

Managing the Innovation Process

Evaluating and Screening



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Part I: Innovation is Experimentation



Innovation = Creativity & Ideas?



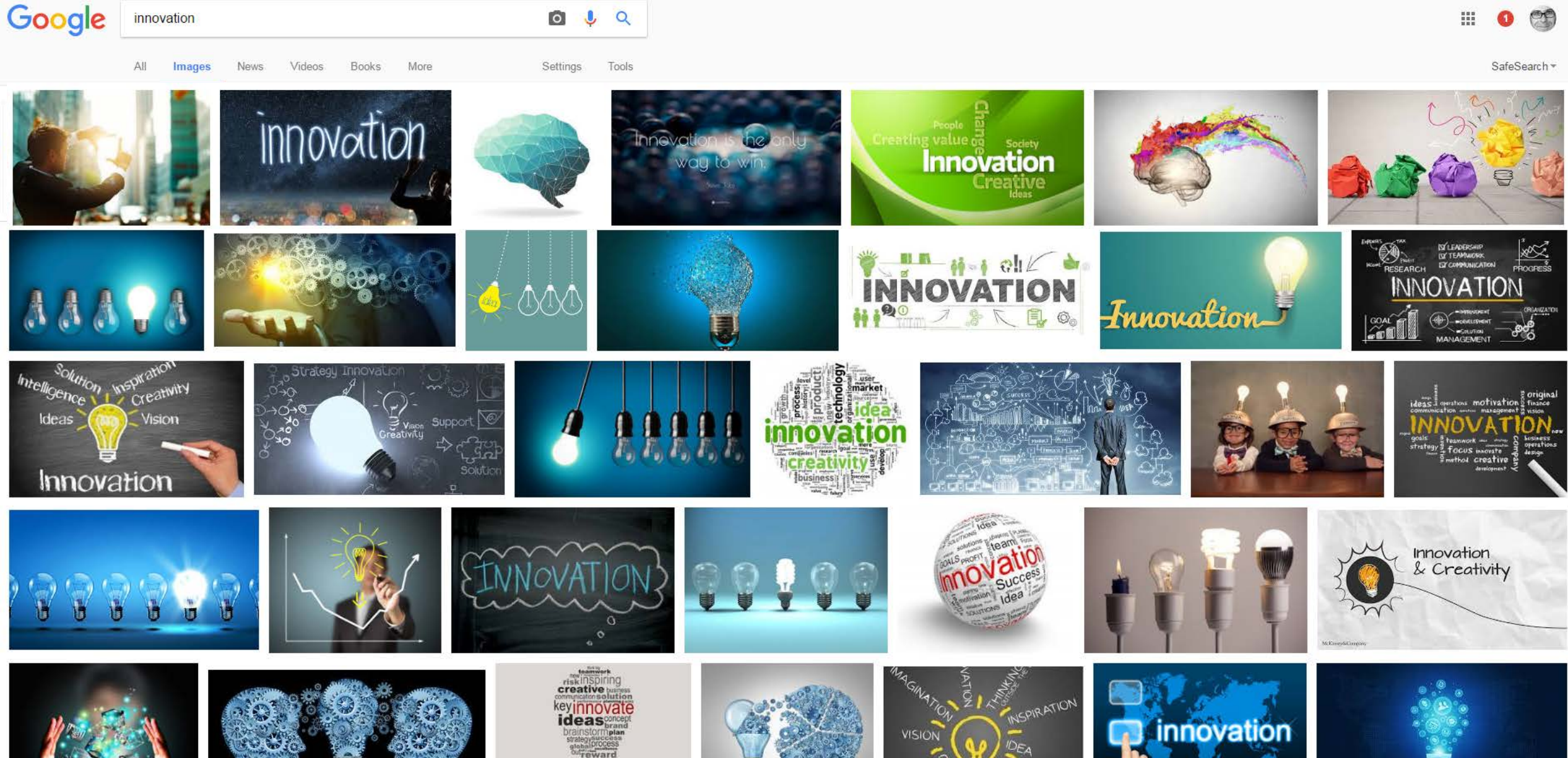
innovation



Google Search

I'm Feeling Lucky

Innovation = Creativity & Ideas?



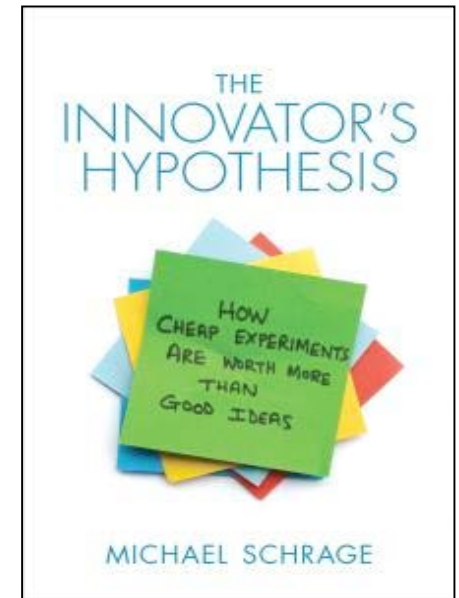
But creativity is not enough

Just being creative is not enough ... or even dangerous:

- Development teams are often **driven away by their own glory** and greatness of ideas.
- However, in the end, **“it is the customer who defines what the business is”** (Peter Drucker).

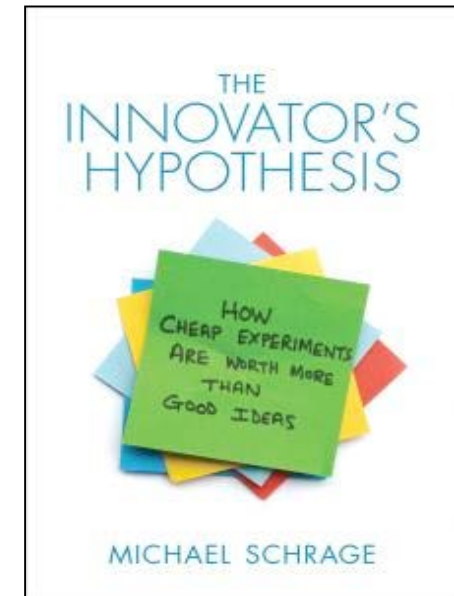
“Ideas are the enemy of innovation”, Michael Schrage, MIT

“ Good ideas are actually the enemy of productivity. A focus on good ideas inflicts terrible damage—operational and emotional—on good managers and good businesses alike. Business *ideaholics*, not unlike meth addicts and other junkies, are always looking for the next fix. They crave the buzz, rush, or high that supposedly comes from injecting a really good idea into their managerial mainstream. Good ideas might be better described as the empty calories of enterprise innovation: accessible, tasty, and momentarily satisfying. But they’re not good for you. They’ll make you sick.

