OpenSource Connections

A model for understanding e-commerce search

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Abou me

- Director E-commerce Search at OpenSource Connections
- Worked in search for ca. 15 years
- Focus on e-commerce search, worked with some of Germany's top 10 online retailers
- Co-Founder/-Organiser of MICES - Mix-Camp Ecommerce Search (https://mices.co)
- Lucene, Solr, Elasticsearch
- Maintainer of Querqy, co-initiator of Chorus

Mental models...

... reflect our thoughts and assumptions about how things work in the real world

... serve as guidance when we interpret and understand observations

... and finally help us make decisions

A mental model for understanding e-commerce search...

... should reflect our understanding how consumers use search to find products and to come to a buying decision

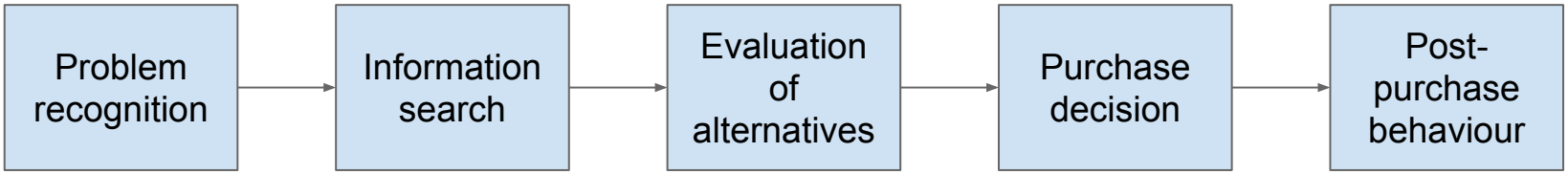
... serve as guidance when we interpret and understand search user behaviour

... and finally help us make decisions about how to optimise search

(I will ignore seller objectives like maximising sales, stock clearance etc. in my talk)

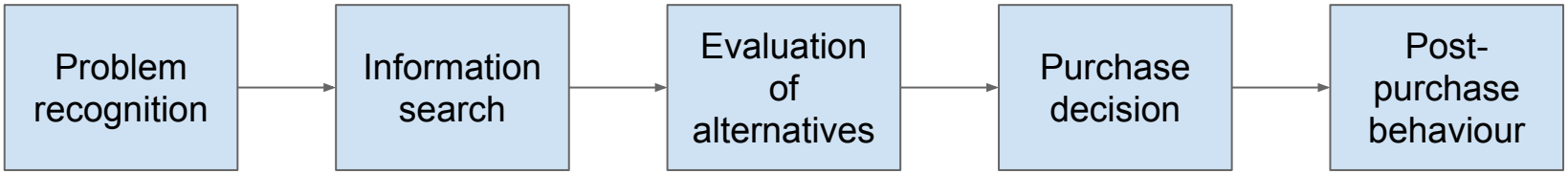
E-commerce search vs the consumer buying decision process

Consumer buying decision process



General model of the ‘consumer buying decision process’

Consumer buying decision process



General model of the ‘consumer buying decision process’ with a long history:

- Thomas Dewey *How we think* - General model of decision making (1910)
- Engel, Blackwell, Kollat and Miniard - research in the late 1960s-1990s
- Philip Kotler & Kevin Lane. *Marketing Management* (1997)
- Peter Morville. *Ambient Findability* (2005) - first mentioning in the context of search

Consumer buying decision process

- The trigger of the process
- Consumer ‘realises’ that ‘the desired state differs from actual state’
  - ‘milk is finished’, ‘my neighbour’s TV has a much better sound than mine’, ’my teflon pan has too many scratches and an iron pan is better for health anyway’

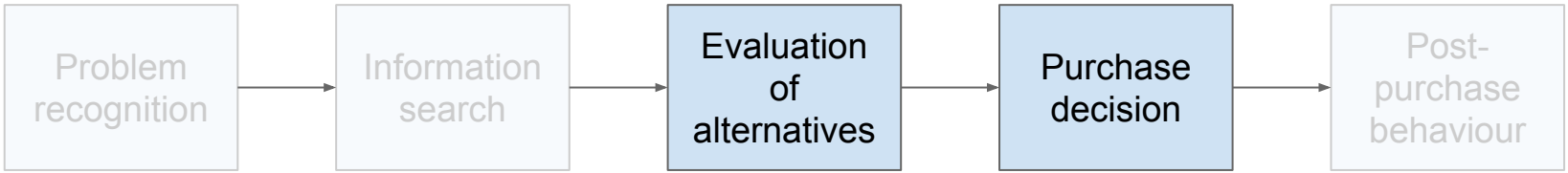
Bruner & Pomazal. Problem recognition: The Crucial First Stage of the Consumer Decision Process. Journal of Consumer Marketing. 1988

