

**Increasing relevant product recall through smart use of  
customer behavioral data**



**KRAMP  
HUB**

FOCUS. FAST FORWARD. FUTURE.

**Haystack 2022**

Eric Rongen & Jelmer Krauwer

# Intro



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**Jelmer Krauwer**

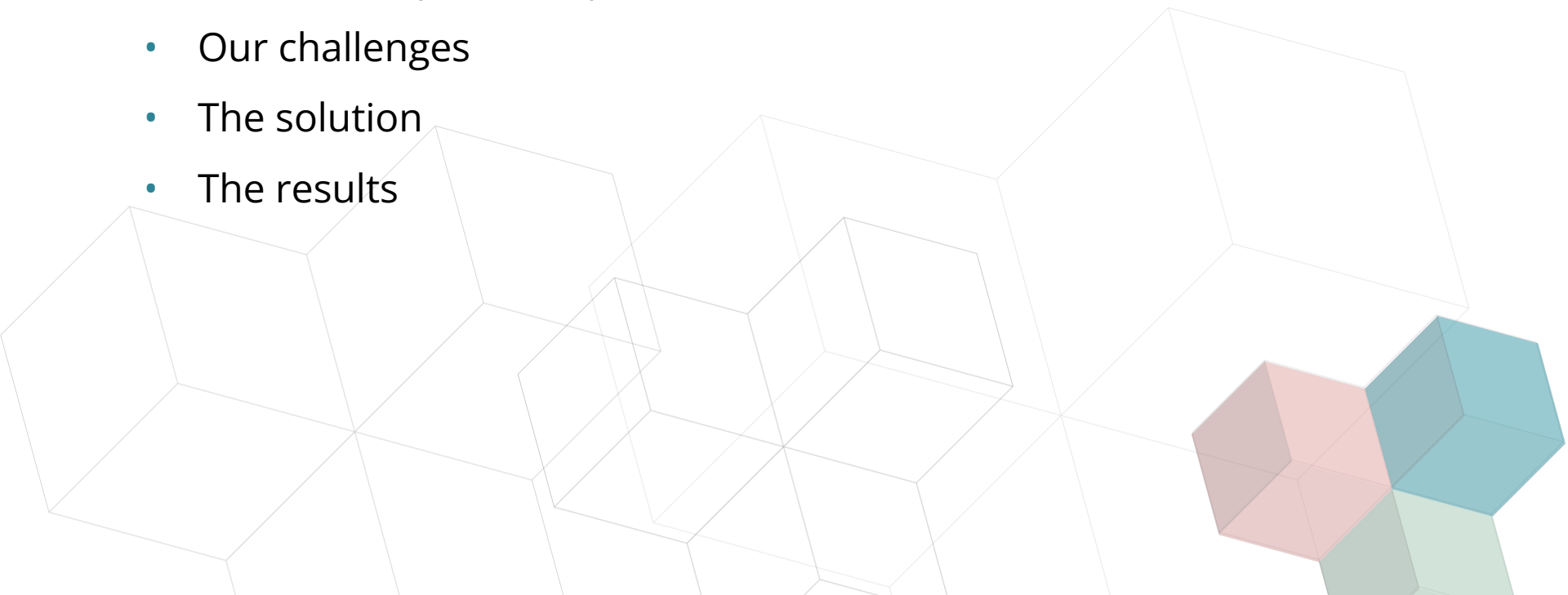
Architect for Data & ML

Kramp Hub

[linkedin.com/in/jelmerkrauwer](https://linkedin.com/in/jelmerkrauwer)

# Today

- About Kramp & Kramp Hub
- Our challenges
- The solution
- The results





# About Kramp



**1031M**

2021 € TURNOVER

**50K**

CUSTOMERS

**>3000**

EMPLOYEES

**30**

COUNTRIES

**>500K**

PRODUCTS (1.7 mln total)

**11**

DISTRIBUTION CENTRES

# About Kramp Hub

## **Kramp e-commerce tech start-up**

- Founded in 2017
- Located in the heart of Utrecht
- ~75 colleagues, 25+ nationalities
- 10+ agile teams

## **Platform**

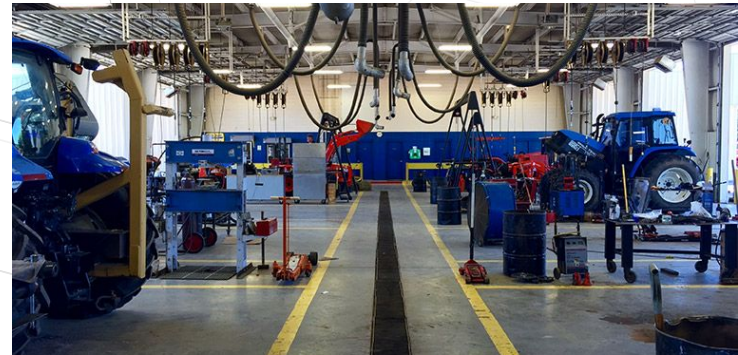
- Microservice e-commerce platform
- Powering multiple channels
- Elastic core with microservices on top



# Why is product findability important for Kramp?

A typical customer:

- Tractor dealership
- Purchaser
- Active during the whole day
- Loyal, persistent
- Knowledgeable
- Searches for specific part
- Trusts expertise of Kramp



# Some numbers on search at Kramp



**3.9 mio** search queries a month in **20** languages



**+80%** of add to carts start with typing a search query in the search box

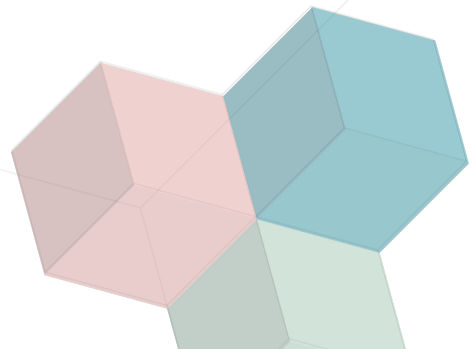


**60%** of search do not lead to any product interaction

# A look back to 2018

Search was the first service of our e-commerce platform that we rolled out to customers ~4 years ago

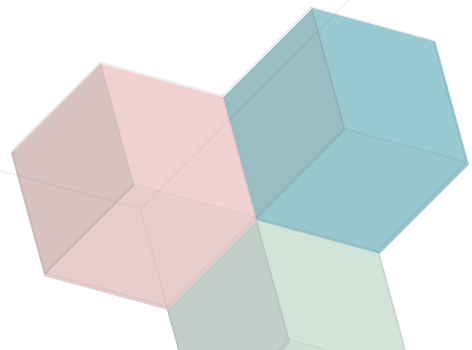
While doing so, we encountered some challenges





# Our challenges ... and their implications

- Product data won't improve overnight
- We can't fix search results manually
  - *Even though we tried*
- Even good product data won't match all possible search terms syntactically
  - *And vector search wasn't a thing yet*
- Our entire landscape was heavily under construction
  - *Early startup phase: there was nothing there*



# Conclusion

*"There is no way we can possibly improve search beyond what we're currently doing"*



But wait...