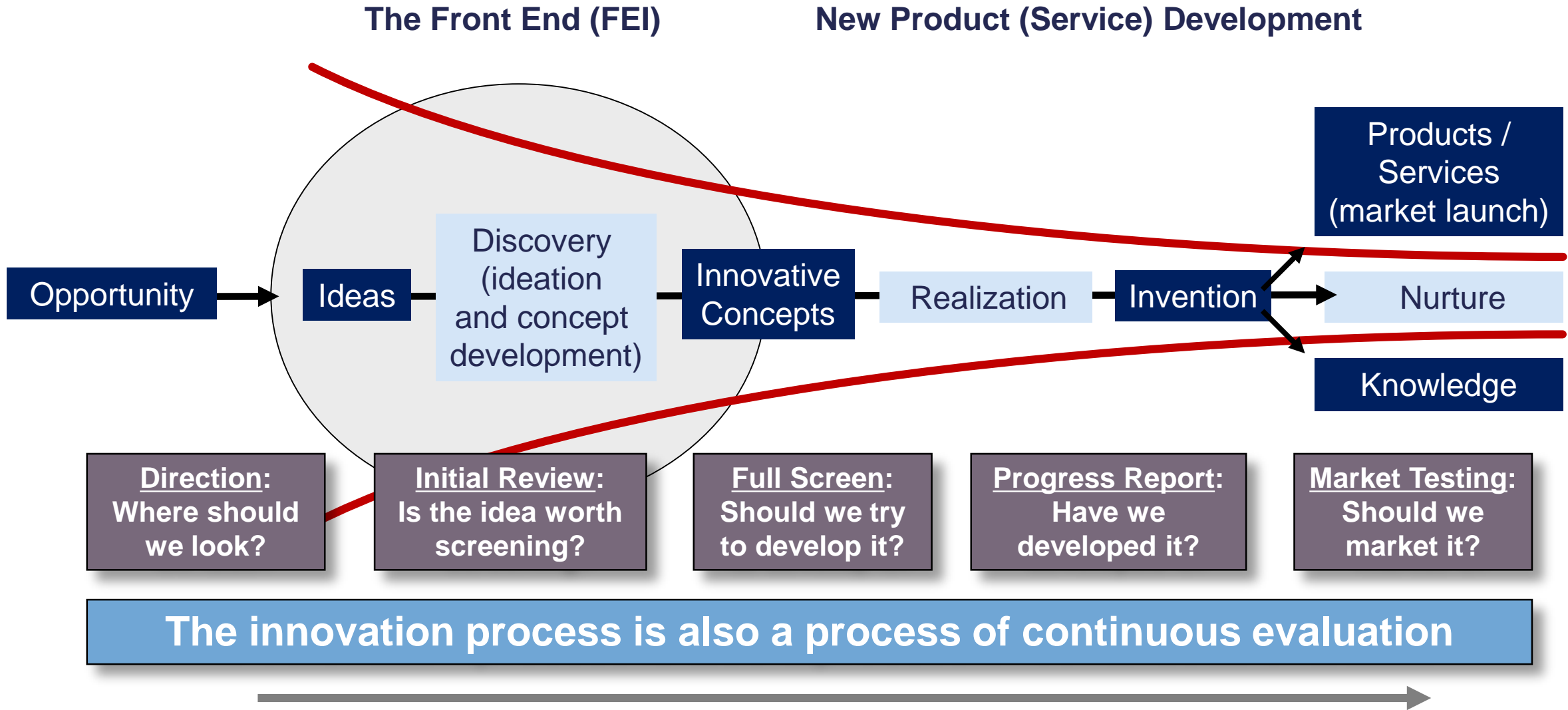


But creativity is not enough

- There is a **serious temptation to fall in love with the process** of generating raw ideas.
- Firms often forget that **something needs to be done with the ideas => turn the focus from ideas themselves to the implementation of them**
- This requires ***testing, prototyping, and experimentation.***
- **Michael Schrage:** “It’s all about forging **low cost, low risk experiments** that help you figure out, for one thing, **if the ideas are any good**, but also **to develop the ideas and make them better.**”
- Hence, the innovation process is also a **process of continuous evaluation!**



The Innovation Funnel



Concepts are the object of testing and screening

Recap: Concepts (concept statements) are the intermediate result of innovation activities

Concept:

- A **bundle of elaborated ideas**.
- It is a **verbal statement or prototype** of what is going to be changed and how users stand to gain.
- Has a **well-defined form** that includes its **primary features** (customer benefits, “jobs to be done”) combined with a broad understanding of the **technology needed**.

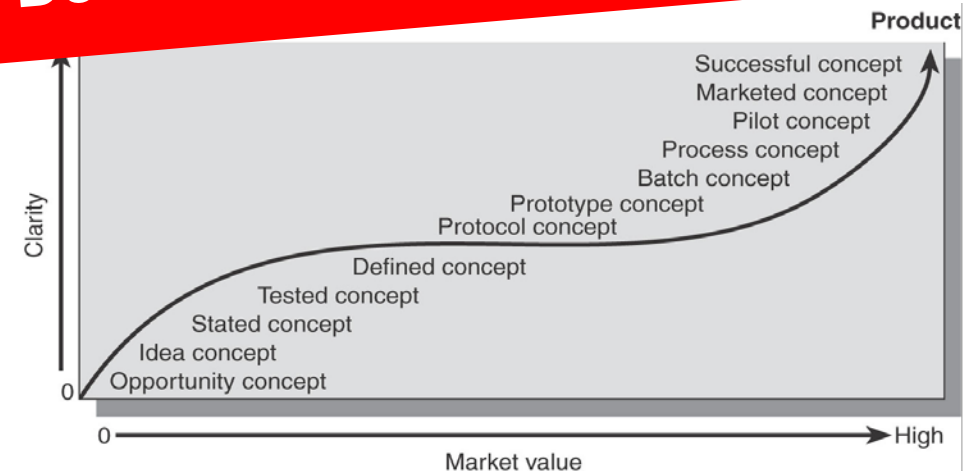
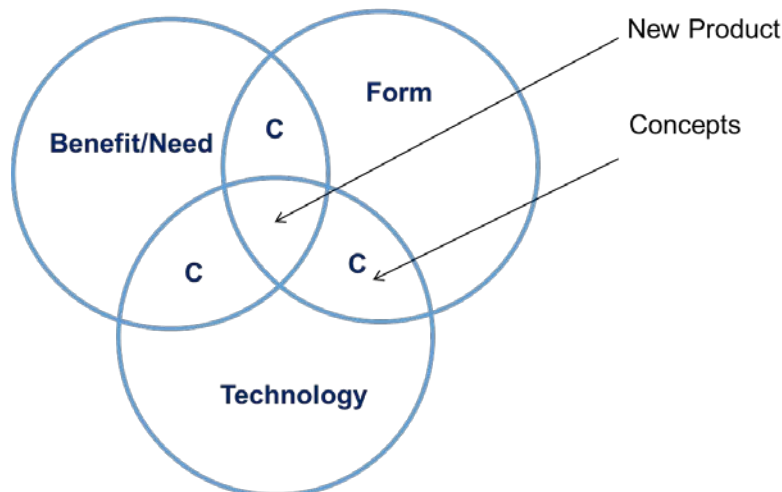
Concepts can be tested & selected

- **Internally** (by the development team, leadership team)
- **Externally** (based on customer feedback via market research)

Decision & evaluation biases

Rule:

You need at least two of three elements to have a feasible new product concept.



Managing the Innovation Process

Evaluating and Screening Part II: Scoring Models for Internal Selection



Internal Selection of Ideas & Concepts

Internal Selection (“Concept Screening”) ...

- Is a step often seen as a necessary evil, yet very powerful and with long-lasting effects.
- Forces pre-technical evaluation and summarizes what must be done.
- Methods range from simple checklists to complex mathematical models.

Managerial Opinion

- Experience based judgment
- Gut feeling
- Look for consensus among raters

Group vote

- Use group judgement
- Often executed by the people who also created the ideas and concepts

Scoring Models

- Frequently used method
- Define criteria and judge alternatives

Criteria often used for concept selection

Dimension	Questions
Strategic Fit	<i>Does the concept fit with our corporate vision? Does the concept fit with our technological priorities?</i>
Customer Fit	<i>Does the concept have a good value as perceived by the customer? Does the concept satisfy an unmet or latent consumer need?: Does the concept meet the Job-to-be-Done?</i>
Market Attractiveness	<i>Is the concept unique relative to the competition? Could our firm be a Number 1 or Number 2 competitor? Is the concept protectable (IP)? Do we have freedom to operate?</i>
Technical Feasibility	<i>Is the concept feasible? Is it “buildable” within the next iteration cycle?</i>
Financial	<i>Would the project break even soon? Would the project achieve earnings expected by the board?</i>

