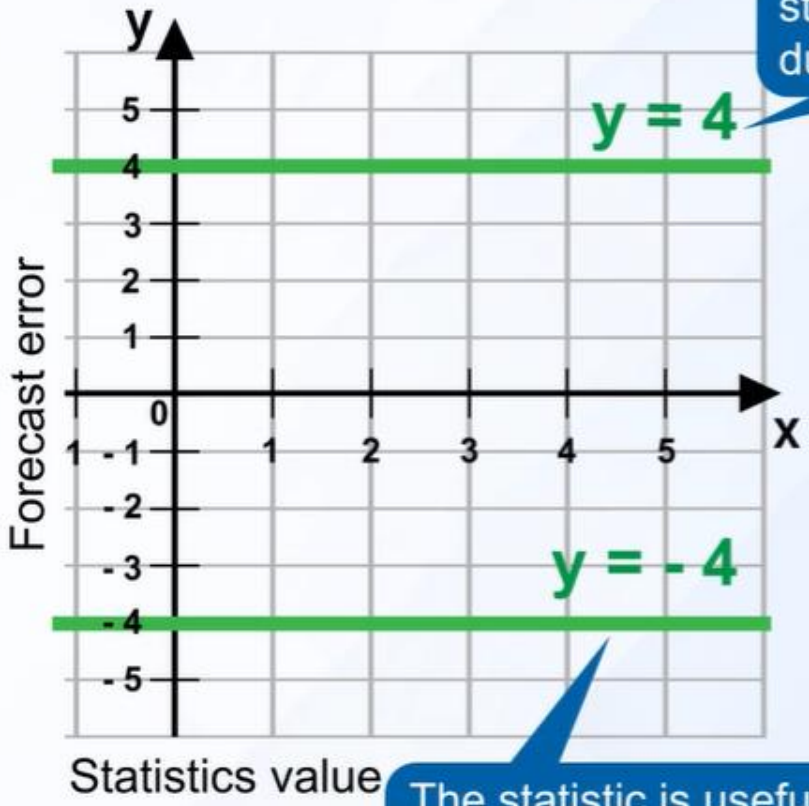
Mean Squared Error (MSE)

- Sum of squares of the forecast errors, divided by (n-1)

Mean Forecast Error (MFE)

- Simple average of the forecast errors

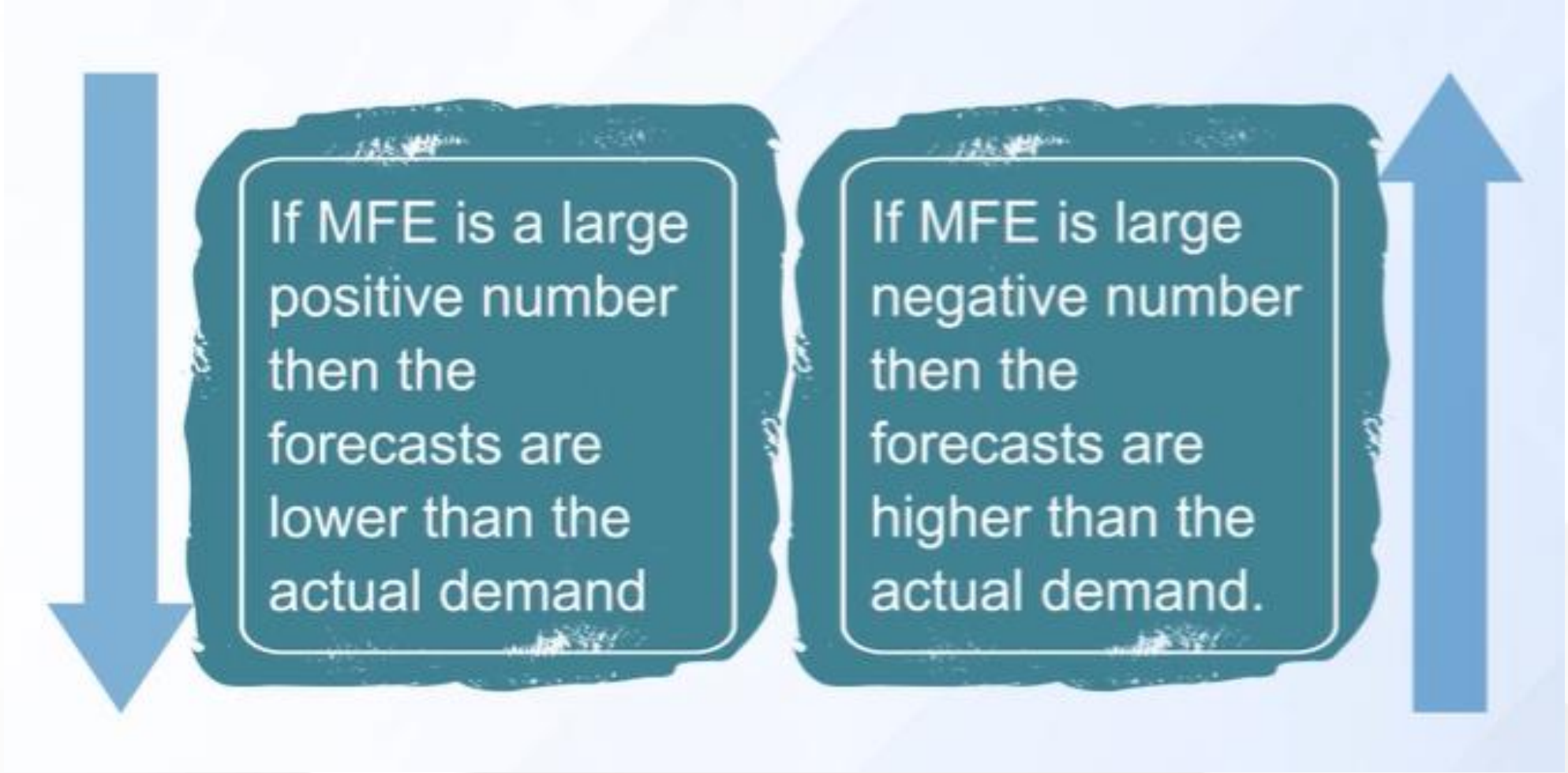
Mean Forecasting Error



If the forecast errors are high, the statistics may show a low value due to low average error.