# Epiphany 1

*"The customer is always right"*

- B2B customers are special
- Loyal, frequent
- Strong intent to buy
- Technical parts, not Pinterest
- Deep knowledge

There must be some value in this...



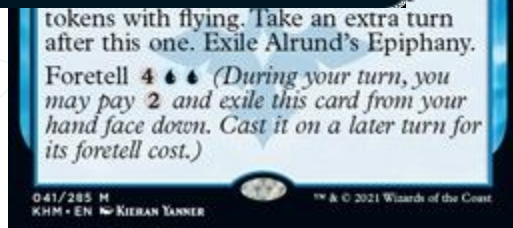


# Epiphany 2

*"Our entire landscape was heavily under construction"*

- Early startup phase
- There was nothing there...

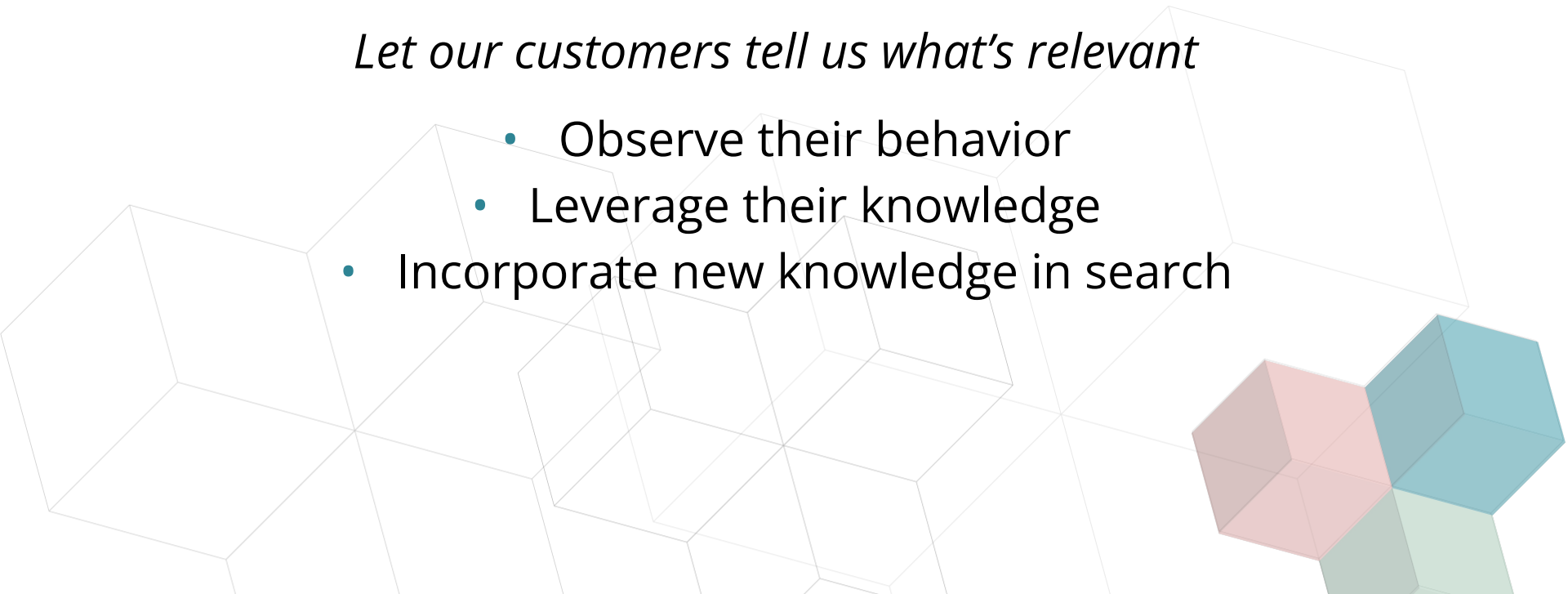
This meant we could do anything!



# Solution

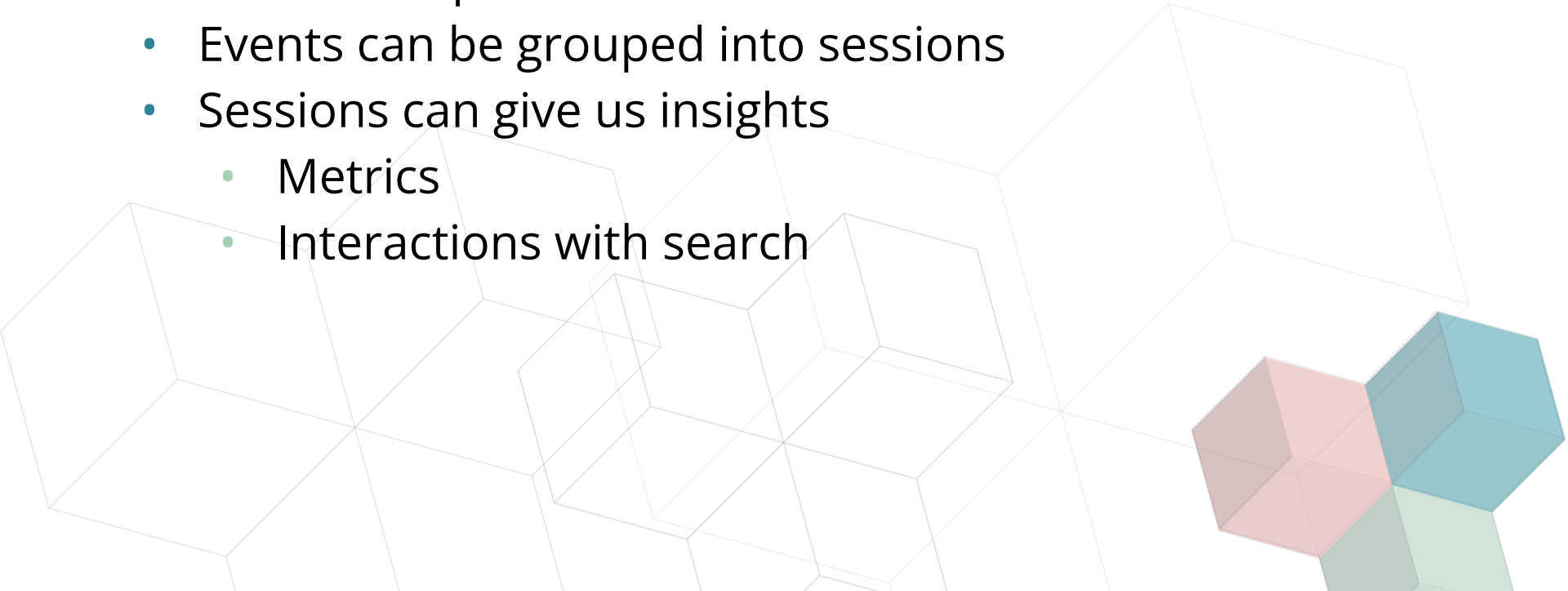
*Let our customers tell us what's relevant*