Consumer buying decision process

- Problem recognition sets a direction for information search
- This can be very vague: ‘It doesn’t feel cosy in my bathroom’ (e.g. when I lie in the bathtub)

  => looks for bathroom furniture (and buys towels later)

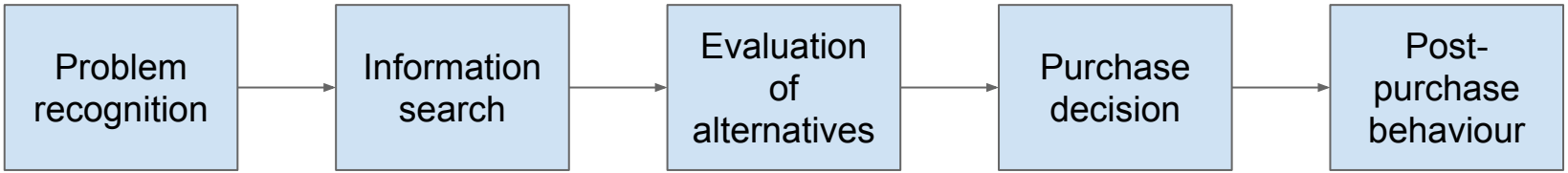
Consumer buying decision process



- Narrowing down the set of considered products (product types, e.g. piece of bathroom furniture vs towels, iPhone 12 256GB vs 64GB)
- But still we choose one single product or offer from a wealth of options:

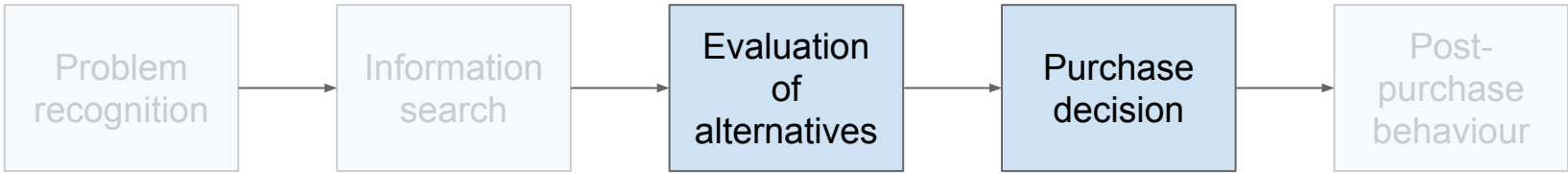
  https://www.mediamarkt.de/de/category/smartphones-579.html - query ‘smartphone’ returns ca. 800 smartphones to choose from

Consumer buying decision process vs search



Browse vs search
Short head vs long tail queries
Result diversity matters
Single term vs many terms in query
ID queries
Click-Through-Rate vs Conversion Rate
Why does search convert better than browse?

Consumer buying decision process



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What makes consumers buy a specific product and decide for a specific offer? And was does this mean for search?

Homo economicus / 'Economic man'

... who inevitably does that by which he may obtain the greatest amount of necessaries, conveniences, and luxuries, with the smallest quantity of labor and physical self-denial with which they can be obtained.

John Stuart Mill (late 19th century)

... humans as agents who are consistently rational and narrowly self-interested, and who pursue their subjectively defined ends optimally.

(Wikipedia, https://en.wikipedia.org/wiki/Homo_economicus)

Homo economicus / ‘Economic man’

Criticism:

- We make irrational decisions
- Incomplete access to information / could we even process all available information (about all available products) to make an optimal decision
- Social values do influence our decision making
- Individual preferences can be unstable

Homo economicus / ‘Economic man’

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=> Challenged by research on behavioural economy / consumer behaviour

$30.00

$29.96

$31.03

Which offer would you trust the most/least?
Which offer would you find the most attractive?

Image: https://www.seekpng.com/ipng/u2q8e6i1y3u2a9e6_avp-cat5e-rj45-ethernet-cable-4m-networking-cables/

Why do we prefer one product over another?

likable, intriguing vs ?

Image: https://world.openfoodfacts.org/cgi/product_image.pl?code=4008452010031&id=5 (CC)

Why do we prefer a certain product or offer?

We struggle to explain our decision making as it happens mostly **unconsciously**.