The statistic is useful for checking for positive or negative systematic bias in the forecast.

Mean Forecasting Error – Charecteristics



Summary

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Key Learnings

Concept generation and how it differs from an idea and a product

Seven-step method of concept testing

- Step 1: Define the purpose
- Step 2: Choose a survey population
- Step 3: Choose a survey format
- Step 4: Communicate the concept
- Step 5: Measure customer response
- Step 6: Interpret the results
- Step 7: Reflect on the results

Key Learnings

Concept generation and how it differs from an idea and a product

Seven-step method of concept testing

Examples of concept testing

Long tail effect

- **How digital technologies have created opportunities for new products?**

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Key Learnings

Concept generation and how it differs from an idea and a product

Seven-step method of concept testing

Examples of concept testing

Long tail effect

Potential and forecast

- **Definition**
- **Estimation**

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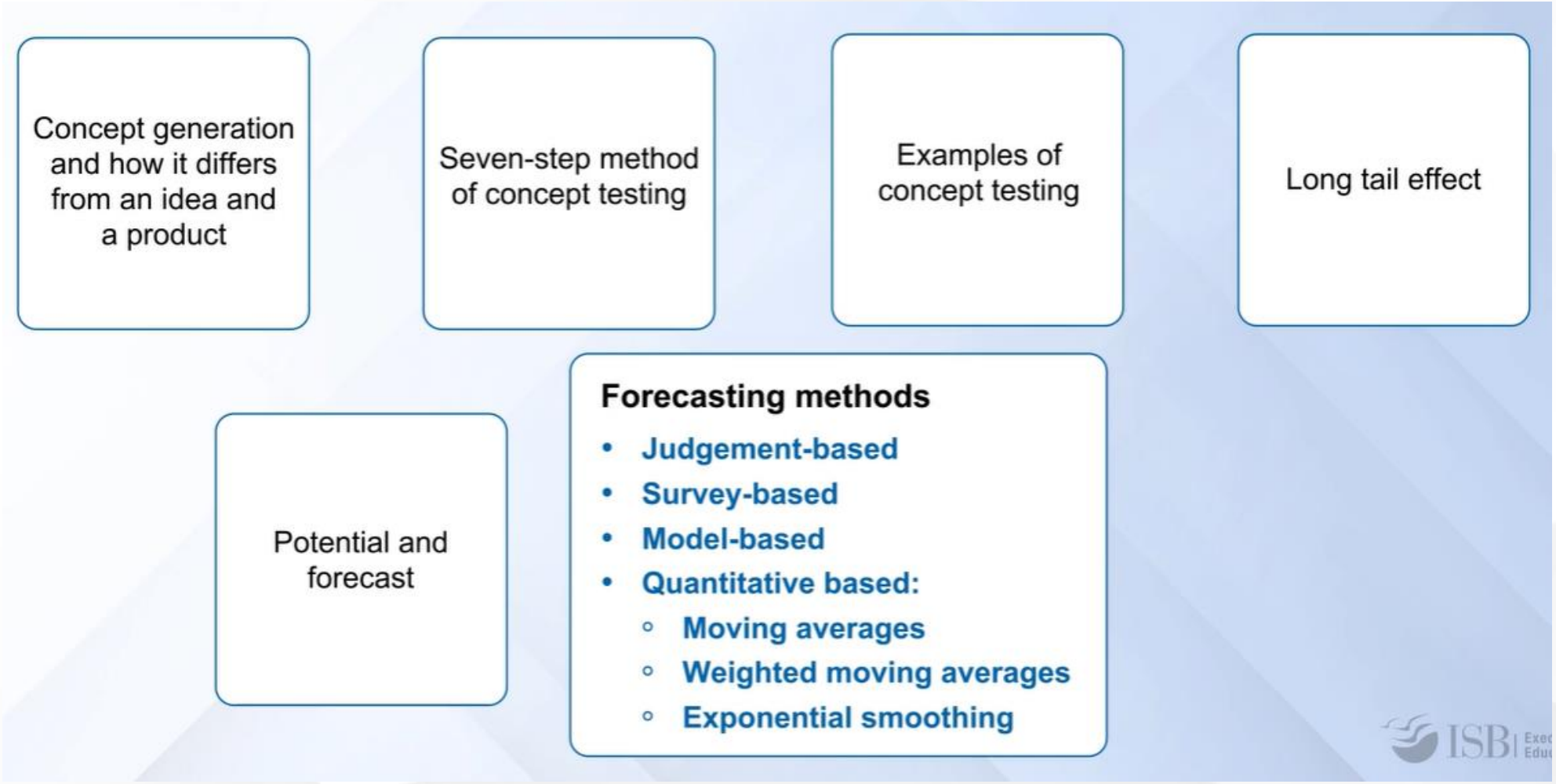
Key Learnings



Key Learnings

Concept generation and how it differs from an idea and a product

Seven-step method of concept testing

Examples of concept testing

Long tail effect

Potential and forecast

Forecasting methods

Statistics

- **Mean absolute deviation**
- **Mean squared error**
- **Mean forecast error**

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