- Observe their behavior
  - Leverage their knowledge
- Incorporate new knowledge in search



# Starting points

- Customers produce events
- Events can be grouped into sessions
- Sessions can give us insights
  - Metrics
  - Interactions with search



# Events



Search

Product  
click

Product  
click

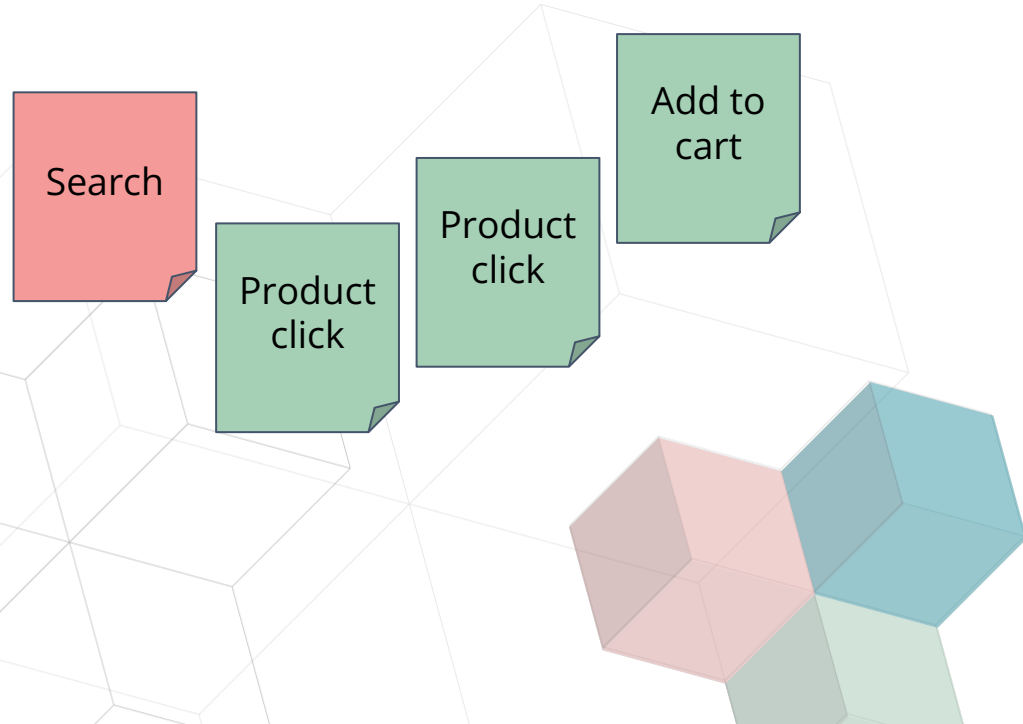
Add to  
cart

- Produced by customers
- Not random
- There is intent
- There is meaning
- There are patterns



# Sessions

- Groups of events
- Micro-sessions
- Focused around a single search
- Small gap between events
- Session ends after short time idle