Internal Concept Selection with a Scoring Model

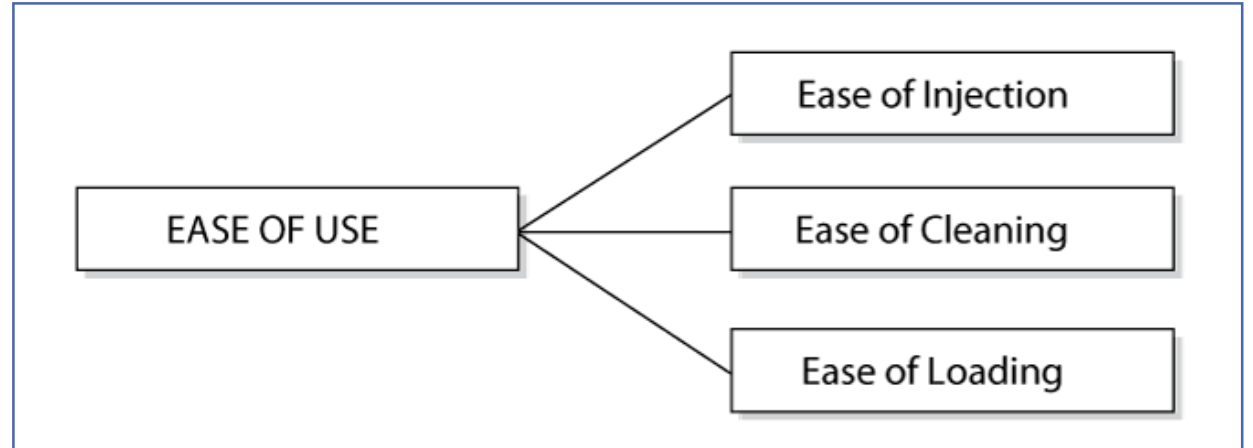


Concept Selection with a Scoring Model

Step 1: Prepare the Selection Matrix & Define Scoring Team

- **Define selection criteria.**

Example:



- **Hierarchical relations:** Useful to illuminate the criteria
- After criteria are entered, **add weights for the criteria to recognize their relative importance**
 - Several different schemes can be used to weight the criteria:
 - Assigning an “importance value” from 1 to 5
 - Allocating 100 percentage points among them
 - ...

Concept Selection with a Scoring Model

Step 1: Prepare the Selection Matrix & Define Scoring Team

Step 1: Concept Scoring Matrix

Now: Allocate the Scoring Team

- Choose Scoring Team Members
 - Major Functions (marketing, finance etc.)
 - New Products Managers
 - Staff Specialists (IT, distribution etc.)
- **Problems with Scorers: They may be...**
 - Always too optimistic or pessimistic
 - "moody"
 - less reliable or accurate
 - easily swayed by the group
 - erratic
 - biased by previous experience

Example: Concept Scoring Matrix

		Concepts							
		A (reference) Master Cylinder		DF Lever Stop		E Swash Ring		G+ Dial Screw+	
Selection Criteria	Weight	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
Ease of Handling	5%								
Ease of Use	15%								
Readability of Settings	10%								
Dose Metering Accuracy	25%								
Durability	15%								
Ease of Manufacture	20%								
Portability	10%								
Total Score									
Rank									
Continue?									

Crucial success factor:

A clear explanation how to give which score for each dimension

Concept Selection with a Scoring Model

Step 2: Rate the concepts

Step 2: Rate the alternatives:

- Rate all of concepts with respect to one criterion at a time.
- Use **reference content** to make each evaluation (as it is easier to judge a concept feature “relatively” to each other)
- Use **different reference points for various selection criteria**. Reference points may come from several of the concepts under consideration or from comparative benchmarking analysis.

Example: Concept Scoring Matrix

		Concepts							
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Total Score									
Rank									
Continue?									

Crucial success factor:

A clear explanation how to give which score for each dimension

Concept Selection with a Scoring Model

Step 3: Rank the concepts

Step 3: Rank the alternatives:

- Once the ratings are entered for each concept, weighted scores are calculated by multiplying raw score by criteria weights.
- Total score for each concept: sum of the weighted scores.

$$S_j = \sum_{i=1}^n r_{ij} w_i$$

Where:

r_{ij} = raw rating concept j for ith criterion

w_i = weighting for ith criterion

n = number of criteria

S_j = total score for concept) j

- Finally, each concept is given a rank corresponding to its total score

Example: Concept Scoring Matrix

		Concepts							
		A (reference) Master Cylinder		DF Lever Stop		E Swash Ring		G+ Dial Screw+	
Selection Criteria	Weight	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
Ease of Handling	5%	3	0.15	3	0.15	4	0.2	4	0.2
Ease of Use	15%	3	0.45	4	0.6	4	0.6	3	0.45
Readability of Settings	10%	2	0.2	3	0.3	5	0.5	5	0.5
Dose Metering Accuracy	25%	3	0.75	3	0.75	2	0.5	3	0.75
Durability	15%	2	0.3	5	0.75	4	0.6	3	0.45
Ease of Manufacture	20%	3	0.6	3	0.6	2	0.4	2	0.4
Portability	10%	3	0.3	3	0.3	3	0.3	3	0.3
Total Score									
Rank									
Continue?									

Concept Selection with a Scoring Model

Steps 4 & 5: Iterate the concepts and make final selection

Step 4: Combine and Improve the Concepts

- **Creative refinements** occur during concept selection process when **team realizes inherent strengths and weaknesses** of certain features of product concepts.

Step 5: Select One or More Concepts

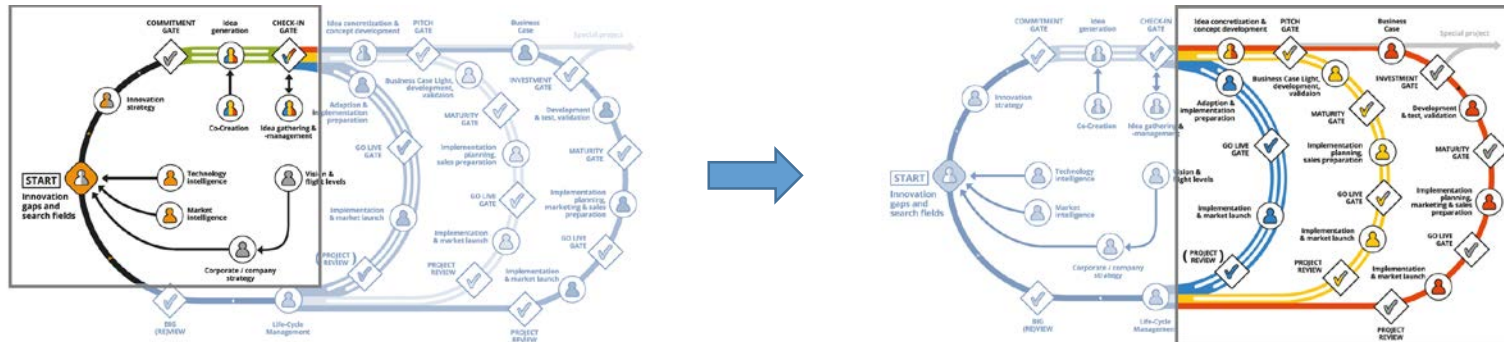
- **Final selection:** Not simply choosing the concept achieving highest ranking after first pass-through.
- Team should explore this initial evaluation: **Sensitivity analysis** (vary weights and ratings to determine their effect on the ranking).

Concept Selection with a Scoring Model

Step 6: Reflect on the results and the process

Step 6: Reflection

- This is conventionally a **"point of no return"** in the concept development process!



- Hence: **Reality check** and **review** of each concept to be eliminated from further consideration.
- If the team agrees that any of the dropped concepts is better overall than some of those retained, then the **source of this inconsistency** should be identified. Perhaps an important criterion is missing, not weighted properly, or inconsistently applied.
- Consider DECISION BIASES**

Managing the Innovation Process

Evaluating and Screening Part III: Concept Testing with Customers



Concept testing with customers

Concept testing with customers:

- Very important activity. **Conventionally** done once before development, and again before launch.
- In **modern (agile, design thinking, highly iterative) innovation models**, a continuous activity between every activity of the development process!

Objectives at this stage:

- To **identify very poor concepts** so that they can be eliminated
- To **estimate sales or adoption rate**
- To help to **develop the concept further** (e.g. make tradeoffs among attributes)

The object of testing: The Product Concept Statement: A statement about anticipated product features (form or technology) that will yield selected benefits relative to other products or problem solutions already available.'

