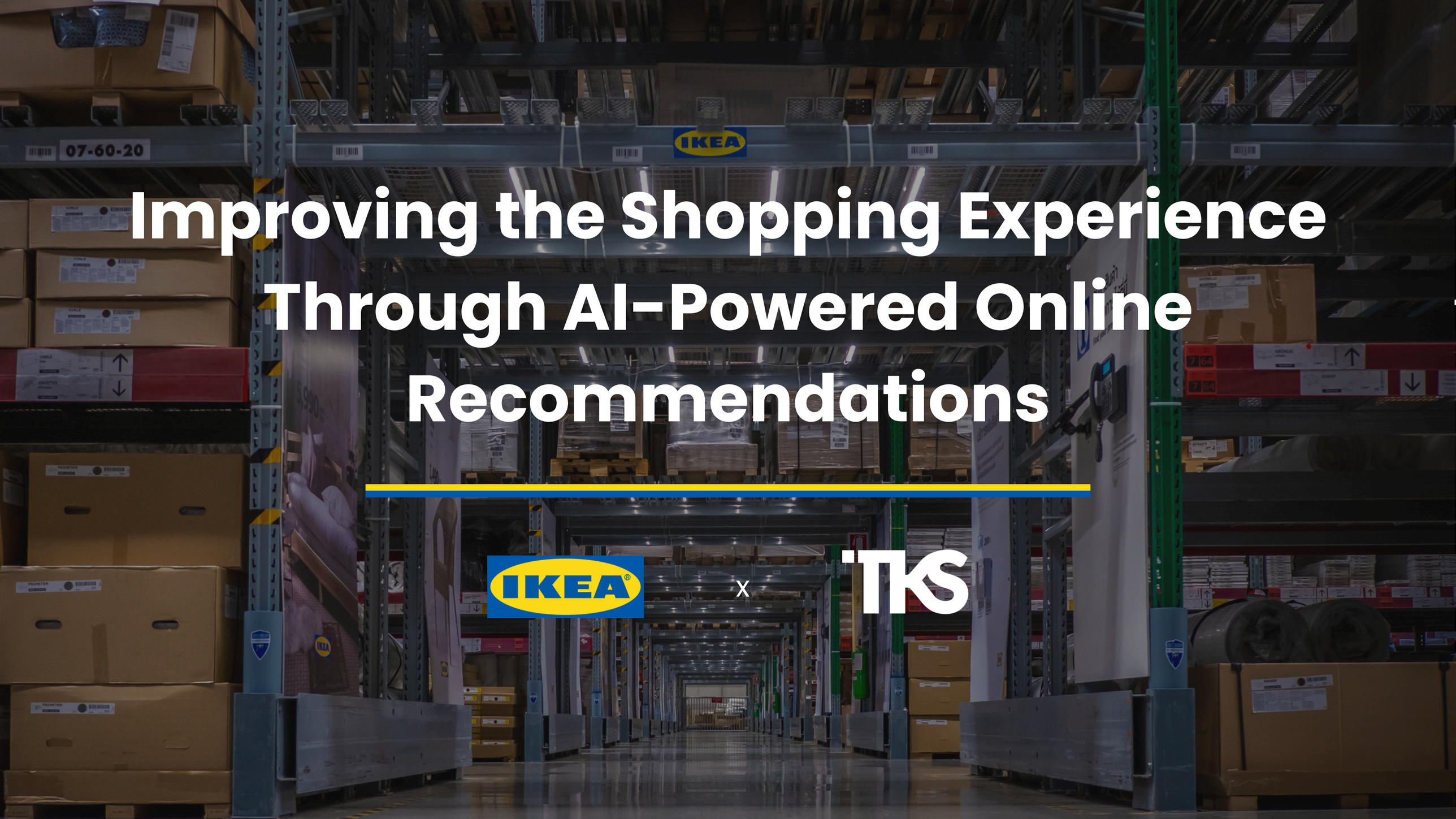


Improving the Shopping Experience Through AI-Powered Online Recommendations

IKEA x TKS

Executive Summary

The Problem

IKEA's recommendation system lacks the personalization consumers expect, putting it at risk of losing engagement to AI-driven competitors like Wayfair.

- IKEA's current recommendation system has limitations in delivering personalized shopping experiences, which are increasingly demanded by consumers.
- Furthermore, with e-commerce competitors like Wayfair excelling in AI-driven personalization. IKEA faces growing competitive pressure, risking a loss of customer engagement and loyalty if they do not match or surpass these capabilities.