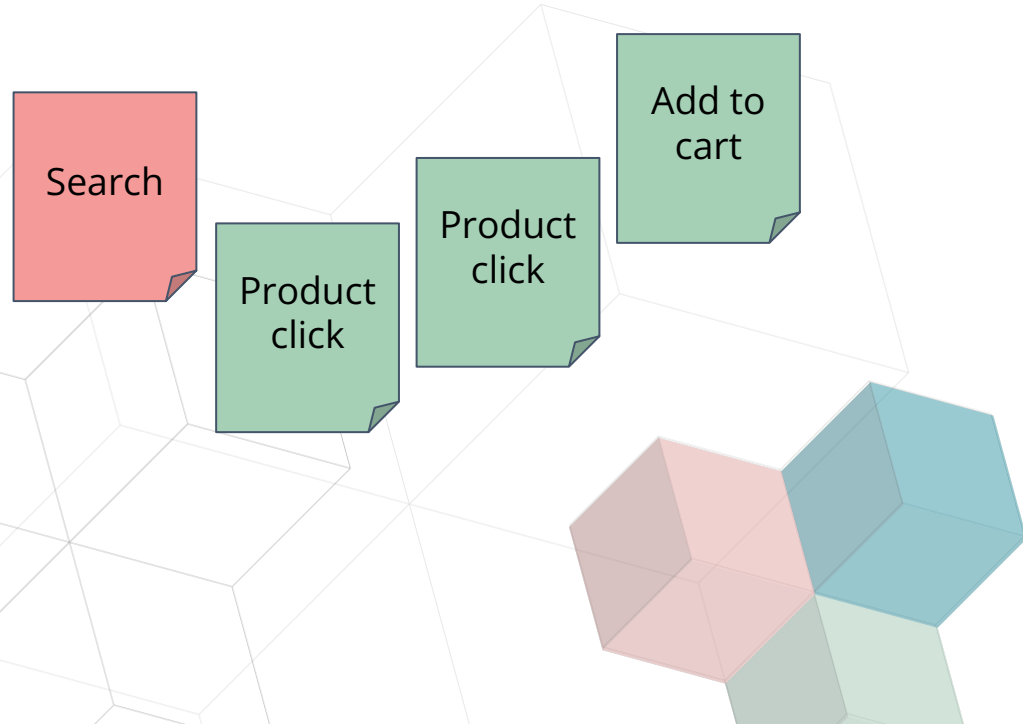


# Metrics

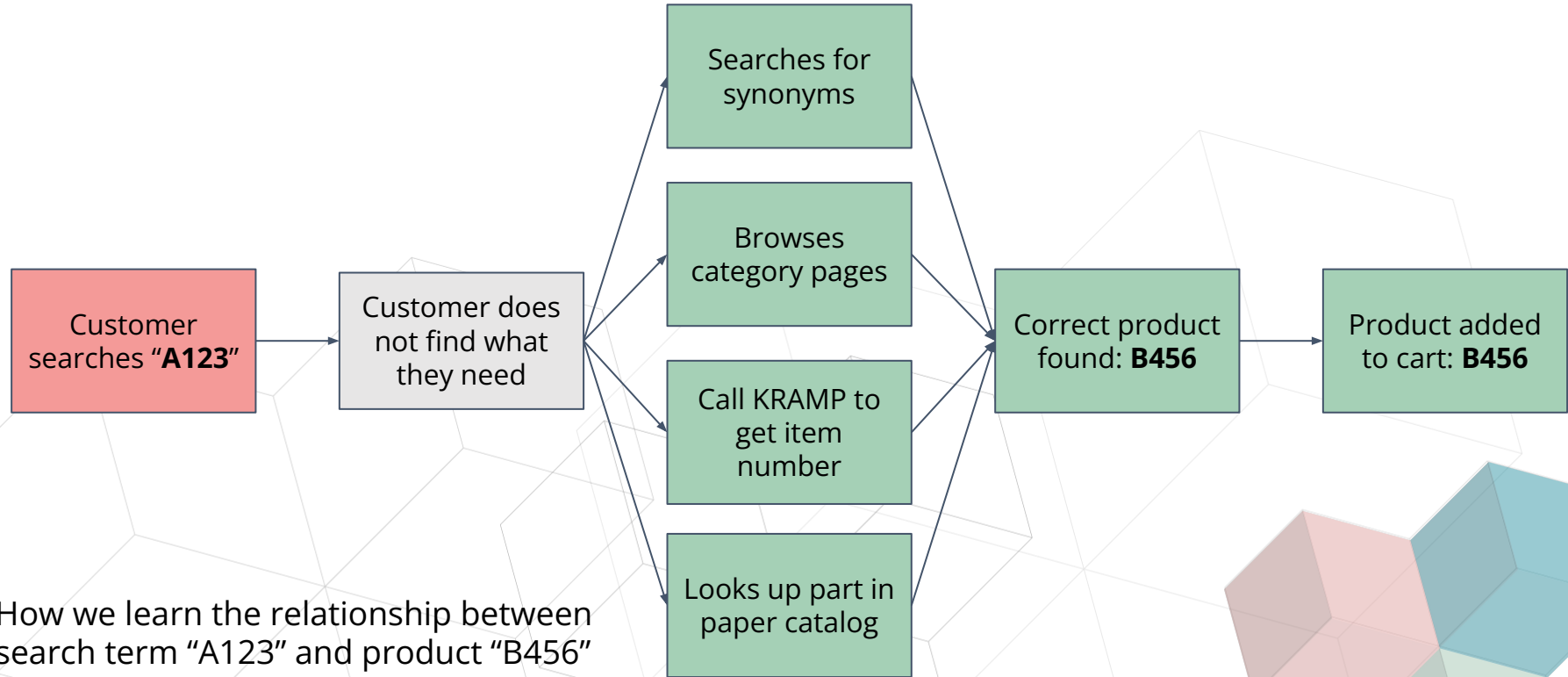
- Calculated on sessions
- Scoring the outcome of a session
- To evaluate a single search event

## Example metrics:

- `has_add_to_cart`
- `has_interaction`
- `has_results`
- `ndcg_at_10` (or 5, or 30)