Example: *“A new electric razor whose screen is so thin it can cut closer than any other electric razor on the market.”*

Different ways of concept testing:

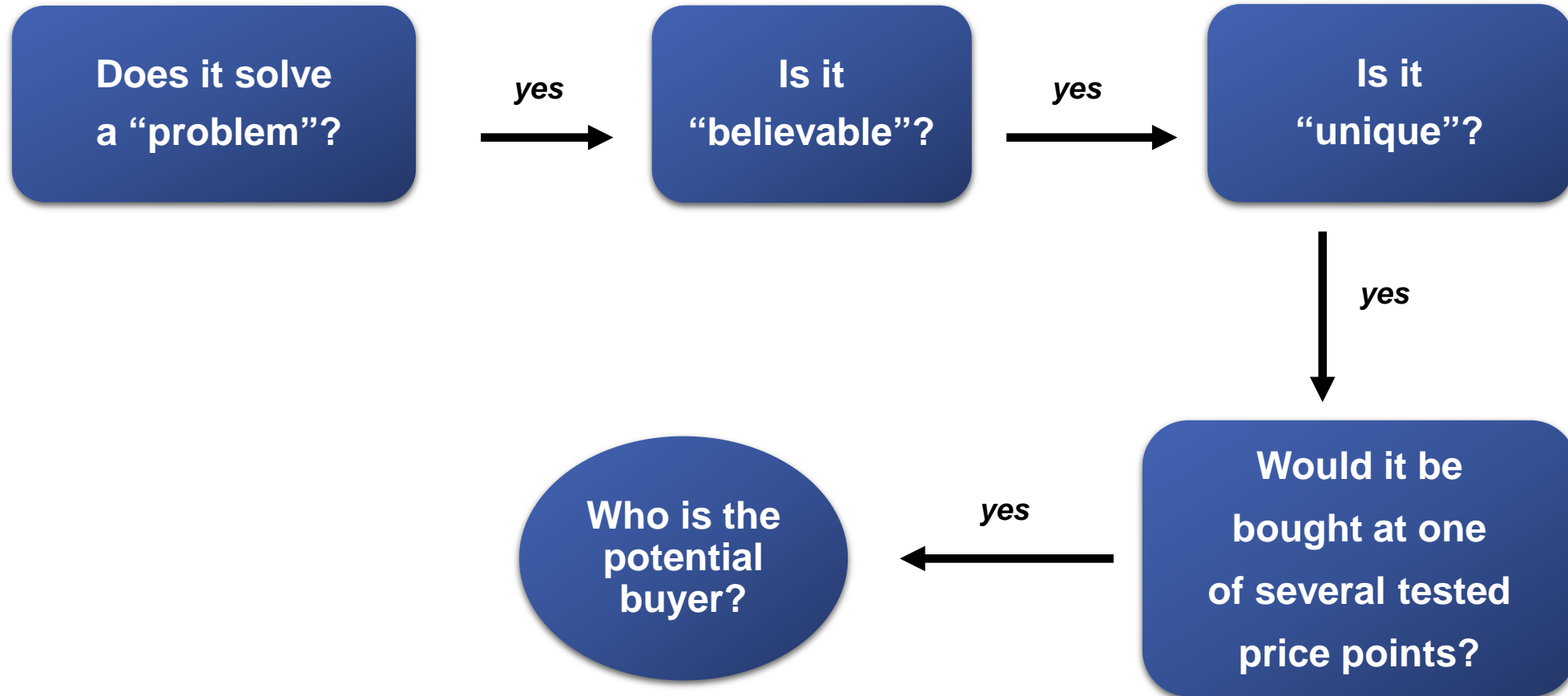
Statements **vs.** prototypes

Internal **vs.** external

Qualitative **vs.** quantitative

Hypothetical **vs.** field tests

What is generally tested?



A Four Step Approach to Concept Testing

(1) Prepare concept statement

- How to present the concept statement to test subjects?
- Select form of commercialization, determine price(s)

(2) Select respondent type(s)

- Average users? Lead users? Innovators? Large users?

(3) Select response situation

- Define interview or survey, conduct pre-tests
- Is the concept understandable? Believable? Important? Interesting? Realistic?
Would it work? What problems do they see? Would they buy?

(4) Analyze and interpret results

Step 1: Prepare Concept Statement

- States **differences** and how that differences benefit the end customer: it is a **customer value proposition**
- Build on positioning statement (**PIC**)
- What it is not: It is **not an advertisement** or commercial text
- Good concept is an **anchor point**, a point of reference for all future decisions (pack design, target group, tone of voice in commercial outings, etc.)
- Various possible **formats**
 - **Verbal description / narrative format**
 - Sketch or drawing
 - Virtual prototype
 - Mock-Up Prototype
 - Working Prototype

The Customer Value Proposition:

- **FOR** {the ideal customer}
- **WHO** {have the following problem}
- **MY PRODUCT IS A** {product category}
- **THAT** {key differentiating benefit}
- **UNLIKE** {the major competitor}

- The product is a lightweight electric scooter that can be easily folded and taken with you inside a building or on public transportation.
- The scooter 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 from a standard electric outlet.
- The scooter is easy to ride and has simple controls – just an accelerator button and a brake.

Elements of a written concept statement

Title: Short descriptive name of concept

Insight/Opening: Opening description; including a truth, need and dilemma

Benefit/Promise: Refers to problem, describes how this product will 'solve' it

Proof: Provides factual elements to sustain the claim in the promise.

Tagline: Summary take out

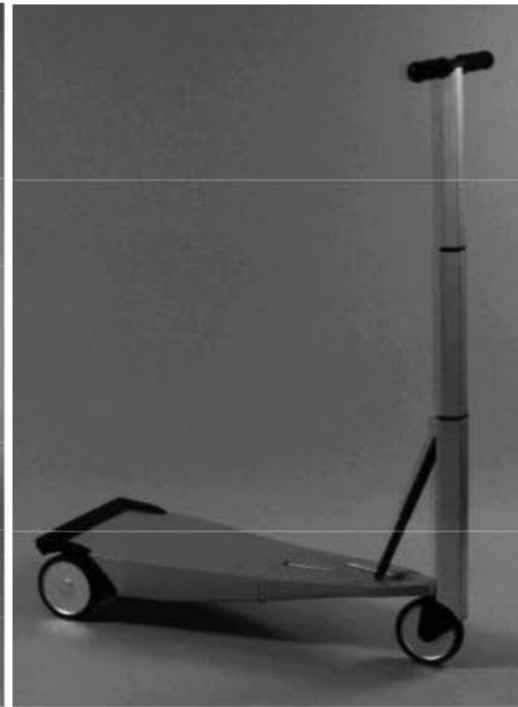
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 - **Working Prototype**

3D Solid CAD Model



Appearance Model



Working Prototype



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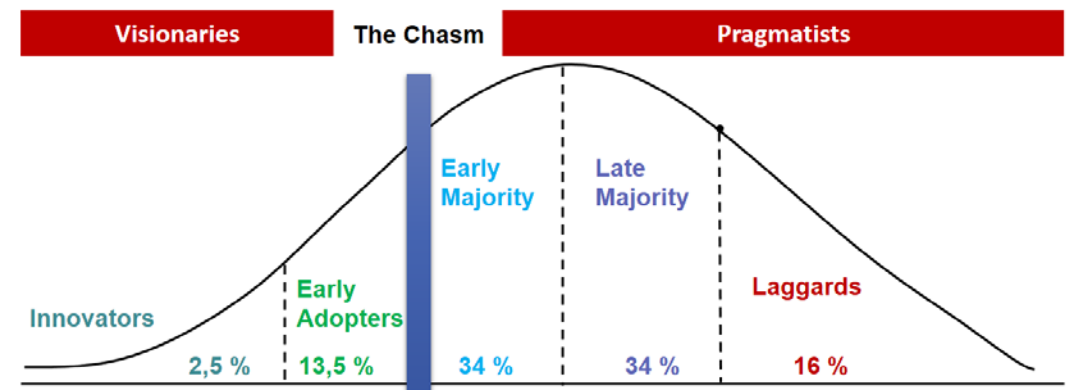


Step 2: Select respondent type(s)

Stakeholders: Test concept with all people who are involved: *Customers / users; dealers / exporters / regulators; own sales team*

- If possible: **Representative sample**
- **Survey population** should **mirror target market as much as possible**, otherwise test results are biased.
- If product targets multiple market segments: potential customers from **each target segment** are required.
- **Sample size:** large enough that the development team's confidence is high enough to guide decision making
→ **Sample sizes vary:** as small as 10 or as large as 1000.
- Depending on desired data: Conduct **multiple surveys with different objectives** & sample populations.

