



# **The potential of Generative AI to enhance the customer experience.**

Addressing in-store out-of-stock  
challenges at Albert Heijn.

Tessa Bruins Slot

Master thesis  
Strategic Product Design  
March 2025

## COLOPHON

### The potential of Generative AI to enhance the customer experience.

Addressing in-store out-of-stock challenges at Albert Heijn.

#### Author

Tessa Bruins Slot

#### Master Thesis

Technical University of Delft  
Faculty of Industrial Design Engineering  
Msc. Strategic Product Design

#### Graduation Committee

Chair Prof. dr. H.J. Hultink  
Mentor Dr. C. Estrada Mejía

#### Company Albert Heijn

Mentor J. Dodemont

March 2025



## PREFACE

Dear reader,

This thesis marks the final project of my Master's degree in Strategic Product Design at the Faculty of Industrial Design Engineering at Delft University of Technology. My graduation project was conducted in collaboration with Albert Heijn, starting in September 2024 and concluding in March 2025.

Over the past six months, I have explored the emerging technology of Generative AI and its applications in retail. My research focused on understanding this technology and designing a new concept for Albert Heijn that leverages its potential to enhance the customer experience. I am particularly excited about the final outcome, as working with such a new technology makes it especially valuable to move beyond theory and create tangible examples.

I am grateful to have had the opportunity to conduct this project at Albert Heijn, as I have always been fascinated by the retail industry. What draws me to retail is its strong customer focus. It is a dynamic space where innovation truly matters because every improvement directly impacts people's daily lives. This made it the perfect environment to explore new possibilities with Generative AI.

As a designer, my approach in this project has been primarily user-centered. From the very beginning, I was driven by the goal of solving a real customer frustration in the in-store shopping experience. After a few weeks

of research, it became clear that I would focus on the frustration of encountering an empty shelf. While Generative AI played a role in addressing this issue, it was never my starting point. Instead, the design process was mostly driven by thorough research into customer needs.

I would like to express my gratitude to my supervisors. To my chair, Erik-Jan Hultink, thank you for your guidance and also pragmatic approach during our meetings. To my mentor, Catalina Estrada Mejía, your enthusiasm and expertise in quantitative customer research have been invaluable, I am truly grateful for your support. To my company mentor, Jan, I really enjoyed working together and gaining insight into the ongoing innovation at Albert Heijn.

In addition, I want to thank everyone who contributed to my graduation project. A big thanks to my fellow students, colleagues, and the many professionals at Albert Heijn for their support and insights along the way.

I am proud to present my thesis and hope you enjoy reading it. If you ever want to discuss my research, feel free to reach out!

Tessa

# EXECUTIVE SUMMARY

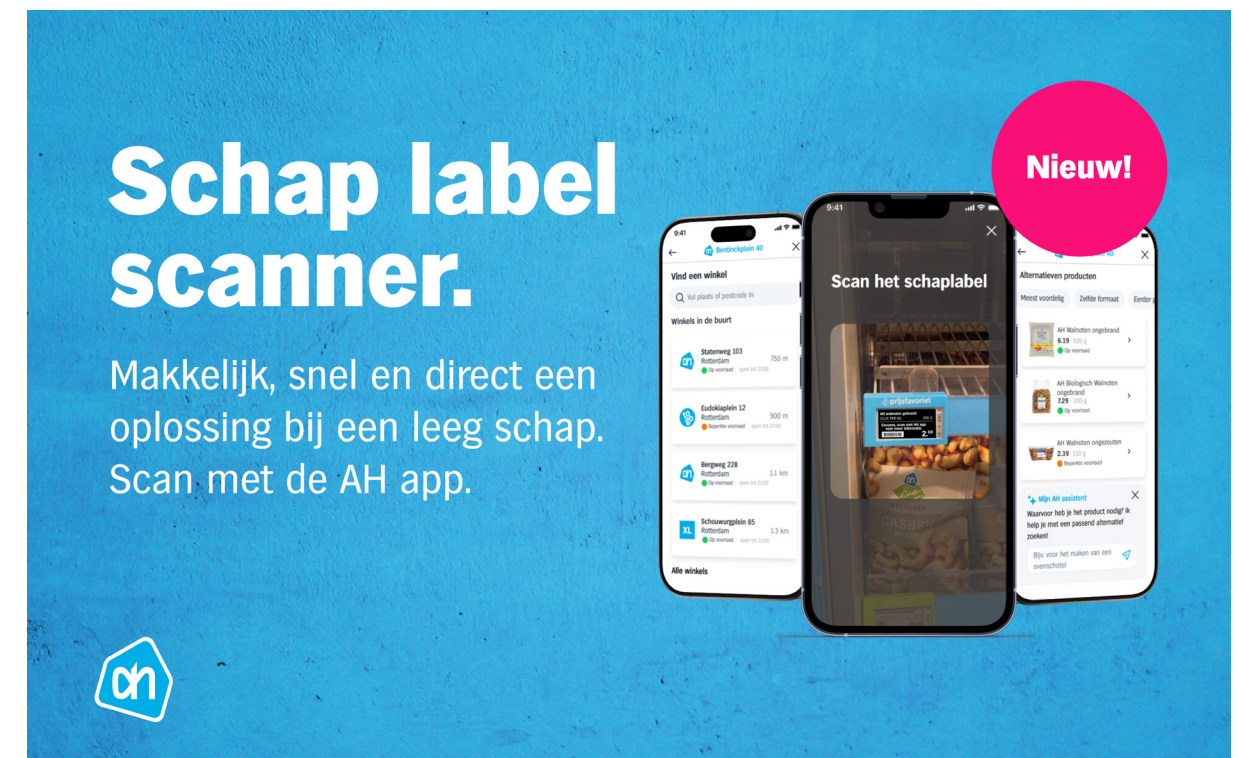
Generative AI is rapidly transforming the retail industry, revolutionizing both the way consumers shop and how businesses operate. To remain competitive, major retailers like Albert Heijn must embrace and experiment with this emerging technology. While Generative AI is already gaining traction in enhancing online shopping, its potential for in-store applications remains largely untapped. As the future of retail increasingly shifts toward an omnichannel experience, and with Albert Heijn's customers still primarily shopping in-store, the technology presents both new opportunities and heightened importance.

This thesis, in collaboration with Albert Heijn, explores how Generative AI can be leveraged to enhance the in-store customer experience through mobile technology. Specifically, it introduces a practical, AI-driven solution: the shelf label scanner. The foundation of this concept is grounded in comprehensive research. Identifying and understanding genuine customer frustrations were crucial in developing an effective technological solution. Through a mix of quantitative and qualitative research methods, five key in-store frustrations were identified: (1) difficulty locating products, (2) stress caused by product unavailability, (3) crowded aisles and long waiting times, (4) choice overload, and (5) the need for additional information and assistance with bonus products.

For this graduation project, particular attention was paid to the frustration of encountering an empty shelf, a problem that significantly impacts both the customer experience and the retailer. To design a solution that addresses this challenge, further research was conducted, recognizing that customer behavior and needs in these situations can vary widely. A survey with 400 respondents, employing an experimental design with four distinct scenarios, provided valuable insights. The results revealed how customers perceive and react to product unavailability, with findings showing that both the context and type of product strongly influence the support needed when faced with an empty shelf.

These insights were then translated into a solution. Through four design steps, including testing with real Albert Heijn customers, the final solution was developed. Integrated into the Albert Heijn app, this feature empowers customers to easily navigate out-of-stock situations. By simply scanning the shelf label, customers receive instant assistance, including information about when the product will be back in stock, alternative product suggestions available in the store and real-time inventory data from other Albert Heijn locations. This feature is designed to improve the in-store shopping experience by providing customers with timely, relevant information and helping them make informed decisions when confronted with an empty shelf.

In addition to the final user interface design, communication materials have been developed to effectively introduce this feature to customers. Lastly, the report outlines key implementation steps for a smooth and gradual rollout, along with several recommendations. These include an analysis of the shelf label scanner's potential and an exploration of further opportunities to leverage Generative AI in addressing customer challenges within the company.





# TERMINOLOGY

## Abbreviations

<b>AH</b>	Albert Heijn
<b>AH app</b>	Albert Heijn app
<b>AI</b>	Artificial Intelligence
<b>ANOVA</b>	Analysis of Variance
<b>DPI team</b>	Digital product innovation team
<b>ESL</b>	Electronic shelf label
<b>GEN AI</b>	Generative Artificial Intelligence
<b>NFC</b>	Near Field Communication
<b>OOS</b>	Out of stock
<b>PAR</b>	Permanent assortment reduction
<b>UX designer</b>	User Experience designer

## Definitions frequently used in this thesis

<b>Utilitarian products</b>	This refers to products that are purchased for practical and functional benefits.
<b>Hedonic benefits</b>	This refers to products that are purchased for emotional and experiential benefits.
<b>Out of stock</b>	When a product is not available to the customer on the shelf.

# TABLE OF CONTENT

<b>Preface</b>	<b>3</b>	<b>Chapter 7: Deliver</b>	<b>81</b>
<b>Executive summary</b>	4	7.1 Technical implementation	82
<b>Terminology</b>	6	7.2 From a business perspective	84
		7.3 Relevant considerations	86
		7.4 Recommendations	88
<b>Chapter 1: Introduction</b>	<b>8</b>	<b>References</b>	<b>91</b>
1.1 Project introduction	9	<b>Appendices</b>	<b>96</b>
1.2 Project goal & scope	10	A. Project brief	99
1.3 Project approach	11	B. Identifying in-store customer problems	101
1.4 Report structure	12	C. Potential design directions	106
		D. Customer research for Albert Heijn	111
<b>Chapter 2: Explore</b>	<b>13</b>	E. Test round 1 with peers	123
2.1 The company: Albert Heijn	14	F. Test round 2 with AH customers	126
2.2 Generative Artificial Intelligence	18		
2.3 Understanding the customer of Albert Heijn	25		
2.4 Design directions	33		
<b>Chapter 3: Define</b>	<b>36</b>		
3.1 Understanding the problem: unavailability of products	37		
3.2 Customer research for Albert Heijn	42		
<b>Chapter 4: Design brief</b>	<b>52</b>		
4.1 Problem statement	53		
4.2 Design scope	53		
4.3 Design goal	53		
4.4 Target group	54		
4.5 Design requirements	54		
<b>Chapter 5: Develop</b>	<b>55</b>		
5.1 Design approach	56		
5.2 Ideation	56		
5.3 Concept refinement	63		
<b>Chapter 6: Final design</b>	<b>68</b>		
6.1 Customer journey	69		
6.2 Shelf interaction	71		
6.3 User interface	74		
6.4 The integration of Generative AI	76		
6.5 Communication materials	78		



# INTRODUCTION

# 01

---

## 1.1 Project introduction

---

## 1.2 Project goal & scope

---

## 1.3 Project approach

---

## 1.4 Report structure

---

### 1.1 Project introduction

The retail industry is in a constant state of evolution, with emerging technologies reshaping both how consumers shop and how businesses operate. Innovations such as e-commerce, mobile payments, and automation have already revolutionized the landscape. Now, Generative AI (Gen AI) is rapidly emerging as a transformative force, with the potential to redefine customer experiences in ways that are only beginning to be understood.

Within the retail sector, Gen AI is gaining traction across various domains, offering opportunities for enhanced personalization, operational efficiency and improved customer engagement. Albert Heijn, one of the largest retailers in the Netherlands and known for its forward-thinking approach to technology, recognizes the potential of Gen AI and is actively experimenting with its applications. By doing so, the company not only sustains its competitive edge but also positions itself as a leader in shaping the future of retail.

Despite the advancements in Gen AI, a significant gap remains in its application to physical retail environments. While most current use cases are centered on online shopping, the integration of Gen AI into brick-and-mortar stores is still largely unexplored. This presents a missed opportunity, particularly for retailers like Albert Heijn, where the majority of customers still prefers in-store shopping.

Moreover, digital touchpoints, such as smartphones, are increasingly integral to the shopping experience, blurring the lines between online and offline retail. With 5 million active users of the Albert Heijn app (Albert Heijn, 2025), there is immense potential to enhance in-store customer experiences and create seamless, engaging interactions by leveraging Gen AI.

Therefore, this graduation project aims to bridge the gap by exploring how Gen AI can address specific customer pain points within the in-store experience. By identifying a relevant use case and exploring its integration, the project seeks to deliver a concept for Albert Heijn that not only enhances the in-store experience but also aligns with their omnichannel strategy and their commitment to innovation and customer service.

Ultimately, this project provides valuable insights into the future of omnichannel retail, contributing to academic research on the integration of emerging technologies like Gen AI. It explores how such a technology can reshape consumer interactions, optimize retail operations and enhance the customer experience. This thesis offers a foundation for further studies at the intersection of AI, consumer behavior and retail innovation.

## 1.2 Project goal & scope

This graduation project is conducted in collaboration with Albert Heijn, specifically with the Digital Product Innovation (DPI) team. The DPI team operates within Albert Heijn's Customer Technology Platform and is responsible for driving digital innovation and implementing cutting-edge technologies. The broader platform manages the technological systems that shape how customers interact with the brand. Figure 1 provides an overview of the key focus areas of this division.

The project was driven by the central research question:

**“How can Albert Heijn leverage Generative AI to enhance the in-store customer experience through mobile technology?”**

Building on these insights, the ultimate objective was to develop and deliver a concrete concept for Albert Heijn. To ensure a meaningful outcome, three essential requirements have been defined.

1. *Customer-centric focus*: the research prioritizes using Gen AI to enrich the customer experience, aiming to create solutions that resonate with Albert Heijn shoppers by addressing their needs and enhancing their shopping journey.

2. *In-store context*: this project emphasizes applying Gen AI specifically in brick-and-mortar stores, rather than in online grocery shopping. The in-store environment presents unique challenges and opportunities, requiring tailored solutions to address its distinct dynamics.

3. *Integration with mobile technology*: the research particularly focuses on integrating Gen AI into the Albert Heijn app to enhance in-store customer interactions. Leveraging this existing mobile platform minimizes the need for additional hardware investments and maximizes the utility of existing tools, ensuring seamless integration of innovative solutions into the shopping routine.

Further details about the initial project brief are outlined in Appendix A.

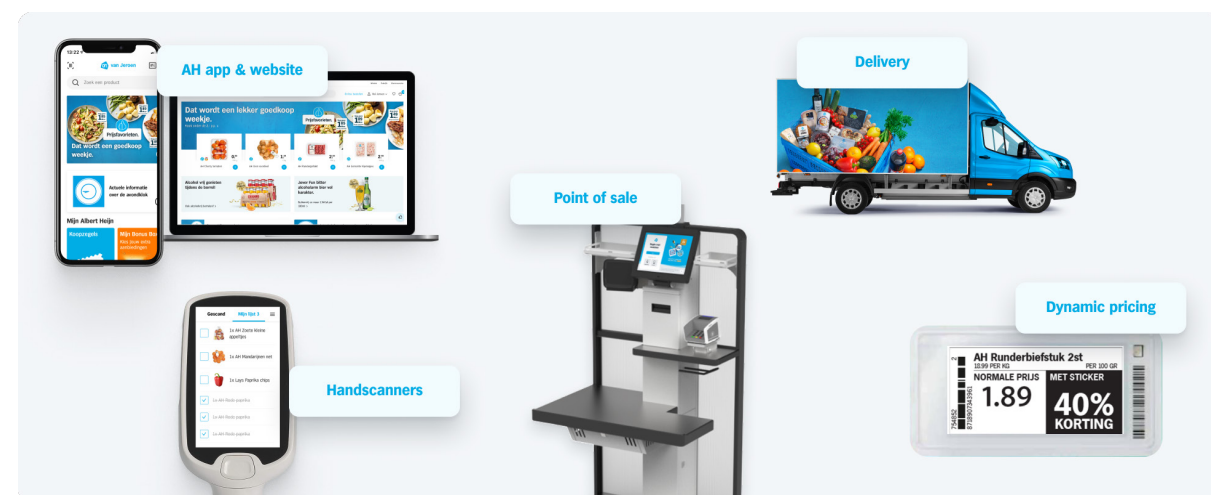


Figure 1: The focus of the Customer Technology Platform.

## 1.3 Project approach

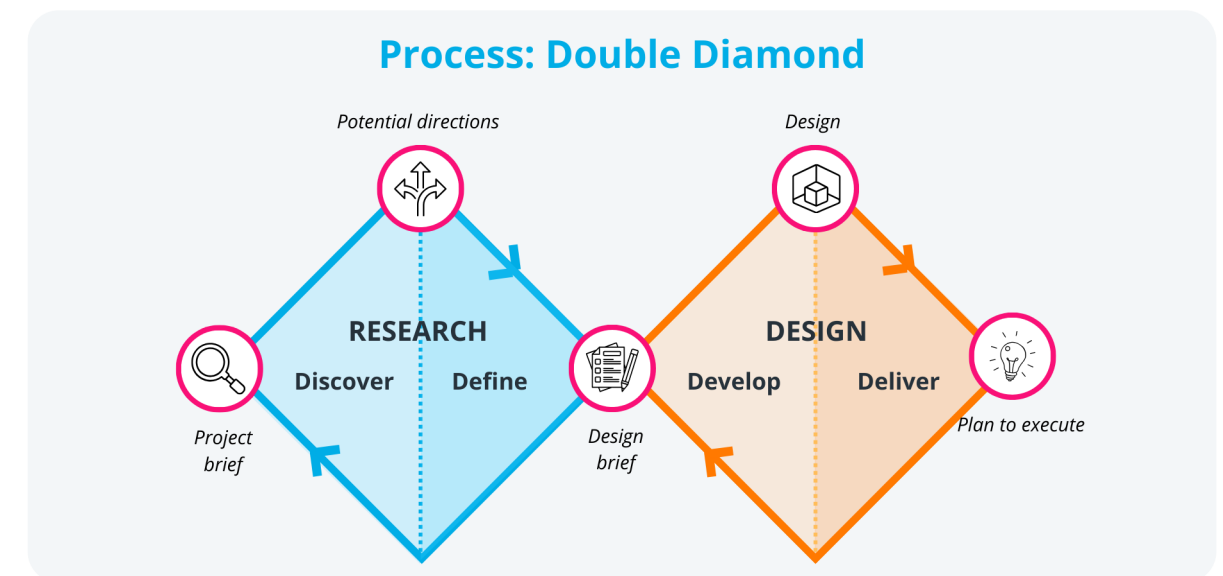


Figure 2: Project approach.

Within this graduation project, the Double Diamond framework is applied, a design methodology popularized by the British Design Council in 2005. By leveraging this scientifically grounded approach, the project ensures thorough problem exploration and the development of evidence-based solutions (Humble, 2023). Figure 2 presents a visual representation of the project approach.

The project is structured into phases, each lasting approximately 6 weeks, with a total duration of 25 weeks. The first diamond, “Research”, consists of the “Explore” and “Define” phases, with the research question at its core. Insights gathered during this diamond are translated into a design brief, which serves as the bridge to the second diamond “Design”. This diamond consists of the “Develop” and “Deliver” phases, where the focus shifts to presenting and refining a concept for Albert Heijn.

### Explore

The ‘Explore’ phase aimed to gain a deep understanding of Albert Heijn, the technology, and its customers, ultimately leading to the development of multiple potential design directions. The company context is analyzed by examining Albert Heijn’s mission and the evolution of grocery shopping, with a particular focus on the increasing integration of digital solutions in retail. The technological context is explored through a literature review to assess the benefits, limitations, and retail applications of Generative AI. Lastly, an empirical investigation into the customers needs and challenges is conducted through surveys, observations, and interviews. Based on these insights, a series of design directions were developed and subsequently ranked, ultimately narrowing down to one direction for further exploration and development.

## Define

In the 'Define' phase, the focus was on gaining a deeper understanding of the problem within the context of Albert Heijn. This involved reviewing relevant literature and gathering practical insights within the company. A key area of investigation was customer behavior and expectations when encountering an out-of-stock product. Due to the context-dependent nature of this issue, an experimental survey was conducted with 400 participants. By systematically manipulating various variables, the study examined their impact on customer responses and preferences. The findings informed the development of a design brief outlining specific requirements for the proposed solution.

## Develop

In the 'Develop' phase, the focus was on creating a concept that met all the requirements outlined in the design brief. The primary goal was to design an ideal solution for the customer, while also ensuring its feasibility. This phase followed a structured, iterative process consisting of four key steps. First, an initial concept was developed through brainstorming and incorporating insights from prior research. Next, the preliminary idea was tested with peers to gather quick feedback and refine the design. Once a more polished version was created, it was presented to experienced UX designers, who provided input on potential visual and functional improvements. Finally, the concept was tested with real customers from the AH panel to validate its effectiveness, ensuring it aligned with their needs and expectations. These insights ultimately shaped the final design.

## Deliver

In the 'Deliver' phase, the focus was on determining the best approach for Albert Heijn to implement the design, considering both business and technical aspects of bringing the concept to life. The roadmap for implementation outlines key steps, with clear attention to refining technical capabilities and scaling the solution progressively. Lastly, relevant considerations of the design are outlined and recommendations for the future are provided to ensure ongoing optimization and alignment with customer needs.

### 1.4 Report structure

This report is structured into seven chapters. Chapter 1 introduces the project, outlining the approach and methodology used. Chapter 2 provides essential background information on the company, the technology and the AH customer trends to contextualize the project. Based on these insights, potential design directions for Albert Heijn are presented. Chapter 3 delves into the identified problem, highlighting in-depth customer research for Albert Heijn, employing an experimental design. In Chapter 4, the key findings are synthesized into a design brief, establishing a clear design goal. Chapter 5 outlines the design phase, including ideation and multiple iterations. Chapter 6 presents the final design, accompanied by relevant details and visualizations. Finally, Chapter 7 focuses on the implementation of the design, addressing the solution from a technical and business perspective. Furthermore, it covers key considerations and recommendations for future development.

# EXPLORE

## 2.1 The company: Albert Heijn

## 2.2 Generative Artificial Intelligence

## 2.3 Understanding the customer of Albert Heijn

## 2.4 Design directions

# 02



## 2.1 The company: Albert Heijn

### 2.1.1 Introducing Albert Heijn

Albert Heijn (AH), founded in 1887, is one of the leading supermarket chains in the Netherlands. What began as a modest grocery store has transformed into a well-established supermarket recognized for its extensive product assortment and commitment to product quality and customer service. Figure 3 showcases a historic image of the first self-service Albert Heijn in Rotterdam, contrasting it with today's representation, highlighting the evolution of its branding and the expansion of its offerings over the years.



Figure 3: The first self-service Albert Heijn store in 1954 (top) and today's store (bottom), (Stichting Albert Heijn Erfgoed, n.d.)

Currently, Albert Heijn holds a 37.7% market share and is operating in 1,276 stores across the Netherlands and Belgium (Albert Heijn, 2025). They have 9 Home Shop Centers from where the customers' online orders are fulfilled and 6 distribution centers from where they replenish the stores. For the fifth year in a row, Albert Heijn has successfully

increased its market share, driven largely by expansion, significantly boosted by acquiring the southern Dutch chain Jan Linders (Van Rompaey, 2024).

When looking at competitors, Jumbo is the primary rival, followed by Plus, which is part of Superunie, but at a considerable distance. Figure 4 illustrates the market shares among different retail chains in 2024 in the Netherlands. Hard discounters Aldi and Lidl, part of 'Other supermarkets', face challenges in expanding within the Dutch market, because they are unable to open new locations (Van Rompaey, 2024). This competitive landscape highlights Albert Heijn's strong market position and its strategic focus on growth and consolidation.

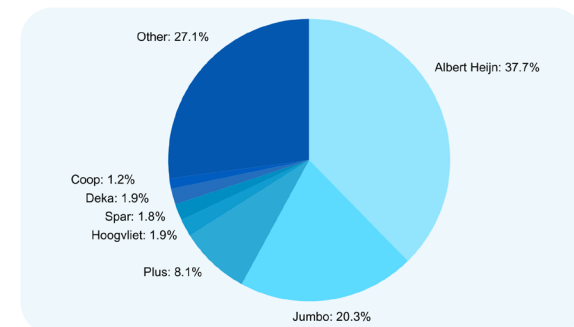


Figure 4: Market shares of Dutch supermarkets in 2025.

Albert Heijn's mission is: "Together, we make eating better the easy choice. For everyone." This mission, along with the company's five key focus areas, is illustrated in Figure 5. One of these focus areas highlights the importance of delivering a seamless customer experience (Albert Heijn, 2024a). This aligns directly with the goal of this graduation project, which aims to enhance the in-store customer experience through the integration of Generative AI. Therefore, the outcome of this project will clearly contribute to Albert Heijn.

**"One of the key focus areas of Albert Heijn is delivering a seamless customer experience."**



Figure 5: The mission of Albert Heijn.

### 2.1.2 The evolution of shopping at Albert Heijn

In today's diverse supermarket landscape, Albert Heijn has established itself as a leader in omnichannel retail, delivering seamless shopping experiences across multiple platforms. By integrating physical stores, online shopping, and mobile applications, Albert Heijn ensures that grocery shopping goes beyond simply picking up ingredients. It now includes activities such as meal planning and online recipe searches, providing customers with a more comprehensive and convenient shopping experience. Additionally, customers have access to a wider variety of brand options than ever before.

This success did not come without effort. The concept of a supermarket has undergone significant evolution

over time, starting after World War II, when the supermarket model began to establish a foothold in the Netherlands (Willemse, 2024). Before the 1940s, grocery shopping was quite different. Women would visit grocers, who would gather and weigh the requested items while customers waited their turn. By the late 1940s, over 40,000 small grocery shops operated across the Netherlands (Alle Supermarkten, n.d.), reflecting the more personalized but time-consuming nature of shopping.

In 1946, the landscape shifted dramatically when Chris van Woerkom opened the first self-service store in Nijmegen (Quak, 2009). For the first time, customers could independently select pre-packaged products,



significantly improving efficiency and service capacity. This marked a pivotal point in the evolution of grocery shopping in the Netherlands and led to the rise of supermarket chains like Albert Heijn and Jumbo, which consolidated smaller grocers and expanded their product offerings.

Technological advancements continued to shape the shopping experience in the following decades, driving Albert Heijn's success. Key milestones included the introduction of automated checkouts with barcodes in 1977 and the launch of the Bonuskaart loyalty program in 1998, fostering customer loyalty. As the 21st century progressed, e-commerce revolutionized the grocery industry. Albert Heijn launched albert.nl in 2001, an online platform where customers could order groceries for home delivery. In 2009, the introduction of the Appie app further streamlined the grocery shopping process, making it more convenient and enjoyable for customers.

Since its founding, Albert Heijn has demonstrated decades of commitment to innovation and adaptability, resulting in an increasingly efficient and streamlined business operation. Looking to the future, in-store grocery shopping will continue to evolve through digital innovation, particularly with mobile technology. Retailers that effectively engage customers through mobile apps will play a crucial role in reshaping the shopping experience (Neurauter, 2022). Emerging trends such as mobile self-checkout, digital shopping lists, and AI-powered assistants promise to enhance convenience and optimize the shopping journey. By leveraging these digital tools, retailers can create a more personalized and efficient shopping environment, meeting the demands of today's tech-savvy consumers.

### 2.1.3 Albert Heijn experimenting with AI

As previously mentioned, Albert Heijn is widely recognized for its technological innovation and is actively leveraging AI across various domains to enhance both operational efficiency and the customer experience. For instance, the company uses self-learning AI algorithms to optimize in-store baking plans, ensuring freshly baked products are available throughout the day. Additionally, AI-driven pricing strategies help adjust product prices in real-time based on shelf life, reducing food waste. In e-commerce, AI is also used to streamline delivery logistics by optimizing routes and improving order accuracy. These innovations reflect Albert Heijn's commitment to using this cutting-edge technology to create a smarter, more efficient, and customer-centric shopping experience.

When it comes to specifically leveraging mobile technology to enhance the customer experience, one of Albert Heijn's most powerful assets is the AH app. With over 5 million daily users, the app plays a crucial role in strengthening Albert Heijn's competitive position. It offers a wide range of features built around three core values: 'voordeel' (benefits), 'gemak' (convenience), and 'koken' (cooking), providing customers with a seamless, personalized, and highly convenient shopping experience. Also within the AH app, they are actively experimenting with new AI-driven features. This subsection highlights several use cases and their impact on improving the overall customer experience.

#### Scan your Recipe

The 'Scan your Recipe' allows customers to easily add recipes from various sources, such as cookbooks or Instagram to their shopping list. The feature uses OCR (Optical Character Recognition) to scan the recipe, followed by ChatGPT to generate an ingredient list. These ingredients are then matched with Albert Heijn products and added to the customer's shopping list with a single click, making meal planning and grocery shopping more convenient.

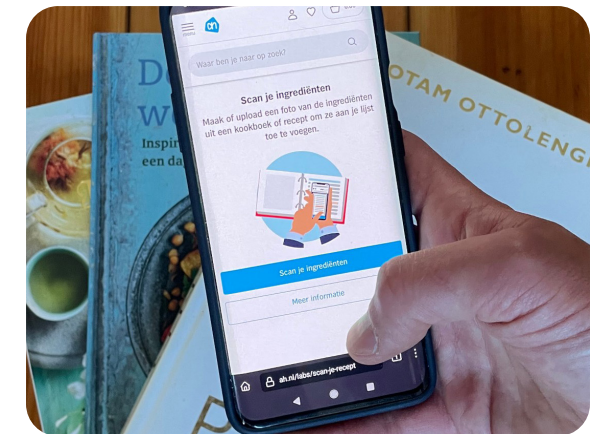


Figure 6: Feature 'Scan je recept'.

#### Scan & Kook

Albert Heijn has introduced the 'Scan & Kook' feature in the AH app, allowing customers to receive personalized recipes by simply taking a photo of ingredients from their fridge or products in the store (Albert Heijn, 2024b). Once a photo is captured, Generative AI processes the information to suggest a suitable Allerhande recipe that can be made with those ingredients. This makes shopping more convenient and personalized but also helps prevent food waste by providing recipe suggestions that utilize leftover ingredients.

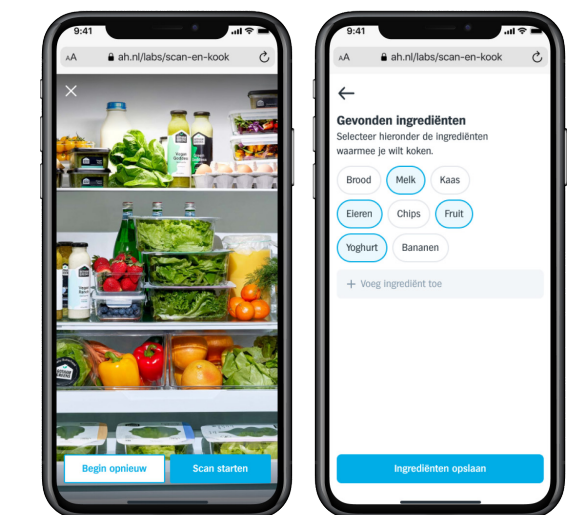


Figure 7: Feature 'Scan & Kook'.

#### Mijn AH Assistent

Mijn AH Assistent is an AI-assistant that provides Albert Heijn customers with personalized cooking support. It suggests recipes based on the customer's input and offers instant cooking tips. It offers immediate responses to queries. Additionally, it suggests relevant products from Albert Heijn's offerings (Albert Heijn, 2024c). This simplifies meal planning, encourages experimentation with new recipes, and ultimately enriches the overall cooking experience.



Figure 8: Feature 'Mijn AH assistent'.

## 2.2 Generative Artificial Intelligence

### 2.2.1 Origin of Gen AI

Generative Artificial Intelligence (Gen AI), a subset of artificial intelligence, refers to computational methods that can create new content, such as text, images, or audio, based on existing data (Feuerriegel et al., 2023). Today, it is considered as one of the most transformative technologies of this decade. In contrast to traditional AI, which focuses on automating tasks and analyzing data for predictions, Gen AI is designed to generate entirely new outputs by learning and emulating complex data patterns.

Its origins trace back to the 1950s with foundational developments in neural networks and natural language processing. Initially, Gen AI applications were focused on basic text generation and pattern recognition (Foote, 2024). One of the earliest examples was the chatbot ELIZA, created in 1966 by Joseph Weizenbaum, which used simple natural language processing to simulate conversation and often responded in an empathic manner (Zhou, 2023).

However, Gen AI achieved a major breakthrough in 2014 with the development of Generative Adversarial Networks (GANs), which allowed AI to create highly realistic images, videos, and audio. Unlike descriptive models, GANs learn the underlying probability distribution of data and generate new samples that closely mimic the original patterns (Benges et al., 2024). This approach shifted AI from descriptive to generative, no longer just summarizing or predicting but instead creating.

A significant and still recent milestone regarding Generative AI was the launch of OpenAI's Generative Pre-trained

Transformer (GPT) models (OpenAI, 2022), particularly its conversational version, ChatGPT in 2022. Built on the GPT-3.5 architecture, ChatGPT revolutionized text generation by enabling coherent, contextually relevant conversations (Ray, 2023). Its ability to produce human-like responses in real-time has significantly broadened AI's applications, making it a powerful tool that is often indistinguishable from human interaction.

As Generative AI advances, it signifies a transition from simple task delegation to co-creation. Initially, interactions may appear as delegating tasks to AI, but they actually involve humans to collaboratively generate meaningful content (Feuerriegel et al., 2023). This shift toward co-creation not only enhances individual creativity but also fosters richer collaboration, ultimately reshaping the way we work and communicate in various domains.