The Solution

A better recommendation system powered by AI to offer online users personalized and relevant product suggestions based on their preferences.

- We recommend that IKEA improve its recommendation system by using AI to offer personalized product suggestions.
- The system should suggest products based on customers' past purchases, preferences, and popular items.
- It can also recommend products based on what customers are browsing and their location.
- This will create a more tailored and enjoyable shopping experience for all customers.

The Impact

Boosted customer satisfaction and convenience

- Makes it easier and more enjoyable for customers to find the products they want.
- Supports affordability, convenience, and a user-centered shopping experience.
- Personalized recommendations create a smoother, more enjoyable shopping journey for customers.
- AI-driven recommendations will help customers discover relevant products more easily, enhancing their shopping experience.

THE PROBLEM

What Customers Are Saying...

I found a weird issue with the “recommendations” for certain products on IKEA. I was searching for a black night stand, after I found one that looked good, it recommended me different things like tables, chairs, etcetera but in the same black colour. **I think that the system messed up** and **assumed I wanted things in the colour black**, not a certain piece of furniture.

Noah Vandenberg | 17 years old | Quebec

I recently shopped online on IKEA’s website, the experience wasn’t smooth... Items can sometimes be hard to find because the sections and subcategories don’t seem to match my searches well... I had to browse through several categories for an item without success, as they were either too broad or too specific. **Better organization, with more precise filters and clearer categories**, would be greatly appreciated.

Kael Deryn | 23 years old | Quebec

THE PROBLEM

IKEA's situation

Innovate in Personalisation.

IKEA is experiencing significant growth in its online presence, with a **21% increase in website visits** (from 3.8 billion in FY23 to 4.6 billion in FY24).

Online sales now account for **26% of total retail revenue**, highlighting the growing importance of e-commerce for the brand.

This success presents an exciting opportunity for IKEA to further enhance its digital strategy by leveraging AI-powered personalization tools. Industry leaders like Amazon have demonstrated the significant impact of tailored recommendations, with **35% of their sales** attributed to these systems. By adopting a similar approach, IKEA can elevate its **customer experience**, driving *higher conversion rates, increased average order value, stronger loyalty and better relationships between IKEA and customer.*

Meeting the growing consumer demand for personalized shopping experiences will also allow IKEA to **stay ahead** in the competitive e-commerce landscape. Embracing this innovation aligns perfectly with IKEA's values of affordability, accessibility, and sustainability, while unlocking the untapped potential of its thriving digital platform.

THE PROBLEM

Customer Decisions Have Three Psychological Factors

Reduced Decision Fatigue
Personalization simplifies decision-making. **37%** of shoppers return to the site, and they are **4.5x** more likely to complete a purchase.

Higher Relevance
Relevant recommendations keep customers on the site longer, boosting engagement and increasing purchases. **52%** of orders include a recommended product.

Contextual and Personalized Recommendations:
Shoppers respond better to recommendations that are relevant to their current preferences or past behavior, leading to higher conversion rates.

OUR SOLUTION IS

VisionMatch

a Convolutional Neural Network utilizes **Reinforcement Learning** to **personalize product suggestions,** boosting sales and customer satisfaction.

THE SOLUTION

Recommendation

The solution uses Convolutional Neural Network to analyze IKEA's product catalog and link items by visual similarity, while **reinforcement learning** improves recommendations based on user feedback.

1

Data Collection & Intent Prediction

Data collection includes **tracking logged-in users'** purchase history and browsing habits, as well as **guest users' real-time behavior** and **contextual factors** like device type and time of day. Intent prediction analyzes search queries, browsing patterns, and cart contents to suggest complementary products.

2

Recommendation Strategies & Enhancements

Recommendation strategies include **personalized suggestions** for logged-in users, **collaborative filtering** for guest users, and **hybrid recommendations** combining both methods. **Real-time adjustments** update recommendations based on session activity. Visual enhancements, like **AI-driven similarity**, suggest related products, while room compatibility and in-stock priority ensure **relevant recommendations based on the user's space and location.**