**Challenge in defining the respondents:
Pilot Users and Innovators vs. Mainstream Market**



Step 3: Select response situation

Response situation

1. Define the interview or other type of survey situation
2. Conduct pre-tests
3. Interview / survey

Methods:

- One-on-One personal interviews
- Online (mail) real-time response surveys
- Focus Groups
- Test centers
- Phone Interviews
- Hybrids (e.g., phone-mail-phone)


Core question of concept testing is:


“Would you buy this new product”?


How important is the product “experience”?


Does the customer have to “touch & feel” the product to understand the benefits offered?


- Most concept test surveys **first communicate the product concept** and **then measure customer response**.
- Customers can be asked to **choose between two or more alternative concepts**, or how the product concepts could be **improved** or to **measure purchase intent**.
- The most commonly used purchase-intent scale has five response categories:


I would **definitely not purchase** the scooter.


I would **probably not purchase** the scooter.


I **might or might not purchase** the scooter.

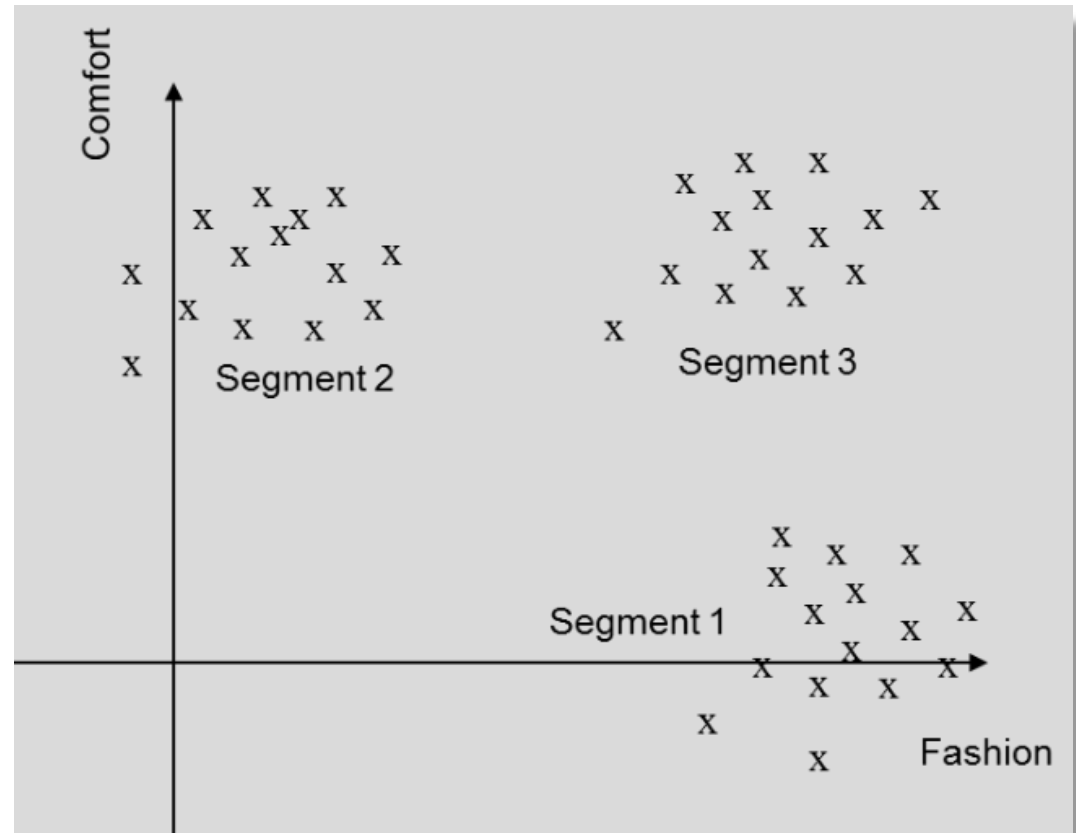

I would **probably purchase** the scooter.


I would **definitely purchase** the scooter.

Step 4: Analyze and interpret results

Analyze the results

- **Simple "top two boxes" score**
- **Discount survey bias based on past experiences:**
 - Calibrate responses to match stated intentions with actual behavior
 - Service companies like Nielsen offer **calibration** based on past data ("BASES")
- **But often, more sophisticated analysis is needed:**
 - When market is not homogenous and benefit segmentation of different customer groups is needed:
 - **Cluster analysis** of respondents along their distribution of preferences



Step 4: Analyze and interpret results

Interpret the results

- If concept test helps comparing two or more concepts only: interpretation of the results rather straightforward.
- If results are not conclusive, the team may **decide to choose a concept based on cost or other considerations**, or may decide to offer multiple versions of the product.
- In many cases the team might also be interested in **estimating the demand** for a product.
- Sources of errors in such a forecast might be:
 - Word-of-Mouth Effects
 - Quality of Concept Description
 - Pricing
 - Level of Promotion
 - Competition

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

Quantity **Q** expected to be sold of product =
Number of potential customers **N** x Fraction of
customers available and aware of product **A** x
Probability that product is purchased **P**

With

$$P = C_{\text{definitely}} \times F_{\text{definitely}} + C_{\text{probably}} \times F_{\text{probably}}$$

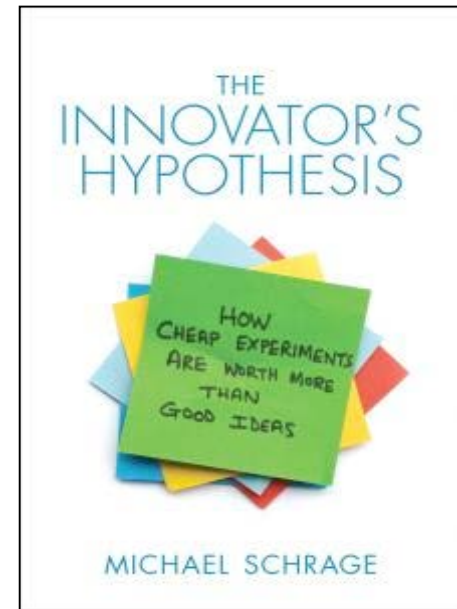
Managing the Innovation Process

Evaluating and Screening Part IV: Rapid Experimentation



Creativity is not innovation

- There is a **serious temptation to fall in love with the process** of generating raw ideas.
- Firms often forget that **something needs to be done with the ideas => turn the focus from ideas themselves to the implementation of them**
- This requires ***testing, prototyping, and experimentation.***
- **Michael Schrage:** “It’s all about forging **low cost, low risk experiments** that help you figure out, for one thing, **if the ideas are any good**, but also **to develop the ideas and make them better.**”



Test concepts (*assumptions*) effectively “in the wild”

Michael Schrage, (2014, *The Innovator’s Hypothesis*):

5 x 5 x 5 x 5 x 5

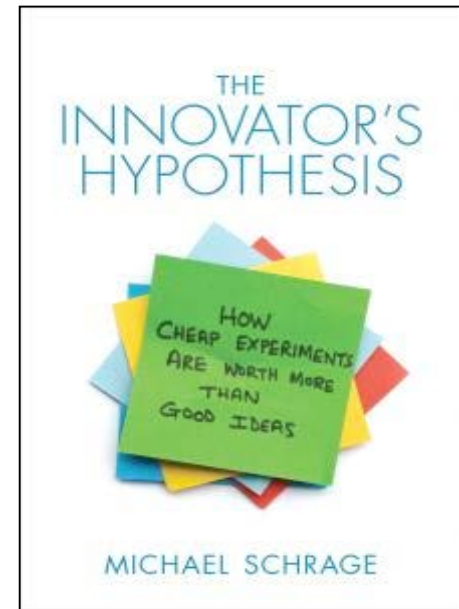
5 teams doing each ...