Two types of decision making

Controlled, mostly conscious decision making

- Slow (~ 0.5s)
- Small capacity in the brain (can process ca. 7-40 bits/s)
- Burns a lot of energy

Automatic, mostly unconscious decision making

- Very fast
- Can cope with huge amounts of information - our senses send an estimated ca. 11 million bits/s of information/stimuli to our brain
- ‘Energy efficient’

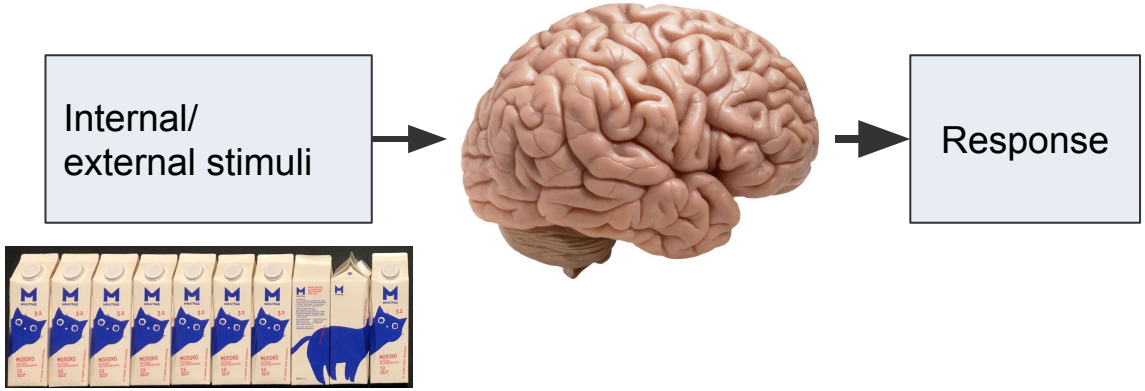
Daniel Kahneman: “System 2” vs “System 1”

Tor Nørretranders: “I” vs “Me”

Why do we prefer a certain product or offer?

Assuming that decision making happens mostly unconsciously - which is already bad news for understanding search user behaviour as we cannot simply ask users - can we still understand better why a given consumer prefers one product over the other?

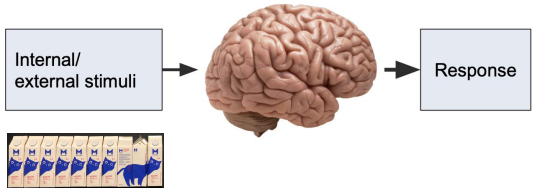
Neural consumer behaviour research



Skin response
(e.g. sweating)

Muscle response
(e.g. facial expression)

Cardio response
(e.g. heart rate, heart rate variability, pulse volume)



Skin response
(e.g. sweating)

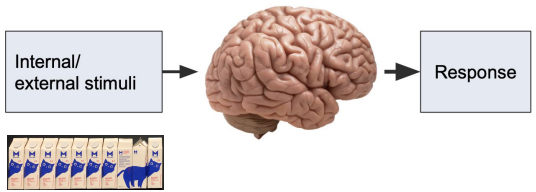
Muscle response
(e.g. facial expression)

Cardio response
(e.g. heart rate, heart rate variability, pulse volume)

Emotions

<< measurable >>

<< interpreted >>



Skin response
(e.g. sweating)

Muscle response
(e.g. facial expression)

Cardio response
(e.g. heart rate, heart rate variability, pulse volume)