**“As Generative AI advances, it signifies a transition from simple task delegation to co-creation.”**

Figure 9 displays a graph from a recent McKinsey Global Survey on AI, which included 1,363 participants from diverse regions, industries, company sizes and roles. It indicates a swift rise in GenAI adoption, with 65% of respondents now using it regularly (Singa & Sukharevsky, 2024). Just like Albert Heijn, many B2C companies are actively exploring and experimenting with Generative AI, highlighting its growing appeal across a range of business processes.

AI adoption worldwide has increased dramatically in the past year, after years of little meaningful change.

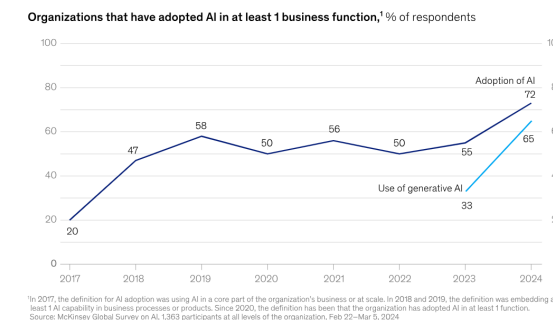


Figure 9: Use of Gen AI by organizations (McKinsey, 2024).

### 2.2.2 Generative AI in retail

The retail industry has long been shaped by disruptive technologies, from barcode systems to online retail, each transforming operations. Today, Generative AI is at the forefront of innovation, enabling content creation, insight generation, and process automation (Harris, 2024). A Deloitte survey found that 84% of U.S. grocery retail executives are familiar with Generative AI, with over 40% expecting adoption by late 2024 (Edsall & Gray, 2024).

This technology is transforming key areas such as customer service, marketing, supply chain, and product development (Ooi et al., 2023), enhancing both front-end and back-end operations. In customer support, AI-powered chatbots and virtual assistants are introduced to automate tasks and provide real-time

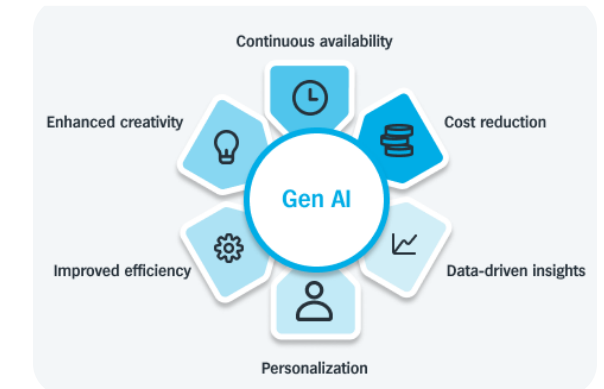


Figure 10: Benefits of Generative AI.

assistance. In marketing, Generative AI delivers high-quality, personalized content, strengthening customer loyalty (Dilmegani, 2024a). On the back-end, it enhances supply chain management by improving forecasting and decision-making through advanced data analysis. Additionally, it accelerates product development by identifying trends, generating creative ideas. For instance, refining product descriptions to better engage customers (Levine, 2024).

The widespread adoption of Generative AI in retail is actually fueled by its numerous benefits for both retailers and customers, as outlined in Figure 10. This section delves into these advantages, showcasing real-world applications that enhance omni-channel shopping experiences.



## Enhanced creativity

Generative AI possesses the unique ability to generate novel content, driving innovation across diverse domains such as art, music and design. Its transformative capabilities have the potential to fundamentally reshape creative processes, influencing how creators conceptualize ideas and bring them to fruition (Epstein et al., 2023). By redefining the boundaries of creativity, Generative AI empowers creators within retail companies to innovate and explore uncharted possibilities. Moreover, its accessibility and user-friendly nature lower the barriers to entry, even enabling customers to become creators themselves, opening up entirely new opportunities for engagement and personalization.

*Example: Nike is revolutionizing athletic gear design with a custom GenAI model that uses deep athlete data to create highly personalized sports products. This innovation allows Nike to generate multiple design iterations quickly, incorporating athlete preferences and refining them using digital tools like 3D sketching and printing. For Nike, this approach accelerates the design process and boosts creativity, while ensuring that products align with the specific needs and aspirations of athletes. For customers, it means more tailored and empowering athletic wear, enhancing performance.*



Figure 11: Nike Gear with Gen AI (MING Labs, 2024).

## Improved efficiency

By automating repetitive tasks, Generative AI enhances efficiency across various retail operations, enabling both retailers and customers to benefit from streamlined processes. For retailers, this leads to productivity gains, as it frees up resources for more strategic activities. A study by Noy and Zhang (2023) demonstrates these effects, showing that ChatGPT significantly boosted productivity in professional writing tasks by reducing completion times by 40% and improving output quality by 18%. For customers, the benefits are even more noticeable in physical retail settings, where increased efficiency leads to quicker service, more accurate product information, and a smoother, more convenient shopping experience overall.

*Example: Amazon's Just Walk Out technology eliminates the need for traditional checkouts, allowing customers to simply pick up items and walk out without waiting in line. The system uses a combination of computer vision, advanced sensors, deep learning models, and generative AI to track items as they are added to the cart and automatically charges the customer's account upon exit. This innovation creates a faster, more seamless shopping experience, enhancing both convenience and efficiency for customers while streamlining the payment process to make it quicker and hassle-free.*



Figure 12: Amazon's Just Walk Out technology (Amazon, 2023).

## Personalization

One of the key advantages of Generative AI is its ability to understand consumer context, including preferences, behaviors, and individual needs. This capability allows retailers to create hyper-personalized customer journeys by analyzing vast amounts of data to build detailed customer profiles. With this insight, retailers can accurately predict customer needs and recommend highly relevant products or services (Usmanova, 2024). This tailored approach not only drives higher conversion rates and sales but also enhances the overall shopping experience for customers, offering them recommendations, solutions, and products that truly align with their specific desires (Alladi, 2024).

*Example: Walmart leverages Generative AI to enhance its product search function, enabling customers to express their needs in natural language, like "Help me plan a football watch party," instead of relying on exact keywords. This simplifies the search process, providing curated product suggestions efficiently and turning product searches into seamless, personalized interactions. By streamlining this experience, Walmart not only saves customers time but also creates a more engaging and enjoyable shopping experience.*

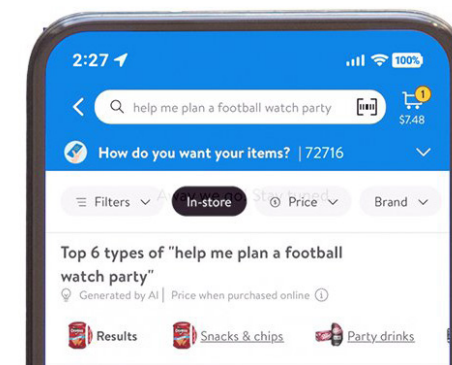


Figure 13: Walmart integrating Gen AI into search bar (Walmart Global Tech, 2024b).

## Data-driven insights

Generative AI offers the advantage of processing diverse data types quickly, providing deeper insights and reducing human error (Merced, 2024). For retailers, this means making more informed decisions by analyzing data from sales history, customer feedback, and trends. It helps predict demand, optimize supply chains, and personalize marketing strategies. For customers, it leads to more relevant product recommendations, improved product availability, and a more reliable shopping experience, creating a personalized and efficient customer journey.

*Example: Carrefour's AI Assistant, Hopla, is a perfect example of how Generative AI can leverage data-driven insights to enhance the customer experience. Powered by ChatGPT, Hopla assists customers with multiple questions, such as selecting products based on their preferences, dietary restrictions and budget. However, it also offers recommendations for minimizing food waste creates personalized shopping lists (Carrefour Group, 2023). This data-driven approach allows Carrefour to better understand customer preferences and shopping behaviors, leading to a smoother shopping experience.*

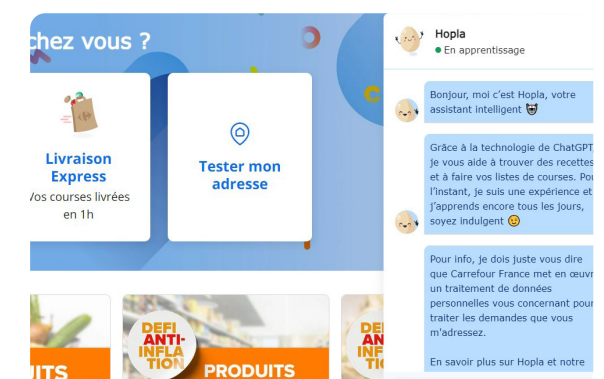


Figure 14: Carrefour AI assistant Hopla (2023).

**Cost Reduction**

Implementing Generative AI into a retailer’s operation can significantly reduce costs. This is because tasks and streamlining processes minimizes the need for extensive human labor. According to McKinsey’s research, its financial impact is most pronounced in four key functions: customer operations, marketing and sales, software engineering, and research and development (Chui et al., 2023).

*Example: IKEA has launched an AI-powered assistant (Ingka, 2024), built on OpenAI’s GPT technology, that offers personalized home design, shopping recommendations, and answers to customer service queries, including order-related questions. By automating these services, IKEA reduces the need for human involvement in design consultations and customer support. This leads to improved operational efficiency, but also saving costs for IKEA.*

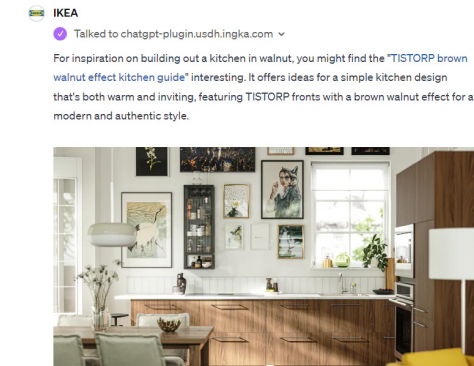


Figure 15: IKEA AI assistant (Ingka, 2024).

**24/7 Availability**

Generative AI operates 24/7, delivering instant responses and support at any time. For customers, this continuous availability enhances service and engagement by providing immediate assistance without delays. For retailers, it enables seamless customer interaction beyond traditional business hours, reducing reliance on human employees and ensuring consistent support (Soliman & Al Balushi, 2023). As a result, retailers can offer a frictionless, always-accessible experience that meets customer needs whenever they arise.

*Example: Google’s virtual try-on feature revolutionizes the online shopping experience by leveraging Generative AI to display how clothing fits on a diverse range of models, accurately reflecting various body types, skin tones, and the natural draping and movement of fabrics (Rincon, 2023). Some retailers take this further by enabling users to virtually try on clothes using their own photos or body scans. This technology simplifies the process of receiving personalized styling advice and visualizing clothing fit on demand, eliminating the need for in-store assistance. Available 24/7, it allows shoppers to explore options beyond traditional store hours, offering a more flexible, personalized, and convenient experience tailored to their individual preferences.*

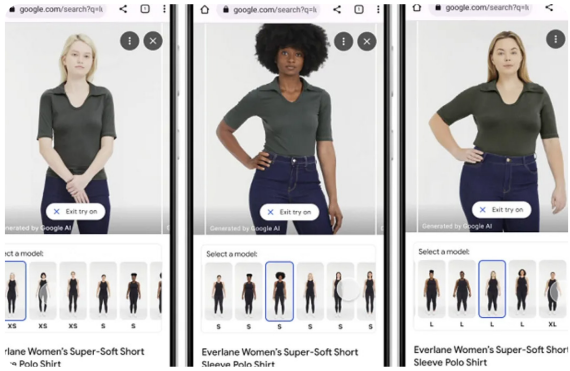


Figure 16: Google virtual try-on (Walk-Morris, 2023).

**2.2.3 Limitations of Gen AI**

The implementation of Generative AI in business operations also comes with challenges and limitations. Below, the most common ones are highlighted.

**Incorrect outputs**

One limitation of Generative AI is the possibility to produce incorrect and misleading outputs which results in deceiving users (Spitale et al., 2023). While these models are highly capable of generating responses that are often indistinguishable from authentic content, it is important to note that these models generate the most probable response to a prompt, not necessarily the correct response (Feuerriegel et al., 2023).

**Bias in data**

Another topic gaining significant attention in both academic literature and real-world discussions is the bias and fairness of Generative AI. Since these models are typically trained on vast, unfiltered datasets, they often inherit and reproduce biases from the data, sometimes resulting in toxic outputs and inadvertently reflecting societal ethical and moral norms (Schramowski et al., 2022). For companies that want to utilize Gen AI applications, ensuring transparency in how Generative AI models are trained and how data is curated is therefore crucial for understanding and addressing embedded biases.

**Privacy concerns**

In addition, a key limitation of Generative AI is the potential risk to privacy. One issue is the use of user data within AI models, which raises important questions about consent, data ownership, and the security of how this information is stored and utilized. This ties into a phenomenon known as the “privacy paradox” (Pavlou, 2011), where users may express

concerns about their privacy but still choose to share personal information on digital platforms. They often perceive that the immediate benefits of using these services, such as personalized recommendations or convenience, outweigh the potential risks associated with disclosing their data (Wottrich et al., 2017). Another aspect of this concern relates to the data used to train these models, as they may inadvertently generate outputs containing sensitive or personal information, even if it was not part of the original input.

**Copyright violation**

Generative AI models, systems, and applications could potentially infringe copyright laws by generating outputs that mimic or replicate existing works without obtaining permission or providing compensation to the original creators (Smits & Borghuis, 2022).

**Environmental**

Lastly, there are substantial environmental concerns from developing and using generative AI systems due to the fact that such systems are typically built around large-scale neural networks and they require substantial computational resources which demand considerable energy (Strubell et al., 2019).

**2.2.4 Adoption of Gen AI**

Introducing a new technology like Generative AI is a complex process that extends beyond technical implementation. History has shown that for retailers, the successful adoption of new technologies depends on more than just technical capabilities. Long-term success and sustainability require a strong focus on customer factors such as engagement, trust, and positive experiences (Ooi et al., 2023). Extensive research has explored how to achieve



this, though the approach largely depends on the specific application of the technology. To provide relevant insights for Albert Heijn, this subsection presents key frameworks that highlight the importance of a customer-centric approach in driving effective AI integration strategies.

In general, customers in the grocery retail sector primarily embrace customer-facing technologies for utilitarian reasons. While there may be enthusiasm for exploring new technologies, they are fundamentally perceived as tools to achieve specific objectives (Larsen & Følstad, 2024). This means that the success of any new technology depends on how well it aligns with customers' practical needs and expectations. This aligns with key factors influencing consumer acceptance and adoption of omnichannel strategies. Perceived usefulness, ease of use, and compatibility positively influence brand experience, which is a key factor in shaping consumers' behavioral intentions to engage with these strategies (Silva et al., 2018).

More specifically, to explain customers' willingness to adopt AI in service interactions, a study by Gursoy et al. (2019) identified six key predictors: *social influence, hedonic motivation, anthropomorphism, performance expectancy, effort expectancy, and emotional responses to AI*. Social influence and hedonic motivation encourage adoption by making AI seem socially accepted and enjoyable. Anthropomorphism enhances comfort and trust by making AI feel more human-like. Performance expectancy and effort expectancy are critical, as people are more likely to adopt AI if it provides clear benefits, performs well and is easy to use. Finally, emotional responses,

such as trust and curiosity, further drive acceptance. These factors highlight that AI adoption depends not only on functionality but also on emotional appeal and relatability.

Building on these frameworks, it is logical that not everyone understands, uses, and adopts new technologies at the same pace. Therefore, the Technology Adoption Lifecycle (Rogers, 2003) provides a more general framework for understanding how new technologies spread among consumers, see Figure 17. The model categorizes adopters into five segments; innovators, early adopters, early majority, late majority, and laggards, each with distinct attitudes toward innovation. Early adopters, with greater technological literacy, readily embrace innovations like Generative AI for their perceived benefits, while laggards resist change, favoring traditional methods and often feeling skeptical due to unfamiliarity, perceived risks, or past negative experiences.

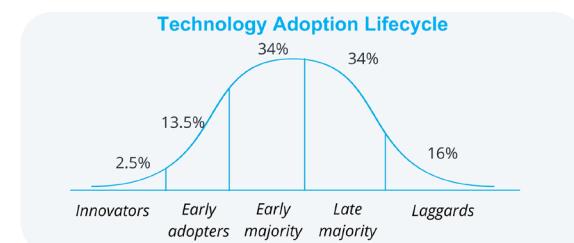


Figure 17: Technology adoption life cycle.

To conclude, by understanding the factors and patterns influencing customer adoption, retailers are able to better design and implement Generative AI solutions. Focusing on customer needs and aligning with the perceived usefulness of the technology proves to be crucial. These frameworks informed subsequent decisions, such as identifying a genuine customer problem. Additionally, they guided the development of the solution and shaped how Albert Heijn should implement it effectively.

## 2.3 Understanding the customer of Albert Heijn

To identify a relevant use case for leveraging Generative AI in-store at Albert Heijn, it is essential to gain a deeper understanding of Albert Heijn's customers and their needs. Who are they, what motivates them, and what challenges do they face when shopping in-store? As found in research, addressing a genuine customer problem is key to ensuring acceptance and engagement with any potential solution.

This chapter provides insights into Albert Heijn's current customer base, examining their characteristics, needs, and shopping behaviors. Additionally, it outlines the research conducted to identify the challenges customers face while shopping.

### 2.3.1 Customer base Albert Heijn

Over the years, Albert Heijn has cultivated a diverse and widespread customer base, including busy families, working professionals, students, and elderly shoppers. Figure 18 illustrates segmentation based on various life stages. As shown, Albert Heijn has a broad reach and this reflects the company's ability to adapt and serve a wide range of customer profiles with their products and services.

At the moment no single group significantly dominates the customer base. However, looking at the future, several major demographic shifts will reshape the retail landscape and impact Albert Heijn's customer base. Notable

changes include an aging population, the emergence of millennials and Gen Z as influential consumer groups, and the growing prevalence of one- and two-person households (Mulder, 2024). These shifts will require Albert Heijn to adapt its offerings and strategies to meet the evolving needs and preferences of its diverse customer segments.

For this graduation project, it was also interesting to look at the customer base from another perspective. To move beyond traditional segmentation based on life stages. While demographic factors such as income, age, and household size influence shopping behavior, customers' attitudes toward

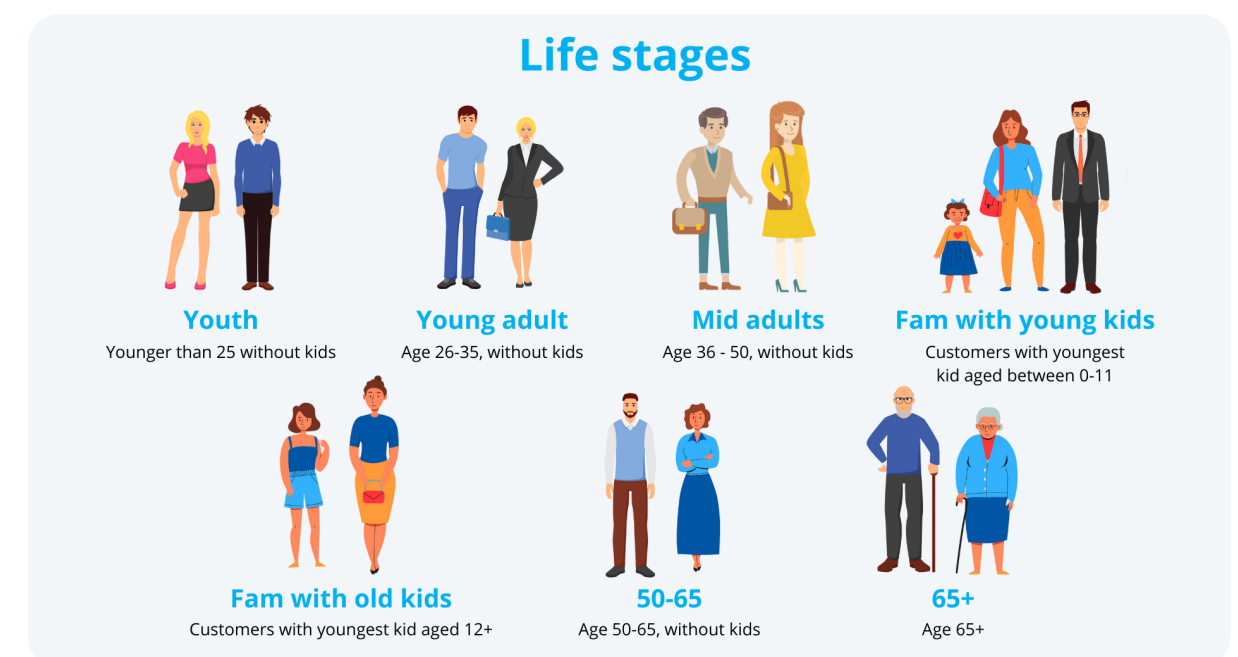


Figure 18: Albert Heijn's customer base across different life stages.



food, considered as “food profiles”, provide also insights into what they buy (Jagt et al., 2024). Understanding these attitudes can inform the project by revealing deeper motivations and needs, allowing for more targeted and effective use cases for Generative AI.

This is recognised by Albert Heijn and that is why they also segmented its customers based on what they buy. These profiles are shown in Figure 19 and include Traditional, Conscious, and Convenience shoppers. Within Albert Heijn, Convenience shoppers represent the largest group, reflecting broader trends in the Dutch grocery market, where simplicity and ease are increasingly prioritized by consumers.

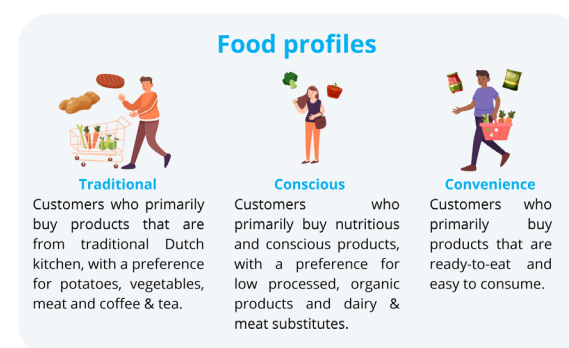


Figure 19: Albert Heijn's customer base across different food profiles.

## 2.3.2 Drivers and values of today's customers

In addition to food profiles based on the types of products customers purchase, it is essential to identify the key values and drivers that resonate with today's customers. These underlying motivations also shape how they approach grocery shopping and their overall experience throughout the entire shopping journey. This section highlights these key drivers and values, providing a deeper understanding of what shapes modern customer behavior.

### Convenience

As highlighted by one of the food profiles, convenience has become increasingly important to the modern consumer, emerging as a key driver of purchasing decisions (Van Tilburg, 2023). This demand for convenience extends beyond the popularity of ready-to-eat products and is reflected throughout the entire shopping journey. Examples include the growing use of automated checkouts and self-scanners, as well as the expansion of store opening hours. Additionally, the significant rise in online grocery shopping underscores this trend, with the number of online orders at Albert Heijn tripling over the past five years (Albert Heijn, 2024d).

### Affordability

Affordability is one of the key drivers, especially for Dutch consumers. According to Deloitte's annual Supermarket Consumer Survey (2024), 83% of Dutch shoppers express concern about rising food prices. This has led to increasingly cost-conscious behavior these days, with many customers favoring store brands, such as Albert Heijn's private label over A-brands. In 2024, this accounted for nearly 55% of total sales. Research by Circana (RetailTrends, 2023) reveals that the market share of store-brand items has even reached an all-time high. Additionally, global research by PwC shows that 52% of Dutch consumers are willing to try an unfamiliar brand for the same product if it offers better value for money.

### Diverse product assortment

Alongside with the price, a diverse product assortment is a key driver for customers to go to a specific supermarket, and thus also switch to a different chain if not satisfied (Wyman, 2019). For retailers, offering a broad range of products is

essential to attracting and retaining customers. By meeting the growing consumer demand for choice, retailers can cater to diverse tastes, preferences, and dietary needs. For instance, the rising popularity of veganism and plant-based diets illustrates the increasing demand for tailored product options that align with specific dietary requirements. Today's consumers expect offerings that reflect their lifestyle and values (Homburg, 2024).

### Hyper - Personalisation

While customers appreciate a broader range of product choices, they also expect retailers to know exactly which products to offer, tailored to their specific needs and preferences at any given moment. Beyond the assortment, features like Albert Heijn's "Persoonlijke Bonus" illustrate how the retailer is actively investing in personalization (Albert Heijn, 2024e). Additionally, the development of various store formats, such as AH to go or AH XL, reflects the brand's commitment to being increasingly present in customers' daily lives, offering a shopping experience that fits seamlessly into different moments and needs.

### Digital integration

Furthermore, digital transformation, which has been underway for some time, has become crucial in reshaping the in-store shopping journey and meeting consumers' expectations for efficiency and convenience across multiple channels (Berghaus, 2024). This integration enables customers to engage through features such as self-checkout systems, digital promotions, and personalized shopping applications. However, resistance to "pin-only" stores (Deloitte, 2024) highlights the need to balance technological advancements with consumer preferences for flexibility and accessibility.

### Health

Health has become a key consideration for Dutch supermarket shoppers, with consumers increasingly prioritizing products that support their wellness goals. This shift is reflected in growing demand for healthier options, such as organic, low-sugar, and nutrient-dense foods. Shoppers are more selective about their choices, seeking clear and informative labeling that guides them in making health-conscious decisions. At Albert Heijn, sales of products with a Nutri-Score A or B increased to 55.7% (Albert Heijn, 2024f). Furthermore, there is a growing emphasis on personal well-being, with supermarkets playing a key role in helping consumers achieve their health goals (Deloitte, 2024).

### Sustainability

Sustainability has become a crucial consideration for today's Dutch shoppers. Many consumers now actively seek products that align with their environmental values, such as eco-friendly packaging and locally sourced items to reduce their carbon footprint. This shift toward sustainability is not merely a passing trend; it reflects a growing societal concern about the environmental impact of consumption. Supermarkets that prioritize sustainability are more likely to resonate with customers who are increasingly conscious of the ecological consequences of their purchasing choices (Deloitte, 2024). Recent data from Albert Heijn (2025) also reveals that in the fruit and vegetable category, sales of organic products rose by 16% in 2024, highlighting the demand for sustainable options.

### 2.3.3 The customer journey

Beyond understanding food profiles and the motivations behind customers' purchasing decisions, it is equally crucial to examine their shopping behavior. Gaining a comprehensive view of the entire customer journey helps identify challenges and uncover opportunities to enhance the in-store experience at Albert Heijn. This subsection offers a concise overview of the current in-store shopping experience, highlighting common patterns and trends while acknowledging individual differences.

#### Theoretical background

The grocery shopping journey is traditionally divided into three stages: pre-purchase, purchase, and post-purchase (Ayutthaya & Koomsap, 2019). In the pre-purchase phase, customers engage in planning activities such as creating shopping lists and researching products. Upon entering the store, they move into the purchase phase, where the in-store environment significantly influences their decisions and behaviors, including interactions with product displays and promotional materials. In the post-purchase phase, customers reflect on their overall experience, assessing satisfaction with the products and service received.

#### Two type of shoppers

Customers generally can be categorized into two distinct types: planned shoppers and unplanned shoppers. Planned shoppers enter the store with a clear list of items, making quick and efficient decisions with minimal deviation from their plan. Their pre-purchase phase is characterized by careful preparation, simplifying decisions at the point of purchase. In contrast, unplanned shoppers approach their shopping

more flexibly, often making decisions while in-store. They tend to spend more time browsing and exploring products, leading to spontaneous purchases.

While these two types are helpful, it is important to acknowledge that multiple factors influence their decision-making and the way they navigate in-store, causing these behaviors to sometimes overlap. Shoppers frequently modify their initial intentions based on in-store experiences or post-purchase reflection.

Several factors contribute to in-the-moment decisions during shopping. A key factor is the overwhelming variety of choices in modern supermarkets. The wide range of brands, price points and product types can overwhelm shoppers, making it impractical to research and evaluate every option beforehand (Hart & Rafiq, 2006). Even when customers know what they want, they often reassess product attributes while shopping.

Additionally, retailer strategies, such as in-store branding and product placement, play a significant role in shaping purchase decisions (Katz, 2024). These tactics can divert customers from their original plans, illustrating the dynamic relationship between consumer behavior and retailer influence. Factors like product unavailability or limited assortment also force customers to adjust their choices, adding further uncertainty to the shopping experience.

Ultimately, the effectiveness of the purchase phase depends not only on how well customers prepare for the exact products they want but also on how well they can adapt to the changing circumstances in-store, whether planned or unplanned.

#### Mobile use during journey

Understanding how mobile phones are utilized at various stages of the shopping journey is crucial, given their significant role in shaping the customer experience at Albert Heijn. Figure 20 provides an overview of the key mobile features used throughout each stage. By analyzing these mobile touchpoints, Albert Heijn can further enhance its digital ecosystem, ensuring a seamless and engaging shopping experience for all customers.

#### Pre-Purchase: inspiration & planning

Before visiting the supermarket, mobile phones primarily serve as a tool for inspiration. The main question for many shoppers is: What will I eat? This involves browsing recipes, deciding which groceries are needed, and planning meals accordingly. At Albert Heijn, the Bonus offers play a crucial role in this phase. Many customers base their purchasing decisions on these promotions. Additionally, digital shopping lists are widely used, which is why Albert Heijn also offers this feature in its app. Customers primarily add products or ingredients to their lists.

#### Purchase: guidance & decision-making

During the purchase stage, inspiration and Bonus offers remain key influences, shaping shopping decisions based on individual preferences. Digital shopping lists help shoppers stay organized, while phones are also used in-store to look up product information and compare options in real time. Moreover, mobile payments are increasingly common, supported by Albert Heijn's self-scanning feature for a faster checkout. Within these payment processes, digital coupons, gift cards and Koopzegels are frequently used and remain popular.

#### Post-Purchase: cooking & budgeting

After shopping, mobile phones continue to play a role, particularly in meal preparation. Many customers store recipes and use their phones while cooking. Budget tracking is also common, which is why Albert Heijn now provides digital receipts in the app. Additionally, customers frequently share experiences and reviews, contributing to a more interactive and community-driven shopping experience.

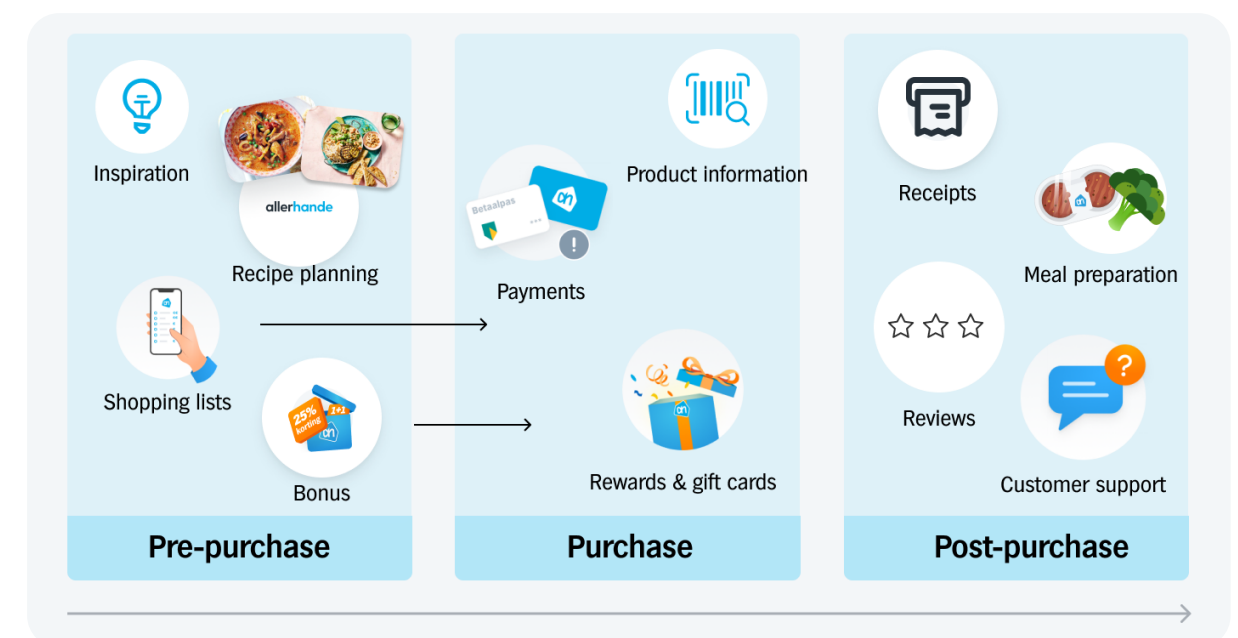


Figure 20: Mobile use cases for in-store grocery shopping.



### 2.3.4 Problem identification

The next step was to identify the most common problems and challenges Albert Heijn customers face while shopping in-store. Given Albert Heijn's strong customer-centric approach, an internal review was conducted to gather insights into known issues. This involved conversations with AH experts, analyzing existing customer feedback and reviewing discussions on forums such as Facebook and Reddit. However, these insights were sometimes very specific and did not always provide a clear overview of the broader, more general topics. Therefore, it was essential to engage directly with customers to ensure a more comprehensive understanding. This direct interaction helped confirm and expand on the findings, providing a foundation for exploring how Generative AI could address these common challenges.