... 5 experiments...

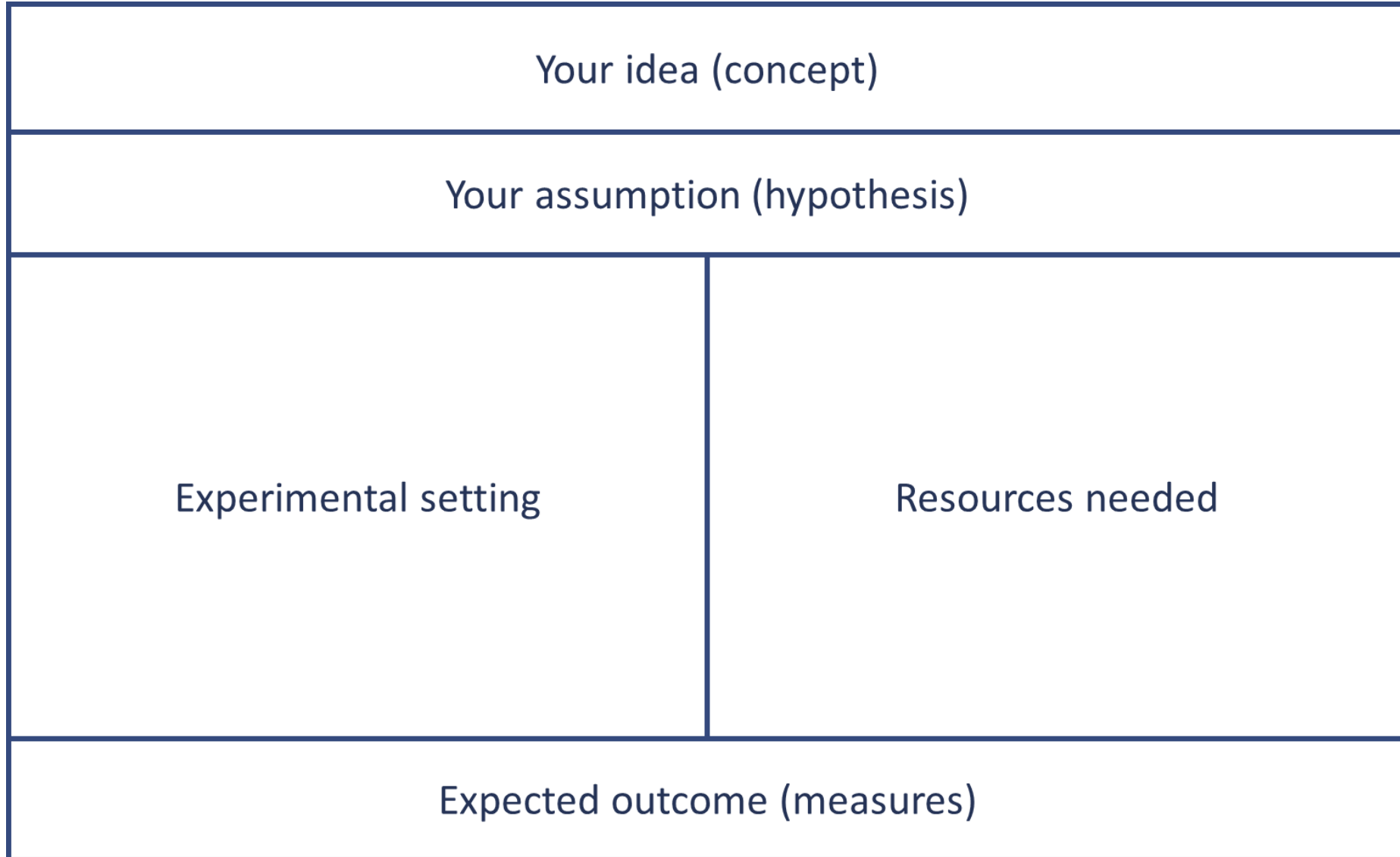
... within 5 weeks...

... with a team of 5 people

... with a budget of max 5.000€ per experiment.



How to set up experiments?





Pretendotypes

*“Pretotyping is the art and science
of faking it before making it”
(Alberto Savoia, Google 2009)*

Test concepts (*assumptions*) effectively “in the wild”

*Pretotyping was originally introduced at Google in 2009/2010
by Alberto Savoia*

Pretotyping differs from prototyping

The main objective of prototyping is to answer questions related to building the product: Can we build it? Will it work as expected? How cheaply can we build it?

The main objective of pretotyping is to answer questions about the product's appeal and usage: Would people be interested in it? Will they use it as expected? Will they continue to use it? ...

=> Get feedback about the “**Initial Level of Interest**”

=> A similar idea is the “**minimum viable product**” (MVP)

Different tools for prentendotypes

Paper, wood, etc. The Palm Pilot pretotype is a great example of how you can test a concept and usage with a simple mockup (a Pinocchio pretotype.)



Google AdWords, a great way to measure the ILI (Initial Level of Interest) interest in a product before investing to create it.

Pretotype It
www.pretotypeitbook.com
The official book on prototyping
by Alberto Savoia. Only \$20.00

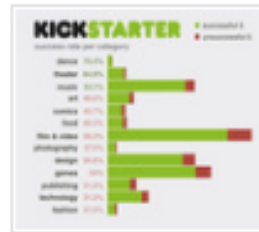
Balsamiq is a great tool for visualizing pretotypes—both for yourself and to help convey the message to potential users.



PrototyperPro by JustInMinds is another great tool for visualizing and making ideas more concrete for yourself and others.



If you can get over your (mostly unfounded) fears of other people stealing your idea, **Kickstarter** is a great tool for testing the Initial Level of Interest (ILI) in an idea.



YouTube is great to help people imagine a product and its uses—even if the product does not exist yet.



An example of experimentation for innovation

Amazon Recommendation Engine

Customers Who Bought This Item Also Bought



Oliver Twist (Dover Thrift Editions)
> Charles Dickens
★★★★☆ (213)
Paperback
\$3.50

David Copperfield (Dover Thrift Editions)
> Charles Dickens
★★★★☆ (196)
Paperback
\$5.00