3

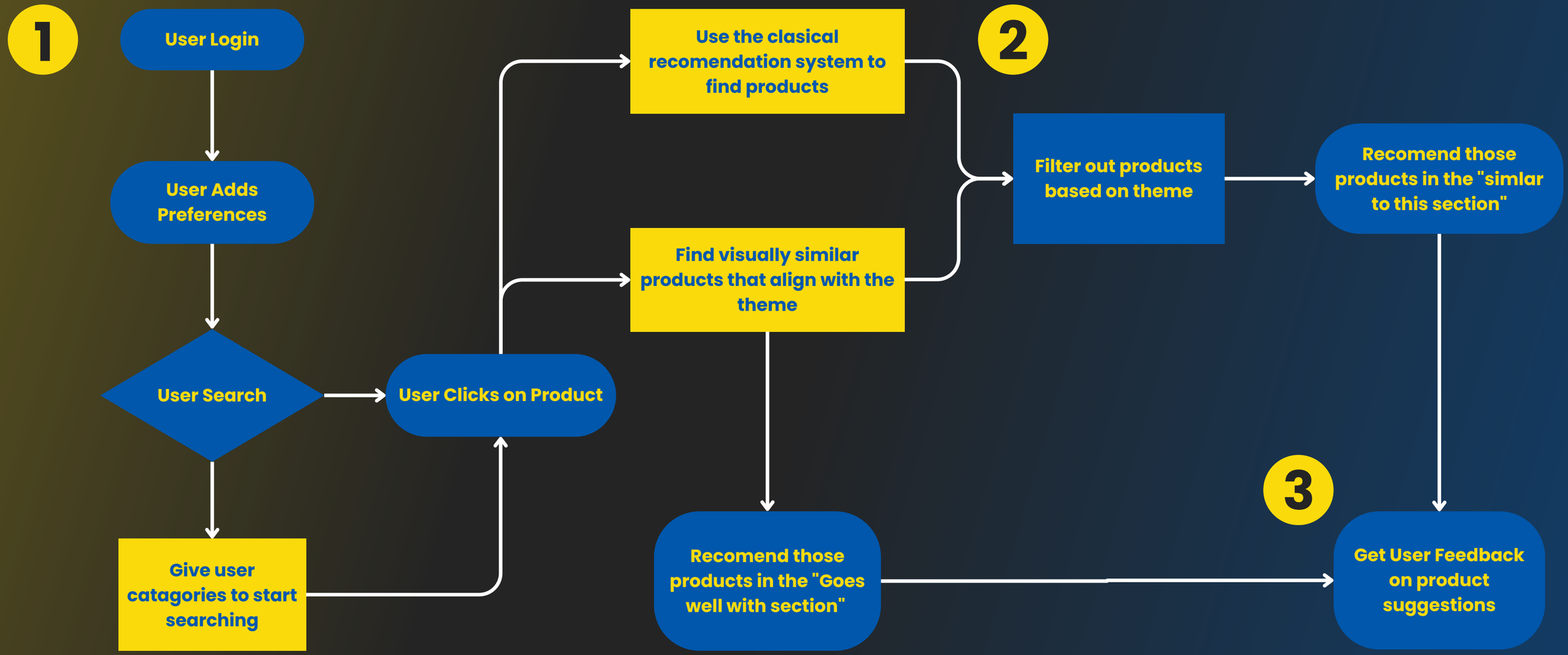
Post-Purchase Feedback Loop & Output

Post-purchase recommendations suggest complementary products, replacements, and loyalty incentives. The **feedback loop** uses user feedback and A/B testing to refine recommendations. **Personalized and collaborative suggestions** are displayed across channels like the website, app, and in-store kiosks.

THE SOLUTION

User Journey

A better Convolutional Neural Network -powered recommendation system to offer online users personalized and relevant product suggestions that align with the users' wants and needs



THE SOLUTION

How It Looks

Currently, related products only list the **same product with different colour** variations, instead of **suggesting other complementary goods** that customers have also bought with the selected item.

After VisionMatch

Products that match

Best seller

MELLTORP
Table,
49 1/4x29 1/2 "
$99.99

+

VATTENKRASSE
Propagation set
$14.99

+

MONSTERA DELICIOSA
Potted plant, 9 ½ "
$24.99

Add to Bag

$139.97

THE SOLUTION

The Technical Aspect

System Data Imputs

What it is: The information the system uses to make recommendations.

Types of Data:

1. **User Behavior:** Actions like clicks, searches, purchases, or time spent on a product.
2. **Product Information:** Details like product images, descriptions, prices, and categories.

Why it’s important: This data helps the system understand what users like and what products are available to recommend.

Convolutional Neural Network (CNN) Analysis

What it is: A computer program that learns to recognize patterns in pictures.

How it works: It looks at parts of a picture and identifies things like shapes or colors to understand what the picture is about.