To achieve this, customer research was conducted in two phases. First, quantitative research was carried out by distributing two surveys. The second step involved qualitative research, which included in-store observations and interviews with customers and store employees.

#### Quantitative research

For the quantitative research, two online surveys were distributed. The first survey, conducted through UserZoom, targeted Albert Heijn's regular customer panel with the aim of collecting 200 responses from a diverse mix of age groups and genders. The second survey, conducted via Instagram, was specifically targeted at a younger demographic, gathering responses from 115 participants. The full surveys and their results can be found in Appendix B.

#### Frustrations while shopping in-store

One of the key questions explored was the obstacles customers encounter during physical shopping. The results are displayed in Figures 21 and 22. In the first survey, 30% of respondents identified product availability as a challenge. Additionally, 23% said the crowdedness of the store, while 15% mentioned issues related to staff. In the second survey, 24% reported encountering empty shelves, 24% struggled with locating products, and 14% noted confusion regarding the product assortment.



Figure 21: Results from survey 1 about what challenges customer face in-store.



Figure 22: Results from survey 2 about what challenges customer face in-store.

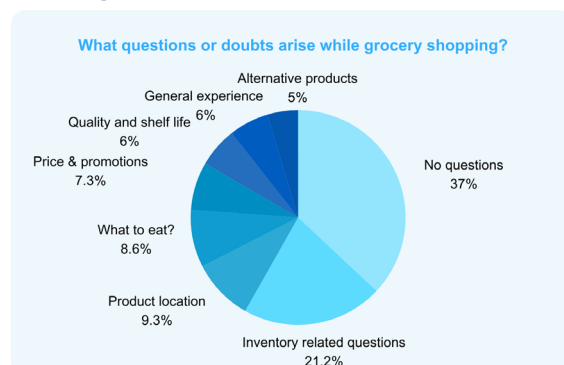


Figure 23: Results from survey 1 about what questions customers have during shopping.

To further investigate, participants were asked about the doubts or questions they have during their shopping experience. The results, presented in Figure 23, reveal that approximately 37% of respondents reported having no doubts or questions. Meanwhile, 21% expressed concerns related to inventory, and 9.3% raised issues about the location of products.

Participants were also asked whether they ever approach a staff member and the reasons behind it. This indirectly suggests that customers need assistance with certain aspects of their shopping experience, indicating areas for improvement. Within the first survey, a total of 87% of respondents reported occasionally or frequently engaging with staff, while the remaining 13% did not. The majority of inquiries were related to product location (77%), availability (49%), and promotions (13%).

#### Potential to use mobile phone as support

In addition, participants were asked about their phone usage and what the added value of their phone could be during shopping or what the potential could be, see Figure 24 and 25.

In terms of potential, the first survey 20% indicated no need for this. Furthermore, 12% mentioned product information and comparison, 11% finding products, 10% see the shopping list, 10% scan and make payments, 10% promotions, 8% recipe and meal planning. Within the second survey 34% said locating products, 11% shopping with a list, 15% seeing assortment for store, 11% inspiration for recipes, 8% paying with phone. 7% providing alternatives and 5% comparing prices.

#### Qualitative research

The second step was to conduct some qualitative research by visiting two stores (Albert Heijn and Jumbo). Interviews

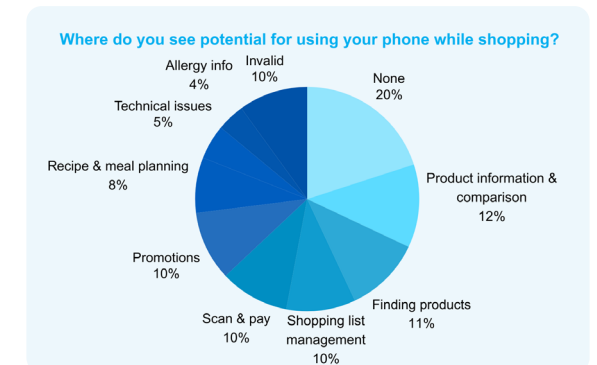


Figure 24: Results from survey 1 about the added value of the phone during shopping.

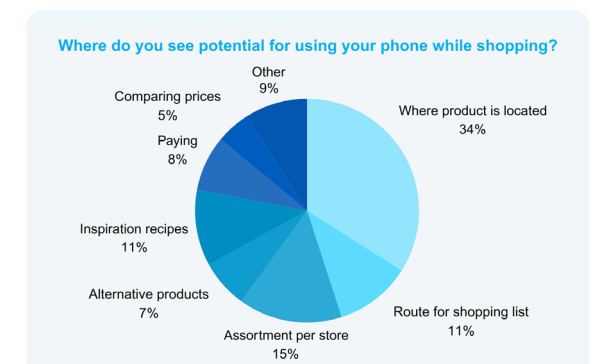


Figure 25: Results from survey 2 about the added value of the phone during shopping.

were held with six employees and twelve shoppers, and observational research was carried out to gain insights into consumer behavior and experiences. This helped assess how customer and employee feedback aligned with previous findings.

The top three questions customers had were:

1. Which product offers the best value for money?
2. Where can I find specific products in the store?
3. Is this product in stock or part of the current assortment?

The top three questions customers asked employees were:

1. Where can I find a specific product in the store?
2. The shelf is empty. Is the product out of stock, or is it located somewhere else in the store?
3. Questions related to Bonus offers.

## Conclusion

Based on the quantitative and qualitative research, the top five most frequently reported problems that customers face when shopping in-store at Albert Heijn are outlined below, along with their implications for the overall shopping experience.

### 1. Difficulty finding products

Customers often struggle to locate the items they need. This can be due to messy shelves, changes in product assortment, or simply not being familiar with the layout of the store. This difficulty can lead to frustration and wasted time during shopping trips.

### 2. Disappointing product assortment and stock levels

It can be very frustrating for customers when a desired product is unavailable, whether due to it not being part of the assortment or being out of stock, particularly during promotions. This disappointment is amplified when shoppers have come specifically for a sale item, leading to feelings of letdown and dissatisfaction.

### 3. Crowdedness and long waiting lines

During peak hours, the store can become very crowded, making shopping more difficult. This congestion, combined with staff restocking shelves and shopping carts blocking aisles, can cause customers to feel rushed or overwhelmed, negatively impacting their shopping experience. Additionally, long wait times at the checkout or fruit and vegetable scales can further frustrate customers. When shoppers face these delays and obstacles, it disrupts the overall experience and can lead to a negative impression of the store.

### 4. Choice complexity

With so many options available, selecting the right product can be overwhelming for customers. Comparing products to see if they align with personal goals, such as fitting within a specific diet or meeting preferences for sustainability, price, and health, can add to this complexity. This choice overload can lead to decision stress, resulting in longer shopping trips than necessary and leaving customers feeling fatigued by the experience.

### 5. Need for information and assistance with promotions

Many customers express a need for more information and assistance regarding promotions. This includes finding clear details on discounts, understanding specific offers, and easily locating promotional products in-store. Providing better support around promotions can help shoppers make informed choices and feel confident they are getting the best deals.

Other:

- The question “What to eat tonight?”.
- No supportive employees.
- Poor wifi connection.

## 2.4 Design directions

Based on the previous research, potential design directions were created. Some of these directions were more problem-driven, while others were opportunity-focused. In total, 13 directions were generated and evaluated based on key criteria such as desirability, feasibility, and viability. Initially, an individual assessment was conducted, which was then discussed with a product manager at Albert Heijn for further validation. Figure 26 presents an overview of the final ranking of these ideas, evaluated along the axes of feasibility and impact. A higher position on the feasibility axis indicates that an idea is easier to implement. Following a thorough analysis, six design directions were identified as having the highest potential for further exploration in this graduation project. These directions align closely with Albert Heijn’s objectives and are detailed on the next page. A comprehensive description of all the design directions can be found in Appendix C.

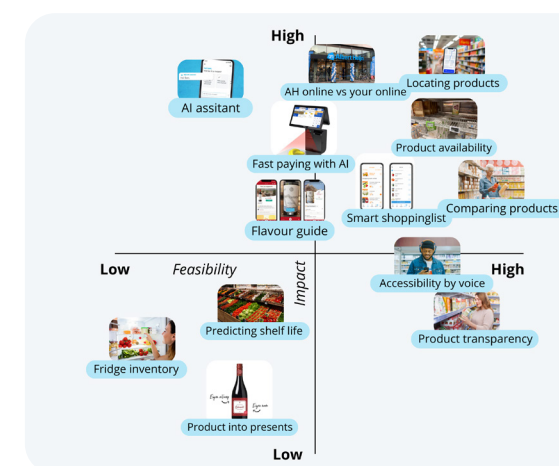


Figure 26: Overview of the ranking process of potential design directions.

### Choosing a direction

To refine the six potential directions into a singular focus, a second round of evaluation was conducted, considering the following key factors:

- Identification of a clear customer problem that resonates with Albert Heijn’s target audience to ensure the solution addresses a genuine need.
- Exploration of how to effectively harness Generative AI, aiming for a direction that integrates innovative technology while enhancing the customer experience.
- Prioritization of a concrete direction with short-term solution possibilities, considering the rapid advancements in Generative AI.
- The chosen direction must align with the researcher’s skills to ensure effective execution while maximizing the use of my expertise.

Ultimately, this process led to a focus on the direction of ‘missing out on preferred products’. This decision tackles a significant customer pain point, offering an opportunity to provide a functional solution that not only delivers value but also drives customer acceptance. Furthermore, it presents a key opportunity for Albert Heijn, as they are currently losing substantial revenue in this area. Regarding Generative AI, this direction has the potential to enhance both efficiency and personalization, presenting an opportunity to explore how the technology can be effectively leveraged. Lastly, addressing this issue requires a strategic approach, as it influences various aspects of both Albert Heijn’s operations and the overall customer experience.



## Most promising directions

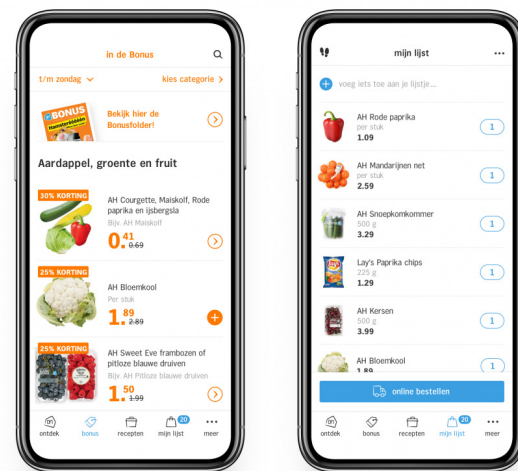
### 1. Missing out on preferred products

This design direction aims to provide customers with real-time solutions when their desired products are unavailable. The strength of generative AI lies in its capacity to synthesize extensive datasets, delivering actionable insights and solutions instantly. By harnessing this technology, Albert Heijn could explore multiple possibilities to mitigate the frustration caused by product unavailability, ultimately fostering a deeper connection with their customers and enhancing the overall shopping experience.



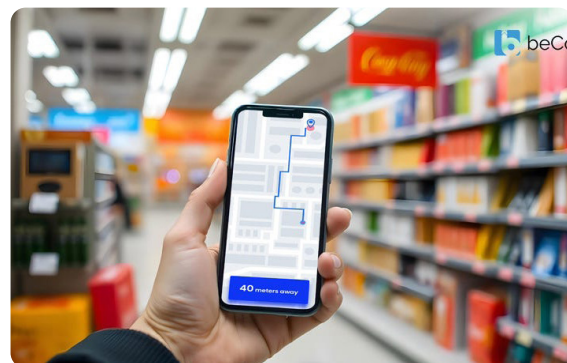
### 2. Smart shopping list

Generative AI unlocks new possibilities for utilizing the Albert Heijn shopping list in-store. This technology can provide personalized suggestions and prioritize items based on dietary restrictions and previous purchased products, enhancing the relevance and utility of the shopping list for each customer. Furthermore, it transforms the shopping list into a dynamic, tailored tool that enriches the in-store shopping experience. By integrating these capabilities, customers can enjoy a more efficient and satisfying shopping journey at Albert Heijn.



### 3. Struggle to locate desired products

Generative AI can be applied to deliver real-time assistance. By analyzing shopping lists, it can offer tailored guidance to help customers efficiently navigate the store, taking into account current store layouts and product placements, ultimately reducing time spent searching for items.



### 4. Discrepancies between AH online and my AH

In this design direction, Generative AI can serve as a powerful analytical tool to assess and communicate the differences between online and in-store offerings. It can process data from both platforms to provide personalized insights about product availability, pricing, and promotions, helping customers make informed decisions about where and what to shop based on their preferences.



### 5. Challenges in product comparison

Generative AI can be leveraged to simplify the process of comparing products for customers in-store. By analyzing extensive datasets, generative AI can provide real-time insights and facilitate quick comparisons based on various factors such as price, nutritional information, ingredients, and customer reviews. Moreover, it can streamline the decision-making process by visually presenting data in an accessible format, allowing customers to quickly grasp the essential information without feeling overwhelmed.



### 6. Optimizing payment with Gen AI

Within this design direction, Albert Heijn could leverage generative AI to enhance the checkout experience by optimizing interactions and streamlining transaction processes. Utilizing its advanced visual recognition capabilities, generative AI can quickly identify items, enabling efficient handling of various touchpoints, such as scanning barcode-less products and weighing items. The ultimate goal is to facilitate faster payment methods and significantly reduce the time customers spend at the check-out, resulting in a smoother and more satisfying shopping experience.



## 3.1 Understanding the problem: unavailability of products

## 3.2 Customer research for Albert Heijn

## 3.1 Understanding the problem: unavailability of products

### 3.1.1 Background theory

#### Introduction to the problem

The customer frustration of missing out on a preferred product refers to the experience when they are unable to purchase a product they specifically wanted. This frustration can arise from two main situations:

1. Out-of-stock (OOS) refers to a temporary situation where a product is unavailable.
2. Permanent Assortment Reduction (PAR) occurs when a product is permanently removed from a store's inventory.

In both cases, customers feel negative emotions because they may have planned their purchase or had specific needs tied to the product. However, their responses and expectations in these two situations differ. This is because they differ in two key aspects: the expected nature of the events and their duration (Campo et al., 2002). With OOS, customers often expect the product to be restocked soon and may switch to a different product at that moment or postpone or cancel their purchase. In contrast, PAR leads to a more significant shift in customer expectations, as the product is permanently unavailable. This often results in more drastic reactions, such as switching stores or brands entirely.

For this graduation project, the focus was on out-of-stock situations because the research identified that as a significant issue for customers. The unexpected nature of OOS events often has a highly negative impact on the shopping experience. Additionally, for

Albert Heijn, these situations result in missed purchases. As such, addressing OOS situations presents a relevant and impactful starting point for improvement. Furthermore, the insights gained from this project inform future stocking and assortment decisions, which can also contribute to reducing the effects of permanent assortment reductions.

#### Definition out-of-stock

A clear definition of out-of-stock is essential as it forms the foundation for analyzing consumer behavior. Out-of-stock refers to a situation where a product is unavailable for immediate purchase (Oxford English Dictionary, n.d.). This can occur when there is no inventory of a specific stock-keeping unit (SKU) in the store, meaning stock levels are zero. However, a more customer-focused perspective defines OOS as when a product is absent from the shelf, regardless of whether inventory is available in the backroom (Sanchez-Ruiz et al., 2018).

Given that this project focused on customers, OOS was defined as: **Any situation where the product is not accessible to shoppers on the shelf, regardless of its availability elsewhere in the store.** This approach ensures alignment with the customer experience.

#### Causes

Out-of-stock situations can have different causes. According to T. Gruen et al. (2002), there are three groups of stockout causes that can contribute to products being unavailable to customers. These categories vary in nature, with some being more strategic and others more operational.



- 1. *Inventory management*: this cause is related to how the store manages its inventory. Poor ordering practices or inaccurate demand forecasting can lead to stockouts. If the store overestimates or underestimates customer demand for a product, it may either order too much (leading to waste) or too little (leading to stockouts).
- 2. *Shelf management*: this situation occurs when a product is physically present in the store but not available on the shelves for customers to purchase. This could happen if stock is misplaced, not properly stocked on shelves, or if the store’s replenishment process is inefficient. Even though the product is in the back or storage areas, it’s not readily accessible to customers, causing frustration.
- 3. *Supply chain disruptions*: these causes refer to problems originating in the supply chain or upstream processes, such as manufacturing delays, transportation issues, or disruptions from suppliers. This can result in products not being delivered on time to the retailer, leading to stockouts. This type of stockout is often harder to control from the retailer’s perspective because it’s influenced by external factors beyond their direct control.

While these causes are presented individually, product availability ultimately depends on how effectively the distribution systems of suppliers, retailers, and store operations work together. Beyond these processes, which are within the control of the retailer, the “controlled” operations must align with the “uncontrolled” demand from customers, who may react in various ways when the product they want is unavailable (Aastrup & Kotzab, 2009).

**Business impact**  
Out-of-stock situations can have a significant impact on a business, both directly and indirectly. When a product is unavailable and not on the shelf, there is an immediate revenue loss as customers are unable to purchase it. European research indicates that the average out-of-stock percentage is around 9%, sometimes rising to as high as 15% in the Netherlands, depending on the product category (Van Loon, 2023).

Furthermore, product unavailability results in missed opportunities for cross-selling and upselling, which can reduce both the overall basket size and per-customer revenue. OOS situations also lead to higher operational costs, as managing stock outs requires additional resources for inventory checks, restocking, and addressing customer inquiries or complaints, all of which increase operational expenses. Therefore, having products unavailable on the shelf leads to the loss of millions of euros annually for retailers.

**Customer impact**  
Out-of-stock situations significantly affect the customer experience, often resulting in frustration and disappointment, particularly when customers have planned to purchase specific items. Consumers are likely to feel a sense of loss of control when their desired product is unavailable, which can lead to negative emotional reactions. This feeling of reduced behavioral freedom during OOS events contributes to customer dissatisfaction.

How this influences customer behaviors and reactions at that specific moment has been extensively researched in the literature. When faced with a stockout, consumers typically follow one of three

responses: Substitute, Delay, or Leave, collectively referred to as “SDL” (Zinn & Liu, 2001). These responses capture the main reactions of customers when an in-store item they desire is unavailable. Further studies have detailed these responses, noting that consumers may substitute the item by choosing a different size or type of the same brand, or they might switch to an entirely different brand that fulfills their needs (Campo, 2004). These substitution choices highlight the varying degrees to which customers are willing to adjust their preferences when confronted with a stockout.

Table 1 presents an overview of all the customer responses to an out-of-stock considered in this project. Given the significant growth of online grocery shopping among today’s consumers, this is also included as a potential response, along with the option of asking someone else to make the purchase.

There are also a few studies that describe why customers respond to an OOS situation in the ways they do. As mentioned before, understanding the ‘uncontrolled’ behaviour of customers is crucial for solving product unavailability as a retailer. Prior research reveals that customer behaviour and reactions in an OOS situation are really dependent on a variety of factors, including product related characteristics, consumer characteristics, and situational circumstances (Campo et al., 2000).

One factor that plays a crucial role in shaping customer responses is the type of product that is out-of-stock, whether it offers hedonic or utilitarian benefits (Batra & Ahtola, 1991; Dhar & Wertenbroch, 2000). Hedonic products, like ice cream or salty snacks, provide consumers with experiential enjoyment, excitement, and pleasure.

**Table 1:** Overview of customer reactions to out-of-stock situations.

1.Substitute for a product from same brand, other size
2. Substitute for a product from other brand
3. Substitute for a product from another category
4. Go to another store to purchase
5. Postpone purchase
6. Cancel purchase
7. Ask someone else to purchase
8. Order product online

Utilitarian products, such as detergent or toilet paper, primarily fulfill practical, functional needs. Some products may offer a mix of both benefits (Sloot et al., 2005).

Additionally, consumer reactions to stockouts are significantly affected by their personal commitment to the out-of-stock item. The more committed a customer is to a specific product, such as when it is a key ingredient in a planned recipe, the stronger their negative reaction tends to be when the product is unavailable (Fitzsimons, 2000).

Lastly, consumer emotions toward stockouts are heavily influenced by how these situations are communicated, shaping their frustration, disappointment, or acceptance (Pizzi & Scarpi, 2013). Retailers play a crucial role in managing service failures and addressing unmet customer expectations. Research suggests that rather than simply offering apologies, expressing appreciation is a more effective approach (You et al., 2019). Additionally, findings indicate that customers perceive service recovery efforts from a human as more sincere than those from a service robot, leading to higher levels of satisfaction (Hu et al., 2021).

### 3.1.2 The current situation at Albert Heijn

Based on the insights gathered from interviews with Albert Heijn experts in Product Assortment and Inventory Management, a clearer understanding of out-of-stock issues within the company has emerged.

At Albert Heijn, out-of-stock situations are recognized as a critical challenge that directly impacts customer satisfaction. This issue is further complicated by the company's commitment to reducing food waste, creating unique challenges in managing inventory effectively. Striking a balance between maintaining product availability and minimizing waste has become a key area of focus.

Customer feedback data reveals that problems related to product availability are the leading reasons for customer service calls from in-store shoppers, with 10.000+ reports received annually. The data indicates a clear upward trend in the number of cases reported regarding product unavailability over the years. Furthermore, the feedback received on Albert Heijn's website reveals also frequent complaints about this issue. On a scale of 1 to 5, this topic receives an average rating of 2.46, which is relatively low.

### **“10.000+ customer service calls per year about the issue: product unavailability.”**

Figure 27 illustrates the entire supply chain of Albert Heijn's operations, beginning with the suppliers who deliver products to the distribution centers. These distribution centers then supply the stores, ensuring that products are consistently available on the shelves. At the core of this process, head office employees determine the product assortment for all stores and oversee the forecasting for store replenishment. However, store employees play a pivotal role in maintaining product availability, as they are on-site and have the most accurate insight into when to reorder products and address specific inventory needs.

According to the interviews, the primary causes of out-of-stock situations occur in Albert Heijn's stores. A major challenge lies in maintaining reliable inventory data, which makes accurate forecasting difficult. Key contributing factors include inventory discrepancies due to theft and inconsistencies in shelf restocking, leading to mismatches between recorded and actual stock levels. This aligns with research showing that at

least 50% of OOS cases are attributed to store-level issues (Corsten & Gruen, 2005). Another contributing factor, though less significant, is the forecasting process at headquarters, which relies on generalized models that often lack the precision needed to account for demand fluctuations and store-specific variations.

### **“The primary causes of out-of-stock situations occur within Albert Heijn stores themselves.”**

Fortunately, Albert Heijn is actively working to improve its processes in order to optimize these operational tasks. Achieving accurate inventory data could make a significant difference. However, it is important to recognize that OOS situations cannot be completely avoided due to the inherent unpredictability of supply chains, where unforeseen events can always occur. As a result, Albert Heijn should continue to face these situations and must focus on providing an effective solution for customers.

Despite the well-known nature of this problem and the many potential ways Albert Heijn could better support its customers, the current approach remains quite limited. Currently, it only involves communicating the unavailability of a product on the Electronic Shelf Label (ESL). Figure 28 presents an overview of Albert Heijn's approach: the top image illustrates how out-of-stock products are communicated, while the bottom image shows the indication for products that are going out of the assortment. After seeing this, customers are left to manage the situation on their own, with no additional guidance or support provided.



Figure 28: Communication at the shelf of Albert Heijn during out-of-stock situations (top) and permanent assortment reduction (bottom).

This presents significant opportunities for Albert Heijn, where Generative AI could play a key role in providing innovative solutions. However, there is still a limited understanding of how customers behave in these situations and what they truly need. Customer preferences during an out-of-stock scenario can vary widely depending on the context, making it challenging to identify the most effective ways to enhance their experience and develop tailored solutions.

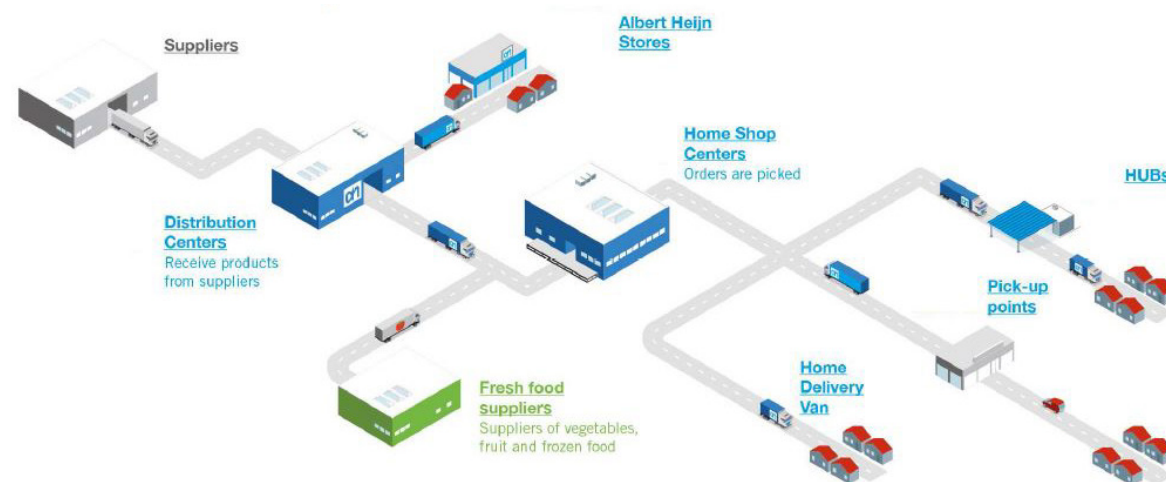


Figure 27: Supply chain of Albert Heijn.



## 3.2 Customer research for Albert Heijn

As previously highlighted, out-of-stock situations negatively impact customer satisfaction and result in lost sales and decreased store loyalty for Albert Heijn itself. However, there is a lack of concrete data quantifying the exact impact on customers. Furthermore, the nuanced ways in which customers react to these situations remain underexplored, revealing a gap in understanding their specific needs and expectations in such scenarios.

An experimental design was employed to systematically investigate customer perceptions of OOS situations at Albert Heijn across four distinct scenarios. This approach allowed for the controlled manipulation of variables, providing insights into their effects on consumer behavior. The goal was to generate actionable insights to inform the design process. This section details the study's design, the scenarios guiding the research and the statistical analysis methods applied to interpret the findings.

**“The goal of the research is to systematically investigate customer perceptions of out-of-stock (OOS) situations at Albert Heijn across four distinct scenarios.”**

### 3.2.1 Research design and methodology

#### Research design

A survey was developed using a between-subjects experimental design to investigate how two product characteristics (independent variables) influence various customer-related outcomes in response to out-of-stock situations.

The two product characteristics were:

1. Product Type: Hedonic (pleasure-focused) vs. Utilitarian (function-focused).
2. Product Context: Recipe (part of a meal or dish) vs. Standalone (independent item).

These variables formed a 2x2 framework, resulting in four distinct experimental conditions, as shown in Figure 29.

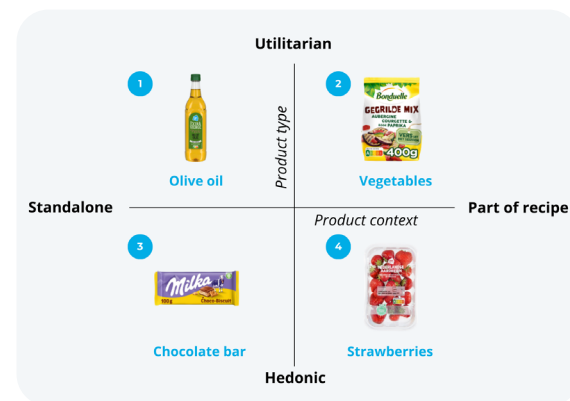


Figure 29: The distinct experimental conditions.

A unique scenario was developed for each condition, enabling a targeted exploration of their impact. The description of the scenarios can be found in Appendix D.

#### Participants

The survey was distributed to 400 participants from the Albert Heijn research panel using the software UserZoom, enabling efficient data collection across diverse customer demographics. The only criterion for participation was that respondents must have experience shopping in-store at Albert Heijn, ensuring the sample was relevant to the research context.

To ensure the validity of the experimental conditions, participants were randomly assigned to one of the four scenarios, with an equal distribution across conditions. Additionally, demographic

variables such as age, gender, and shopping frequency were balanced across the groups to minimize potential biases. From all the participants 44% was female and 56% male. Figure 30 and 31 illustrate the age and shopping frequency distributions of the participants. Randomization ensured that each participant evaluated only a single scenario, minimizing cognitive fatigue and reducing biases that could arise from comparing multiple scenarios.

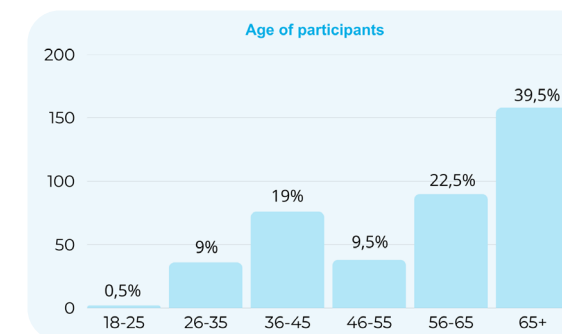


Figure 30: The distribution of age.

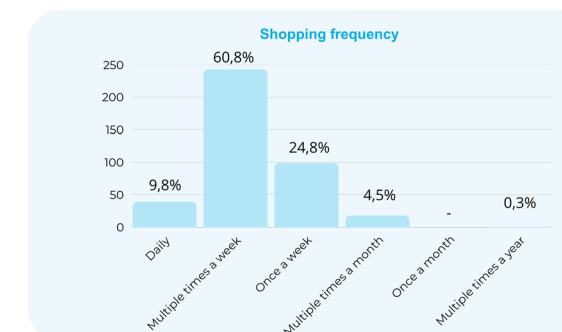


Figure 31: The distribution of shopping frequency.

#### Procedure

Before respondents began the survey, they were provided with information about the study and asked to provide their informed consent. Subsequently, they were introduced to a specific scenario, which formed the basis for most of the survey questions. The initial section of the survey focused on the scenario's impact, exploring respondents' emotions, reactions, and how the scenario influenced their overall shopping experience (e.g. What feelings would you experience in the given scenario?). The next section addressed

scenario-specific needs, with solution-oriented questions such as the type of information respondents would find useful and how Albert Heijn could best provide support. The survey concluded with general questions about this issue within the context of Albert Heijn and respondents' perspectives on the matter (e.g. How important is it to you that Albert Heijn addresses the issue of product availability in stores?). See Appendix D, for an overview of all the questions.

#### Analysis

The analysis employed multiple methods to ensure comprehensive and reliable findings. To evaluate the influence of the two product characteristics on the likelihood of customer responses to out-of-stock situations, a series of Analyses of Variance (ANOVA) was conducted. This statistical technique is particularly suited for assessing how independent variables and their interactions affect a dependent variable, enabling a detailed comparison of effects.

For most other quantitative questions, descriptive statistical methods were applied. This included calculating frequencies, percentages, and mean scores to effectively summarize the responses.

Open-ended questions were analyzed using a qualitative approach to capture nuanced customer insights. The responses were coded to identify recurring themes and keywords, revealing underlying patterns. A few examples of the coding process are provided in Appendix D. To complement this qualitative analysis, the identified themes were quantified by calculating their frequencies, percentages, and mean scores, providing a comprehensive understanding of the data.

3.2.2 Results

Context of the problem

The results show that 90% of the participants consider addressing out-of-stock issues to be important or very important.

Additionally, it negatively impact both the shopping experience and customer loyalty. Over half of respondents (53.3%) reported a negative to very negative effect on their shopping experience, while 45.5% felt neutral, and only 1% viewed it positively. Similarly, 25.4% indicated a negative to very negative impact on their decision to continue shopping at Albert Heijn, whereas 69.9% remained neutral, and 4.7% perceived a positive effect. No significant differences were observed across scenarios.

“Approximately 90% of participants consider out-of-stock situations to be (very) important.”

Influence on customer emotions

One of the objectives was to explore the emotions triggered by an out-of-stock situation. Table 2 presents how often each emotion was selected in response to the question: ‘What feelings would you experience in the given scenario? (Multiple answers possible).’ The figure also shows the average percentage of responses attributed to each emotion, providing insights into the overall emotional distribution. Disappointment was the most prominent emotion (36%), followed by irritation (23%) and frustration (18%).

“The most prominent emotion during OOS is dissatisfaction.”

A Chi-square test was conducted to assess whether product type and context significantly influence the emotions triggered in each scenario. Table 3 presents the results.

The analysis revealed that the emotions ‘frustration’ and ‘anger’ were significantly affected by product context, occurring more frequently when the out-of-stock item was part of a recipe rather than a standalone purchase.

In contrast, the emotion ‘disappointment’ was significantly influenced by the product type. Meaning that hedonic products that are out-of-stock lead to a higher likelihood of disappointment compared to utilitarian products.

For the emotions ‘irritation’, ‘understanding’ and ‘no strong emotion’ neither product type nor product context showed a significant effect.

The exact effects are presented in Appendix D.

“When a product is part of a recipe, the likelihood of experiencing frustration or anger is higher.”

Table 2: Frequency and distribution of customer emotions across the scenarios.