JANE EYRE
> Charlotte Bronte
★★★★☆ (1,045)
Paperback
\$2.99

An example of experimentation for innovation

Greg Linden, Inventor of the Amazon Recommendation Engine

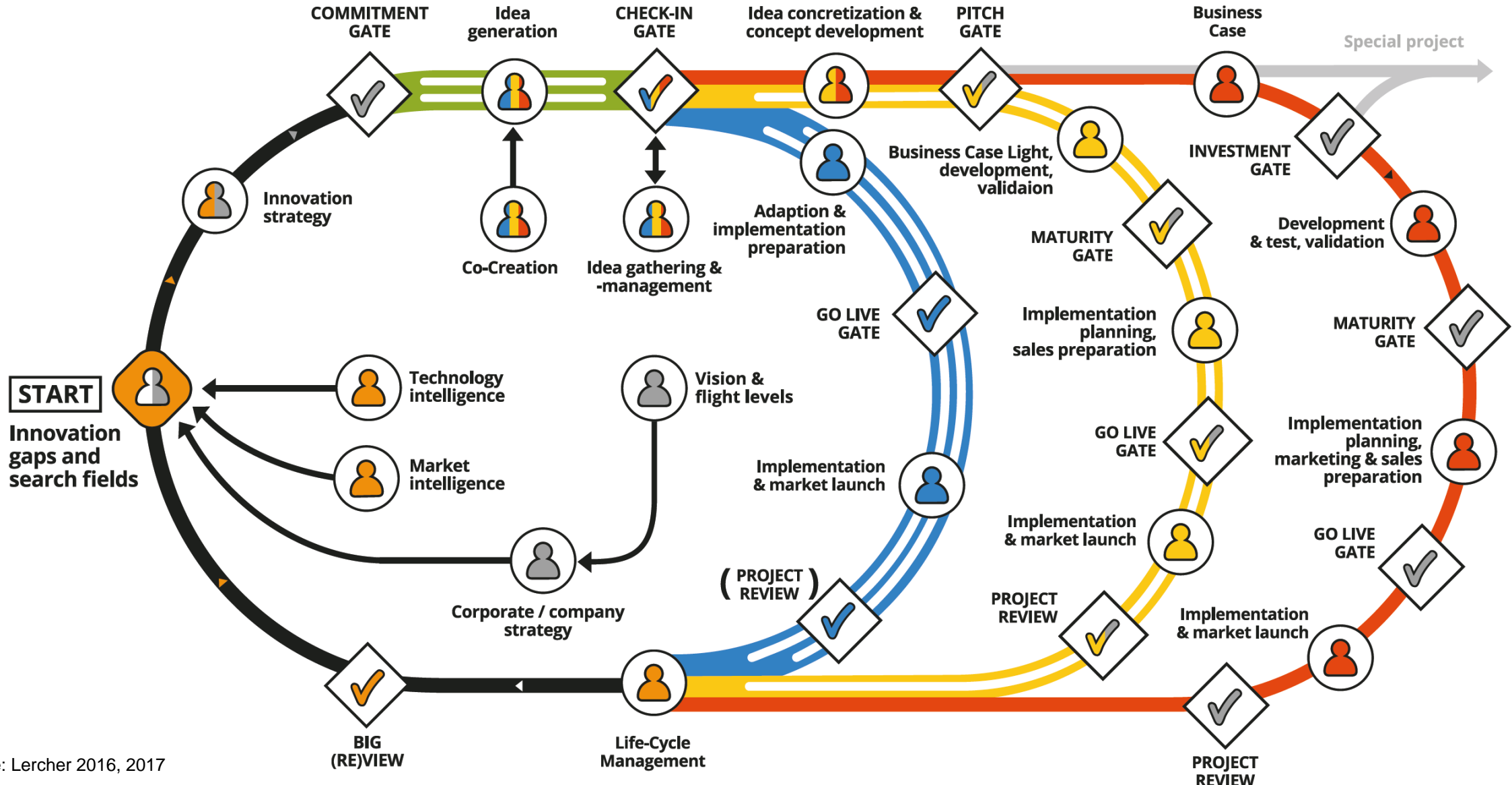


“I hacked up a prototype. On a test site, I modified the Amazon.com shopping cart page to recommend other items you might enjoy adding to your cart. Looked pretty good to me. I started showing it around...”

“At this point, I was told I was forbidden to work on this any further. I was told Amazon was not ready to launch this feature. It should have stopped there.

Instead, I prepared the feature for an online test. I believed in shopping cart recommendations. I wanted to measure the sales impact....”

Evaluation and Screening in the Big Picture



Managing the Innovation Process

Evaluating and Screening Analytical Attribute Techniques



Analytical Attribute Techniques

Basic principles of evaluating customer insights & feedback

Analytical Attribute Techniques allow to change current attributes of a product or add new ones, hence generating new concepts. They are used to evaluate and screen concepts in different process stages using a set of techniques that are based on **analyzing attributes of existing products**.

There are various quantitative and qualitative attribute analysis techniques.
Two main forms of quantitative analysis are:

Perceptual Gap Analysis

- factor analysis (FA)
- correspondence analysis (CA)
- composite perceptual mapping
- multidimensional scaling (MDS)

Conjoint Analysis

- traditional conjoint analysis (TCA)
- adaptive-conjoint analysis (ACA)
- choice-based conjoint (CBC)

Perceptual Gap Analysis

Perceptual Gap Analysis is a statistical technique to determine how various products are perceived by how they are positioned on a market map.

The idea is to identify "gaps" as opportunities for new concepts.

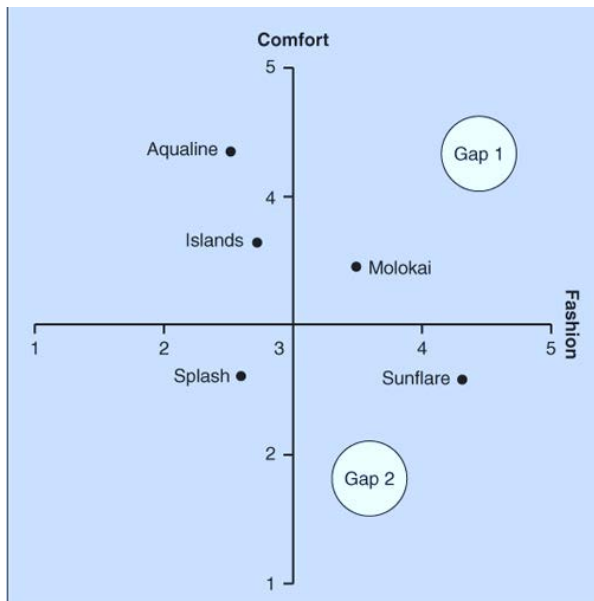
Attribute Rating (AR) perceptual gap map:

Based on attribute ratings by customers, acquired via market research.

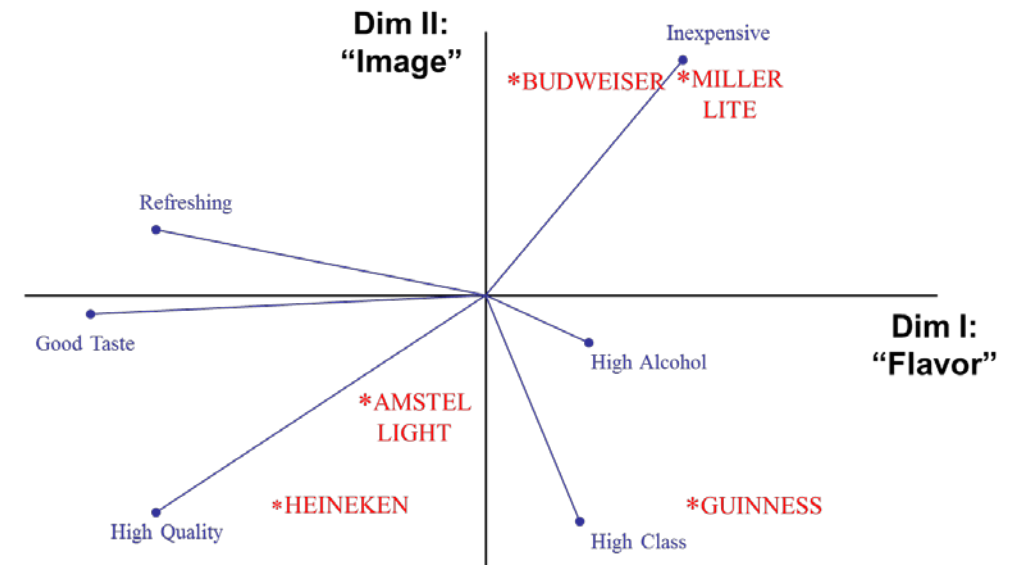
Overall Similarities perceptual gap map:

Based on overall similarities ratings by customers.