Why it's useful: It helps recommend products by finding items

How it improves experience: It allows users to discover relevant products more easily and quickly.

Reinforcement learning (RL)

What it is: A way for computers to learn by trying things out and getting better over time.

How it works: The computer gets rewards for good choices and learns to make better decisions in the future.

Why it's useful: It helps recommend the best products by learning what users like based on their actions.

How it improves experience: It makes recommendations more accurate by continuously adapting to users' preferences.

THE SOLUTION

Mitigating The Risks of VisionMatch

Introducing New Data

New items on a website with a recommendation system won't be suggested to users until they are purchased, limiting the chance for good products to gain visibility.

Lack of User Activity

A recommendation system relies on user activities, but if many users buy a product without leaving feedback or ratings, it becomes difficult for the system to recommend that product.

Lack of Data

Recommendation systems rely on ample user data to make accurate suggestions. In new businesses with limited data, these systems struggle to provide effective recommendations due to a lack of insights into user behavior.

Content Based Filtering

Use content-based filtering to recommend new products based on attributes like category, price, or style. Also, promote them alongside trending products to boost visibility.

Leveraging Explicit Data

Leverage implicit data (clicks, views, time spent) to recommend products even without ratings. Predict user preferences using machine learning models based on these behaviors.

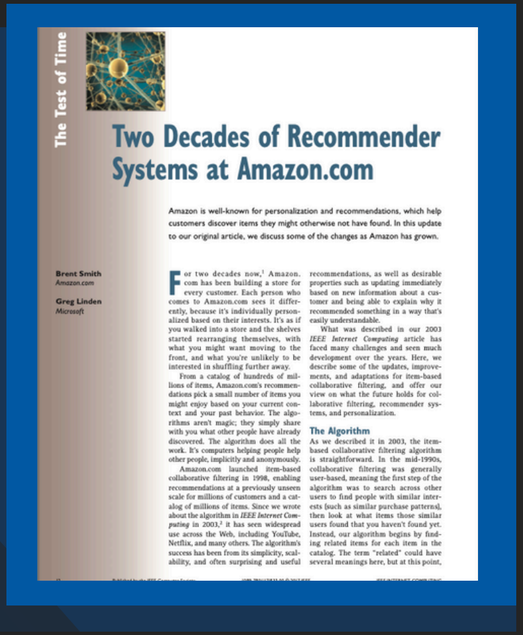
Using a Hybrid System

Implement a hybrid recommendation system that combines content-based and collaborative filtering to suggest products, even with limited user data. The system improves as more data is collected.

Case Study

Two Decades Of Recommender Systems at Amazon.com

By: **Brent Smith** and **Greg Linden**


The Test of Time

Two Decades of Recommender Systems at Amazon.com

Amazon is well-known for personalization and recommendations, which help customers discover items they might otherwise not have found. In this update to our original article, we discuss some of the changes as Amazon has grown.

Brent Smith
Amazon.com

Greg Linden
Microsoft

For two decades now,[1] Amazon.com has been building a store for every customer. Each person who comes to Amazon.com sees it differently, because it's individually personalized based on their interests. It's as if you walked into a store and the shelves started rearranging themselves, with what you might want moving to the front, and what you're unlikely to be interested in shuffling further away.

From a catalog of hundreds of millions of items, Amazon.com's recommendations pick a small number of items you might enjoy based on your current context and your past behavior. The algorithms aren't magic; they simply share with you what other people have already discovered. The algorithm does all the work. It's computers helping people help other people, implicitly and anonymously.

Amazon.com launched item-based collaborative filtering in 1998, enabling recommendations at a previously unseen scale for millions of customers and a catalog of millions of items. Since we wrote about the algorithm in *IEEE Internet Computing* in 2003,[2] it has seen widespread use across the Web, including YouTube, Netflix, and many others. The algorithm's success has been from its simplicity, scalability, and often surprising and useful recommendations, as well as desirable properties such as updating immediately based on new information about a customer and being able to explain why it recommended something in a way that's easily understandable.

What was described in our 2003 *IEEE Internet Computing* article has faced many challenges and seen much development over the years. Here, we describe some of the updates, improvements, and adaptations for item-based collaborative filtering, and offer our view on what the future holds for collaborative filtering, recommender systems, and personalization.