	Frustration	Angry	Disappointment	Irritation	Understanding	No strong emotion	Other	Total
Utilitarian - Standalone	28	4	48	34	6	15	8	143
Utilitarian - Part of recipe	32	8	48	35	5	21	3	152
Hedonic - Standalone	18	4	64	34	9	14	1	144
Hedonic - Part of recipe	33	10	62	35	9	13	9	171
On average	18%	4%	36%	23%	5%	10%	4%	100%

Table 3: Impact of product type and product context on customer emotions.

	Frustration	Angry	Disappointment	Irritation	Understanding	No strong emotion	Other
Type of product			H > U				
Context of product	R > S	R > S					

This table illustrates the primary effects of product type and product context (independent variables) on a specific customer emotion (dependent variable). The values indicate whether a particular factor leads to significantly stronger emotional responses compared to another. “R” represents products used in a recipe, while “S” refers to standalone products. “H” refers to hedonic products (associated with pleasure), and “U” represents utilitarian products (functional or practical).



Influence on customer responses

Another key objectives was to examine how customers react to out-of-stock situations and how product type and context influence their likelihood of choosing specific responses.

Table 4 presents the descriptive statistics, detailing the mean probability of each response across all scenarios on a scale of 1 to 5. The most common response to an out-of-stock product is substitution, particularly choosing a different brand (3.46), a different size within the same brand (3.22), or a different category (2.59). Following substitution, customers are more likely to visit another store (2.74) before considering canceling the purchase (2.47) or postponing it (1.92). Asking someone else to buy the product (1.78) or ordering online (1.54) are the least preferred alternatives.

To further analyze these behaviors, a two-way ANOVA was conducted to assess the influence of product type and context, as well as any potential interaction effects. Table 5 provides a detailed overview of these effects.

The results indicate that customers are more likely to substitute an out-of-stock product with another brand when it is utilitarian rather than hedonic and when it is part of a recipe rather than standalone. Likewise, they are more inclined to substitute it with a different category when it is hedonic rather than utilitarian and part of a recipe rather than standalone.

“When a product is out-of-stock, customers are most likely to substitute it for another product, especially when it was intended for a recipe.”

Beyond substitution, product type and context also influence customers’ alternative shopping decisions. When a hedonic product is out of stock, customers are more likely to visit another store, especially if it is needed for a recipe. In contrast, postponing the purchase is more common for utilitarian and standalone products, while canceling the purchase occurs more frequently with hedonic products, particularly those tied to a recipe.

Interestingly, the decision to ask someone else to buy the product remains unaffected by either factor. However, ordering online is notably more common for standalone products than for those that are part of a recipe.

A detailed breakdown of these effects can be found in Appendix D.

Table 4: Likelihood of customer responses across all scenarios (1-5).

	Same brand other size	Other brand	Other category	Other store	Postpone	Cancel	Ask someone else	Order online
Utilitarian - Standalone	3.32	3.57	2.15	2.44	2.37	2.33	1.80	1.71
Utilitarian - Part of recipe	3.36	3.97	2.78	2.65	1.83	2.30	1.69	1.51
Hedonic - Standalone	3.09	2.91	2.42	2.18	1.78	2.23	1.66	1.62
Hedonic - Part of recipe	3.11	3.37	3.01	3.70	1.71	3.00	1.95	1.32
Average	3.22	3.46	2.59	2.74	1.92	2.47	1.78	1.54

Table 5: Impact of product type and product context on the likelihood of customer responses.

	Same brand other size	Other brand	Other category	Other store	Postpone	Cancel	Ask someone else	Order online
Type of product	-	U > H	H > U	H > U	U > H	H > U	-	-
Context of product	-	R > S	R > S	R > S	S > R	R > S	-	S > R
Interaction effect	-	-	-	H * R	U * S	H * R	-	-

This table presents the main effects of product type and context (independent variables) on specific customer responses (dependent variable). Besides, it presents their interaction effects, meaning that the influence of one variable depends on the presence of the other. For example, when a utilitarian product is out of stock, customers are more likely to postpone their purchase, and this is even stronger when the product is standalone.

### What type of information

To enhance the out-of-stock experience, customers were asked what type of information they would find most helpful in these situations. This was assessed through both an open-ended question and a structured rating scale to capture both qualitative insights and measurable preferences.

The open-ended question, “What information would help you the most in this situation?”, provided key insights into what customers need when faced with an unavailable product. As shown in Figure 32, the most frequently mentioned responses were: ‘when the item will be back in stock’ (27.4%), ‘what a suitable alternative is’ (21.6%), ‘nothing’ (16.2%), and ‘what the current stock level is, or whether it might still be available in the back of the store’ (14.4%).

Additionally, a scale-based question was asked to prioritize the different types of information. Figure 33 presents the results, showing that respondents considered seeing a suitable alternative as the most valuable (3.53), followed by ‘when it will be available again’ (3.50) and ‘why it is out of stock’ (3.34). Information about other stores was rated at 2.88. All of these are considered valuable, with scores above the neutral midpoint.

When examining the influence of product type and context, the results were consistent with customer responses. For out-of-stock products related to a recipe, customers showed greater interest in finding a good alternative or checking other stores for availability. Interest in finding good alternatives was also stronger for utilitarian products compared to hedonic products.

### “The most helpful information: ‘when is it back in-stock?’ and ‘what is a suitable alternative?’.”

For standalone items, customers prioritized knowing when the product will be available again, especially for utilitarian products, which tend to be more functional.

A comprehensive overview of these effects is provided in Appendix D as well.

### Channel of information

Furthermore, respondents were asked about which channel they would prefer to receive this information. The most common preferences were through communication at the shelf (44.7%), followed by the app (18.4%) or an AH employee (18%).

### Willingness & channel to give feedback

Finally, customers were asked about their willingness to provide feedback on out-of-stock products. The results revealed that 58.2% of participants were very willing, 28.4% were neutral, and 13.4% were not willing at all.

Of particular interest was how customers preferred to provide feedback. As shown in Figure 34, 26.2% of customers indicated they would use the app, while 19% said they would speak to a staff member for this purpose.

### “58% of participants were (very) willing to provide feedback on out-of-stock products.”

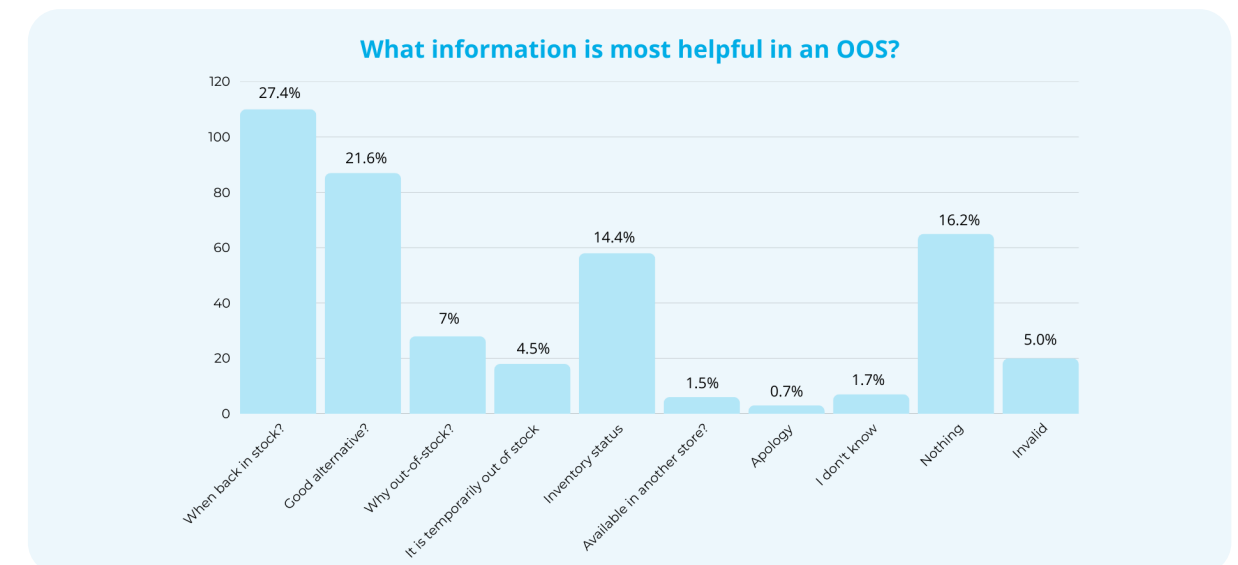


Figure 32: Results of the open-ended question about helpful information when facing OOS.

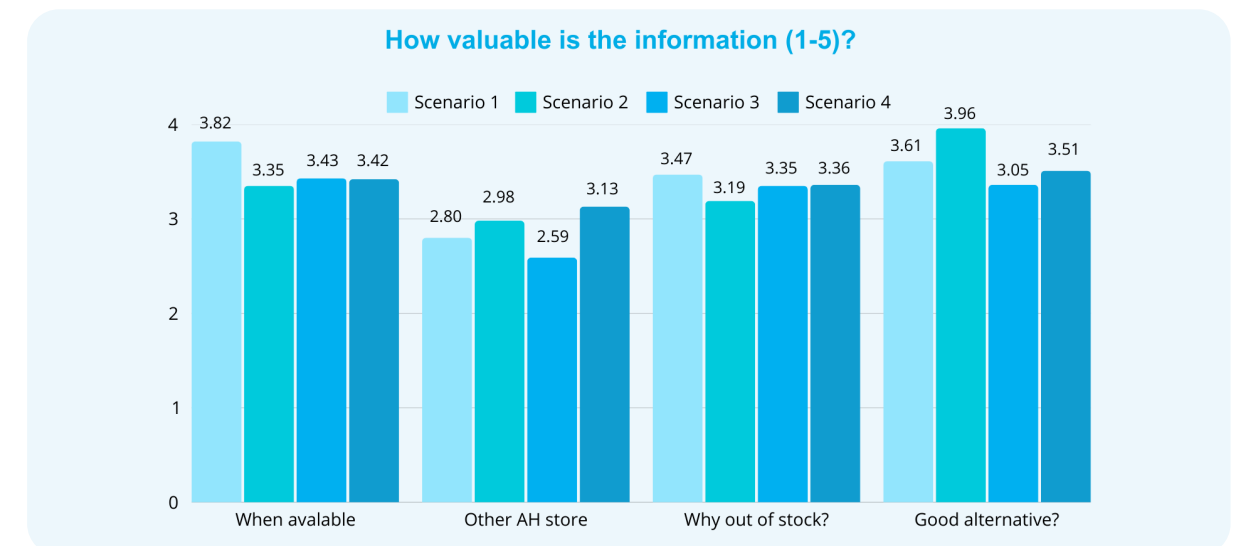


Figure 33: Results of the scale-based question about the relevance of different types of information.

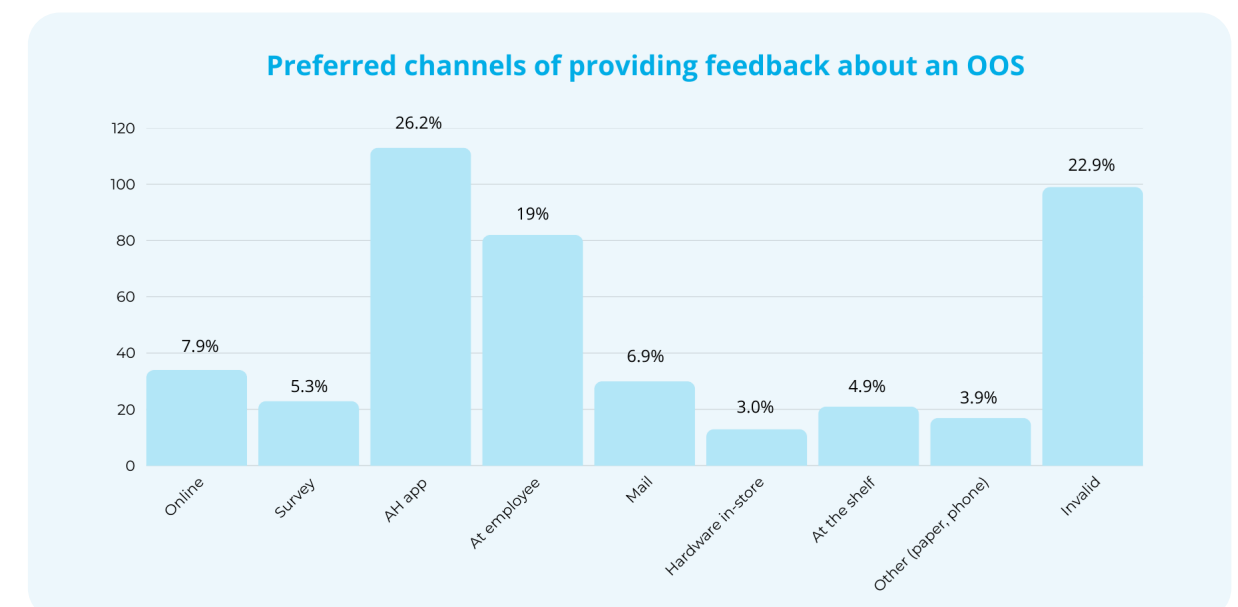


Figure 34: Results of the question about how to provide feedback.



### 3.2.3 Conclusion

The following section outlines the key insights derived from the findings.

#### **Relevance of solving the issue**

For customers, the out-of-stock issue is important to resolve, regardless of product type or context. It causes significant disappointment, irritation and frustration, directly impacting their shopping experience in a negative way. More importantly, for some, it also influences their decision to continue shopping at Albert Heijn in the future.

To address this, Albert Heijn could actively work to reduce the negative emotions customers experience in these situations. For example, offering timely apologies or displaying empathy through personalized notifications in the AH app or in-store interactions can help maintain customer trust and satisfaction.

#### **Tailored solutions**

The customer's emotions, behavior, and needs were examined in various situations, revealing that both product type and context significantly influence customer expectations and actions. This insight is crucial for Albert Heijn, as it emphasizes the importance of tailoring the approach to different scenarios that customers encounter in-store. The information presented below provides a foundation to address these factors individually, enabling a more targeted and effective strategy to enhance the customer experience at Albert Heijn.

##### *Product context*

When products that are part of a recipe are out of stock, frustration and anger are significantly higher. In contrast, when a standalone product is out of stock, no significant emotional reaction was observed.

In general, when a product is out of stock, customers are looking for an alternative. However, when the product is part of a recipe, they expect an immediate solution in-store and are more likely to choose a substitution or visit another store if necessary, compared to standalone items. If neither option is available, they are more likely to cancel their purchase altogether. These findings emphasize the importance of providing information on suitable alternatives and the availability of the product in other Albert Heijn stores, particularly for recipe-related products. For standalone items, if no substitution is possible, customers are more likely to postpone their purchase or order the product online. This is also in line with the significant importance of indicating when the product will be back in stock for standalone items.

##### *Product type*

When products provide hedonic benefits, disappointment is significantly higher. This is likely because customers were specifically seeking that product for pleasure or emotional satisfaction. As a result, they tend to react more strongly, often by going to another store, canceling their purchase, or switching to an entirely different category to meet their needs. In contrast, for utilitarian products, customers are more willing to accept an alternative within the same category, even if it is a different brand, as their main goal is to fulfill the product's functional purpose. This aligns with the finding that a good alternative is more highly valued for utilitarian products, suggesting that consumers prioritize functionality over emotional connection. Furthermore, when no suitable alternative is available for utilitarian products, customers are more likely to postpone their purchase.

Therefore, it would be wise to investigate how to integrate the distinction between product type and context when addressing out-of-stock situations, tailoring the approach to the specific needs and expectations of customers in each case.

#### **Providing the right information**

In an out-of-stock situation, providing clear and concise information is crucial, particularly regarding the product's unavailability, including whether it may still be in the store's stockroom. Without this, confusion can arise, leading customers to approach employees unnecessarily. When a product is truly out of stock, the results show that customers prioritize knowing "when the product will be available again" and "what a good alternative is." Additionally, providing information about which other Albert Heijn stores have the product in stock and explaining the reasons for the out-of-stock situation can significantly enhance the customer experience.

#### **Channel of information**

Customers prefer to receive this information directly at the shelf, as they are often reluctant to ask an employee for assistance. Besides, some customers are also willing to obtain information via the app, particularly regarding alternatives. Therefore, it is important to carefully consider the provision of information, identifying what is best displayed at the shelf (including shelf labels) and what functionalities are most effectively leveraged through the app.

#### **Giving the opportunity to give feedback**

Lastly, research shows that the majority of customers are open to providing feedback on out-of-stock products, either through the app or a staff member. It is valuable to explore how this can be integrated into the current customer journey as best as possible, since this could really help improve the accuracy of inventory data.

# DESIGN BRIEF

# 04

---

## 4.1 Problem statement

---

---

## 4.2 Design scope

---

---

## 4.3 Design goal

---

---

## 4.4 Target group

---

---

## 4.5 Design requirements

---

### 4.1 Problem statement

When customers face an out-of-stock situation in-store, it disrupts their shopping journey, often leading to negative emotions, such as disappointment and irritation. Customers often come with a specific ingredient or product in mind, whether for a planned recipe or because of personal preference. When the product is unavailable, customers are forced to adjust their plans, a process that can be both time-consuming and mentally demanding, requiring quick decisions under uncertain circumstances.

Ultimately, these moments of disruption undermine the seamless and enjoyable experience customers expect. Next to resolving the logistical processes, AH could address the lack of confidence customers feel in adapting their shopping plans when facing an empty shelf.

In summary, the problem statement is: **“In-store customers experience negative emotions during out-of-stock situations due to a lack of confidence and knowledge, making it difficult for them to quickly adapt their shopping plans.”**

### 4.2 Design scope

Research has shown that providing key information to customers is essential for assisting them in out-of-stock situations. However, the effectiveness of this approach depends on the customer's shopping style, whether their shopping is planned or spontaneous. Generally, offering information as early as possible in the shopping journey is highly beneficial for customers, such as displaying real-time product availability before they enter the store.

However, from a business perspective, this approach comes with challenges. For instance, if inventory information is shown online and customers check it from home, the reliability of that information may be compromised due to the time lapse between viewing the data and arriving in-store. While many retailers offer this information, the high turnover of products in supermarkets makes it particularly challenging to ensure real-time accuracy.

This raises a critical question: in out-of-stock situations, at what point in the shopping journey should Albert Heijn intervene and provide a solution to ensure both customer satisfaction and operational feasibility? In line with the initial research question, the focus has been placed on offering a solution to in-store customers when they face this issue at the shelf. However, Section 7.4 presents a broader vision for potential future expansion beyond this scope.

### 4.3 Design goal

Building on the problem statement and the scope, a design goal has been established as the starting point for the design phase. This goal focused on reducing the negative emotions, during out-of-stock situations while enhancing the overall shopping experience.

**“The design aims to improve the in-store customer experience by addressing the frustration caused by stock-out situations. It seeks to reduce the mental effort required to adjust shopping plans when a desired product is unavailable. Through a digital solution accessible directly at the shelf, the design will empower customers with the necessary tools and information to confidently and effortlessly continue their shopping journey.”**



## 4.4 Target group

Albert Heijn serves a diverse customer base, all of whom may encounter the issue of out-of-stock products. Therefore, it has been decided to design a general solution that can cater to all customers. However, there are a few criteria for using the solution: owning a mobile phone, having the Albert Heijn app installed, and being logged in with an AH account. These requirements form the foundation for engaging with Albert Heijn's digital features, ensuring seamless access to personalized services and specific information, and have therefore been deemed essential.

Additionally, Section 2.3.3 identified two types of shoppers. While the solution does not exclude any customer group, it is particularly relevant for those who shop in a more planned manner and value efficiency. These customers are more likely to experience negative emotions when unexpected situations occur in-store, requiring them to adjust their plans. As a result, they stand to benefit the most from a solution designed to support them in these moments.

## 4.5 Design requirements

To effectively navigate the second diamond, 'Design,' and deliver an impactful solution, specific functional and user-centric design requirements were set up. These requirements ensured the solution not only met technical and operational needs but also aligned with customer expectations for a seamless and intuitive experience.

### Functional requirements

- The solution must be accessible directly at the shelf.
- The solution should be integrated with the Albert Heijn app for seamless interaction.
- The solution should communicate clearly that a product is temporarily out of stock, and if possible why.
- The solution should leverage the customer's location within the store to provide context-specific recommendations.
- The solution should provide real-time updates on when the product will be back in stock.
- The solution should offer real-time information about alternative products that are available.
- The solution should communicate real-time information about product availability across other AH stores.
- The solution should have a feature for customers to provide feedback on product availability.
- The solution should leverage Gen AI to personalise this experience.

### User-centric requirements

- The solution must be visually appealing to engage users and enhance their experience.
- The solution must be intuitive and easy to navigate, enabling effortless interaction.
- The solution must present information in a clear and understandable manner to support decision-making.
- The solution must be accessible and seamlessly integrate into the user's existing shopping routine.
- The solution must be reliable, trustworthy, and function consistently throughout the shopping journey.

# DEVELOP

---

5.1 Design approach

---

---

5.2 Ideation

---

---

5.3 Concept refinement

---

# 05

## 5.1 Design approach

In the ‘Develop’ phase, the focus was on creating a concept that met all the requirements outlined in the design brief. The process began with ideation, where insights from the research phase were translated into a tangible design. After that, the design was thoroughly tested, starting with peers to gather initial feedback. Additionally, both the design and technical implementation were reviewed with Albert Heijn employees to ensure alignment and feasibility. Finally, the concept was tested with real Albert Heijn customers, leading to final refinements. Figure 35 provides an overview of the steps taken throughout the process.

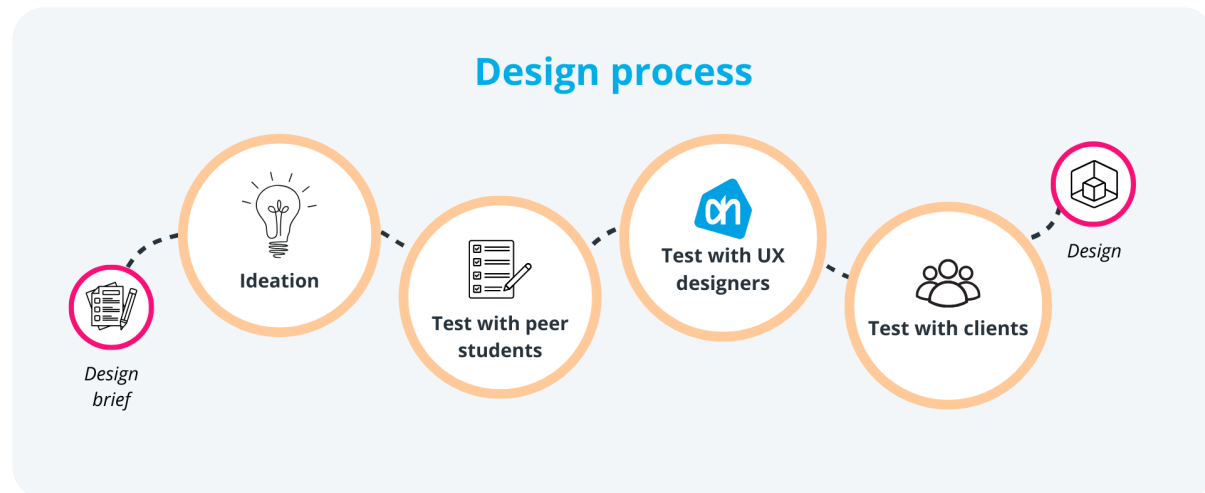


Figure 35: Overview of the design process.

## 5.2 Ideation

The first step of the development phase focused on ideation and brainstorming to incorporate the requirements into an initial design. This process involved exploring key design components, the technical logic behind them, and mapping out an initial version of the user interface to ensure a seamless and intuitive customer experience.

To guide this process, different “how to” questions were set up to explore various aspects of the design, including:

- How to access the digital solution (within the AH app) at the shelf?
- How to provide all information in a clear user flow?
- How to reduce the negative emotions as best as possible?
- How to provide store specific recommendations?

- How can Generative AI be leveraged to provide context-specific recommendations by effectively integrating product context and type into the user flow?
- How to integrate the aspect of feedback in the design?

Throughout this ideation phase, also careful attention was given to balancing desirability with feasibility. The goal was to create a forward-thinking, customer-centric design while ensuring alignment with existing systems and capabilities. Therefore, early in the process discussions were held with employees of Albert Heijn about technical feasibility. This section presents and explores several key aspects that are central to the solution.

### 5.2.1 Access to the solution

Research revealed that customers prefer a solution that is immediately accessible at the shelf, enabling quick and effortless interaction with AH app, providing a smooth and connected experience. As a result, it was crucial to explore how users would access the AH app at the shelf and initiate the interaction. It quickly became apparent that the electronic shelf label (ESL) would play a significant role in this process. ESLs are electronic systems of shelf labels used in stores to dynamically display product prices and other relevant information. By connecting the customer’s phone to these systems, the necessary information could be exchanged. However, the exact method for users to connect their phones to the ESLs was still to be determined. Various technical possibilities were explored, all of which could allow consumers to access store- and product-specific details quickly and conveniently.

One option is to scan the electronic shelf label (ESL) using the AH app, which would require Albert Heijn to introduce a new functionality. Customers would first need to open the AH app. Another quicker option is to use NFC technology, where customers tap their phone against the ESL to be redirected to the app. This is the fastest method but may not be available on all phones, and could be unfamiliar to some customers. Lastly, a QR code could be added on the ESL, as many customers are already familiar with scanning, but it takes up extra space on the shelf label. The final decision will be explained in Section 6.2.

In addition to the interaction between the customer, a mobile device and the shelf, clear communication about this new feature is essential to ensure customers are informed. This communication can take place at several touchpoints:

- Information within the Albert Heijn app about the new feature.
- Messaging within the electronic shelf labels itself.
- Communication materials placed near the shelves.
- In-store marketing materials.
- Employees informed about the new feature to assist, guide, and notify customers.

These elements can be implemented in various ways, offering numerous possibilities for execution. A detailed overview of how this could look is provided in Section 6.5.

### 5.2.2 Reducing negative emotions

Research highlighted that customer recovery strategies should prioritize building a positive relationship with customers, rather than simply admitting fault. In this context, Albert Heijn acknowledging the issue and offering assistance to customers in navigating the situation would already provide significant value.

Beyond only providing information, Albert Heijn could adopt a more personalized approach to show functional appreciation. This could involve gestures such as offering discounts on alternative products, providing free home delivery, or allowing customers to reserve the next batch of the product in-store. Such strategies would convey to customers that their experience is valued, helping to foster trust and loyalty, even in challenging situations.

Given the complexity of these strategies, the development of these new services is considered out of scope for this project. However, within the user interface, clear



communication and apologies have been explored to support customers. Additionally, making it easy for customers to order the unavailable product online could be seen as functional appreciation.

### 5.2.3 User interface

A key aspect of the development phase and design process was creating the user interface. Inspiration was drawn from the existing Albert Heijn app as well as other retail apps, providing valuable insights into effective design features and functionalities. The process began with mapping out the design components and combining them into an initial flow. To facilitate this, a mix of low-fidelity and high-fidelity elements were used, allowing for thorough exploration of ideas and iterative refinement, see Figure 36. In this subsection several key components are presented along with their initial exploration and design considerations.

#### Displaying that a product is temporarily out of stock

Research revealed that it is crucial to clearly indicate when a product is temporarily out of stock. While it might seem obvious to a customer standing in front of an empty shelf, without a clear indication, confusion can arise. Customers may wonder, “Could the product still be in the store somewhere?” To eliminate this uncertainty, a clear and straightforward message, “Niet op voorraad”, was chosen to provide immediate confirmation and prevent any misunderstanding.

There were different ways to present this, as shown in Figure 37. Here, there has been experimented with different colors, placement, and the shape of a label to indicate this. Additionally, there was consideration given to whether removing the price could contribute to this

message. However, the product photo, title, and price are key components that indicate the product is the correct one. Placing the label on the product photo was also blocking essential information

#### Providing real-time information about when a product will be back in stock.

Research indicates that customers, particularly for utilitarian products, are highly interested in knowing when an out-of-stock product will be back on the shelves. At Albert Heijn, this information has never been directly communicated to customers. Fortunately, the necessary internal data to enable this functionality is available, making it technically feasible. See Section 7.1 for further details on technical details.

For this component, various options were explored, see Figure 38. An analysis of other (online) webshops and apps revealed that many use timelines with different stages to display delivery status, balancing simplicity with detail. However, early feedback clarified that customers in-store are primarily interested in the availability date rather than the detailed status of the product’s journey. Therefore, it was decided to just present straightforward availability information for simplicity and clarity.

#### Providing real-time information about alternative products that are available.

Research revealed that customers are particularly interested in alternative products when their desired item is out of stock, especially when the product is utilitarian or part of a recipe. The current Albert Heijn app already includes a feature that suggests alternative products, such as when adding items to the cart from an Allerhande recipe. It is important to note that this differs from



Figure 36: Ideation with low- and high-fidelity prototypes.

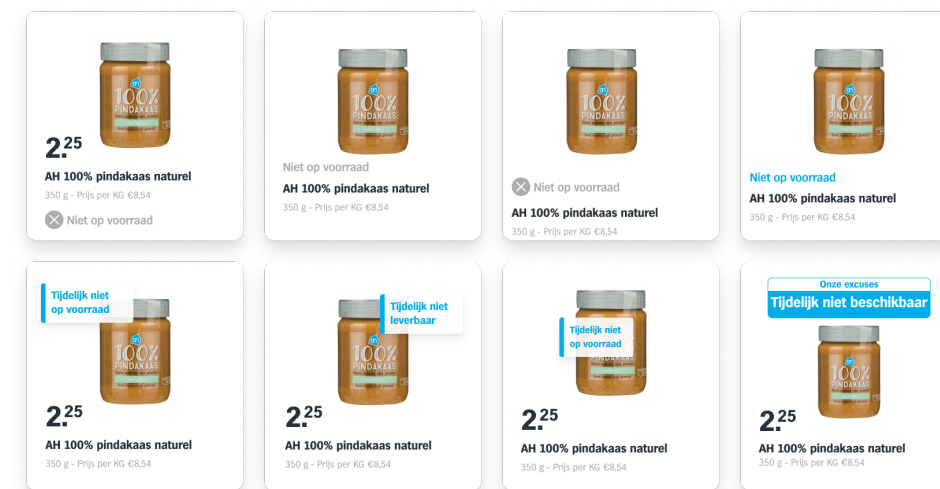


Figure 37: Exploration of displaying out-of-stock.

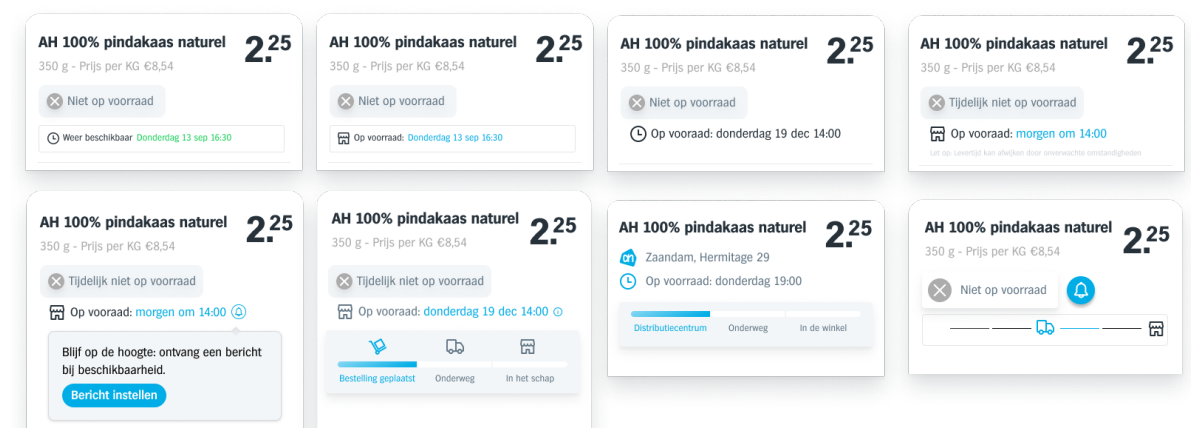


Figure 38: Exploration of displaying when a product would be back in-stock.

the “Andere soorten” section, which appears when searching for a product in the app. The design of this feature inspired the presentation of available alternatives, both as a preview and on a dedicated alternatives page. See Figure 39 for exploration. Various approaches were tested, including displaying the original product, using stock labels or text to indicate availability, categorizing alternatives, and offering filters to enhance the user experience.

Providing real-time information about product availability across other AH stores

As also found in research, it may be useful to know if a product is available in other Albert Heijn stores, particularly for customers who live near multiple locations. Existing components from the “overblijvers” feature and store finder were used as inspiration for this component and also to maintain

consistency with Albert Heijn’s current interface. In Figure 40, various approaches to presenting this information were explored, experimenting with different colors, placement, and the inclusion or exclusion of distance.

Combining it into one flow

The last step of ideation involved integrating all components and creating a high-fidelity flow. This could be approached in various ways. Figure 41 illustrates the initial version of the user flow, which serves as the foundational framework for the subsequent development phases. It showcases the user interface of the digital product, highlighting intermediate steps and the connections between buttons and their corresponding pages.