The AR Perceptual Map



Result of Multidimensional Scaling



Perceptual Gap Analysis: Factor analysis

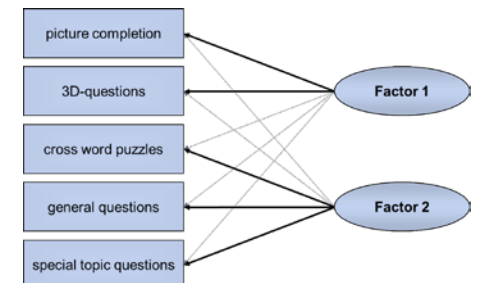
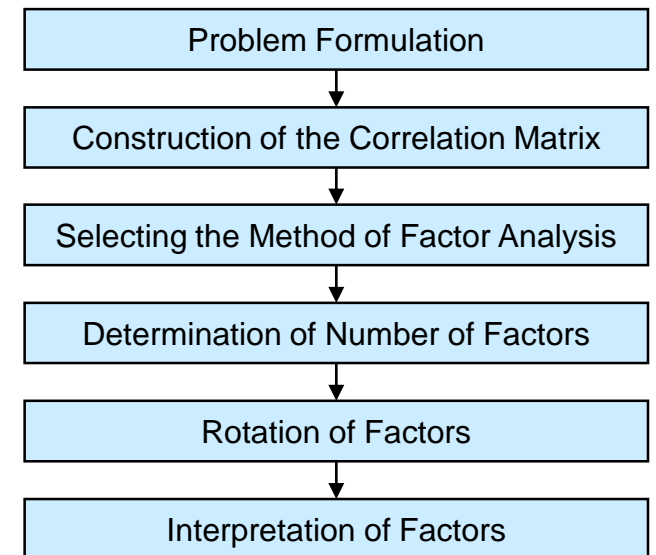
**Data Reduction Using Multivariate Analysis: Factor Analysis reduces the original number of attributes to a smaller number of factors, each containing a set of attributes that “hang together”.
An interdependence technique.**

Why?

- To **identify underlying dimensions** that explain correlations among variables.
- To identify a new (smaller) set of uncorrelated variables to replace the original set of correlated variables in subsequent multivariate analysis (e.g. regression or ANCOVA).
- **Exploratory** (reveal interrelationships; generate hypotheses) or **confirmatory** (test hypotheses; structural equation modeling) factor analysis

Practical Applications:

- **Market segmentation:** identify underlying variables to group customers.
- **Product research:** determine brand attributes that influence consumers' choice.
- **Price management:** identify characteristics of price-sensitive consumers.
- Assess the validity of construct measurements.



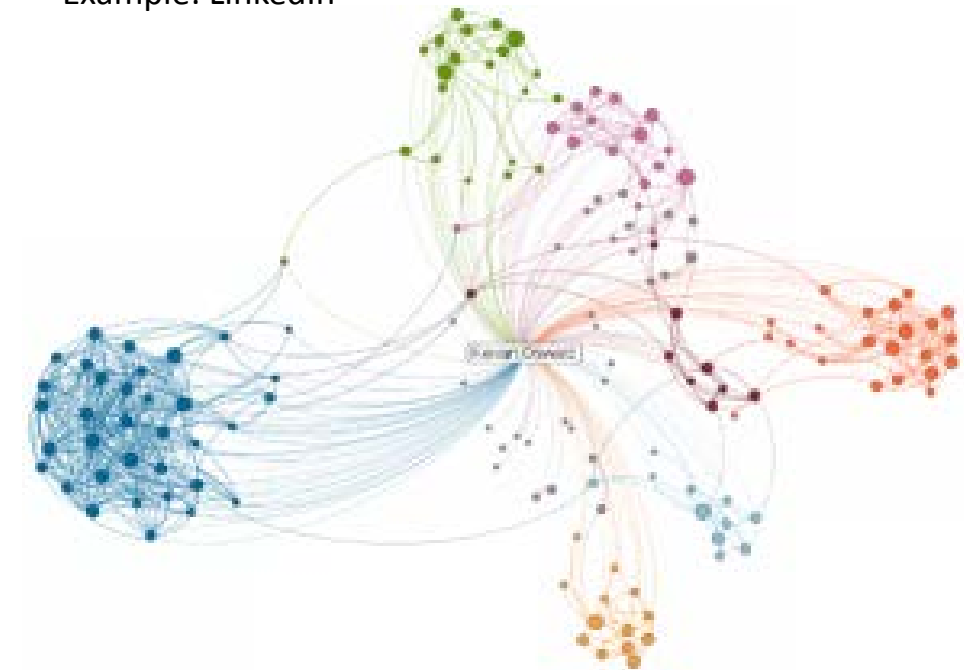
Perceptual Gap Analysis: Cluster Analysis

Data Reduction Using Multivariate Analysis: Cluster Analysis reduces original number of respondents to a smaller number of clusters based on their benefits sought, as revealed by their “ideal brand”.

Why? Practical Applications?

- To **group a set of objects** in such a way that objects in the same group (cluster) are more similar to each other than to those in other clusters, i.e. to partition the general population of consumers into **market segments**.
- A main task of **exploratory data mining**, and a common technique for **statistical data analysis**
 - including machine learning, pattern recognition, image analysis, information retrieval, bioinformatics, data compression, and computer graphics.
- To understand relationships between different groups of (potential) consumers:
 - **Market segmentation, Product positioning, New product development, Selecting test markets.**

Example: LinkedIn



Conjoint Analysis

Conjoint Analysis is an analytical attribute technique based on features using the idea of a Trade-Off Analysis

Why?

- Avoiding the problem of directly asking about **feature importance**:
“Everything is important and should be big – except price”
- Force respondents to engage in **trade-offs**: high quality, but high price.

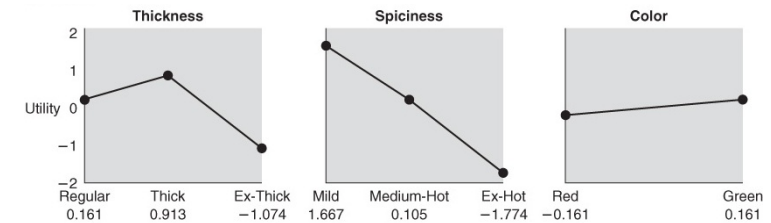
How?

- Combinations of attributes that respondents have to **“consider jointly”**.
- Respondents **rank** these sets in order of preference.
- Conjoint analysis finds the **optimal levels** of each attribute by decomposing additive utility (even for single respondents).

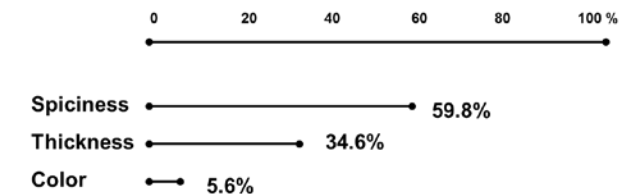
Practical Applications:

- Define optimum combination of features.
- Show relative attribute contributions to overall product evaluation.
- Predict customer judgments.
- Isolate segments of potential customers.
- Identify market opportunities: explore potential for new feature combinations.

Salsa example: Part worth utilities



Salsa example: Relative Importance of Attributes



Salsa example: Conjoint Analysis calculations

Attribute level	Rankings across stimuli	Average ranking	Deviation from grand average ranking	Part worth utility	Range	Relative Importance
Regular	4 3 10 6 15 16	9,000	-0,500	0,500		
Thick	2 1 8 5 13 11	6,667	-2,833	2,833	6,167	34,6%
Extra-Thick	7 9 14 12 17 18	12,833	3,333	-3,333		
Mild	4 3 2 1 7 9	4,333	-5,167	5,167		
Medium	10 6 8 5 14 12	9,167	-0,333	0,333	10,667	59,8%
Extra-Hot	15 16 13 11 17 18	15,000	5,500	-5,500		
Red	4 10 15 2 8 13 7 14 17	10,000	0,500	-0,500	1,000	5,6%
Green	3 6 16 1 5 11 9 12 18	9,000	-0,500	0,500		
SUM						17,833

Conclusions: Screening, Testing & Evaluation

Innovation means to create alternatives => requirement to select between those!

Stage-Gate-Logic and **The Big Picture** build on the idea of a sequence of actions and decision gates:
Continue or go back or stop?

The recent emphasis on **agile, highly iterative innovation** (Design thinking, SCRUM, agile development) even more demands **advanced and frequent evaluation and testing capabilities** – the art of experimentation!

Sources and further readings

- Crawford, C. M., & Di Benedetto, C. A. (2011). *New products management*. McGraw-Hill Education.
- Eppinger, S. D., & Ulrich, K. T. (2011, 2015). *Product design and development*. McGraw-Hill.
- Wheelwright, S. C., & Clark, K. B. (1992). *Revolutionizing product development: quantum leaps in speed, efficiency, and quality*. Simon and Schuster.
- Further Readings: Savoia (2016); Schrage (2015); Seamon (2004).