The Algorithm

As we described it in 2003, the item-based collaborative filtering algorithm is straightforward. In the mid-1990s, collaborative filtering was generally user-based, meaning the first step of the algorithm was to search across other users to find people with similar interests (such as similar purchase patterns), then look at what items those similar users found that you haven't found yet. Instead, our algorithm begins by finding related items for each item in the catalog. The term "related" could have several meanings here, but at this point,

"Once this related items table is built, we can generate recommendations quickly as a series of lookups. For each item that's part of this customer's current context and previous interests, we look up the related items, combine them to **yield the most likely items of interest**, filter out items already seen or purchased, and then we are left with the items to **recommend**." - *Greg Linden*

- The algorithm improves on older **user-based collaborative filtering** by processing most computations offline, enabling **real-time recommendations.**
- It delivers **high-quality, scalable recommendations** even with millions of users and **items**, and **remains competitive** over time.
- Recommendations are **instantly updated** with new data and can be **easily explained** based on a user's past purchases.

Comparing Success Metrics

The predictions come from assuming that VisionMatch would increase IKEA's Conversion Rate, Average Order Value and Click-Through Rate based on one third of Amazon's same key performance indicators.

	amazon	IKEA	IKEA VisionMatch
Conversion Rate	7.5-8.0%	0.5-1.0%	2.4-2.6%
Average Order Value (AOV)	+10-15% AOV	+2% AOV	+3.3-5% AOV
Click-Through Rate (CTR)	+30-60% CTR	+30% CTR	+30-60% CTR

The Opportunity

to employ technology and maximize experience.

1

Capitalize on Growing Online Traffic

The increasing number of visitors to IKEA's website presents a prime opportunity to convert traffic into sales through better recommendations.

2

Use of AI and Machine Learning

By adopting advanced AI tools, IKEA can significantly improve personalization, aligning with customer expectations for convenience and relevance.

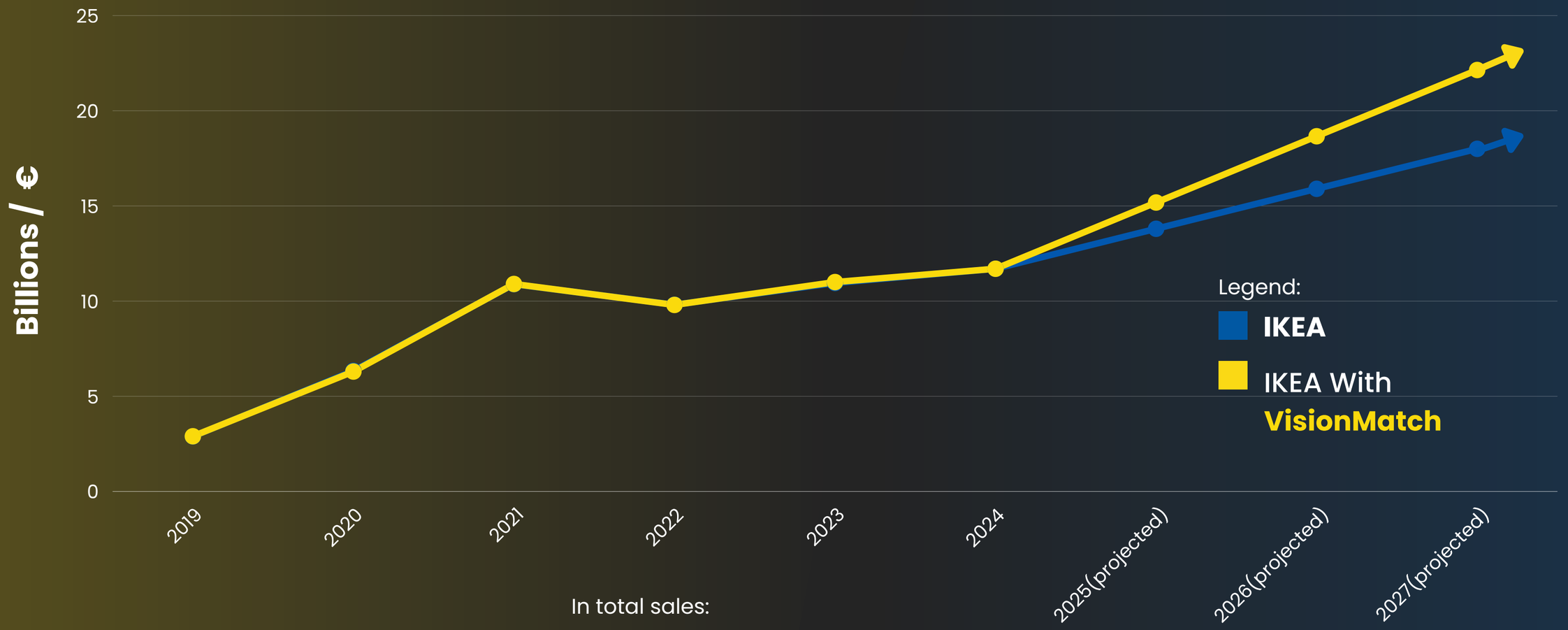
3

Enhance Brand Affinity

Delivering tailored and seamless shopping experiences can foster customer loyalty, reinforcing IKEA's value proposition of affordability and user-centric design.