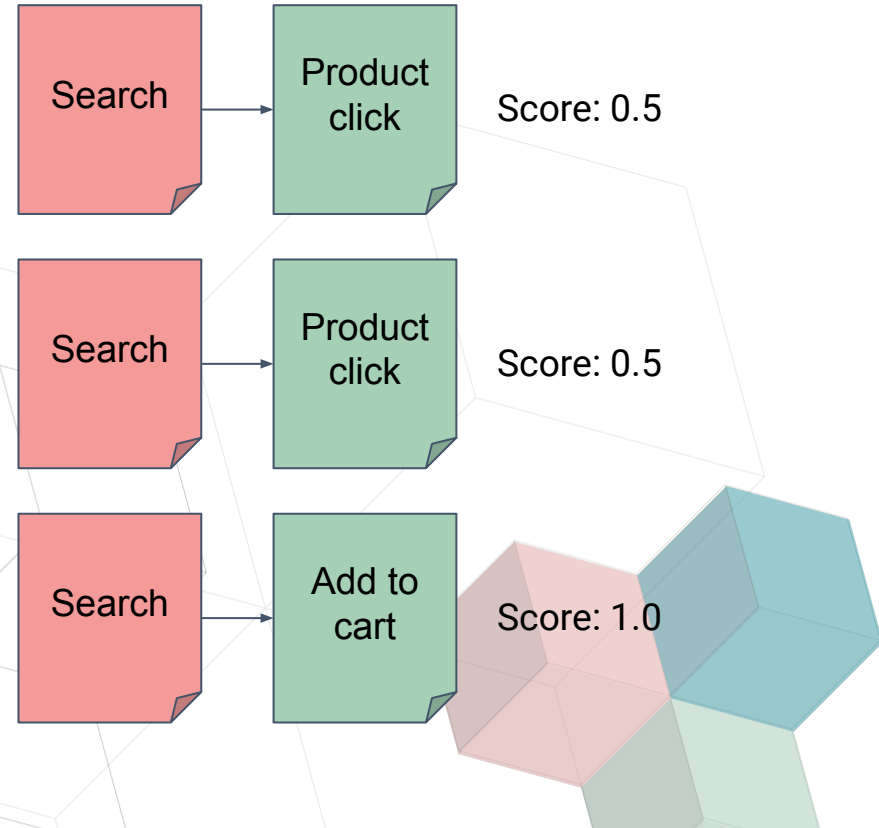


# Session: patterns



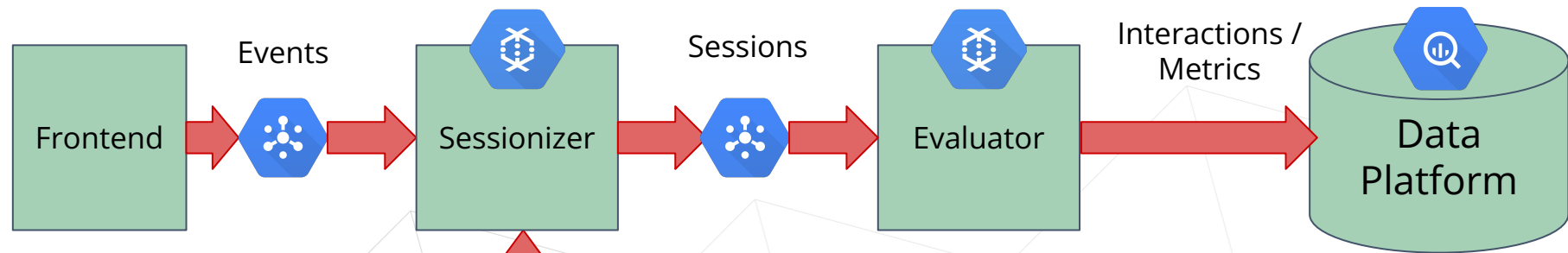
# Interactions

- Micro session
- Split into tuples
- Search + other event
- Interaction score





# Data collection setup



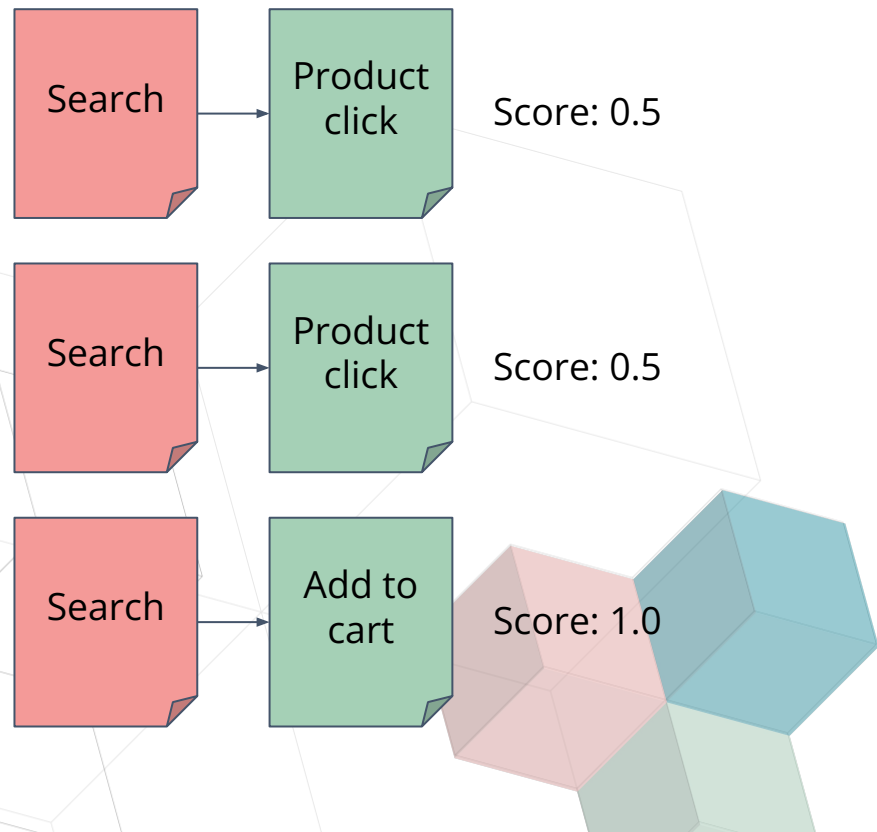
## Asynchronous, streaming analytics

- Google Cloud Platform
- Pub/Sub
- Apache Beam/DataFlow
- BigQuery sink



# Interpretation of the data

- Search term X...
- ...leads to interaction with Product Y...
- ...And score Z indicates the relevance of the interaction



# Aggregation (drawing conclusions)

*If we observe that:*

**Search term X**

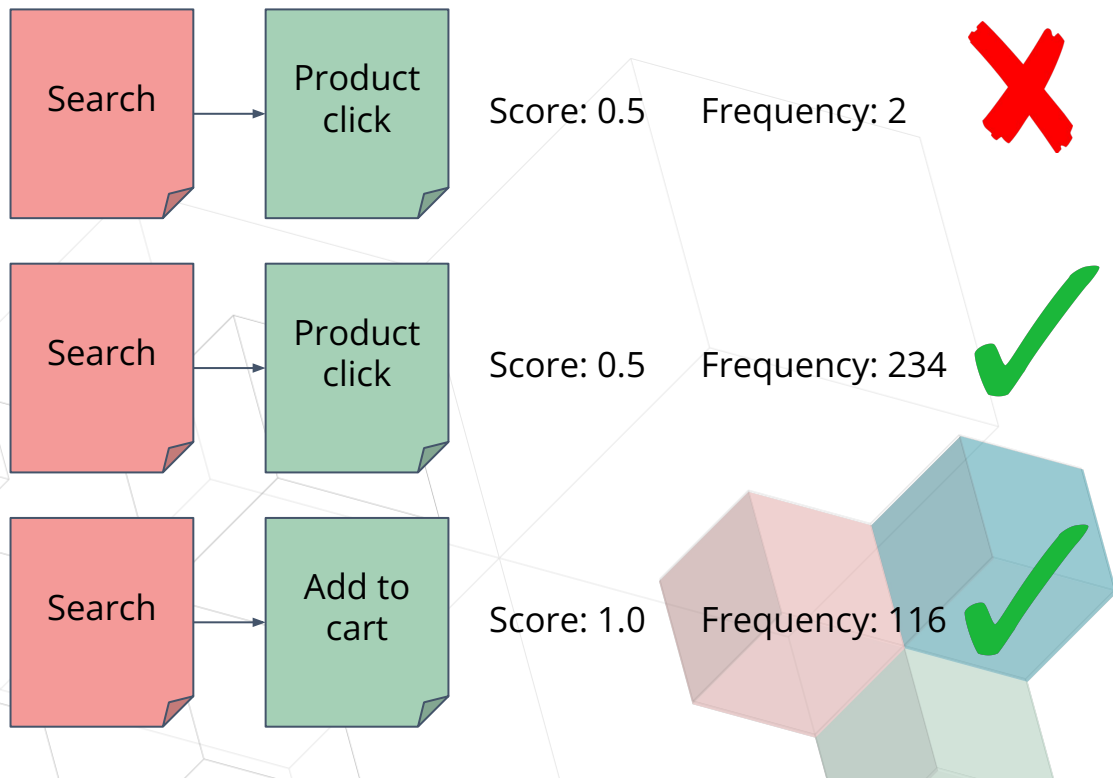
*Leads to interaction with*

**Product Y**

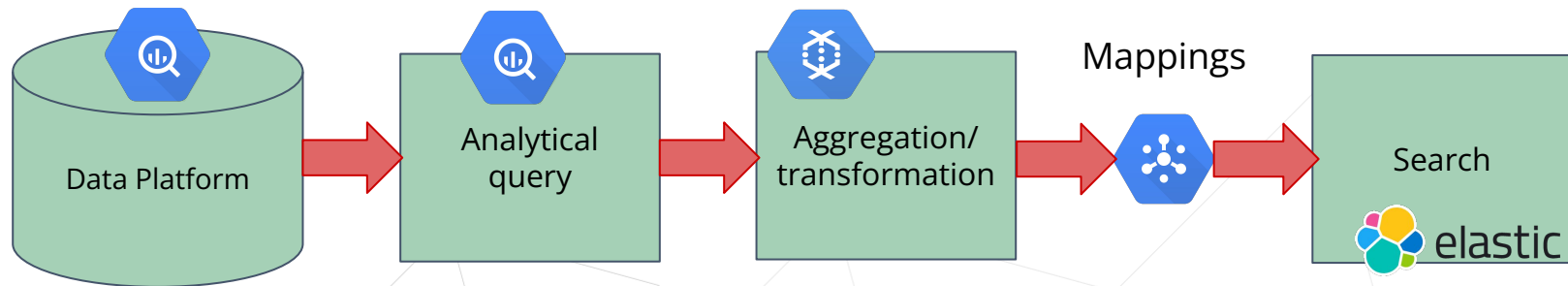
*More than **N** times*

*...*

We feel confident that  
we can use this  
mapping in search!