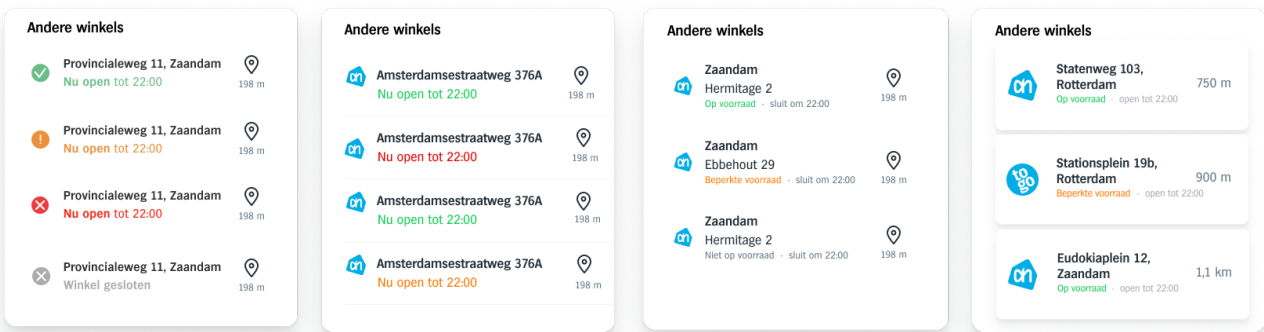


Figure 40: Exploration of displaying product availability across other AH stores.

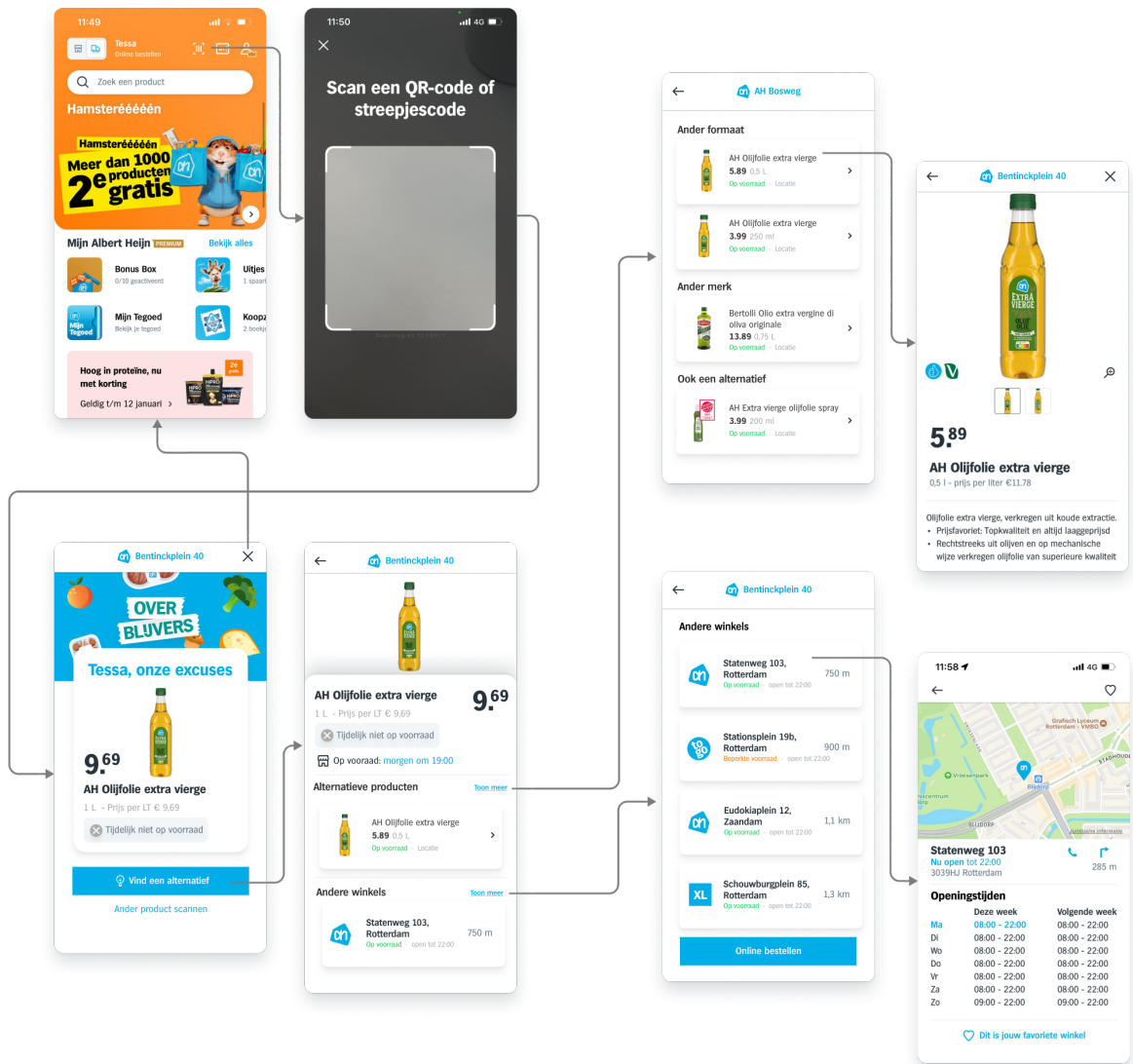


Figure 41: Initial version of the user flow.

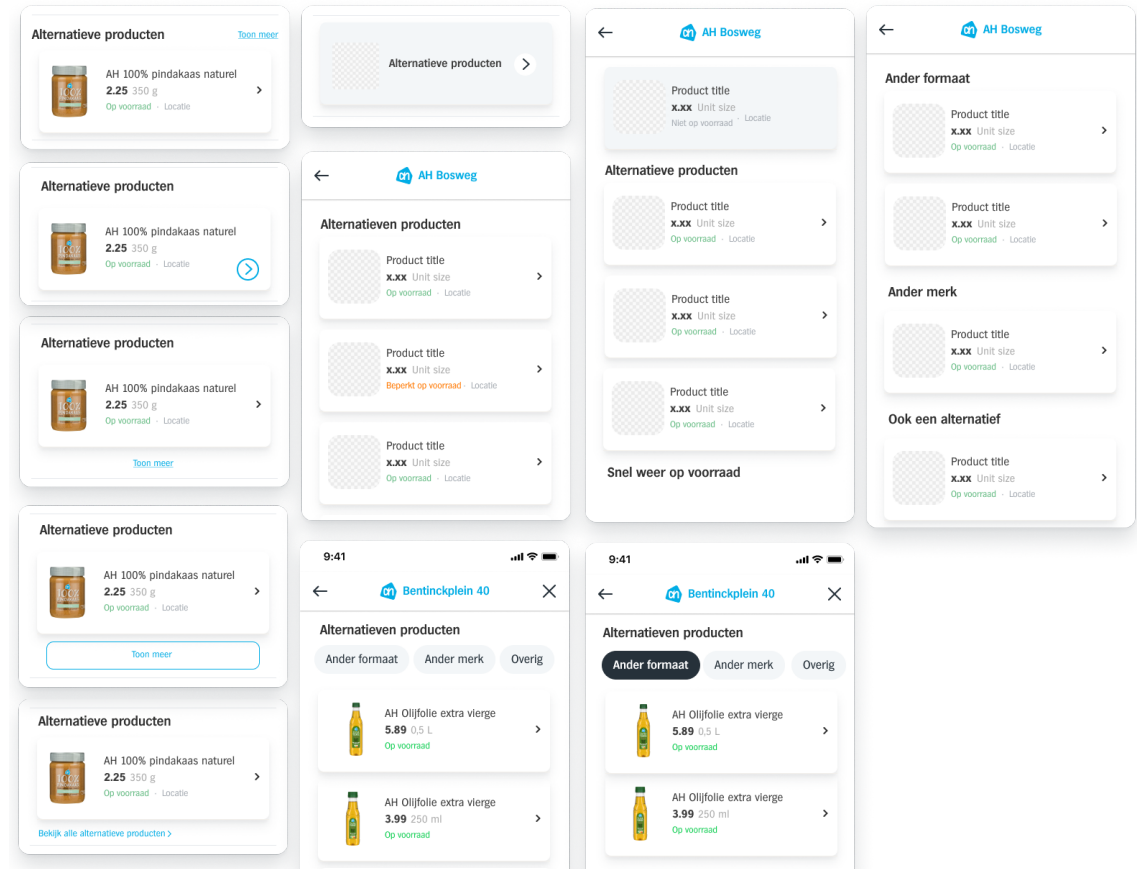


Figure 39: Exploration of displaying alternative products, also with filters.



## 5.2.4 Tech exploration

In parallel with the visualization process, the technical feasibility was carefully considered. This involved evaluating whether the proposed components could be integrated into Albert Heijn's existing systems and app functionalities. Given the complexity of the solution and its impact across various domains within the organization, meetings were held with Product Owners and specialists from teams such as Shopping, Store Assortment, Inventory Management, and Electronic Shelf Labels to gather expert input.

As the design evolved during the refinement phase, a clearer understanding of the technical requirements emerged. Key questions addressed throughout the ideation and refinement process included:

- What information can be retrieved by scanning the electronic shelf label?
- Which access method would allow Albert Heijn to retrieve specific data most efficiently?
- What is required to provide store-specific recommendations?
- What technical capabilities are needed to display stock levels and store inventory to customers?
- What technical model currently supports displaying alternatives, and what factors does it consider?

The answers to these questions will be addressed in Section 7.1, where the implementation details and technical requirements are discussed in greater detail.

## 5.2.5 Feedback

The design focuses on supporting customers when a product is out of stock, primarily by providing information. Additionally, the exploration of how to involve customers in reporting

these situations has been considered. Research revealed that the accuracy of stock levels is an internal issue at Albert Heijn that requires improvement. As a result, customers frequently encounter situations where the shelf is empty, but the store's inventory still shows the product as available, and the information displayed on the electronic shelf labels does not match the actual stock levels, causing confusion. This mismatch is particularly confusing when the shelf is empty, yet the system indicates positive stock. Conversely, cases where the shelf is full but the label indicates negative stock are rare and generally do not cause customer frustration since the product is available. See Figure 42 for the discrepancy between the shelf and the ESL.

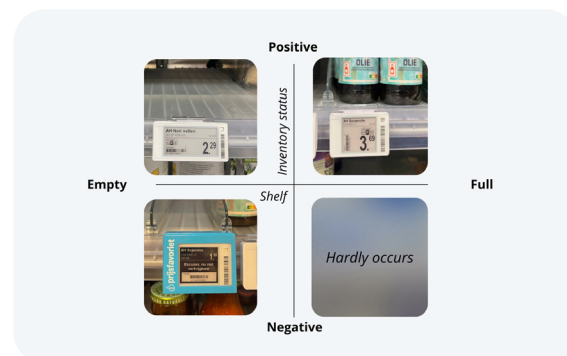


Figure 42: Communication at the shelf in different situations at Albert Heijn.

Albert Heijn's customers can be a valuable source of feedback and support in addressing this issue, as they are in direct contact with the shelves. Fortunately, it was found that customers are generally open to providing feedback when a product is out of stock. Most customers prefer a solution directly at the shelf, and the AH app was identified as a suitable channel for reporting this, rather than a hardware device or engaging with a staff member, as these options present a higher threshold for participation. Therefore, the design incorporated this to involve customers in this process. This is also showcased in Section 6.3.

## 5.3 Concept refinement

After creating an initial design, it was tested extensively in three rounds to collect feedback and refine the solution. This iterative testing process played a crucial role in identifying and resolving issues, ultimately resulting in a user-friendly and effective final design.

### 5.3.1 Testing with peers

The first round of testing was conducted with five students (recruited through the researcher's network), all of whom had a background in design or innovation and were also Albert Heijn customers. Each participant took part in a 30-minute session. The goal of the testing was to uncover user expectations related to specific buttons and screens, as well as to gather feedback on the overall flow and development of the concept.

The test began with a brief introduction to the concept, supported by a printed version of the user interface to create a more interactive and tangible testing experience, see Figure 43. To guide the sessions, a test plan was developed, incorporating a set of questions designed to uncover user expectations and preferences, found in Appendix E. Participants were encouraged to think out loud during the process, sharing their thoughts, expectations, and any areas of confusion. This approach facilitated the collection of both verbal and non-verbal feedback, providing a comprehensive understanding of user behavior. The gathered feedback was then summarized into insights, which are also detailed in Appendix E. These insights were used to inform key adjustments to the design, as outlined below.

**P1: "I like getting some help with the alternatives."**

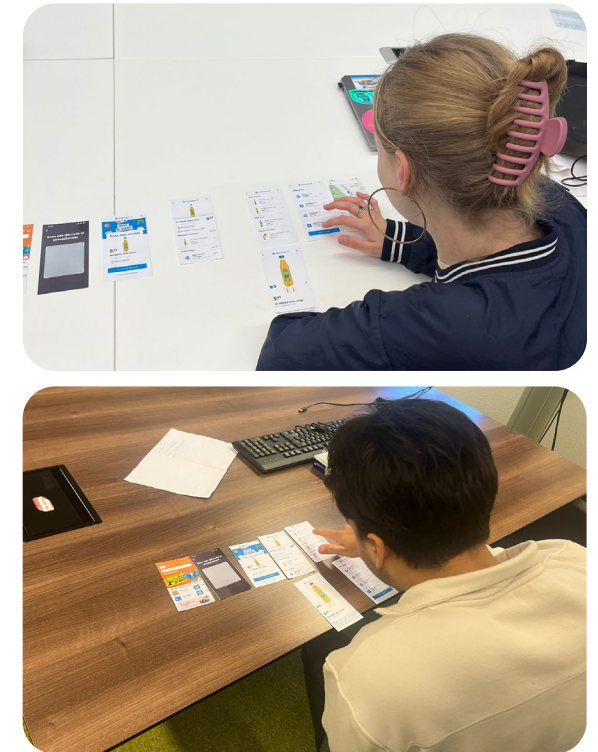


Figure 43: Testing with peers.

**P4: "I don't like too many clicks; I want to get to the needed information as quickly as possible."**

#### Main adjustments:

- Shift the focus of communication to scanning the shelf label instead of the product and this should become a whole different scan functionality than QR code or barcode.
- Display the preview of alternatives in a carousel format, rather than arranging them vertically.
- Remove the location information of potential alternatives (e.g., meter 2, shelf 3, row 4), as it is currently unclear for customers.
- Add a close button (X) in the top-right corner to allow users to easily exit the feature and go to the home page of the AH app.

**P2: “Seeing that a product is not available is useful for confirmation.”**

**P3: “I would display the alternatives in a carousel rather than stacking them underneath each other.”**

#### To be tested and decided:

- Offering an apology can be an effective way to acknowledge customer frustration; however, feedback showed mixed reactions. Conducting further tests with different phrasing could provide valuable insights into what resonates best with customers.
- Develop two separate flows and test which works best: (1) a confirmation screen that also provides new information (e.g. when back in-stock) and (2) a direct transition to the overview screen without a confirmation screen.
- Seeing a clear categorization for alternative products with GenAI is highly convenient, especially when it aligns with the customer's preferences. Develop a component that allows customers to filter and personalize the alternatives, making it easier for them to focus on the most relevant options.
- Reevaluate the screen displayed when clicking on an alternative product: should they be directed to the general product detail page, or should it lead to a store-specific page?
- Evaluate where offering the option to order online would be most logical: on the overview page or under “other stores.”

### 5.3.2 Testing with UX designers from Albert Heijn

The second round of testing was scheduled with three experienced UX designers from Albert Heijn, each participating in separate meetings. During these sessions, the problem and proposed solution were introduced, and various user interface variations were presented in Figma, see Figure 44. The goal was to evaluate the designs and gather feedback on the overall concept through a natural and open conversation. Based on these discussions and the exploration of different variations, a clearer idea emerged about what approach might work best for users.

Based on these sessions, a few adjustments were made, as listed below. Additionally, several aspects were identified that could benefit from further testing and refinement.

#### Main adjustments:

- The confirmation screen can be removed; go directly to the screen with all the information. That is more clear and expected by customers.
- Presenting the initial product can be more clean, remove the card.
- Combine the “out of stock” label and “when back in stock” element into one component to create a clearer hierarchy.
- Change the “Show more” button to “Show all” for better clarity.
- The online ordering option is currently quite hidden; it could be placed alongside the store stock information. Many other retailers display these together as well.
- Maintain the flow as consistently as possible when a product is in stock.

#### Further testing:

- Is it clear that these are the alternatives available in this store?
- Look how to present the option of ordering online in combination with store status on the overview page.
- Offering an apology would align with AH's new vision, but what do customers actually prefer?
- Explore different ways to incorporate the customer's input (literal text) into the search for alternative products and using GenAI, such as referencing an assistant on a separate screen, using a popup or applying a filter on the same page.
- Test whether customers would prefer being directed to a separate page for other stores, or if a button with a popup would be more convenient.

**UX designer 1: “The scanning entry makes sense to me, especially since customers are already familiar with it.”**

**UX designer 2: “I like the more personal approach and offering an apology, this aligns with AH's new vision.”**

**UX designer 3: “Interacting with AI is so new; it is important to really test with customers to see what works best for them.”**

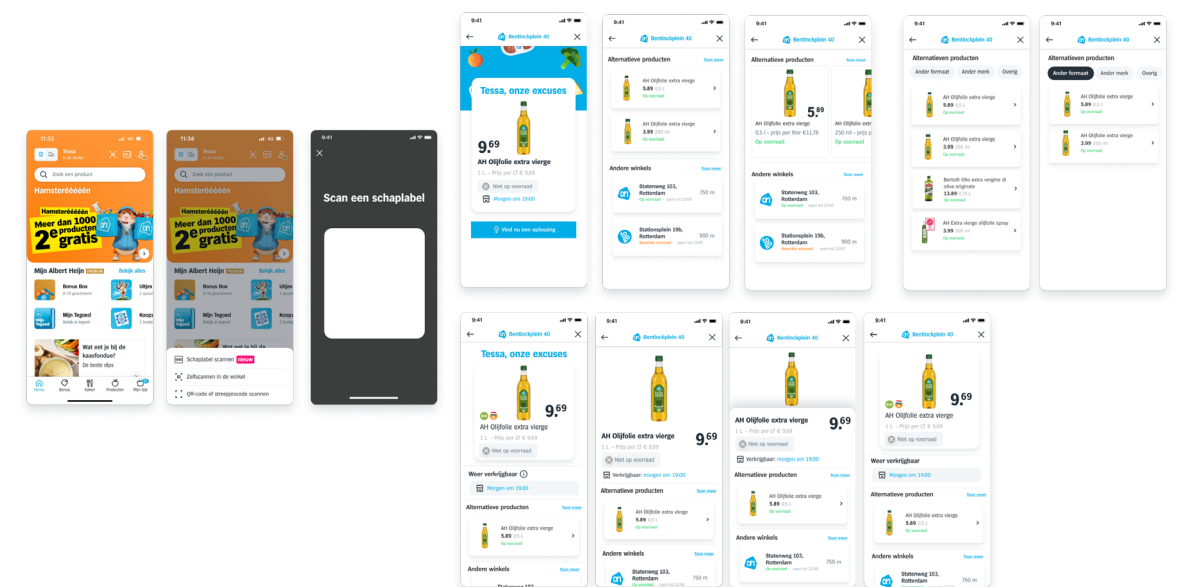


Figure 44: V2 with multiple options, tested with Albert Heijn UX designers.



5.3.3 Testing with customers

The final round of testing was conducted with five Albert Heijn customers from the AH panel, varying in age, gender and region, see Table 6. The aim was to gather in-depth insights into the overall concept, evaluate its alignment with the user-centric requirements outlined in the design brief, and uncover areas for improvement based on their feedback.

Table 6: Participants.

Participant	Age	Gender	Region
P1	58	F	Noord-Holland
P2	47	F	Friesland
P3	68	M	Noord-Brabant
P4	30	M	Zuid-Holland
P5	35	M	Utrecht

The participants were individually interviewed via the UserZoom software, with each session lasting 20 minutes. During these sessions, they interacted with a high-fidelity prototype in Figma and were free to explore the solution. A set of structured and open-ended questions, detailed in Appendix F, guided the discussions to assess participants' impressions, usability challenges, and the overall fit of the concept with their needs and expectations. These conversations provided valuable qualitative insights that informed the last refinement. Figure 45 presents some interesting quotes.

Main insights

- All respondents recognized the problem, saw value in the solution, and indicated they would use it. However, what they found most useful at a given moment depended on the product and its urgency.
- The shelf label scanner was perceived as easy to use while shopping, but its visibility could be improved by placing it more prominently on the home page rather than only behind the scan icon, because it is new.
- The personal approach and apology were appreciated and provided reassurance.
- Seeing the stock status was also perceived as a confirmation. For missed Bonus deals, online ordering could be an interesting option, though the €50 minimum order requirement was noted as a limitation.
- When considering alternative products, respondents valued the price-to-volume ratio, and a “best deal” label was seen as helpful. Additionally, knowing the exact location of the alternative product in the store was considered useful.
- The alternative products page was not immediately noticed but was seen as a useful feature. Filters were viewed as a helpful tool in the decision-making process. Providing input through the assistant received mixed reactions, some would use it if they were truly stuck, while others found it too much effort.
- Showing availability in other stores was seen as a real added value, and participants responded positively to the search function. Displaying the route to another store on a map would be a helpful addition.

Additional details can be found in Appendix F.

**P1: “It’s nice that I am addressed by my name, and it also makes us feel like we’re being helped. It feels like an Albert Heijn employee is assisting you, and that you’re being seen.”**

**P2: “I especially like other stores because sometimes I cycle to a different store and it’s not available there either. This would save me time.”**

**P3: “It is clear what the purpose is and easy to navigate. It helps me answer the question, ‘What should I do?’ It makes the search much easier, I don’t have to walk through the entire store.”**

**P4: “I already use the scan feature for products, and this is a great addition. I believe it is useful to check if something is in stock.”**

**P5: “I find it very interesting, as such a situation does occur from time to time, and I would definitely use it.”**

Figure 45: Quotes from participants during the test sessions.

## 6.1 Customer journey

## 6.2 Shelf interaction

## 6.3 User interface

## 6.4 The integration of Generative AI

## 6.5 Communication materials

This chapter presents the final design, outlining its context and integration within the customer journey. It details how users access the solution in the AH app directly at the shelf and provides an overview of the user interface design. Additionally, the chapter explains how Generative AI is integrated on the back-end to enhance the user experience, ensuring relevant and personalized interactions. Lastly, a few communication materials are presented to facilitate the launch of this new feature.

### 6.1 Customer journey

Before introducing the solution, it is essential to understand the context in which it is being implemented, see Figure 46.

This solution is designed specifically for the in-store experience, focusing on the purchase phase. It addresses the moment when a customer encounters an out-of-stock product while standing in front of the shelf. In this scenario, the customer can access the solution through their mobile device and the Albert Heijn app via the (new) shelf label scanner functionality. Since mobile phones are already an integral part of the shopping journey, this approach

feels intuitive and seamlessly integrates into existing behavior. By providing relevant information at the right moment, the solution empowers customers to make informed decisions and navigate the situation more effectively.

To illustrate the concrete steps and actions a customer can take in-store, a detailed breakdown of the user journey is provided, see Figure 47. This offers deeper insight into key interactions throughout the shopping process. The first three steps represent the existing journey. Steps 4 to 8 demonstrate how the proposed solution enhances the experience.



Figure 46: Context of the proposed design.



### Situation right now



### With proposed solution



Figure 47: Storyboard of the solution.

## 6.2 Shelf interaction

To access the digital solution within the AH app at the shelf, several approaches were considered. The chosen interaction leverages a new scanning feature; the shelf label scanner.

This approach was selected because it offers a logical and familiar experience for customers, particularly since many are already accustomed to using scanning functionalities. For Albert Heijn, it is also a practical choice, as it builds on the existing app infrastructure without requiring significant technical development, unlike NFC technology. Additionally, relying solely on NFC could reduce the visibility of the feature, as users may not always be aware of their exact location within the app after being redirected. Scanning, on the other hand, is universally supported across smartphones, making it a more accessible solution.

A QR code was also considered but ultimately not selected, as it would occupy valuable space and introduce unnecessary steps in the user journey. To clarify, customers will use the new shelf label scanner rather than the existing scan functionality for product barcodes or QR codes. Figure 48 illustrates the user interface for this feature. Each electronic shelf label is unique, allowing it to retrieve the relevant product information, with technical details further explained in Section 7.1.

Furthermore, when a product is out-of-stock, displaying a message or reference directly on the ESL could help increase customer awareness of the shelf label scanner. As illustrated in Figure 49, a simple prompt directing users to the AH app would make the feature more visible and enhance the overall shopping experience.

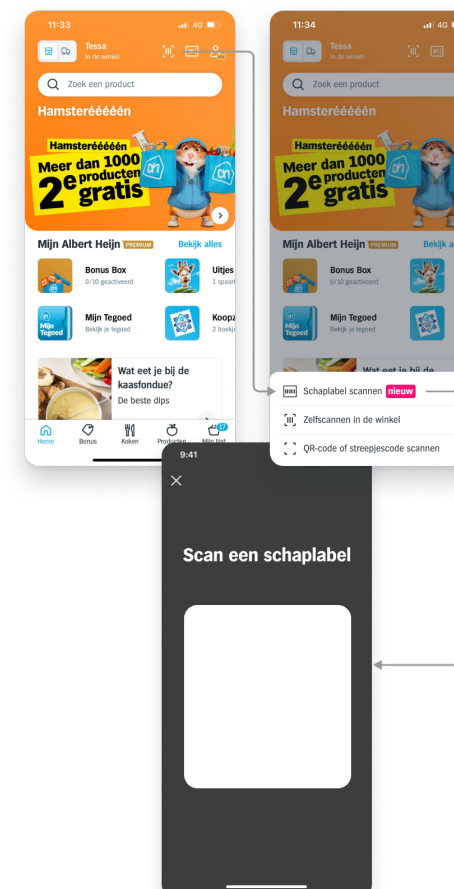


Figure 48: Functionality shelf label scanner.



Figure 49: Adjustment electronic shelf label (ESL).

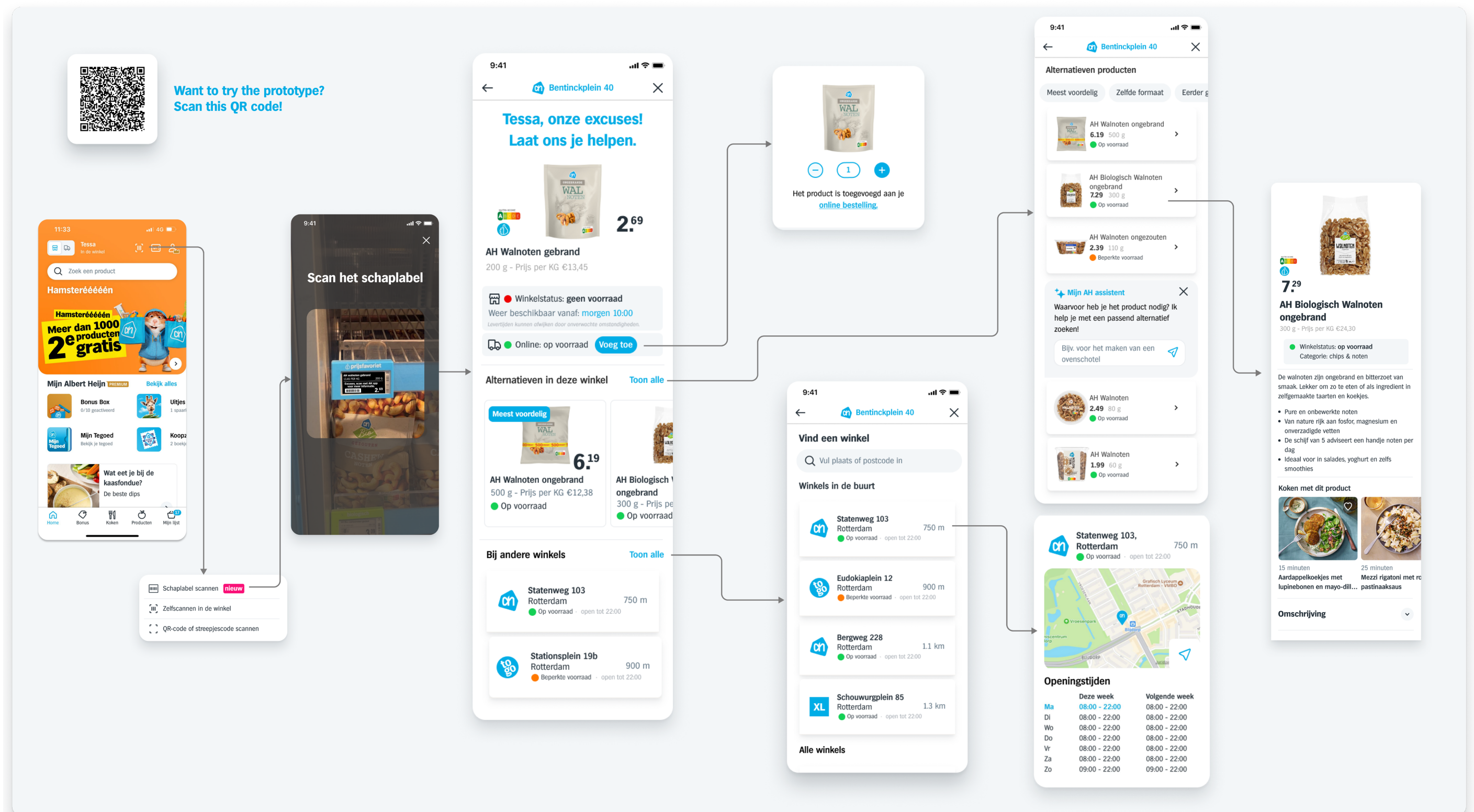


Figure 50: The final user interface of the shelf label scanner.



## 6.3 User interface

Figure 50 presents an overview of the user interface created for this solution. Each component of the interface will be explained to clarify its functionality and purpose.

### Location

When a customer scans the shelf label, the system will recognize which store the customer is in. This information will then be displayed at the top of the screen at all times to clearly indicate that the details provided are specific to that store.

### Apology

Additionally, a personal apology is offered first, along with a message that Albert Heijn is eager to help. Research indicated that this approach conveys empathy and was perceived positively by customers. This approach helps to immediately reduce the negative emotions customers experience when a product is out of stock.

### Product information

It is important that customers receive confirmation when a product is out of stock and that they are provided with the correct information. Therefore, basic product details, such as the image, title, subtitle and price are displayed. If customers wish to access more detailed information about the product, they can simply click on the image, which will direct them to a dedicated product detail page.

### Store status

An important component of the solution is displaying the store status. Research found that customers often experience uncertainty when facing an empty shelf, unsure if the product is available elsewhere in the store. This component

helps eliminate that uncertainty. Additionally, it is highly desirable to show when the product will be back in stock, as customers are often willing to return, especially if they do not need the product immediately. Since Albert Heijn delivers to its stores seven days a week, products that are ordered can typically be restocked the following day.

### Online status

Furthermore, the product's current online status is clearly displayed, along with the option to order the product online. Since many customers shop both in-store and online, this makes it easy for them to add the item to their online order, offering a convenient shopping experience. This is especially valuable for Bonus products, as they are often sold out in-store due to high demand. When customers click 'Voeg toe,' a pop-up will appear confirming that the product has been added to their online shopping basket.

### Available alternatives

#### Preview top 5 alternatives

Since research indicated that customers frequently look for alternatives, these are presented in a carousel format, which was found to be the most preferred option. The top 5 available alternatives in the store at that moment are displayed, along with their current availability status for added clarity.

Additionally, labels can be shown, such as "Meest voordelig" or "Beste deal" to support customers in decision-making. If customers want to see more details about a specific alternative, they can click on it to view additional information, including its location within the store. Details on how these alternatives are selected will be further explained in Section 6.4.

### Alternative screen

If the customer wants to see more options, they can click on 'Toon alle' to navigate to an additional screen that provides an overview of all suggested alternatives that the model has selected. Customers can apply filters to refine their selection based on their preferences. These filters are generated by Generative AI, meaning they can vary per product and customer, ensuring a personalized experience. Additionally, customers can provide more context about their preferences by typing their request and sending it to the Mijn AH assistant. Then the model will do an additional search based on their input, offering more tailored suggestions.

### Other AH stores

#### Preview top 2 stores

At the bottom of the page, the availability of the out-of-stock product in other Albert Heijn stores is displayed, as research indicated that customers find this information useful. The stores are sorted by distance, with the two closest locations displayed as a preview, including their opening hours and the distance to each store. For more details, users can click on a store to expand a map with directions to that location. To explore additional store options, users can click on "Toon alle" to view more locations.

### Other stores screen

This screen allows users to check the stock availability of the product across all Albert Heijn stores. At the top, a list of nearby stores within a 5 km radius is displayed. However, recognizing that people also travel between different places, users can also search by city or zip code for more precise results.

### What if the product is in-stock?

When introducing the shelf label scanner to Albert Heijn customers, it is important to account for the possibility that customers may scan shelf labels even when a product is in stock. In such cases, the screen displayed to customers would be similar, but with a few adjustments. The store status would be shown as "Op voorraad" (in stock), and the component for the availability in other AH stores would be replaced with an option to cook with the product. Available alternative products would still be visible to give customers additional choices.