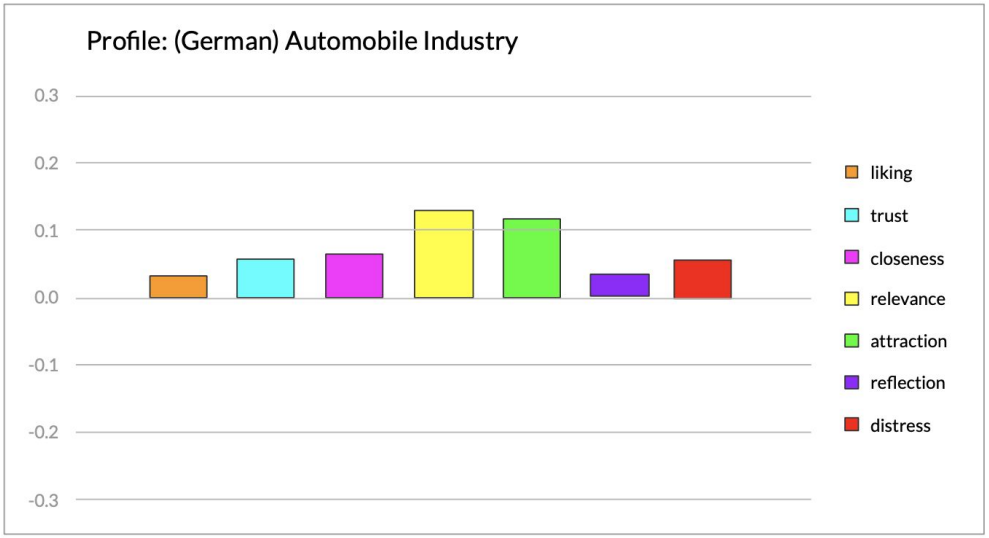
Emotional KPIs

Attraction
Sympathy
Emotional closeness
Trust
Relevance
Reflexion
Distress

<< measurable >>

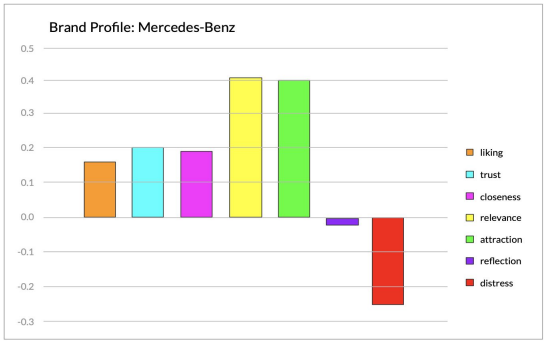
<< interpreted >>

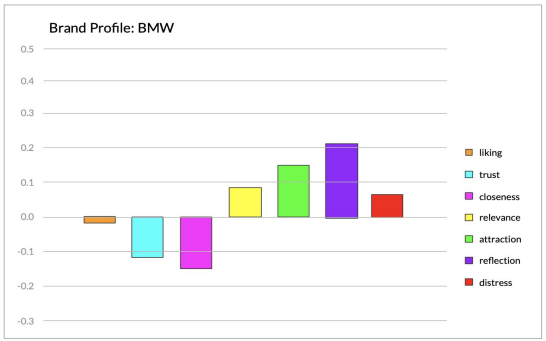
Küppers, Schenkel, Spitzer. *How to kill your brand*. 2021; Feldmann Barrett. *How Emotions Are Made*. 2017



Applied consumer behaviour research: Emotional KPIs for car industry vs other industries

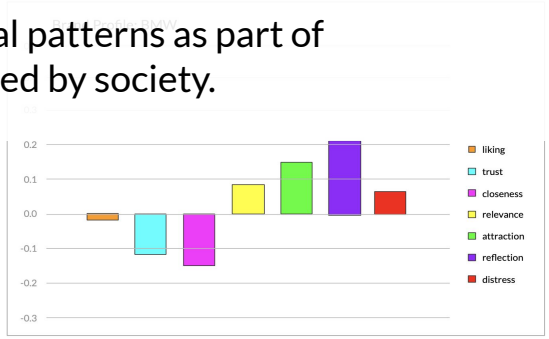
(Source: heart.facts / marktfoschung.dossier Mai 2016)





(Data source: heart.facts / marktfoschung.dossier Mai 2016)

We establish our preferred emotional patterns as part of our individual development, influenced by society.



The consumer buying decision process vs search

Putting it all together…

The What

The right type of item, the utility of the item

The Purchase

Readiness to spend money on that item, making the purchase decision for a concrete offer

The Implied

(Social) Implications on the self

Aspects of the buying decision

The What Having

The right type of item, the utility of the item

The Purchase Buying

Readiness to spend money on that item, making the purchase decision for a concrete offer

The Implied Being

(Social) Implications on the self

‘Buying, Having, Being’

‘Buying, Having, and Being’ is taken from the subtitle of Michael R. Solomon. *Consumer Behavior. Buying, Having, and Being*. 2006. The book is not organised around these terms but I’m using them in the context of e-commerce search as I find them very pointed.

The What Having

The right type of item, the utility of the item

Modelling in search
Core retrieval algorithm matching the semantics of the query ('topicality')

Evaluation
Manual evaluation

Predominant emotional KPIs
Relevance, trust (product), reflexion

Is this the right product, size, for whom, product attributes, …

A huge portion of 'Having' aspects of consumer intent is made explicit in queries:

'tshirt navy xl', 'shoes kids', 'm8', 'nappies', 'pampers', 'grain free dog food'

We need to bring back results that are relevant to these queries (implied: relevant to the consumer) => this sounds familiar!