# Insights creation setup



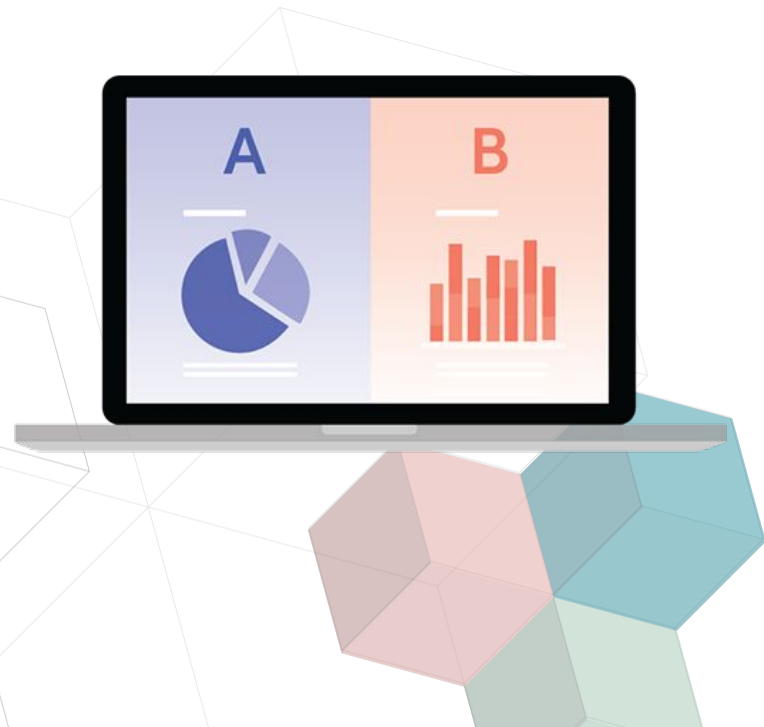
Feeding our insights back into the Search service

- Interaction tuples
- Analyzed/filtered
- Dataflow to aggregate & transform
- Mappings added to Elastic index



# A/B test on initial roll-out

- Pre-tested on simulated customer behavior (markov-style synthetic sessions)
- Tested for real using Multi Armed Bandit Service (epsilon greedy method)
- New variation with new mappings was successful
- Automatically rolled out to 90% of all traffic



# An example: query “Muthing” in Germany

Customer searches for



*Without* Relevance mappings

Suchergebnisse für *Muthing*

Leider ergab Ihre Suche keine Treffer.

*With* Relevance mappings

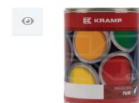
Suchergebnisse für muthing



**Kramp  
CK0960**  
Hammerschlegel leicht  
Hammerschlegel  
Gesamtübersicht



**Kramp  
CK0950**  
Hammerschlegel schwer  
Hammerschlegel  
Gesamtübersicht



**Kramp  
100708KR**  
RAL 1007 Narzissengelb 1 L  
Farben RAL-Nummern



**Kramp  
100704KR**  
RAL 1007 Narzissengelb 400  
ml  
RAL-Farben, Kramp



**BH5350**  
Schrb+Mutter M16x1,5x85  
SW27  
Schlegelmesser und  
Schrauben und Muttern für  
Hammerschlegel

# An example: query “Makita” in Netherlands













The Dutch love HIKOKI

Alle makita

NL Support Login

tuig Tuin & Park Hydrauliek & Aandrijftechniek Grondverzettechniek Winkel & Werkplaats

Weergave

 <b>gopart</b> <b>FGP430096</b> Luchtfilter Makita/Dolmar Luchtfilter universeel	 <b>Non Original</b> <b>FGP456501</b> Luchtfilter Makita/Dolmar Luchtfilter universeel	 <b>Motip</b> <b>000563</b> Remmenreiniger 500ml Remmenreiniger Motip	 <b>FGP4552365</b> Adaptor type N, 10 spline Ø 6mm, suitable for Makita Haakseoverbrenging Onderdelen FGP455976	 <b>HIKOKI</b> <b>750363</b> Bitset 32 delig Bitset 32-delig
 <b>HIKOKI</b> <b>WR18DBDL2W4Z</b> Accu slagschroevendraaier EX WR18DBDL2 slagmoeraanzetzer 18V	 <b>HIKOKI</b> <b>372120HIK</b> Batterij multivolt 36V 4,0Ah / 18v 8,0Ah Batterij - Accu	 <b>HIKOKI</b> <b>UC18YSL3WEZ</b> Booster Pack 18/36V Powerpacks	 <b>HIKOKI</b> <b>G18DBBLW2Z</b> Accu haakselijpmachine EX HSC G18DBBL slijpmachine 18V / 125mm	 <b>HIKOKI</b> <b>G13SR4YGZ</b> Haakse slijper G13SR4 Haakse slijpmachine 730 W / 125mm

# An example: query “Makita” in France



French people prefer  
Dewalt

Search results for "makita" on a French website. The header shows the search bar with "makita" entered and a search icon. The navigation bar includes categories: Tout, Makita, FR, Aide, Connexion. The main content area displays "Résultats de la recherche pour makita" and "35 résultats ont été trouvés. Vous pouvez affiner votre recherche à l'aide des filtres dans la colonne de gauche." Below this, there are 10 product listings, each with an image, a brand name, a product code, and a description.

Image	Brand	Product Code	Description
	Gopart	FGP430096	Filtre à air p/Makita/Dolmar Filtres à air universelle
		FGP4552365	Adaptateur type N, 10 cannelures Ø 6 mm, adapté à Makita Pièces pour boîtier standard FGP455976
	Dewalt	DCF899HNTXJ	Clé à choc 1/2" XR 18V 950Nm sans batterie Clé à chocs DCF899HNT-XJ 1/2" 18V
	Dewalt	DWE4217QS	Meuleuse Ø125mm - 1200W - fil DWE4217-QS Meuleuse d'angle 1200 W / 125mm
	Dewalt	DCB115P2QW	Pack 2 batteries + chargeur 5Ah 18V Pack 2 batteries + chargeur 18V Li-Ion

# An example: query “Makita” in Germany



Germans like Milwaukee

Alle ▾ makita 🔍

DE Hilfe Anmelden

& Fahrzeuge Forst & Garten Hydraulik & Antriebstechnik Baumaschinentechnik Shop & Werkstatt