Projected Value

Online Retail Sales



In total sales:

Average Growth: 5.8%

IKEA + VisionMatch Growth: 7.2%

Understanding Retail Impact and Cost Efficiency

Contribution to Online Sales:

Since nearly 35% of Amazon's sales come from personalized recommendations, we assume that IKEA will exhibit a similar pattern of growth, although with a more conservative estimate of 10% due to its range of products being narrower than Amazon's. This would mean that IKEA will have an added 10% of their EUR 13.8B (2025 online sales forecast) which would be 1.38B.

Incremental Sales Due to Recommendations:

Growth in online sales from 2024 to 2025 without recommendations:
EUR 13.8 billion - EUR 11.7 billion = EUR 2.1 billion.

With recommendations driving 10% of sales:
EUR 1.38 billion additional online revenue.

Total Retail Impact:

Including this boost, total sales for IKEA in 2025 could rise from the predicted EUR 46 billion to approximately **EUR 47.38 billion**, resulting in a **3%** increase over the baseline projection.

Total Cost:

The total development cost is **€1,081,150.35** for six months, with an annual maintenance cost of **€1,014,467.95**. The total first-year investment is **€2,095,618.30**.

*Since IKEA doesn't reveal how much of their sales come from recommendations, we assume that VisionMatch will add **10% (≈ 1/3 of the impact it had for Amazon).**

Next Steps

What should be done to implement VisionMatch?

Planning + Design/Prototyping (Weeks 1–6)

- Draft system architecture and prototype UI/UX components.
- Set up the database schema and basic backend logic.
- Prototype recommendation algorithms and test basic data flows.

Core Development (Weeks 7–18)

- **Frontend Development** *(Weeks 7–14)*:
  - Build responsive UI and integrate APIs.
  - Ensure frontend meets accessibility and scalability standards.
- **Backend Development** *(Weeks 7–18)*:
  - Implement core server logic, APIs, and database connections.
  - Build user authentication, data management, and system logic.
- **ML/Recommendation Algorithm** *(Weeks 10–18)*:
  - Train and validate machine learning models.
  - Optimize recommendations for scalability.
- DevOps Integration *(Ongoing)*:
  - Set up CI/CD pipelines and cloud infrastructure.

Phase 1

Phase 2

Testing/Deployment

(Weeks 18–24)

- Conduct integration and performance testing.
- Fix bugs and optimize systems for production.
- Launch the system and transition to the maintenance phase.

Phase 3

Maintence

(Weeks 24+)

- Fix Bugs: Address reported issues and glitches.
- Optimize Performance: Improve system speed and reliability.
- Update Features: Add enhancements and security patches.

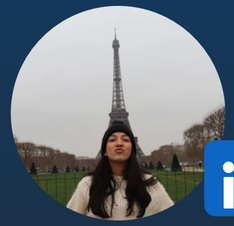
Phase 4

Understanding *GenZ's* Perspective

We all have a need to **feel understood and heard**.

With Noah and Kael as our inspiration, we aim to **connect meaningfully** with Gen Z to help them find what they need. By **enhancing the website recommendations**, we can have a better understanding of their preferences.

Our intention is to help every customer **feel seen, heard, and valued**, delivering an experience that feels truly special.



Maria Camila Rivas

Malek Hammoud

Kathya Otero

Evelyn Teng

Ayman Oumamass

Dear IKEA,

We would like to express our sincere thanks to your team for this wonderful opportunity to help IKEA achieve its vision: creating a better everyday life for the many people. As a team passionate about problem-solving, we have learned so much and will be able to apply this knowledge into future projects we take on. This chance to contribute an idea to companies who change families' homes was a truly special experience.

The five of us are extremely excited to see the company grow even more and be part of millions of families' homes all over the world. Please contact us with any questions or comments about our recommendation. We hope our proposal inspires further action!

Best regards,
Maria, Malek, Evelyn, Ayman, Kathya