Problem typical in e-commerce: handling of accessories

The Purchase **Buying**

Readiness to spend money on that item, making the purchase decision for a concrete offer

Modelling in search
Mostly explicit, numerical factors that influence the buying decision

Evaluation
Implicit in user behaviour

Predominant emotional KPIs
Trust (seller), attraction, distress

Aspects of the offer that interact with the buying decision, for example:

Price, delivery time, average product rating, number of reviews/ratings, popularity of the product (eg. number of sales), 'item freshness', shipping costs, seller rating (marketplace), distance between buyer and seller (classifieds)

=> Must be taken into account in search quality evaluation, in addition to relevance. How can we split these criteria from relevance in the evaluation?

=> Qualitative/quantitative analysis: strong interaction with product category and consumer/query intent

=> Criteria can be exploited as ranking factors

The Implied **Being**

(Social) Implications on the self

Modelling in search
Implicit/latent decision factors

Evaluation
Implicit in user behaviour

Predominant emotional KPIs
None - all of them should matter

Choices that consumers make in relation to their personality and to their social positioning, for example:

Belonging to the group of Jeep drivers, buying locally, buying toys from brand X as all the other parents do in our child's daycare group, green is my colour! …

Certain latent criteria could be exploited via images:

- Idealo: Classifier to choose 'good' image for display in search results
- Zalando (research): can generate fashion images (human model wearing apparel) using male/female poses (-> poses should also be detectable)

Personalisation / user demographics

Very hard to understand and measure! Fall back to general brand/product popularity

Application (examples)

The What Having

The right type of item, the utility of the item

The Purchase Buying

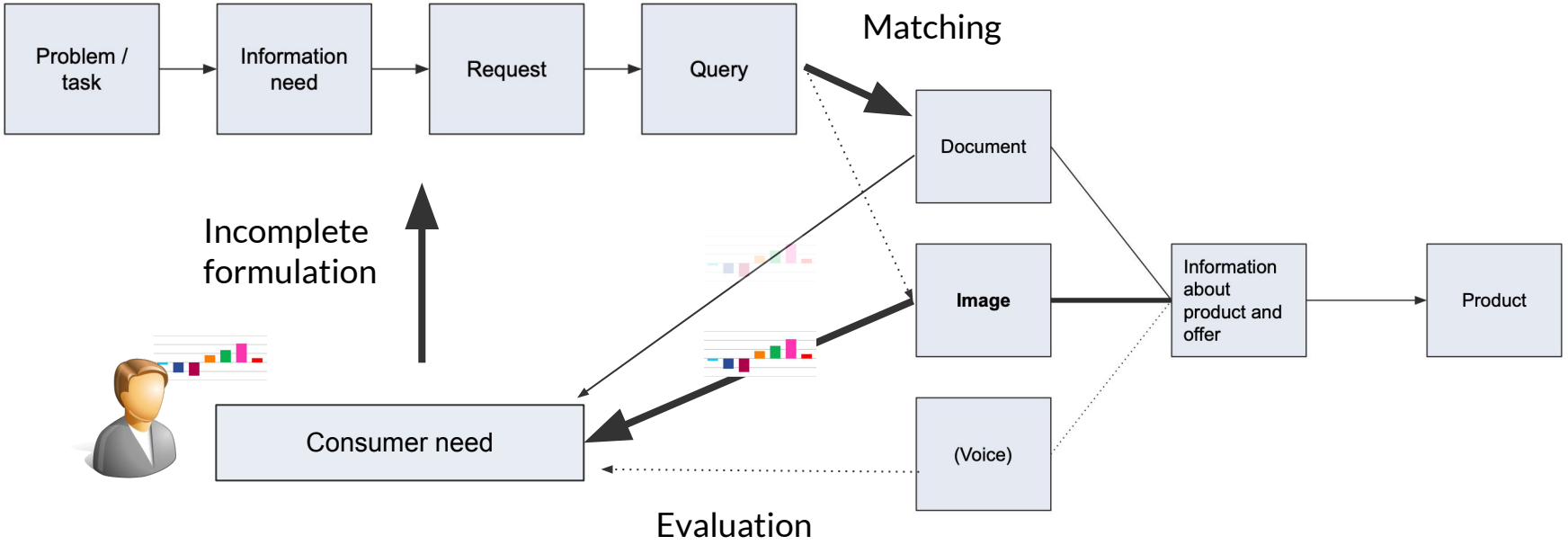
Readiness to spend money on that item, making the purchase decision for a concrete offer

The Implied Being

(Social) Implications on the self

Search development roadmap

often starts with 'Having => adds ranking factors from 'Buying' => and moves to more integrated models that include 'Being'.



Line width = amount of information & speed of processing
(Evaluation can use all types of information but textual information is ignored for most search results)
Hypothesis: clues for emotions are mostly conveyed visually

Matching and evaluation

Thank you!

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