However, since the current system sometimes fails to accurately reflect real-time stock levels, there is a risk that customers may encounter this page even when the shelf is actually empty. To address this, a feature was included that allows customers to provide feedback on whether the stock status and the actual shelf availability align, see Figure 51. Research indicated that most customers are willing to provide such feedback. If the stock status and shelf availability do not match, this ensures that customers are directed to the correct page, and employees receive a notification to check the stock level.

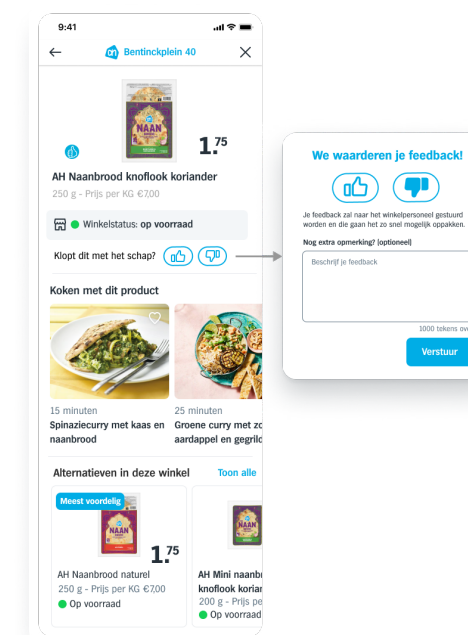


Figure 51: User interface for product in stock.

## 6.4 The integration of Generative AI

At the core of this project is the question: “How can Gen AI enhance the in-store customer experience?” Research indicated that Gen AI excels in data processing and, particularly within customer engagement, plays a crucial role in personalization. Additionally, the customer research in Section 3.2 revealed that when encountering an out-of-stock product, shopping needs vary. Each customer makes individual decisions and prioritizes certain information as more relevant than others. More importantly, it revealed that the product type and product context significantly influence these preferences. This subsection explores how AI and Gen AI are applied in various ways to customize the shopping experience according to these diverse needs.

### Classifying

It is clear that the context of a purchase plays a crucial role in shaping customer preferences and behavior. But how can Albert Heijn respond effectively without understanding this context? This is actually the first step where AI can play a role; internally assessing the context of each purchase while remaining invisible to the customer. The AI would analyze whether the product belongs to a specific category, helping Albert Heijn identify patterns across customer data. For example, it could distinguish between products typically purchased for hedonic reasons (like snacks) or predict whether an item is bought independently or as part of a recipe (based on other items in the shopping list). With this classification, Albert Heijn can then take targeted actions to improve the customer experience.

### Order & highlighting components

Once Albert Heijn understands the context of a purchase, AI can be leveraged to dynamically adjust the order of information and highlight the most relevant details. For instance, with utilitarian products that are typically purchased standalone (like olive oil or toilet paper), customers are more likely to postpone their purchase. In these cases, prominently displaying restock information, such as the expected availability date, becomes particularly valuable. AI-generated, strategically placed messages can effectively highlight this information and guide customers in their decision-making, as shown in Figure 52. For recipe ingredients, highlighting the availability at nearby Albert Heijn stores could be more helpful.



Figure 52: Example of highlighting components in UI.

### Displaying alternatives

AI can also play a crucial role in presenting alternative products to customers. Currently, a basic recommendation model suggests similar items to the one being searched. For example, when customers add items from the Allerhande Weekmenu to their shopping cart, they can modify certain products and view alternatives. However, this model is relatively generic, offering a limited selection of alternatives and presenting the same suggestions to all customers.

To better serve customers, a broader range of alternative products should be shown. In general, research highlighted that the price-to-volume ratio plays a significant role in the selection of alternatives, so products with similar price and volume should be prioritized in the recommendation order.

Refining the current model with AI can further improve the customer service and offers significant potential, not only for this use case but also for other areas. By integrating AI, the recommendation system can evolve from basic suggestions to offering highly personalized alternatives, tailored to each customer's unique needs. Factors such as a customer's favorite products, purchase history, and dietary preferences can influence these recommendations.

**“By integrating AI, the recommendation system can evolve from basic suggestions to offering highly personalized alternatives.”**

As mentioned earlier, the model can also take the purchase context into account and adjust the alternatives accordingly. Research has shown that customer openness to alternatives varies by product type. For hedonic products (e.g., snacks), customers are more likely to consider alternatives from different categories. In contrast, for utilitarian products (e.g., household essentials), customers tend to prefer alternatives within the same category, and are generally more open to switching brands. Additionally, when an out-of-stock product is intended for a recipe, offering a suitable alternative becomes more critical than for standalone products. Although research did not identify a clear preference for specific types of alternatives, the system could take this into account and help customers find the right substitute for that recipe.

**“The model can also take the purchase context into account and adjust alternative products accordingly.”**

As illustrated, leveraging AI to suggest alternative products offers significant potential to make recommendations more personalized, aligning with customer preferences and the specific context of their purchase.



## 6.5 Communication materials

Since the shelf label scanner is a new feature, clear communication about its use is essential. This section presents a range of materials designed to support this communication, from in-store displays near the shelves to broader marketing materials.

Starting with communication close to the shelves, the template on the ESL serves as the first direct message to inform customers, as shown in Section 6.2. Additionally, wobblers can be strategically placed on shelves where this issue is more prominent, drawing attention and guiding customers, see Figure 53.



Figure 53: Examples of wobblers that can be placed at the shelves in Albert Heijn stores.

Once customers are aware that they need to use the app, it is important that this feature is clearly visible within the app itself. While it is located behind the scan icon, Figure 54 illustrates how it could be made more prominent on the homepage of the Albert Heijn app, ensuring better visibility and easier access for users.

Furthermore, a series of posters have been designed for general marketing, see Figure 55. These can be placed both within the store and outside, to increase awareness and usage of the new feature.



Figure 54: The shelflabel scanner at the home page of AH app.



Figure 55: Communication materials.





# Schap label scanner.

Makkelijk, snel en direct een oplossing bij een leeg schap. Scan met de AH app.



DELIVER

07

7.1 Technical implementation

7.2 From a business perspective

7.3 Relevant considerations

7.4 Recommendations



## 7.1 Technical implementation

To make this design possible, a significant amount of technical data is required to ensure that the desired information can be effectively displayed to the customer. Due to confidentiality concerns and the scope of this project, there will not be delved into the specifics of data services, API calls or other technical details. However, this section will address the general technical feasibility.

The feasibility of the proposed solution heavily depends on the integration of various system components, such as data access, real-time updates and seamless communication between the Albert Heijn app and the shelf labels. Despite positioning itself as an omnichannel retailer, the current systems used in stores and within the app are mostly separate and lack alignment in terms of data. While this creates obstacles, it is not impossible. To provide a seamless omnichannel experience for

customers, the systems will need to be more synchronized. Figure 56 illustrates the key data components involved in the design and how they contribute to the customer-facing elements of the solution. Additionally, further insights into each key design component are provided in the subsections below.

### The store and product details

Currently, each electronic shelf label (ESL) is linked to a specific product, which is connected to the store's inventory system. This allows the shelf label to display product information directly, which store employees can also view in their systems. With the proposed solution, when a customer scans an ESL, the app would identify the product number and use it to query relevant information. This would include the store's location and product details, such as the image, title, and price, ensuring seamless access to the latest and most accurate information.

### Store and online inventory

Similar to how the app retrieves product information and store location, displaying real-time stock status requires the AH app to connect to the store system that manages product inventory. This data is already accessible to both store employees and the ESL, as it is used to display specific messages on the label. Instead of showing exact stock numbers, the app will use a classification system (out-of-stock, limited stock, and in-stock) to communicate product availability.

Additionally, to show online product availability, the app should integrate stock levels from the distribution centers. Fortunately, this connection already exists within the AH app, as customers can currently order products online through its e-commerce functionality.

### When back in-stock

One of the most complex aspects of this solution is accurately displaying when a product will be back in stock. The challenge comes from the need to integrate and combine multiple data sources to provide reliable information. To predict restock timing, the system must connect to the store's inventory management, which tracks stock levels and incoming deliveries. While this is technically feasible, the real difficulty lies in predicting when the product will actually be available on the shelf for customers. This depends on in-store restocking processes, employee schedules, and operational priorities, which can be difficult to forecast accurately.

**“The current systems used in stores and within the app are mostly separate and lack alignment in terms of data.”**

### Alternative products

To display alternative products, the system identifies the scanned shelf label and, consequently, the product in question. This triggers the (AI-powered) recommendation model, as outlined in Section 6.4. The model then suggests alternative products tailored to the customer's preferences and purchase context. At the same time, it generates personalized filters to assist the decision-making process. Customers can also input additional preferences, and once submitted, the model will reprocess the request to offer even more relevant alternatives based on the updated context. Finally, the availability of these suggested alternatives is checked within the relevant store to ensure they are accessible to the customer. If a product is unavailable, it will be filtered out.

### Displaying availability across other AH stores

Lastly, by retrieving the product number, the AH app should connect not only to store-specific inventory but also to stock levels across all Albert Heijn stores. It will query the availability of the product using its unique number. Additionally, by utilizing the store's location, the app can calculate the distance to other stores and display this as well.,

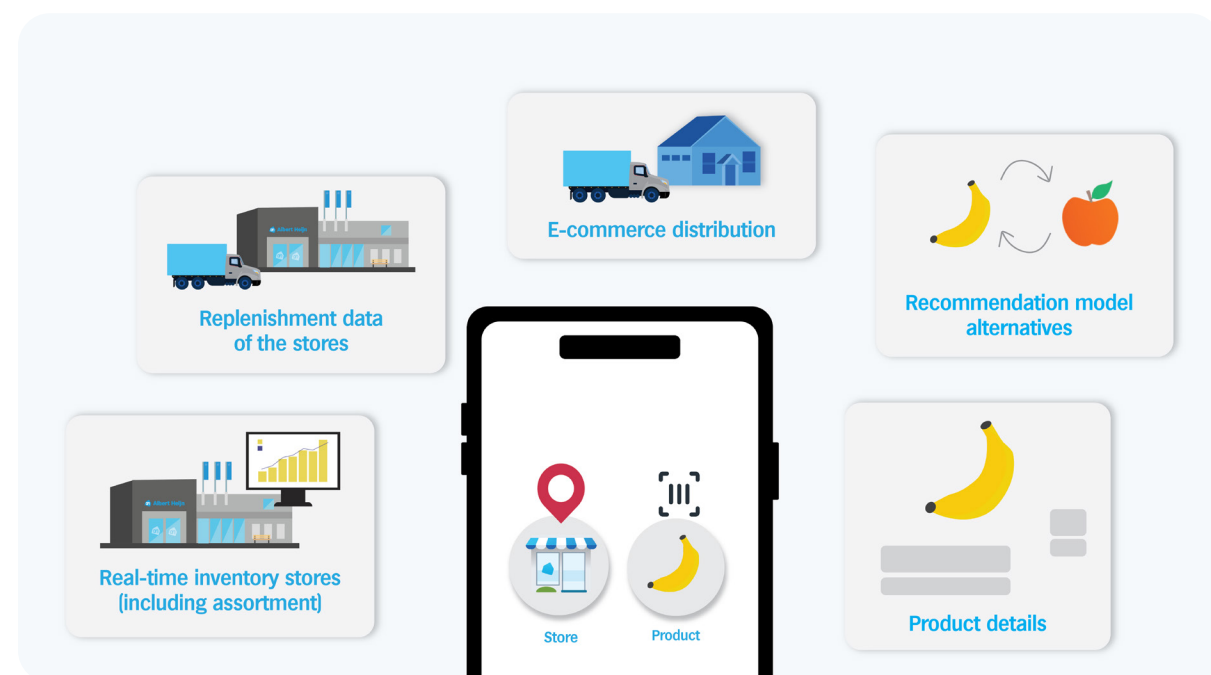


Figure 56: Technical overview of data components.

## 7.2 From a business perspective

This section discusses the solution from a business perspective, outlining its strategic alignment with Albert Heijn's mission, its impact, implementation steps for execution and key considerations to ensure successful integration of Albert Heijn's operations.

First of all, the proposed solution strongly aligns with Albert Heijn's vision. By addressing frustration in out-of-stock situations, the design enhances the overall in-store customer experience. Ensuring a seamless shopping journey is a core focus for Albert Heijn, as mentioned in Section 2.1, making this solution a natural fit within its strategic priorities.

Compared to the current situation and Albert Heijn's existing approach, this design would have a substantial positive impact on the customer experience. As previously mentioned in Section 3.1, Albert Heijn provides minimal assistance when a product is out of stock. The only action they currently take, is communicating a product's unavailability by updating the text on the electronic shelf label. While customers can always approach employees for more detailed information, this is not an immediate solution and can be a significant barrier for many customers. With the proposed design Albert Heijn shifts to become proactive, offering assistance directly at the shelf, eliminating the need for customers to approach an employee. This shift is intended to create a smoother, more efficient experience, while also showing empathy for customers by addressing their needs.

Besides benefiting customers, the solution presents valuable opportunities for Albert Heijn. Preventing lost sales is one of its key advantages. If customers encounter an out-of-stock product, the solution allows them to easily find and purchase an alternative product (from the same store or another Albert Heijn location), ensuring that sales are not lost due to unavailability. Additionally, it reduces the workload for employees by enabling customers to independently check product availability, minimizing the need for staff intervention and allowing them to focus on other tasks.

**“ It can be broken down into distinct steps to ensure a gradual and effective rollout.”**

### Steps for implementation

Given the scale of this solution, implementing it all at once may be challenging. Therefore, the process can be broken down into distinct steps to ensure a gradual and effective rollout. Figure 57 visualizes these steps, which are based on two key factors: (1) the level of detail in the information and (2) the level of personalization. By progressively introducing these elements, Albert Heijn can ensure a smooth and sustainable integration, adapting the solution in a manageable way.

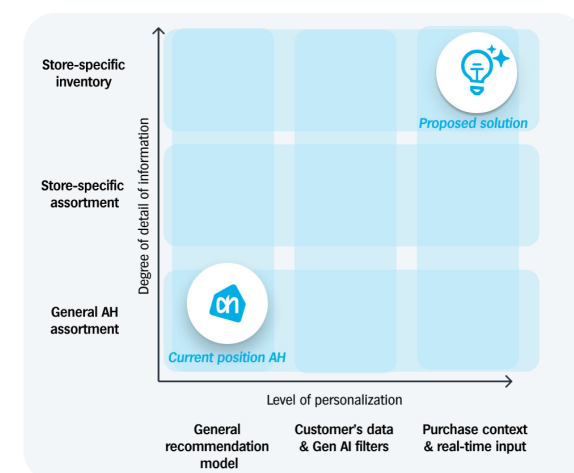


Figure 57: Proposed implementation steps.

### Level of detail of information

Regarding the information displayed within the solution, a clear distinction can be made between showcasing a store-specific assortment and displaying the stock availability of products within that assortment. For the implementation, it is advised to split this process into phases, allowing Albert Heijn to gradually develop and test the solution. The first step should focus on presenting the in-store assortment, providing customers with clear information about the products available at their location. This alone would already be a significant improvement compared to the current situation, where customers are often unaware if a product is even available at their store. The second step would be to add real-time stock data, which would elevate the customer experience to a whole new level.

### Level of personalisation

Furthermore, at the core of this solution, personalization plays a key role in enhancing the overall customer experience during out-of-stock situations. The ability to offer personalized support and suggest alternatives that align with each customer's individual preferences and needs adds significant value to the experience. However, this requires dedicated development time and careful integration to ensure it functions effectively and seamlessly within the existing system. Therefore, it is also beneficial to break this process down into steps.

The personalization is primarily reflected in suggesting alternative products for out-of-stock items, leveraging the existing recommendation model. While applying this model to this use case is already a new step, the first step for Albert Heijn would be to refine the

model by incorporating personal data, such as purchase history and dietary preferences. This approach moves beyond generic suggestions, making the alternatives more relevant and tailored to each customer's unique needs. At the same time, Generative AI can be utilized to categorize the suggested alternatives and generate relevant filters, simplifying the selection process. Both of these steps can be explored and tested starting tomorrow.

A second step would be to actively consider the customer's purchase intent. Personalized suggestions are most effective when the system understands the reasoning behind a shopper's choices at that moment. For example, someone might be shopping for a specific recipe or preparing a dinner for friends with dietary restrictions. To address this, Albert Heijn can leverage AI to assess the purchase context and respond accordingly, as discussed in Section 6.4. Factors such as 'product type' and 'product context' play a significant role in shaping the customer's decision-making. For instance, for an out-of-stock product intended for a recipe, customers would expect an immediate solution.

This context can be assessed internally, by recognizing patterns in customer data. However, in this step, Albert Heijn could also enable customers to share about their purchase intent. The proposed solution allows customers to provide real-time input directly through the app, enabling the AI to instantly refine recommendations and make them more relevant to the customer's specific needs. While this dynamic collaboration between AI and customer input is still relatively new and received mixed reactions, it holds long-term potential to enhance the shopping experience.



## 7.2 Relevant considerations

### 7.2.1 Technical considerations

Although the concept has been discussed multiple times with Albert Heijn employees, the technical feasibility of the solution needs to be validated through actual development and testing. Luckily, AI continues to evolve, and this ongoing development will play a key role in enhancing its performance.

#### Scanning shelf labels

The ability to quickly and accurately scan the shelf label and identify the right information can be challenging, as they contain lots of information and two barcodes, which may cause confusion. Therefore, thorough testing and refinement are essential.

#### When in-stock

Displaying “when in stock” is one of the most challenging aspects of the design, especially in the short term, as it requires significant amount of data. Besides, unforeseen supply chain disruptions can make it difficult to provide reliable restock information. Despite its complexity, it is included in the design. In the coming years, Albert Heijn is committed to make significant improvements in their supply chain, with a strong focus on optimizing data processes. If successful, this will also reduce data inaccuracies and allow Albert Heijn to quickly detect unexpected events. Although such issues remain unavoidable, being aware of them will enable Albert Heijn to communicate changes directly to customers, providing more reliable and timely information. In this context, adding a notification feature to keep customers informed about these changes would be valuable.

**“The technical feasibility needs to be validated through actual development and testing.”**

### 7.2.2 Business considerations

In addition to offering new opportunities for the business, there are several important factors to consider.

#### Personalisation vs promotions

The challenge lies in striking the right balance between personalization and business constraints when suggesting alternative products. On one hand, Albert Heijn would like to provide recommendations tailored to the customer’s preferences and shopping needs. On the other hand, Albert Heijn must foster partnerships with suppliers, meaning promoting certain products. Ensuring that the suggested alternatives are both relevant and commercially viable requires a thoughtful approach.

#### Going to the competitor or not?

When presenting alternative products and stock availability, retailers risk losing customers to competitors if the desired product is unavailable and the suggested alternatives are not compelling enough. However, if done effectively, this approach can also help retain customers by guiding them toward suitable alternatives. Testing and analyzing customer behavior is essential to understand both the risks and opportunities.

**“Ensuring that the suggested alternatives are both relevant and commercially viable requires a thoughtful approach.”**

#### Workload employees

If the data provided is inaccurate, it can lead to confusion for customers, causing them to question the availability or suitability of the suggested alternatives. This confusion can result in customers seeking assistance from employees to clarify the situation, ultimately increasing the workload for staff. Therefore, ensuring accurate information is crucial to avoid this challenge.

#### Unintended usage

There is a possibility that customers might use the functionality in ways not originally intended. For instance, they could take pictures of shelf labels at place them at home to check availability, bypassing the real-time scanning process. This could have negative implications for the business. To mitigate this risk and ensure an optimal customer experience, it is essential to monitor how the solution is being used from the start, conduct early testing, and make necessary adjustments to align it with the intended usage.

### 7.2.3 Customer considerations

Although the design is primarily designed from a customer perspective, there are a few important considerations.

#### Reliance on accurate data

There is a risk of the inventory status being inaccurately displayed as “in-stock” when the shelf is actually empty. This can lead to confusion and may cause customers to seek assistance from staff, ultimately complicating and disrupting the shopping experience even more. As mentioned earlier, providing accurate information is crucial for this solution. For this reason, a feedback component has been integrated to address this issue and quickly identify and correct any discrepancies.

#### Option to order online

The solution provides customers with the option to order products online. However, the current minimum spend threshold of 50 euros may prevent customers from actually completing their purchase, particularly if they are buying a single item. This option is more suited to customers who regularly shop online and are accustomed to meeting higher spending thresholds. For customers looking to purchase lower-priced items, this could lead to frustration and ultimately reduce their satisfaction. Finding a way to accommodate these customers would be a truly customer-friendly approach for Albert Heijn.

#### Why not show this earlier?

Displaying stock information late in the shopping experience, particularly at the shelf when customers are already frustrated, can amplify negative emotions. Customers may wonder why this crucial information is not available earlier, such as when they are planning their purchases at home. This delay could increase their dissatisfaction and frustration.

**“Customer may wonder why this information is not available earlier, such as when they are planning their purchases at home.”**

## 7.4 Recommendations

In addition to the proposed solution presented in Chapter 6, there are several additional recommendations, ranging from very specific suggestions for the concept to innovations involving AI within Albert Heijn.

### 7.4.1 For the proposed solution

When rolling out, explore the option of sending notifications when a product is back in stock and if this improves the customer experience. By keeping customers informed and engaged, it can encourage them to return to the store or app to finalize their purchase. See Figure 58 for an example.

It would be helpful to identify the products that are most frequently out of stock or those that cause the most frustration for customers. Promoting the shelf label scanner for these specific products could be highly beneficial.

As a follow-up to the customer research, it would be valuable to investigate whether certain product categories trigger more specific customer reactions. For example, with non-perishable items or products purchased only on a monthly basis, postponing the purchase might be a more logical response. This can be used to assess purchase context more easily.

When suggesting alternative products, Gen AI can also be leveraged to provide brief descriptions explaining why each alternative would be a good fit. See Figure 59 for an example. This could be interesting to explore.



Figure 58: Sending a notification when a product is back in stock at Albert Heijn.



Figure 59: An additional AI description when suggesting alternative products.

### 7.4.1 For solving the frustration during out-of-stock products

#### Moment of intervening with solution

While the solution is a step in the right direction, it does not end here. It actually opens up many more possibilities for further improvement and innovation. As highlighted before, the timing of presenting information plays a crucial role in enhancing the customer experience. While the current design focuses on addressing in-store out-of-stock situations, research showed that customers would also benefit from accessing this information outside the store. Given that the stock data then is connected to the AH app, there is an opportunity for gradual expansion.

For example, Albert Heijn could introduce an “in-store mode” activated upon arrival, allowing customers to see the real-time inventory of products available in that specific store, along with personalized recommendations for store-specific items. Additionally, features like a “list checker” for plan-oriented customers or recipe suggestions based on available stock could be added for spontaneous shoppers. This integration would create a seamless omnichannel experience, further aligning the digital and physical shopping journeys.

Looking even further ahead, Albert Heijn could showcase stock visibility even before customers enter the store. This expansion would allow customers to plan their shopping more effectively, potentially increasing satisfaction and loyalty. However, a critical challenge lies in managing the time gap between when customers view stock availability and when they physically arrive at the shelf. Ensuring that the information remains accurate and reliable during this window would require thorough testing and robust operational systems.

Moreover, this broader implementation brings up important business considerations. Could showing real-time inventory at home discourage customers from visiting the store if their desired items are unavailable, potentially driving them to competitors? Alternatively, could it enhance customer trust by positioning Albert Heijn as a reliable, customer-focused brand, while also creating upselling opportunities? To better understand the impact on operations, Albert Heijn should consider piloting the display of inventory data online with a small test group before a full-scale rollout.

#### Recover strategies

In addition to simple recovery methods such as apologies and providing information, it can be helpful for Albert Heijn to explore more proactive strategies that can further enhance the customer experience and boost satisfaction. For example, offering discounts on future purchases or free home delivery when ordering the product online from the store. This approach is particularly interesting for Bonus products, as it could unlock many new opportunities for both customers and Albert Heijn. It would also demonstrate to customers that their concerns are acknowledged and valued. Another, more advanced and future-oriented approach would be to introduce product reservations, allowing customers to secure out-of-stock items in advance and ensuring they do not miss out on desired products.

By broadening the range of recovery options, Albert Heijn can not only resolve immediate frustrations but also create opportunities for deeper customer engagement, leading to long-term satisfaction and increased retention.



## 7.4.1 General innovation at Albert Heijn

### NFC interaction

Feedback indicated that interacting with shelf labels using NFC technology is highly appealing to customers. By simply tapping their phone on an ESL, users can activate the embedded NFC chip, which seamlessly redirects them to relevant information. This provides a streamlined experience by reducing the number of clicks required. This feature is especially beneficial for customers who already have the AH app installed and are logged in. While the initial rollout focuses on the scanning functionality, NFC could serve as a complementary feature, offering an additional convenient way for customers to engage with the shelf. Figure 60 illustrates what a customer would see on their phone when using NFC.

### Other use cases for shelf interaction

The shelf label scanner has potential for a variety of use cases. Therefore, it would be valuable to explore ways to expand its functionality beyond simply displaying stock availability and product details. Additional features could include enabling quick payments or providing a fast check for dietary requirements when scanning the shelf label. The same applies to potential use cases for NFC technology, as ESLs are already equipped with NFC chips.

### Location of products

Throughout this project, the customer challenge of finding products in-store emerged frequently. It would be highly beneficial for Albert Heijn to conduct research on communicating product locations. Investigating strategies to make this information clearer and more intuitive could greatly enhance the overall customer experience. Given that product locations often change, AI could also play a key role in supporting this process by providing real-time, dynamic information to customers.

### Improve inventory management

This research primarily focuses on front-end customer experiences, but there is significant potential in exploring internal Generative AI applications, such as inventory management, to improve product availability and overall customer satisfaction at Albert Heijn. To maximize the impact, the organization should think beyond individual domains and features in the AH app and focus on how data agents can be systematically integrated across all areas, driving both efficiency and innovation throughout the entire operation.

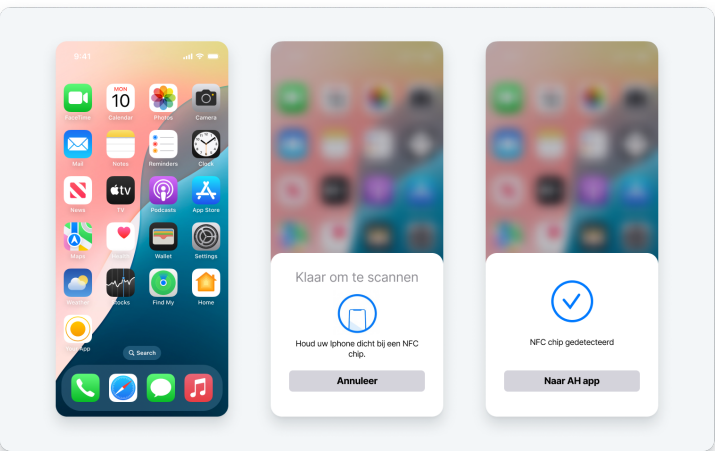


Figure 60: An example of the user interface when a customer interacts with the shelf via NFC technology.

# REFERENCES

Aastrup, J., & Kotzab, H. (2009). Analyzing out-of-stock in independent grocery stores: an empirical study. *International Journal of Retail & Distribution Management*, 37(9), 765–789. <https://doi.org/10.1108/09590550910975817>

Albert Heijn. (2024a). AH Duurzaamheidsverslag. In Albert Heijn. <https://data.maglr.com/3671/issues/50733/615368/downloads/ah-duurzaamheidsverslag-2023.pdf>

Albert Heijn. (2024b, June 17). Albert Heijn zet volgende stappen in Generative AI. Albert Heijn Zet Volgende Stappen in Generative AI. <https://nieuws.ah.nl/albert-heijn-zet-volgende-stappen-in-generative-ai/>

Albert Heijn. (2024c, November 7). Albert Heijn lanceert Mijn AH assistent met hulp van GenAI voor receptinspiratie en gemak. Albert Heijn Lanceert Mijn AH Assistent Met Hulp Van GenAI Voor Receptinspiratie En Gemak. <https://nieuws.ah.nl/albert-heijn-lanceert-mijn-ah-assistent-met-hulp-van-genai-voor-receptinspiratie-en-gemak/>

Albert Heijn. (2024d, July 1). Albert Heijn zet vol in op verdere groei e-commerce. Albert Heijn Zet Vol in Op Verdere Groei E-commerce. <https://nieuws.ah.nl/albert-heijn-zet-vol-in-op-verdere-groei-e-commerce/>

Albert Heijn. (2024e, April 29). Mijn Albert Heijn Premium bereikt 1 miljoen gebruikers. Mijn Albert Heijn Premium Bereikt 1 Miljoen Gebruikers. <https://nieuws.ah.nl/mijn-albert-heijn-premium-bereikt-1-miljoen-gebruikers/#:~:text=Albert%20Heijn%20heeft%20de%20mijlpaal,en%20extra%20zegels%20bij%20spaaracties.>

Albert Heijn. (2024f, January 17). Verkoop gezondere producten Albert Heijn bovendé 55%. <https://nieuws.ah.nl/verkoop-gezondere-producten-albert-heijn-boven-de-55/#:~:text=In%202023%20groeide%20Albert%20Heijn,distributiecentra%20in%20Nederland%20en%20Belgi%C3%AB.>

Albert Heijn. (2025, January 22). Albert Heijn 2024: Klanten maken duidelijke keuze voor duurzaam en gezond. Albert Heijn 2024: Klanten Maken Duidelijke Keuze Voor Duurzaam En Gezond. <https://nieuws.ah.nl/albert-heijn-2024-klanten-maken-duidelijke-keuze-voor-duurzaam-en-gezond/>

Alladi, R. (2024). How AI can transform Customer Relationship Management. *International Journal of Management IT and Engineering*, 14(07). [https://www.researchgate.net/profile/Rohit-Alladi/publication/382074457\\_How\\_AI\\_can\\_transform\\_Customer\\_Relationship\\_Management/links/668c0683af9e615a15d7116a/How-AI-can-transform-Customer-Relationship-Management.pdf](https://www.researchgate.net/profile/Rohit-Alladi/publication/382074457_How_AI_can_transform_Customer_Relationship_Management/links/668c0683af9e615a15d7116a/How-AI-can-transform-Customer-Relationship-Management.pdf)

Alle Supermarkten. (n.d.). De historie van de Nederlandse supermarkten. AlleSupermarkten. Retrieved October 1, 2024, from <https://www.allesupermarkten.com/informatie/historie-nederlandse-supermarkten/>

Amazon. (2023, September 26). An inside look at the AI tech behind Just Walk Out. <https://www.aboutamazon.com/news/retail/how-does-amazon-just-walk-out-work>

Ayutthaya, D. H. N., & Koomsap, P. (2019). Improving experience clues on a journey for better customer perceived value. In *Advances in transdisciplinary engineering*. <https://doi.org/10.3233/atde190107>

Bengesi, S., El-Sayed, H., Sarker, M. K., Houkpati, Y., Irungu, J., & Oladunni, T. (2024). Advancements in Generative AI: A comprehensive review of GANs, GPT, autoencoders, diffusion model, and transformers. *IEEE Access*, 12, 69812–69837. <https://doi.org/10.1109/access.2024.3397775>

Berghaus, S. (2024, February 28). De 3 belangrijkste retail-trends op EuroCis 2024. Remira. <https://www.remira.com/nl/supply-chain-blog/de-3-belangrijkste-retail-trends-op-eurocis-2024>

Campo, K. (2004). Dynamics in consumer response to product unavailability: Do stock-out reactions signal response to permanent assortment reductions? *Journal of Business Research*, 57(8), 834–843. <https://www.sciencedirect.com/science/article/pii/S0148296302004861#SEC1>

Campo, K., Gijsbrechts, E., & Nisol, P. (2000). Towards understanding consumer response to stock-outs. *Journal of Retailing*, 76(2), 219–242. [https://doi.org/10.1016/s0022-4359\(00\)00026-9](https://doi.org/10.1016/s0022-4359(00)00026-9)

Campo, K., Gijsbrechts, E., & Nisol, P. (2002). Dynamics in consumer response to product unavailability: do stock-out reactions signal response to permanent assortment reductions? *Journal of Business Research*, 57(8), 834–843. [https://doi.org/10.1016/s0148-2963\(02\)00486-1](https://doi.org/10.1016/s0148-2963(02)00486-1)

Carrefour Group. (2023, June 8). Carrefour integrates OpenAI technologies and launches a generative AI-powered shopping experience. <https://www.carrefour.com/en/news/2023/carrefour-integrates-openai-technologies-and-launches-generative-ai-powered-shopping>

Chui, M., Hazan, E., Roberts, R., Singla, A., Smaje, K., Sukharevsky, A., Yee, L., & Zammel, R. (2023). The economic potential of generative AI: The next productivity frontier. In McKinsey & Company. <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier#business-value>

Corsten, D., & Gruen, T. (2005). On Shelf Availability: An examination of the extent, the causes, and the efforts to address retail Out-of-Stocks. In Springer eBooks (pp. 131–149). [https://doi.org/10.1007/3-540-27059-0\\_9](https://doi.org/10.1007/3-540-27059-0_9)