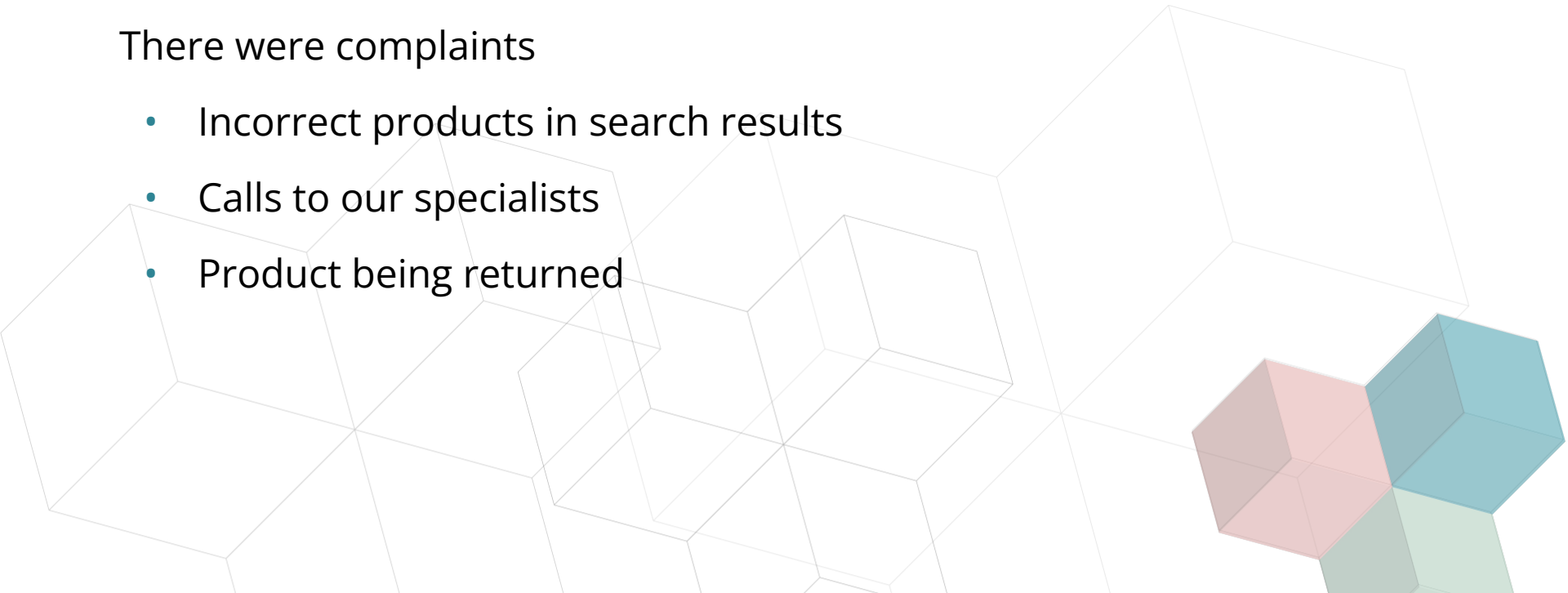
Betrachtungen

<b>FGP4552365</b> Adapter Typ N, 10er Verzahnung Ø 6mm, geeignet für Makita Ersatzteile für Winkelgetriebekopf FGP455976	<b>HIKOKI 752014</b> Sägeblatt für Tigersäge (5Stck) Sägeblatt für Tigersäge	<b>Metabo 600778850MET</b> Radio R12-18 DAB+BT Gehäuse Baustellenradio R 12-18 DAB+ BT	<b>Milwaukee M18B5</b> Batterien 18 V 5,0 Ah Akku, 18 V, RED Li-Ionen, M- Serie	<b>Milwaukee M18GG0</b> Akku-Fettpresse M18 GG Akku-Fettpresse 18V
<b>Milwaukee M12GG40</b> Akku-Fettpresse 4.0Ah M12 GG Akku-Fettpresse 12V	<b>Milwaukee 4933459730</b> Schlagschrauber M18ONEFHWF34-502X M18 ONEFHWF Schlagschrauber 3/4" 18V	<b>Milwaukee 4933464267</b> Akku-Bohrschrauber M18FPD2-502X M18FPD2 Akku-Bohrer/- Schrauber, 18 V	<b>Milwaukee 4933464555</b> Akku-Bohrmaschine M18CBLDD-0X M18 CBLDD Akku- Bohrerschrauber, 18 V	<b>Kramp 32513C64KR</b> Sägekette Vollmeißel, 325"-1,3 mm - 64DL .325"-1,3/1,5/1,6mm

# However, we are not right 100% of the time

There were complaints

- Incorrect products in search results
- Calls to our specialists
- Product being returned





# AB-test to reaffirm impact

KRAMP

Alle 84412164

DE Hilfe Anmelden

Landwirtschaft Traktoren & Fahrzeuge Forst & Gärten Hydraulik & Antriebstechnik Baumaschinentechnik Shop & Werkstatt

> Suchen nach 84412164

Kategorie

- Landwirtschaft (5)
- Traktoren & Fahrzeuge (14)
- Forst & Gärten (2)
- Baumaschinentechnik (11)

Marke

Suche

- ☐ CNH (1)
- ☐ Case IH (3)
- ☐ Donaldson (3)
- ☐ Fleetguard (1)
- ☐ MANN-FILTER (3)
- ☐ New Holland (2)
- ☐ Vapormatic (1)

Mittel

- ☐ Hydrauliköl (1)
- ☐ Kraftstoff (7)
- ☐ Luft (1)
- ☐ Wasser (1)

Suchergebnisse für 84412164

Wir haben 14 Ergebnisse gefunden. Sie können Ihre Suche durch das Filtern in der Spalte links verfeinern.

Betrachtungen

New Holland 84412164 Kraftstofffilter NH Wechselfilter - Kraftstoff

Donaldson P550880 Kraftstofffilter Donaldson Kraftstofffilter zum Anschrauben

Donaldson P550881 Kraftstofffilter Kraftstofffilter zum Anschrauben

MANN-FILTER WK929X Kraftstofffilter Kraftstofffilter zum Anschrauben

Vapormatic VPD6120 Kraftstofffilter Kraftstofffilter zum Anschrauben

Case IH 84278636 Kraftstofffilter CNH Fuel filter - Case IH

Case IH 84328598 Kraftstofffilter CNH Fuel filter - Case IH

Case IH 48142232 Hydraulikdruckfilter CNH Hydraulikfilter\_OE

Fleetguard FS19933 Kraftstoff-Wasser-Abscheider Kraftstofffilter zum Anschrauben

CNH 47509565 Kraftstofffilter Steyr MM & Containers

Donaldson X770684 Luftfiltersatz Donaldson Luftfilter Donaldson

New Holland 84170818 Kraftstofffilter NH Wechselfilter - Kraftstoff OE

MANN-FILTER WK9041X Kraftstofffilter Kraftstofffilter zum Anschrauben

MANN-FILTER WK9042X Kraftstoffwechselfilter Kraftstofffilter zum Anschrauben

Products in search results because of product data

Products in search results because of "Relevance mappings"

# Test scenario Control

**Control**

**KRAMP** Alle 84412164

Landwirtschaft Traktoren & Fahrzeuge Forst & Garten Hydraulik & Antriebstechnik Baumaschinentechnik Shop & Werkstatt

Suchergebnisse für 84412164

Wir haben 14 Ergebnisse gefunden. Sie können Ihre Suche durch das Filtern in der Spalte links verfeinern.