Deloitte. (2024). Consumentenonderzoek 2024. In Deloitte Branchegroep Retail. [https://view.deloitte.nl/rs/502-WIB-308/images/Consumentenonderzoek%202024.pdf?version=0&mk\\_tok=NTAyLVdJQi0zMDgAAAGW-FTevWQ5gCahQux12cHiADQRiX-cam3kVOaIG2n8AT81vj1EueA5dhry-zwP18n48yniOl7ng7nb78eh16f\\_\\_fYsgy\\_CjYo3wj6gjCX0Hj3iWYo](https://view.deloitte.nl/rs/502-WIB-308/images/Consumentenonderzoek%202024.pdf?version=0&mk_tok=NTAyLVdJQi0zMDgAAAGW-FTevWQ5gCahQux12cHiADQRiX-cam3kVOaIG2n8AT81vj1EueA5dhry-zwP18n48yniOl7ng7nb78eh16f__fYsgy_CjYo3wj6gjCX0Hj3iWYo)

Dilmegani, C. (2024, October 16). 10 Generative AI Supply chain use cases. AIMultiple: High Tech Use Cases & Tools to Grow Your Business. <https://research.aimultiple.com/generative-ai-supply-chain/>

Edsall, D., & Gray, C. (2024). The future of grocery retail. In Deloitte Insights. Deloitte Consumer Industry Center. <https://www2.deloitte.com/us/en/insights/industry/retail-distribution/future-of-grocery-retail.html>

Epstein, Z., Hertzmann, A., Akten, M., Farid, H., Fjeld, J., Frank, M. R., Groh, M., Herman, L., Leach, N., Mahari, R., Pentland, A., Russakovsky, O., Schroeder, H., & Smith, A. (2023). Art and the science of generative AI. *Science*, 380(6650), 1110–1111. <https://doi.org/10.1126/science.adh4451>



Feuerriegel, S., Hartmann, J., Janiesch, C., & Zschech, P. (2023). Generative AI. *Business & Information Systems Engineering*, 66(1), 111–126. <https://doi.org/10.1007/s12599-023-00834-7>

Fitzsimons, G. J. (2000). Consumer response to stockouts. *Journal of Consumer Research*, 27(2), 249–266. <https://doi.org/10.1086/314323>

Foote, K. D. (2024, March 5). A brief history of Generative AI. DATAVERSITY. <https://www.dataversity.net/a-brief-history-of-generative-ai/>

Gursoy, D., Chi, O. H., Lu, L., & Nunkoo, R. (2019). Consumers acceptance of artificially intelligent (AI) device use in service delivery. *International Journal of Information Management*, 49, 157–169. <https://doi.org/10.1016/j.ijinfomgt.2019.03.008>

Harris, R. (2024, June 3). Generation Next Thinking: How GenAI can reshape the way grocers do business. *Canadian Grocer*. <https://canadiangrocer.com/generation-next-thinking-how-genai-can-reshape-way-grocers-do-business>

Hart, C., & Rafiq, M. (2006). The dimensions of assortment: A proposed hierarchy of assortment decision making. *The International Review of Retail Distribution and Consumer Research*, 16(3), 333–351. <https://doi.org/10.1080/09593960600697063>

Homburg, L. (2024, April 9). De 4 belangrijkste FMCG-trends in 2024. *Nabuuers*. <https://nabuuers.nl/de-4-belangrijkste-fmcg-trends-in-2024/>

Hu, Y., Min, H., & Su, N. (2021). How Sincere is an Apology? Recovery Satisfaction in A Robot Service Failure Context. *Journal of Hospitality & Tourism Research*, 45(6), 1022–1043. <https://doi.org/10.1177/10963480211011533>

Humble, J. (2023, June 23). What is the Double Diamond Design Process? The Fountain Institute. <https://www.thefountaininstitute.com/blog/what-is-the-double-diamond-design-process>

Ingka Group. (2024, February 7). IKEA launches new AI-powered assistant in OpenAI GPT Store | Ingka Group. <https://www.ingka.com/newsroom/ikea-launches-new-ai-powered-assistant-in-openai-gpt-store/>

Jagt, R., Hop, A., Sheehan, E., Cook, J., & Mishra, S. (2024, August 2). Grocery shopping with personality. *Deloitte Insights*. <https://www2.deloitte.com/us/en/insights/industry/retail-distribution/consumer-behavior-trends-state-of-the-consumer-tracker/food-personality-types-driving-food-sales.html>

Katz, E. (2024, March 4). In-Store Branding And The Psychology Of Shopping. *Forbes*. <https://www.forbes.com/councils/forbesbusinesscouncil/2024/03/04/in-store-branding-and-the-psychology-of-shopping/>

Larsen, A. G., & Følstad, A. (2024). Perceptions of customer-facing digital technology: a qualitative interview study from grocery retail. *Qualitative Market Research an International Journal*. <https://doi.org/10.1108/qmr-01-2024-0008>

Levine, I. (2024, September 19). Amazon's gen AI personalizes product recommendations and descriptions. *Amazon*. <https://www.aboutamazon.com/news/retail/amazon-generative-ai-product-search-results-and-descriptions>

Merced, R. (2024, October 16). GenAI and data summarization: Use cases of GenAI for data analytics. *Outshift by Cisco*. <https://outshift.cisco.com/blog/genai-data-summarization-analytics>

MING Labs. (2024, July 28). Nike Fast-Tracks Tailored Gear with GenAI. *The GenAI Gazette*. <https://genaigazette.com/nike-tailors-shoes-via-genai/>

Mulder, D. (2024, September 23). Retail - Supermarkten. *ING*. <https://www.ing.nl/zakelijk/sector/trade-retail/facts--figures-supermarkten>

Neurauter, C. (2022). The Future of Grocery Stores : Omnichannel and AI technologies and Next-Generation Brick-and-Mortar Grocery Stores [Universidade Católica Portuguesa]. <https://repositorio.ucp.pt/handle/10400.14/40760>

Noy, S., & Zhang, W. (2023). Experimental evidence on the productivity effects of generative artificial intelligence. *Science*, 381(6654), 187–192. <https://doi.org/10.1126/science.adh2586>

Ooi, K., Tan, G. W., Al-Emran, M., Al-Sharafi, M. A., Capatina, A., Chakraborty, A., Dwivedi, Y. K., Huang, T., Kar, A. K., Lee, V., Loh, X., Micu, A., Mikalef, P., Mogaji, E., Pandey, N., Raman, R., Rana, N. P., Sarker, P., Sharma, A., . . . Wong, L. (2023). The potential of generative artificial intelligence across disciplines: perspectives and future directions. *Journal of Computer Information Systems*, 1–32. <https://doi.org/10.1080/08874417.2023.2261010>  
OpenAI. (2022, November 30). Introducing ChatGPT. <https://openai.com/index/chatgpt/>

Oxford English Dictionary. (n.d.). Stock, N.1 & adj. Meanings, etymology and more | Oxford English Dictionary. Retrieved November 11, 2024, from [https://www.oed.com/dictionary/stock\\_n1?tab=factsheet#20759585](https://www.oed.com/dictionary/stock_n1?tab=factsheet#20759585)

Pavlou, P. A. (2011, December 1). State of the Information Privacy Literature: Where are We Now and Where Should We Go? [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2369375](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2369375)

Pizzi, G., & Scarpi, D. (2013). When Out-of-Stock products DO backfire: Managing disclosure time and justification wording. *Journal of Retailing*, 89(3), 352–359. <https://doi.org/10.1016/j.jretai.2012.12.003>

Quak, E. (2009). Het onzichtbare label. KIT Publishers. <https://www.somo.nl/wp-content/uploads/sites/2/2009/09/Het-onzichtbare-label.pdf>

Ray, P. P. (2023). ChatGPT: A comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope. *Internet of Things and Cyber-Physical Systems*, 3, 121–154. <https://doi.org/10.1016/j.iotcps.2023.04.003>

RetailTrends. (2023, August 28). 'Recordaantal huismerken in de supermarkt' RetailTrends, Hét Platform Voor Professionals in Retail & Brands. <https://retailtrends.nl/news/70401/recordaantal-huismerken-in-de-supermarkt>

Rincon, L. (2023, June 14). Virtually try on clothes with a new AI shopping feature. *Google*. <https://blog.google/products/shopping/ai-virtual-try-on-google-shopping/>

Rogers, E. M. (2003). *Diffusion of Innovations*, 5th Edition. Simon and Schuster.

Sanchez-Ruiz, L., Blanco, B., & Kyguolienė, A. (2018). A Theoretical Overview of the Stockout Problem in Retail: from Causes to Consequences. *Management of Organizations Systematic Research*, 79(1), 103–116. <https://doi.org/10.1515/mosr-2018-0007>

Schramowski, P., Turan, C., Andersen, N., Rothkopf, C. A., & Kersting, K. (2022). Large pre-trained language models contain human-like biases of what is right and wrong to do. *Nature Machine Intelligence*, 4(3), 258–268. <https://doi.org/10.1038/s42256-022-00458-8>

Silva, S. C. E., Martins, C. C., & De Sousa, J. M. (2018). Omnichannel approach: Factors affecting consumer acceptance. *Journal of Marketing Channels*, 25(1–2), 73–84. <https://doi.org/10.1080/1046669x.2019.1647910>

Singa, A., & Sukharevsky, A. (2024, May 30). The state of AI in early 2024: Gen AI adoption spikes and starts to generate value. McKinsey & Company. <https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai>

Sloot, L. M., Verhoef, P. C., & Franses, P. H. (2005). The impact of brand equity and the hedonic level of products on consumer stock-out reactions. *Journal of Retailing*, 81(1), 15–34. <https://doi.org/10.1016/j.jretai.2005.01.001>

Smits, J., & Borghuis, T. (2022). Generative AI and intellectual property rights. In *Information technology and law series/Information technology & law series* (pp. 323–344). [https://doi.org/10.1007/978-94-6265-523-2\\_17](https://doi.org/10.1007/978-94-6265-523-2_17)

Soliman, M., & Al Balushi, M. K. (2023). Unveiling destination Evangelism through generative AI tools. *ROBONOMICS: The Journal of the Automated Economy*. [https://www.researchgate.net/publication/372477564\\_Unveiling\\_destination\\_evangelism\\_through\\_generative\\_AI\\_tools](https://www.researchgate.net/publication/372477564_Unveiling_destination_evangelism_through_generative_AI_tools)

Spitale, G., Biller-Andorno, N., & Germani, F. (2023). AI model GPT-3 (dis)informs us better than humans. *Science Advances*, 9(26). <https://doi.org/10.1126/sciadv.adh1850>  
Stichting Albert Heijn Erfgoed. (n.d.). De geschiedenis van onze winkels. Retrieved October 21, 2024, from <https://albertheijnerfgoed.nl/weblog/13-de-geschiedenis-van-onze-winkels>

Strubell, E., Ganesh, A., & McCallum, A. (2019). Energy and policy considerations for deep learning in NLP. *arXiv (Cornell University)*. <https://doi.org/10.48550/arxiv.1906.02243>

Usmanova, V. (2024). INTEGRATING AI AND GENAI INTO THE GROWTH AND DEVELOPMENT STRATEGIES OF B2C COMPANIES. *The American Journal of Engineering and Technology*, 6(8), 73–83. <https://doi.org/10.37547/tajet/volume06issue08-09>

Van Loon, D. (2023, June 1). Out-of-stock: probleem voor retailers, fabrikanten en shoppers. *Platform Voor Managers in De Levensmiddelenhandel En -industrie*. <https://www.foodpersonality.nl/branche-cijfers/branche-cijfers/17877/out-of-stock-probleem-voor-retailers-fabrikanten-en-shoppers>

Van Rompaey, S. (2024, January 17). Albert Heijn grote winnaar in Nederland, Jumbo verliest opnieuw. *RetailDetail NL*. <https://www.retaildetail.nl/news/food/albert-heijn-grote-winnaar-in-nederland-jumbo-verliest-opnieuw/>

Van Tilburg, M. (2023, February 24). Marketing- en social media trends die supermarkten dit jaar kunnen verwachten. *Locality*. <https://www.locality.nl/nieuws/marketing-en-social-media-trends-die-supermarkten-dit-jaar-kunnen-verwachten#:~:text=Gemak%20wordt%20steeds%20belangrijker%20voor,bestellen%2C%20betalen%20en%20laten%20bezorgen.>

Walk-Morris, T. (2023, June 15). Google introduces generative AI virtual try-on tool. *Retail Dive*. <https://www.retaildive.com/news/google-generative-artificial-intelligence-virtual-try-on-tool/653076/>

Walmart Global Tech. (2024, January 30). Walmart's generative AI search puts more time back in customers' hands. [https://tech.walmart.com/content/walmart-global-tech/en\\_us/blog/post/walmarts-generative-ai-search-puts-more-time-back-in-customers-hands.html](https://tech.walmart.com/content/walmart-global-tech/en_us/blog/post/walmarts-generative-ai-search-puts-more-time-back-in-customers-hands.html)

Willemse, T. (2024, April 23). Vaarwel tegen de kleine kruidenier. *Historisch Nieuwsblad*. <https://www.historischnieuwsblad.nl/vaarwel-tegen-de-kleine-kruidenier/>

Wottrich, V. M., Van Reijmersdal, E. A., & Smit, E. G. (2017). The privacy trade-off for mobile app downloads: The roles of app value, intrusiveness, and privacy concerns. *Decision Support Systems*, 106, 44–52. <https://doi.org/10.1016/j.dss.2017.12.003>

Wyman, O. (2019, April 2). Nederlandse supermarkten onderscheiden zich met assortiment versafdeling - Emerce. *Emerce*. <https://www.emerce.nl/wire/nederlandse-supermarkten-onderscheiden-zich-assortiment-versafdeling>

You, Y., Yang, X., Wang, L., & Deng, X. (2019). When and why saying “Thank you” is better than saying “Sorry” in redressing service failures: The Role of Self-Esteem. *Journal of Marketing*, 84(2), 133–150. <https://doi.org/10.1177/0022242919889894>

Zhou, X. (2023). Chatbot improves the customer service in four important industries. *Highlights in Science Engineering and Technology*, 39, 339–346. <https://doi.org/10.54097/hset.v39i.6551>

Zinn, W., & Liu, P. C. (2001). CONSUMER RESPONSE TO RETAIL STOCKOUTS. *Journal of Business Logistics*, 22(1), 49–71. <https://doi.org/10.1002/j.2158-1592.2001.tb00159.x>



# APPENDICES

## A. Project brief

## B. Identifying in-store customer problems

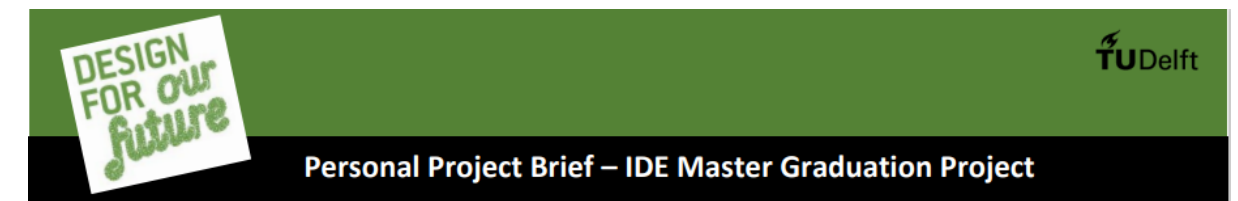
## C. Potential design directions

## D. Customer research for Albert Heijn

## E. Test round 1 with peers

## F. Test round 3 with AH customers

## A. Project brief



**PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT**  
Complete all fields, keep information clear, specific and concise

**Project title** Leveraging Generative AI to enhance the in-store shopping experience in supermarkets.

*Please state the title of your graduation project (above). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.*

### Introduction

*Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)*

This project aims to enhance the in-store shopping experience in supermarkets for customers using Generative AI (Gen AI). While the primary goal is to optimize the physical shopping journey, it also takes into account how customers interact with their mobile devices during their visits, as Gen AI often integrates with these digital tools.

The project is focused on the retail sector, particularly supermarkets, which face growing pressure from online shopping and changing consumer expectations. I am collaborating with Albert Heijn, the largest supermarket chain in the Netherlands, to address these challenges. With rapid technological advancements and the expansion of online grocery shopping, Albert Heijn must innovate by offering unique and engaging in-store experiences to retain and attract customers.

Generative AI offers numerous possibilities to improve the customer experience. But how exactly can it be applied in this setting? What specific challenges of customers in-store can this rapidly evolving technology address? And, just as importantly, how will customers react to these innovations?

Through this research, I aim to explore how Albert Heijn can utilize Gen AI to unlock future possibilities, ultimately empowering the many customers who rely on its stores for their daily groceries.

### Problem Definition

*What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice. (max 200 words)*

The rapid expansion of e-commerce has significantly impacted the Dutch retail market, creating new opportunities and challenges for traditional retail models. Online grocery shopping is booming, with many retailers adopting Generative AI (Gen AI) to innovate and elevate digital shopping experiences.

Albert Heijn, the largest supermarket chain in the Netherlands, has successfully established a robust online presence and is actively experimenting with Generative AI (Gen AI) applications. These innovations primarily focus on improving the shopping experience for customers at home and online. However, the potential for Gen AI to transform the in-store shopping experience, a critical component of their operations, is still relatively unexplored and presents a significant opportunity for growth.

This approach will not only contribute to retaining and attracting customers but also reinforce Albert Heijn's position as a leader in the competitive retail market and excel in both physical and digital retail landscapes.

Assignment

This is the most important part of the project brief because it will give a clear direction of what you are heading for. Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence) As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the green text format:

Investigate how Generative AI can be used to enhance the Albert Heijn in-store shopping experience for customers?

Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)

I will use the Double Diamond framework to structure this project. The first phase will focus on discovery, including a literature review on Generative AI in retail and a market analysis of current implementations to identify potential opportunities for Gen AI. Following this, I will gain a detailed understanding of the in-store shopping experience at Albert Heijn, examining touchpoints, AH services, and key stakeholders involved in the shopping process.

Next, I will move into the definition phase, where I will gather insights to clearly articulate the problem space. This will involve conducting interviews with Albert Heijn experts and customers to explore their experiences, pain points, and expectations. These insights will inform the creation of a well-defined problem statement.

In the second half of the framework, I will enter the design phase, where I will ideate and develop potential solutions based on the problem statement

Project planning and key moments

To make visible how you plan to spend your time, you must make a planning for the full project. You are advised to use a Gantt chart format to show the different phases of your project, deliverables you have in mind, meetings and in-between deadlines. Keep in mind that all activities should fit within the given run time of 100 working days. Your planning should include a **kick-off meeting**, **mid-term evaluation meeting**, **green light meeting** and **graduation ceremony**. Please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any (for instance because of holidays or parallel course activities).

Make sure to attach the full plan to this project brief. The four key moment dates must be filled in below

Kick off meeting	11 Sep 2024
Mid-term evaluation	20 Nov 2024
Green light meeting	12 Feb 2025
Graduation ceremony	19 Mar 2025

In exceptional cases (part of) the Graduation Project may need to be scheduled part-time. Indicate here if such applies to your project

Part of project scheduled part-time	<input checked="" type="checkbox"/>
For how many project weeks	20
Number of project days per week	4,0

Comments:  
I will work on my graduation project 4 days per week, which means it will take me 25 weeks to complete.

B. Identifying in-store customer problems

This appendix outlines the research conducted to identify the key issues impacting the in-store customer experience at Albert Heijn. The goal of the research was to pinpoint and analyze the most common problems faced by shoppers, which are detailed in Section 2.3. The following sections describe the methodologies used to gather these insights and present the results.

User Zoom survey (n=200)

The first survey was conducted on October 8 using the UserZoom software. It was distributed to Albert Heijn’s regular customer panel, with the aim of gathering responses from 200 individuals, evenly distributed across all age groups and genders. The only criterion for participation was that a respondent either shop physically or have done so at least once at Albert Heijn. The survey, consisting of 14 questions, focused on the in-store shopping experience.

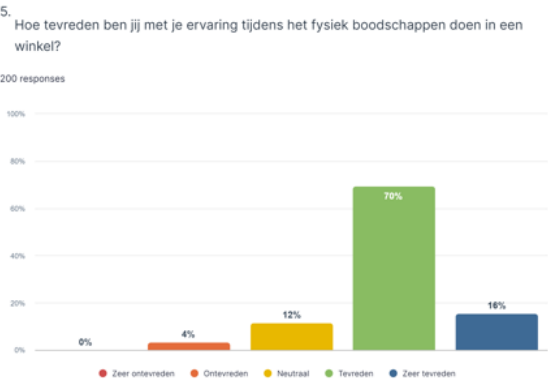
The actual respondent distribution was 66% women and 34% men. In terms of age, 44% of participants were between 46 and 55 years old, 51% were between 56 and 65 years old, and 6% were 65 years or older. The majority of participants (66%) reported shopping multiple times per week, while 20% shop once a week and 7% shop daily.

Below are the key questions along with the insights gathered.

Positief tijdens de winkelervaring

Wat zijn pluspunten tijdens het fysiek boodschappen doen in een winkel?

- 42% benoemt het zien van de producten om de kwaliteit, versheid, en houdbaarheidsdatum te beoordelen
- 12% benoemt het grote assortiment en het hebben van keuze vrijheid om producten te vergelijken
- 11% benoemt inspiratie op te kunnen doen
- 9% benoemt het bekijken van aanbiedingen
- 7% benoemt dat het snel en gemakkelijk is, niet hoeven te plannen
- 5% benoemt het sociale contact



Struikelpunten tijdens winkelervaring

Wat zijn voor jou struikelpunten tijdens het fysiek boodschappen doen in de winkel?

- Beschikbaarheid van producten: 30%
- Drukke in de winkel: 23%
- Vakkenvullers / Belemmeringen door personeel: 15%
- Slecht georganiseerde winkelindeling: 10%
- Problemen met zelfscan of technologie: 5%
- Personeelsgerelateerde klachten: 3%
- Prijs- en productkeuze: 3%
- Tijd en gemak: 4%
- Andere / Diversen: 7%



Vragen/twijfels in de winkel

Wat voor vragen of twijfels komen op tijdens het boodschappen doen?

1. Geen vragen/twijfels

Percentage: 38.4%
2. Voorraadgerelateerde vragen

Percentage: 21.2%
3. Locatie van producten

Percentage: 9.3%
4. Wat te eten of kopen

Percentage: 8.6%
5. Prijs en promotie

Percentage: 7.3%
6. Kwaliteit en houdbaarheid

Percentage: 6.0%
7. Winkelervaring (algemeen)

Percentage: 6.0%
8. Alternatieve producten

Percentage: 4.6%

Vragen aan medewerker

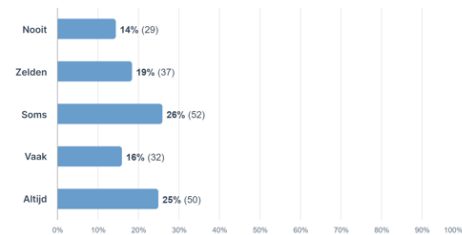
Waarvoor spreek je een medewerkers aan?

- 77% om product te vinden
- 49% voor informatie over de beschikbaarheid van producten
- 13% informatie en hulp bij aanbiedingen
- 10% anders, voornamelijk over het onvermogen om producten te pakken
- 5% over product details of specificaties

Telefoongebruik tijdens winkel ervaring

11. Hoe vaak gebruik jij je telefoon tijdens het winkelen in de supermarkt?

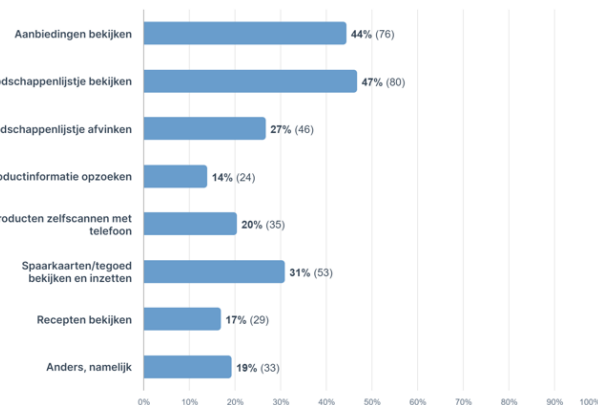
200 responses



- Anders:
- Prijzen vergelijken (met andere winkels)
  - Betalen / Afrekenen
  - Bonus bekijken → valt onder aanbiedingen

12. Waar gebruik jij je telefoon voor tijdens het winkelen in de supermarkt?

171 responses



Toegevoegde waarde van telefoon in het algemeen

Waar zie jij toegevoegde waarde in het gebruik van je telefoon tijdens het boodschappen doen? Denk aan voorbeelden waarin jouw telefoon de winkelervaring zouden kunnen verbeteren. Voel je vrij om ook ideeën te delen die nog niet bestaan of niet realistisch zijn.

- No Added Value/Disinterest: 20.28%

Product Information & Comparison: 11.89%

Finding Products & Navigation: 11.19%

Shopping List Management: 9.79%

Scanning & Payment: 10.49%
- Recipe & Meal Planning: 7.69%

Offers & Promotions: 9.79%

Additional Features (e.g., Dietary Needs, Allergy Info): 4.2%

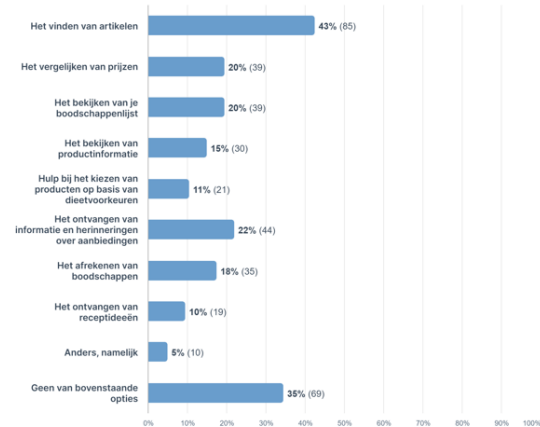
Technical Issues & Network Connectivity: 4.9%

Indifference/Unclear Response: 9.79%

Toegevoegde waarde van telefoon

14. Voor welke situatie zou jij graag ondersteuning ontvangen via de telefoon tijdens het winkelen?

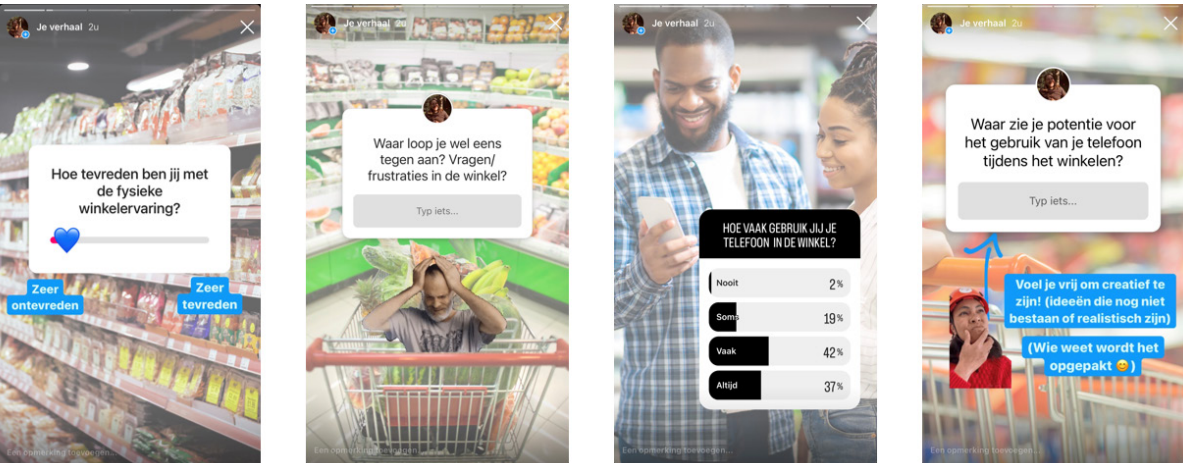
200 responses



- 43% het vinden van artikelen
- 35% geen van bovenstaande opties
- 22% informatie en herinneringen over aanbiedingen
- 20% vergelijken van prijzen
- 20% bekijken van boodschappenlijst
- 18% afrekenen van boodschappen
- 15% bekijken van productinformatie

Instagram Survey (n=115)

Since the first survey did not provide sufficient insights into the younger segments, a second survey was conducted to target this group, using Instagram as the distribution channel. The survey was launched on October 8. A total of 115 participants took part in the survey, with 20% identifying as male and 80% as female. The age distribution shows that 75% of participants were between 18 and 25 years old, 20% were between 25 and 35 years old, and 5% were between 55 and 65 years old.



104 mensen hebben antwoord gegeven. Dit is het gemiddelde antwoord.

## Frustraties in de winkel

- Lege schappen (24%)
- Product zoeken (24%)
- Onduidelijkheden over assortiment (14%)
- Drukke in de winkel (7%)
- Slecht bereik in de winkel (7%)
- Te dure prijzen (7%)
- Overige frustraties
  - Wachten bij de kassa vanwege drukte of controle (2 keer benoemd)
  - Niet behulpzame medewerkers, weten ook niet wat het is of waar het ligt (2 keer benoemd)
  - Weinig personeel in de winkel (3 keer benoemd)
  - Weinig transparantie producten in een oogopslag (1 keer benoemd)
  - Wat is duurzaamste keuze? (1 keer benoemd)
  - Bonus goed verwerkt? (1 keer benoemd)
  - Moet ik dit stuk groente/fruit wegen? (1 keer benoemd)

## Potentie voor telefoongebruik tijdens winkelen

- Laten zien waar een product ligt (34%)
- Route/volgorde van boodschappenlijst (11%)
- Heeft dit filiaal dit product? (15%)
- Product is op, wat is een alternatief of welke winkel heeft het wel (7%)
- Inspiratie voor recepten (11%)
  - Op basis van eerder gekookte recepten
  - Op basis van meerdere mee-eters
  - Op basis van bonus producten
- Snel afrekenen met telefoon (8%)
- Prijzen vergelijken (5%)
- Overig:
  - Koppeling met wat ik nog in huis heb (3 keer benoemd)
  - Drukke in de winkel zien (1 keer benoemd)
  - Geattendeerd worden op de bonus (1 keer benoemd)

## Store visits

In addition to the surveys, two store visits were planned to both Albert Heijn and Jumbo, ensuring a broad exploration of in-store shopping issues. During these visits, interviews were conducted with both customers and employees to evaluate how their feedback aligned with previous insights. A total of six employees and twelve shoppers were interviewed at both Albert Heijn and Jumbo. Observational research was also conducted, offering valuable insights into consumer behavior and experiences within the store.

## Interviews in de winkel - Medewerkers

- N= 6 verschillend medewerkers (AH & Jumbo)
- Vraag: Waar lopen klanten tegen aan/ Welke vraag wordt het meest gesteld?
- Meest gestelde vragen:
  1. Vragen over waar iets ligt
  2. Product is op, heb ik het nog achter liggen?
  3. Vragen over de bonus

Frustraties bij medewerkers:

- Frustraties bij vaste afdelingen over dat zij het aanspreekpunt zijn  
*Brood medewerker: "Wij zijn de enige bemande afdeling vaak"*
- Frustraties bij medewerkers dat ze worden aangesproken  
*Vakkenvuller: "Ik weet ook soms niet wat ze bedoelen of waar het ligt"*  
*Medewerker Vers: "Klanten zijn lui, kijken niet goed op de borden, ik ben eerste aanspreekpunt"*
- Frustraties over assortiment vragen  
*Medewerker: "Mag van mij duidelijker onderscheid tussen online en dit filiaal."*  
*Medewerker: "Helaas heb ik het dan niet, dan kijk ik wel een alternatief te bieden"*

## Interviews in de winkel - Klanten

- N= 12 verschillende klanten (AH & Jumbo)
- Vraag: Waar loop je wel eens tegen aan (frustraties), welke vragen komen in je op tijdens winkelen?
- Meest gestelde gedachten/vragen:
  1. Vergelijken van prijzen (4)
  2. Waar ligt een product (3)
  3. Product voorraad/assortiment (3)
  4. Vragen over bonus (2)
  5. Wat ga ik eten (1)
  6. Lange rijen (1)
  7. Kan niet bij een product (1)

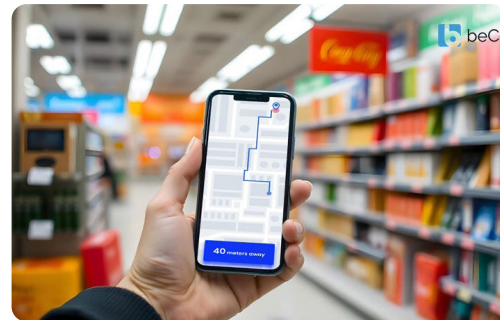


## C. Potential design directions

Based on extensive research into the company, technology, and customer context, 13 design directions were developed. These are outlined below.

### 1. Locating products in-store

Generative AI can be applied to deliver real-time assistance. By analyzing shopping lists, it can offer tailored guidance to help customers efficiently navigate the store, taking into account current store layouts and product placements, ultimately reducing time spent searching for items.



### 2. Missing out on preferred products

This design direction aims to provide customers with real-time solutions when their desired products are unavailable. The strength of generative AI lies in its capacity to synthesize extensive datasets, delivering actionable insights and solutions instantly. By harnessing this technology, retailers can explore numerous possibilities to alleviate the frustration caused by product unavailability, ultimately fostering a deeper connection with their customers and enhancing the overall shopping experience.



### 3. AH online vs my AH

In this design direction, Generative AI can serve as a powerful analytical tool to assess and communicate the differences between online and in-store offerings. It can process data from both platforms to provide personalized insights about product availability, pricing, and promotions, helping customers make informed decisions about where and what to shop based on their preferences.