Betrachtungen

Image	Brand	Part Number	Description
	New Holland	84412164	Kraftstofffilter NH Wechselfilter - Kraftstoff
	Donaldson	P550880	Kraftstofffilter Donaldson Kraftstofffilter zum Anschrauben
	Donaldson	P550881	Kraftstofffilter Donaldson Kraftstofffilter zum Anschrauben
	MANN-FILTER	WK929X	Kraftstofffilter MANN-FILTER zum Anschrauben
	Vapormatic	VPD6120	Kraftstofffilter Vapormatic zum Anschrauben
	Case IH	84278636	Kraftstofffilter CNH Fuel filter - Case IH
	Case IH	84328598	Kraftstofffilter CNH Fuel filter - Case IH
	Case IH	48142232	Hydraulikdruckfilter CNH Hydraulikfilter_OE
	Fleetguard	FS19933	Kraftstoff-Wasser-Abscheider Kraftstofffilter zum Anschrauben
	CNH	47509565	Kraftstofffilter Steyr MM & Containers
	Donaldson	X770684	Luftfiltersatz Donaldson Luftfilter Donaldson
	New Holland	84170818	Kraftstofffilter NH Wechselfilter - Kraftstoff OE
	MANN-FILTER	WK9041X	Kraftstofffilter MANN-FILTER zum Anschrauben
	MANN-FILTER	WK9042X	Kraftstoffwechselfilter MANN-FILTER zum Anschrauben

**Marke**

Suche

- ☐ CNH (1)
- ☐ Case IH (3)
- ☐ Donaldson (3)
- ☐ Fleetguard (1)
- ☐ MANN-FILTER (3)
- ☐ New Holland (2)
- ☐ Vapormatic (1)

**Mittel**

- ☐ Hydrauliköl (1)
- ☐ Kraftstoff (7)
- ☐ Luft (1)
- ☐ Wasser (1)

Products in search results because of product data

Products in search results because of "Relevance mappings"

# Test scenario Variant

Variant

**KRAMP** Alle 84412164

Landwirtschaft Traktoren & Fahrzeuge Forst & Garten Hydraulik & Antriebstechnik Baumaschinentechnik Shop & Werkstatt

Suchergebnisse für 84412164

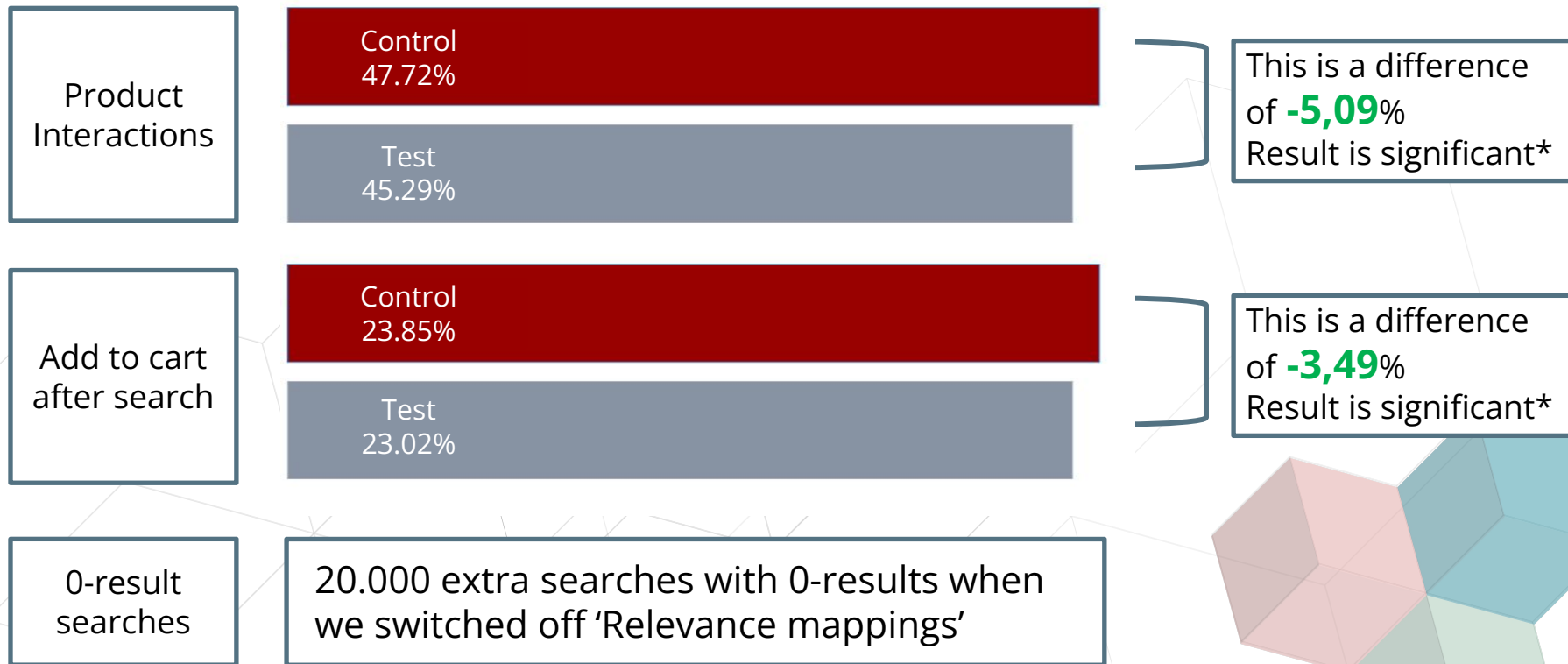
Wir haben 5 Ergebnisse gefunden. Sie können Ihre Suche durch das Filtern in der Spalte links verfeinern.

Betrachtungen

Image	Brand	Product Name	Description
	New Holland	8441 164	Kraftstofffilter NH Wechselfilter - Kraftstoff OE
	Donaldson	P550880	Kraftstofffilter Donaldson Kraftstofffilter zum Anschrauben
	Donaldson	P550881	Kraftstofffilter Kraftstofffilter zum Anschrauben
	MANN-FILTER	WK929X	Kraftstofffilter Kraftstofffilter zum Anschrauben
	Vapormatic	VPD6120	Kraftstofffilter Kraftstofffilter zum Anschrauben

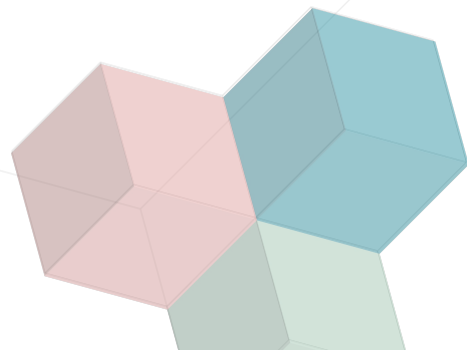
Only products in search results because of product data

# AB-test results



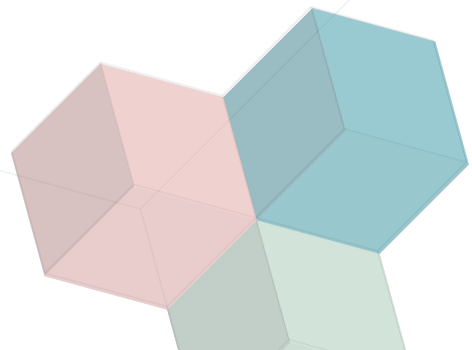
# Conclusion

- There is a lot of value in insights from customer behavior
- Relevance Mappings improve search relevance
- We can't afford to switch it off
- But we should fine-tune the algorithm



# Next steps

- Modifications to the algorithm
  - Exclude incorrect mappings
  - Fine-tune criteria
- We have billions of behavioral examples
  - We can leverage them to improve relevance
  - Vector search
  - Real time insights



# Thank you!

Thank you for your attention!  
Questions?

Feel free to contact us:

[eric@kramphub.com](mailto:eric@kramphub.com)  
[jelmer@kramphub.com](mailto:jelmer@kramphub.com)

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