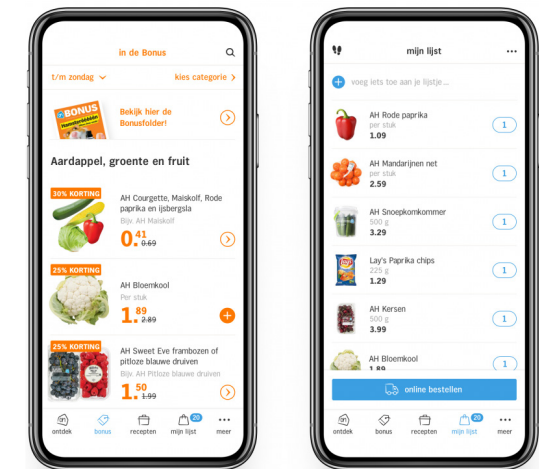
### 4. Payment with Gen AI

Within this design direction, Albert Heijn could leverage generative AI to enhance the checkout experience by optimizing interactions and streamlining transaction processes. Utilizing its advanced visual recognition capabilities, generative AI can quickly identify items, enabling efficient handling of various touchpoints, such as scanning barcode-less products and weighing items. The ultimate goal is to facilitate faster payment methods and significantly reduce the time customers spend at the register, resulting in a smoother and more satisfying shopping experience.



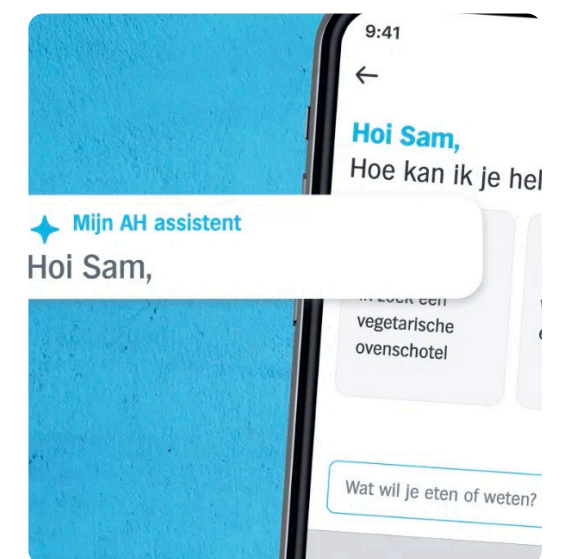
### 5. Smart shopping list

Generative AI unlocks new possibilities for utilizing the Albert Heijn shopping list in-store. This technology can provide personalized suggestions and prioritize items based on dietary restrictions and previous purchased products, enhancing the relevance and utility of the shopping list for each customer. Furthermore, it transforms the shopping list into a dynamic, tailored tool that enriches the in-store shopping experience. By integrating these capabilities, customers can enjoy a more efficient and satisfying shopping journey at Albert Heijn.



### 6. AI assistant

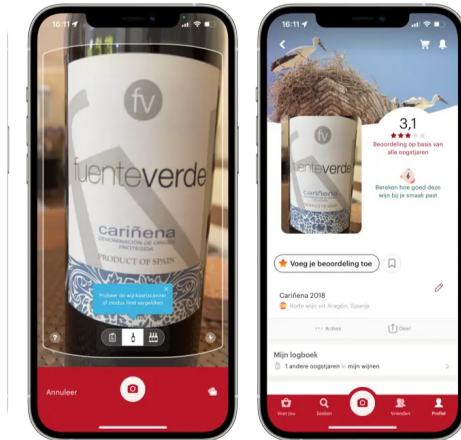
This solution direction focusses on leveraging Generative AI to provide personalized, real-time responses to frequently asked customer questions, using all available data sources, including product information, store inventory, promotions, and customer preferences. Currently, customers often have repetitive questions that are not answered efficiently or in a personalized manner. By integrating a Generative AI assistant, Albert Heijn can streamline this process, offering accurate and context-aware responses that not only address common inquiries but also adapt to individual customer needs.





## 7. Flavour guide

This direction focusses on a personalized tool designed to help customers choose products based on their flavor preferences. By utilizing data on customer tastes, popular combinations, and product characteristics, this guide offers tailored recommendations to enhance the shopping experience. Whether customers are looking for new ingredients to try or need suggestions for pairing with a specific dish, the AH Flavor Guide provides insightful and easy-to-follow suggestions.



## 8. Product transparency

Albert Heijn could leverage Generative AI to automatically generate and present clear, personalized product information in an engaging, visual format. By analyzing large datasets, such as nutritional information, ingredient sourcing, sustainability practices, and customer reviews, Generative AI can create tailored insights for individual customers.



## 9. Comparing products

Generative AI can be leveraged to simplify the process of comparing products for customers in-store. By analyzing extensive datasets, generative AI can provide real-time insights and facilitate quick comparisons based on various factors such as price, nutritional information, ingredients, and customer reviews. Moreover, it can streamline the decision-making process by visually presenting data in an accessible format, allowing customers to quickly grasp the essential information without feeling overwhelmed.



## 10. Fridge inventory

Integrating AI technology to help customers keep track of the products they have at home and suggest ways to use them before they expire. By connecting the customer's shopping data with the contents of their fridge (via the Albert Heijn app or smart fridge integration), Generative AI can automatically update the inventory and notify the customer when items are running low or nearing their expiration dates. It can also offer personalized recipe recommendations based on the ingredients in the fridge, helping customers minimize food waste and make the most of what they already have.



## 11. Predicting shelf life

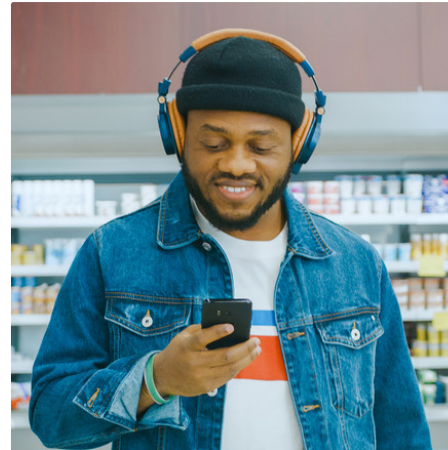
Albert Heijn could predict the freshness and quality of products based on various factors such as product type, storage conditions, and historical data. By integrating data from suppliers, inventory management systems, and real-time environmental sensors (such as temperature and humidity), Generative AI can forecast when products are likely to reach their peak freshness or expiration date. This predictive capability can help Albert Heijn optimize inventory, reduce waste, but it can also be used to proactively notify customers about the remaining shelf life of items, providing them with relevant information to help them make better purchasing decisions.





## 12. Accessibility by voice

Albert Heijn could use Generative AI for creating a seamless, hands-free shopping experience through voice-enabled technology, especially interesting for visually impaired customers. By integrating voice recognition, Generative AI can allow customers to interact with the Albert Heijn app or in-store systems using simple voice commands. Customers could easily search for products, ask questions about product details or receive personalized recommendations—all without needing to touch a screen. This solution would cater to customers with disabilities, enhance convenience for busy shoppers, and align with growing trends in voice technology, making the shopping experience more accessible and intuitive for everyone.



## 13. Turning product into presents

Albert Heijn could leverage Generative AI to effortlessly personalize product labels for special occasions, offering a service where customers can customize labels with unique messages, names, and designs tailored to the product they're purchasing. The AI could suggest creative label ideas based on the customer's purchase history, preferences, and specific occasions such as birthdays, holidays, or anniversaries. This service could be seamlessly integrated into the Albert Heijn app, allowing customers to quickly create a thoughtful, personalized gift with minimal effort. This approach could revolutionize the gift-giving experience, adding a personal touch to everyday products and enhancing customer satisfaction.



## D. Customer research for Albert Heijn

### Scenarios

The scenarios used are shown below.

**Scenario 1:** AH Extra vierge olijfolie 1 liter (Utilitarian product and a standalone item). Stel je voor dat je na een werkdag naar de supermarkt gaat om wat dagelijkse benodigdheden in te slaan. Je hebt net je boodschappenlijstje gecheckt en je weet precies wat je nodig hebt. Een van de items op je lijst is een fles olijfolie van 1 liter van het Albert Heijn huismerk, die je altijd gebruikt bij het koken. Wanneer je bij het schap komt, zie je echter dat de specifieke fles olijfolie die je altijd kiest, niet op voorraad is.

**Scenario 2:** Bonduelle bevroren groenten 400 gram (Utilitarian product and part of a recipe). Stel je voor dat je in de supermarkt bent om ingrediënten te halen voor een recept dat je vanavond wilt maken, een lekkere ovenschotel. Een van de items op je lijst is een zak van 400g bevroren groenten van Bonduelle. Wanneer je bij het schap komt, blijkt echter dat deze specifieke zak bevroren groenten niet op voorraad is.

**Scenario 3:** Milka choco biscuit 100 gram (Hedonic product and a standalone item). Stel je voor dat je in de supermarkt bent en je hebt zin om jezelf te verwennen met een reep chocolade. Je hebt de Milka Chocobiscuit van 100 gram in gedachten, een reep die je vaak koopt omdat je de smaak heerlijk vindt en ervan geniet om jezelf af en toe iets lekkers te gunnen. Wanneer je bij het schap aankomt, ontdek je tot je teleurstelling dat deze reep uitverkocht is. Je had je er echt op verheugd.

**Scenario 4:** AH Nederlandse aardbeien (vers) 250 gram (Hedonic product and part of a recipe). Stel je voor dat je vanavond een gezellig diner hebt gepland met vrienden en je hebt besloten om een lekker toetje te maken voor het dessert, zie foto. Als topping wordt aangeraden om een verse aardbei toe te voegen. Wanneer je in de supermarkt aankomt, ontdek je echter dat de aardbeien die je nodig hebt niet op voorraad zijn. Je had je echt verheugd op dit toetje en het leek het perfecte eind van je maaltijd.

Questions survey

Impact van scenario

In de volgende vragen gaan we dieper in op de impact van het geschetste scenario. Houd het scenario in gedachten bij het beantwoorden van de vragen.

**Scenario: AH Extra vierge olijfolie 1 liter**

Stel je voor dat je na een werkdag naar de supermarkt gaat om wat dagelijkse benodigdheden in te slaan. Je hebt net je boodschappenlijstje gecheckt en je weet precies wat je nodig hebt. Een van de items op je lijst is een fles olijfolie van 1 liter van het Albert Heijn huismerk, die je altijd gebruikt bij het koken.Wanneer je bij het schap komt, zie je echter dat de specifieke fles olijfolie die je altijd kiest, niet op voorraad is.

Wat voor gevoel zou je hebben in het geschetste scenario? (Meerdere antwoorden mogelijk)

☐ Frustratie

☐ Boos

☐ Teleurstelling

☐ Irritatie

☐ Begrip

☐ Geen sterke emotie

☐ Anders, namelijk:

Typ hier uw reactie

Geef aan hoe waarschijnlijk het is dat je in het geschetste scenario één van de volgende acties zou ondernemen.

	Ze er onwaarschijnlijk	Onwaarschijnlijk	Neutraal	Waarschijnlijk	Ze er waarschijnlijk
Ik zou binnen hetzelfde merk naar een andere maat zoeken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou naar een vergelijkbaar product zoeken, maar dan van een ander merk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou naar een product uit een andere categorie gaan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou naar een andere winkel gaan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou het winkelbezoek uitstellen en later terugkomen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou het winkelbezoek beëindigen zonder iets te kopen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou vragen of iemand anders het voor mij zou willen halen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou het product online bestellen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Hoe belangrijk zou het voor je zijn om in het geschetste scenario het genoemde product te krijgen?

Helemaal  
niet  
belangrijk

Niet  
belangrijk

Neutraal

Belangrijk

Ze  
er  
belangrijk

Hoeveel extra tijd zou je gemiddeld verwachten kwijt te zijn om het geschetste scenario op te lossen als genoemde product niet op voorraad is?

☐ 1-2 minuten

☐ 2-5 minuten

☐ 5 -10 minuten

☐ Meer dan 10 minuten

☐ Ik zou geen extra tijd besteden

☐ Ik weet het niet

Hoe zou het geschetste scenario jouw algehele winkelervaring beïnvloeden?

Ze  
er  
negatief

Negatief

Geen  
invloed

Positief

Ze  
er  
positief

Hoe zou het geschetste scenario je beslissing om bij Albert Heijn te blijven winkelen beïnvloeden in de toekomst?

Ze  
er  
negatief

Negatief

Geen  
invloed

Positief

Ze  
er  
positief



Geef aan hoe waarschijnlijk het is dat je in het **geschetste scenario** één van de volgende acties zou ondernemen.

	Ze er on waarschijnlijk	On waarschijnlijk	Neu traal	Waarschijnlijk	Ze er waarschijnlijk
Ik zou binnen hetzelfde merk naar een andere maat zoeken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou naar een vergelijkbaar product zoeken, maar dan van een ander merk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou naar een product uit een andere categorie gaan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou naar een andere winkel gaan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou het winkelbezoek uitstellen en later terugkomen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou het winkelbezoek beëindigen zonder iets te kopen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou vragen of iemand anders het voor mij zou willen halen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zou het product online bestellen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Welke informatie zou je het meest helpen in het **geschetste scenario**?

Typ hier uw reactie

Op welke manier zou je deze informatie het liefst ontvangen (bijv. via telefoon, berichtgeving bij het schap of mededeling van medewerker)?

Typ hier uw reactie

Wat zou de Albert Heijn kunnen doen om je ervaring in het **geschetste scenario** te verbeteren?

Typ hier uw reactie

Hoe waardevol zou je het vinden in het **geschetste scenario** als de winkel je informeert over

	Niet heel waardvol	Niet waardevol	Neu traal	Waardevol	Ze er waardevol
Wanneer het product weer op voorraad is	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De beschikbaarheid van het product in andere AH winkels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Waarom het product tijdelijk niet beschikbaar is	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vergelijkbare producten die mogelijk een goed alternatief zijn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Anders, namelijk:

Typ hier uw reactie

Hoe waardevol zou je het vinden in het **geschetste scenario** als de winkel:

	Niet heel waardvol	Niet waardevol	Neu traal	Waardevol	Ze er waardevol
Al vooraf aan je winkelbezoek inzicht geeft in de beschikbaarheid van het product in de winkel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Het mogelijk maakt om het product online te bestellen met de optie om het thuis te laten bezorgen?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De mogelijkheid biedt om het product in een andere vestiging te reserveren voor later ophalen?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Een korting biedt voor een vergelijkbaar of alternatief product als het gewenste product niet op voorraad is	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Anders, namelijk:

Typ hier uw reactie

Hoe belangrijk is het voor jou dat Albert Heijn het probleem van productbeschikbaarheid in de winkels aanpakt?

Helemaal niet belangrijk	Niet belangrijk	Neutraal	Belangrijk	Ze er belangrijk
--------------------------------	--------------------	----------	------------	------------------------

Hoe vaak ervaar je dat het product dat je wilt kopen, niet op voorraad is?

☐ Nooit

☐ Zeer zelden (minder dan één keer per maand)

☐ Af en toe (ongeveer één keer per maand)

☐ Regelmatig (twee tot drie keer per maand)

☐ Vaak (meer dan drie keer per maand)

☐ Altijd (of bijna altijd)

In welke situatie zou u het het meest vervelend vinden als een product niet op voorraad is?

Typ hier uw reactie

Hoe bereid ben je om feedback achter te laten (bijvoorbeeld via een enquête of melding bij werknemer) als een product dat je zoekt niet beschikbaar is in de winkel?

Helemaal  
niet bereid

Niet bereid

Neutraal

Wel bereid

Zeer bereid

Kun je aangeven waarom je wel of niet bereid zou zijn om feedback achter te laten?

Typ hier uw reactie

Wat zou voor jou de handigste manier zijn om je feedback over productbeschikbaarheid te geven?

Typ hier uw reactie

Wat is je leeftijd?

☐ Jonger dan 18 jaar

☐ 18-25

☐ 26-35

☐ 36-45

☐ 46-55

☐ 56-65

☐ Ouder dan 65

Wat is je geslacht?

☐ Man

☐ Vrouw

☐ Wil ik liever niet zeggen

☐ Anders, namelijk

Typ hier uw reactie

Hoe vaak doe jij boodschappen in de winkel?  
Kies het antwoord dat het meest van toepassing is.

☐ Dagelijks

☐ Meerdere keren per week

☐ Eén keer per week

☐ Meerdere keren per maand

☐ Eén keer per maand

☐ Een aantal keer per jaar

☐ Eén keer per jaar

☐ Nooit



## Results of the analysis

### Affect of product type and context on different emotions

#### Main effect of context of product (Frustration & anger)

The analysis revealed a significant association between product context and the emotions of 'frustration' and 'anger'. Specifically, the likelihood of experiencing frustration,  $\chi^2(1,402) = 5.429$ ,  $p = 0.020$ , and anger,  $\chi^2(1,402) = 4.804$ ,  $p = 0.028$ , was greater when the product was part of a recipe. However, no significant association was found between product type and the emotions of frustration,  $\chi^2(1,402) = 0.704$ ,  $p = 0.401$ , or anger,  $\chi^2(1,402) = 0.326$ ,  $p = 0.568$ .

*These results suggest the likelihood of experiencing frustration and anger is greater when the product in question is part of a recipe.*

#### Main effect of type of product (disappointment)

The analysis revealed that there was a significant association between the emotion of disappointment and product type,  $\chi^2(1,402) = 10.970$ ,  $p < 0.001$ , meaning that the likelihood of experiencing disappointment is higher for hedonic products compared to utilitarian products.

There was no significant association between disappointment and product context,  $\chi^2(1,402) = 0.000$ ,  $p = 1.000$ .

*The results suggest that the likelihood of experiencing disappointment is greater when the product is offering hedonic benefits.*

#### No effects (irritation, understanding, no strong emotion)

The analysis revealed that there were no significant associations between the emotions of irritation, understanding, or no strong emotion and both product type and product context. Specifically, irritation showed no significant relationship with product type,  $\chi^2(1,402) = 0.005$ ,  $p = 0.941$ , or product context,  $\chi^2(1,402) = 0.044$ ,  $p = 0.835$ . Similarly, there was no significant association between understanding and product type,  $\chi^2(1,402) = 1.747$ ,  $p = 0.186$ , or product context,  $\chi^2(1,402) = 0.037$ ,  $p = 0.847$ . Lastly, experiencing no strong emotion did not show any significant correlation with product type,  $\chi^2(1,402) = 1.633$ ,  $p = 0.201$ , or product context,  $\chi^2(1,402) = 0.471$ ,  $p = 0.493$ .

*These results suggest that these particular emotions are not significantly influenced by the type or context of the product.*

### Affect of product type and context on different customer responses

#### Response same brand, other size

The analysis revealed that there was no significant interaction effect between product type and product context,  $F(1, 387) = 0.006$ ,  $p = .937$ ,  $\eta^2 = .000$ . Additionally, there was no significant main effect of product type,  $F(1, 387) = 3.666$ ,  $p = .056$ ,  $\eta^2 = .009$  and there was no significant main effect of product context,  $F(1, 387) = 0.065$ ,  $p = 0.799$ ,  $\eta^2 = 0.000$ .

*These results indicate that neither the type of product nor the product context had a significant influence on the likelihood of substituting a product for the same brand, but another size.*

#### Response other brand

The analysis revealed no significant interaction effect between product type and product context,  $F(1, 387) = 0.077$ ,  $p = 0.782$ ,  $\eta^2 = 0.000$ . However, there was a significant main effect of product type,  $F(1, 387) = 28.959$ ,  $p < 0.001$ ,  $\eta^2 = 0.070$ , indicating that the probability of substituting a product for a product from another brand differed significantly between Utilitarian products ( $M = 3.770$ ,  $SD = 0.083$ ) and Hedonic products ( $M = 3.140$ ,  $SD = 0.083$ ). There was also a significant main effect of product context,  $F(1, 387) = 13.487$ ,  $p < 0.001$ ,  $\eta^2 = 0.034$ , indicating that the probability of substituting a product for a product from another brand differed significantly between standalone products ( $M = 3.240$ ,  $SD = 0.083$ ) and products part of a recipe ( $M = 3.670$ ,  $SD = 0.083$ ).

*These results suggest that the probability to substitute a product for a product from another brand is higher when it is an utilitarian product compared to hedonic and if a product is part of a recipe compared to a stand alone product.*

#### Response Other category

The analysis revealed no significant interaction effect between product type and product context,  $F(1, 387) = 0.019$ ,  $p = 0.891$ ,  $\eta^2 = 0.000$ . However, there was a significant main effect of product type,  $F(1, 387) = 5.091$ ,  $p = 0.025$ ,  $\eta^2 = 0.013$ , indicating that the probability of substituting a product for a product of another category differed significantly between Utilitarian products ( $M = 2.464$ ,  $SD = 0.078$ ) and Hedonic products ( $M = 2.714$ ,  $SD = 0.078$ ). In addition, there was a significant main effect of product context,  $F(1, 387) = 30.019$ ,  $p < 0.001$ ,  $\eta^2 = 0.072$ , indicating that the probability of substituting a product for a product of another category differed significantly between standalone products ( $M = 2.2286$ ,  $SD = 0.078$ ) and products part of a recipe ( $M = 2.893$ ,  $SD = 0.078$ ).

*These results indicate that the probability of substituting a product for a product of another category is higher for hedonic products compared to utilitarian products and also for products that are part of a recipe compared to standalone products.*

#### Response Other Store

The analysis revealed a significant interaction effect between product type and product context,  $F(1, 387) = 24.354$ ,  $p < 0.001$ ,  $\eta^2 = 0.059$ , indicating that the effect of product type on the probability of going to another store depends on the product context. Follow-up simple effects analyses showed that for hedonic products, the probability of going to another store was significantly higher when they were part of a recipe ( $M = 3.701$ ,  $SD = 0.133$ ) compared to when they were stand-alone items ( $M = 2.184$ ,  $SD = 0.132$ ). Conversely, for Utilitarian products, there was no significant difference between part of a recipe ( $M = 2.653$ ,  $SD = 0.132$ ) and stand-alone ( $M = 2.439$ ,  $SD = 0.132$ ).

*These results indicate that customers are more likely to go to another store for hedonic products than utilitarian products and also if products are part of a recipe rather than stand-alone products. More specifically, for hedonic products they are more likely to go to another store when part of a recipe.*

#### *Response Postpone*

The analysis revealed a significant interaction effect between product type and product context,  $F(1, 387) = 4.930$ ,  $p = 0.027$ ,  $\eta^2 = 0.013$ , indicating that the effect of product type on the probability of postponing purchase depends on the product context. Follow-up simple effects analyses showed that for Utilitarian products, the probability of postponing the purchase was significantly lower when they were part of a recipe ( $M = 1.827$ ,  $SD = 0.107$ ) compared to when they were presented as stand-alone items ( $M = 2.367$ ,  $SD = 0.017$ ). Conversely, for Hedonic products, there was no significant difference between part of a recipe ( $M = 1.711$ ,  $SD = 0.108$ ) and stand-alone ( $M = 1.776$ ,  $SD = 0.107$ ).

*These results indicate that utilitarian products are more likely to be postponed than hedonic items and stand-alone products more likely than products that are part of a recipe. More specifically, for utilitarian products they are more likely to be postponed when bought as a stand-alone product.*

#### *Response Cancel*

The analysis revealed a significant interaction effect between product type and product context,  $F(1, 387) = 9.139$ ,  $p = 0.003$ ,  $\eta^2 = 0.023$ , indicating that the effect of product type on the probability of canceling a purchase depends on the product context. Follow-up simple effects analyses showed that for Hedonic products, the probability of canceling the purchase was significantly higher when they were part of a recipe ( $M = 3.000$ ,  $SD = 0.132$ ) than when they were presented as stand-alone items ( $M = 2.235$ ,  $SD = 0.131$ ). Conversely, for Utilitarian products, there was no significant difference between part of a recipe ( $M = 2.296$ ,  $SD = 0.131$ ) and stand-alone ( $M = 2.327$ ,  $SD = 0.1331$ ).

*These results indicate that the purchasing of hedonic products are overall more likely to be cancelled than utilitarian products, and products that are part of a recipe are more likely to be cancelled than stand-alone products. More specifically, hedonic products are more likely to be cancelled when they are part of a recipe compared to when they are presented as stand-alone items.*

#### *Response Ask for someone else*

The analysis revealed there was no significant interaction effect between product type and product context,  $F(1, 387) = 3.661$ ,  $p = 0.056$ ,  $\eta^2 = 0.009$ . In addition, no significant main effect of type of product,  $F(1, 387) = 0.363$ ,  $p = 0.547$ ,  $\eta^2 = 0.001$  and no significant main effect of product context,  $F(1, 387) = 0.819$ ,  $p = 0.366$ ,  $\eta^2 = 0.002$ .

*This suggests that customers' likelihood of seeking help for purchasing an out-of-stock product remains consistent regardless of the type of product or product context.*

#### *Response order online*

The analysis revealed no significant interaction effect between product type and product context,  $F(1, 387) = 0.276$ ,  $p = 0.600$ ,  $\eta^2 = 0.001$ . However, there was a significant main effect of product context,  $F(1, 387) = 7.263$ ,  $p = 0.007$ ,  $\eta^2 = 0.018$ , indicating that the probability of ordering an out of stock products differed significantly between standalone products ( $M = 1.668$ ,  $SD = 0.066$ ) and products that are part of a recipe ( $M = 1.415$ ,  $SD = 0.067$ ).

*These results indicate that standalone products are more likely to be ordered online when out of stock than products that are part of a recipe.*

#### *When available*

The analysis revealed a significant interaction effect between product type and product context,  $F(1, 402) = 3.900$ ,  $p = 0.049$ ,  $\eta^2 = 0.010$ , indicating that the effect of product type on the value of receiving availability information depends on the product context. Follow-up simple effects analyses showed that for utilitarian products, the value of receiving availability information was significantly higher when purchased standalone ( $M = 3.623$ ,  $SD = 0.082$ ) compared to products that are part of a recipe ( $M = 3.383$ ,  $SD = 0.082$ ).

#### *Other store*

The analysis revealed there was no significant main effect of the type of product,  $F(1, 402) = 0.054$ ,  $p = 0.817$ ,  $\eta^2 = 0.000$ . However, there was a significant main effect of product context,  $F(1, 402) = 8.405$ ,  $p = 0.004$ ,  $\eta^2 = 0.021$ , indicating that the value of getting information about if a product is available in another AH store is higher for products that are part of a recipe ( $M = 3.054$ ,  $SD = 0.087$ ) than standalone products ( $M = 2.697$ ,  $SD = 0.087$ ). There was no significant interaction effect between product type and product context,  $F(1, 402) = 2.070$ ,  $p = 0.151$ ,  $\eta^2 = 0.005$ .

#### *Why out of stock*

The analysis revealed there was no significant main effect of the type of product,  $F(1, 402) = 0.036$ ,  $p = 0.849$ ,  $\eta^2 = 0.000$  and no significant main effect of product context,  $F(1, 402) = 1.429$ ,  $p = 0.233$ ,  $\eta^2 = 0.003$ . In addition, there was no significant interaction effect between product type and product context,  $F(1, 402) = 1.647$ ,  $p = 0.200$ ,  $\eta^2 = 0.004$ .

#### *Good alternative*

The analysis revealed there was a significant main effect of the type of product,  $F(1, 402) = 0.22.694$ ,  $p < 0.001$ ,  $\eta^2 = 0.056$ , indicating that the value of getting information about a good alternative is higher for utilitarian products ( $M = 3.785$ ,  $SD = 0.075$ ) than for hedonic products ( $M = 3.282$ ,  $SD = 0.074$ ). There was also a significant main effect of product context,  $F(1, 402) = 14.918$ ,  $p < 0.001$ ,  $\eta^2 = 0.036$ , meaning that the value of getting information about a good alternative is significantly higher for product that are part of a recipe ( $M = 2.737$ ,  $SD = 0.075$ ) than for stand alone products ( $M = 3.330$ ,  $SD = 0.075$ ). There was no significant interaction effect between product type and product context,  $F(1, 402) = 0.299$ ,  $p = 0.585$ ,  $\eta^2 = 0.001$ .



## Coding process

For the open-ended questions, a coding process was used in which the answers were analyzed and categorized into overarching themes. Below are some examples for clarification.

Question: “Welke informatie zou je het meest helpen in het geschetste scenario?”

Answers with corresponding themes:

P22: “*De reden waarom het product er niet is.*” --> *Why out-of-stock?*

P58: “*Wanneer het product weer beschikbaar is*” --> *When back in-stock?*

P112: “*Eigenlijk zou ik denk ik geen info nodig hebben. Hooguit waarmee ik het zou kunnen vervangen.*” --> *Nothing*

P222: “*Een prijskaartje op het schap waaruit blijkt dat het product werkelijk uitverkocht is, zodat ik weet dat het geen zin heeft om een medewerker te vragen achter te gaan zoeken.*” --> *Inventory status*

P252: “*Geen. Het is geen levensbehoefte alleen maar jammer. Volgende keer beter.*” --> *Nothing*

P351: “*Informatie over actuele voorraad (wellicht in magazijn?)*” --> *Inventory status*

P388: “*Producten moeten niet uitverkocht zijn. Dit komt veel te vaak voor en mijn irritatie groeit met iedere keer.*” --> *Invalid*

P400: “*Tips voor vervangend product.*” --> *Good alternative?*

Question: “Op welke manier zou je deze informatie het liefst ontvangen?”

P26: “*Berichtgeving bij het schap.*” --> *Message at the shelf*

P74: “*Via de AH app zodat ik de info zie als ik mijn boodschappenlijst opstel*” --> *AH app*

P157: “*Suggestie van medewerker*” --> *Employee*

P229: “*Op het schap of via de telefoon bijvoorbeeld door een qr code te scannen.*” --> *Message at the shelf*

P336: “*Een schriftelijke mededeling bij het schap.*” --> *Message at the shelf*

P393: “*Ik kan wel zien, dat het op is.*” --> *Not applicable*

P399: “*Ga zelf kijken voor alternatieven.*” --> *Not applicable*

## E. Test round 1 with peers

### Test plan for test round 1

**Who:** 5 peer students (design)

**Duration:** 30 min each session

**Goal:** Understand customer expectations for specific buttons and screens, and gather feedback to refine the overall flow and development of the concept.

### Questions

*Start screen:*

- Niet op voorraad of tijdelijk niet op voorraad?
- Naam + excuses echt nodig?
- “Vind een alternatief” of iets anders? (een oplossing)
- “Ander product scannen”, logisch?
- Wat verwacht je als je op het kruisje klikt? Waarheen?
- PDP olijfolie op een manier bereiken?
- Winkel waar je in bent weergeven, handig?

*Information screen:*

- Wanneer op voorraad, logisch?
- Alternatieve producten: moet er achter staan “in deze winkel” , preview beste alternatief, hoeveel (1-3)?, nog label met ‘beste’ , wat als je op alternatieve productkaart klikt, wat zou je verwachten als je op ‘toon meer’ klikt, op basis van Gen AI beste match of wat verwacht je?
- Andere winkels: preview andere winkels, hoeveel (1-2), altijd dichtbijzijnde of eentje met op voorraad, wat als je op de winkel kaart klikt?
- Zou je nog informatie over het uitverkochte product willen zien? En hoe? Door onderaan de pagina of door op de foto te klikken?

*Alternative page*

- Alleen producten laten zien die op voorraad zijn (en beperkte voorraad), of ook niet op voorraad?
- Gwn een lijst met ‘alternatieven’ of fijn om ‘ander formaat’, ander merk, etc.. te hebben
- Onder productkaart per categorie ‘toon meer’?
- Het model erachter (alternative model), hoe zou je dat zien?
- Filters ‘vega, beste prijs/volume’etc..
- Indien mogelijk, is de locatie van de producten van meerwaarde?
- Wat gebeurt er als je op productkaart klikt en wil je dan ook weer terug naar dit scherm?
- Onderaan toch nog laten zien of het op voorraad is bij andere AH winkel?

#### *Other stores*

- Op volgorde van afstand (op voorraad, beperkt op voorraad), goed?
- Niet op voorraad niet tonen of wel (stel meest dichtbij)?
- Knop online bestellen, meerwaarde?
- Informatie die mist

#### *General questions*

- Naam voor feature?
- Tap met NFC of scannen?
- Als je op kruisje klikt, wat dan? AH app?
- Dit uitgaande van een voorraadstand die ook op 0 staat als product niet op voorraad is. Op dit moment zijn standen niet accuraat, klanten inzetten om hierbij te helpen is handig. Dus stel je staat voor leeg schap, je scant, maar voorraad staat op plus. wat zou je dan zien?

## Insights

#### *Access to feature*

- To access the feature, the participants preferred to take as few steps as possible. Therefore, an NFC chip was the preferred option. However, it was also important to have some access available in the AH app, and the two options do not have to be mutually exclusive.
- After scanning the shelf label, participants generally expected a quick solution, often in the form of showing alternatives immediately. While confirming the correct product was appreciated, it did not need to be on a separate page unless relevant information was provided on the initial screen. In the current design, the first screen does not present any new or additional value.

#### *When back in-stock*

- The participants expected that the information about when the product will be back in stock should be specific to the shelf location, rather than just the store in general.

#### *Showing alternatives*

- Participants appreciated seeing a preview of the best alternative first, followed by the option to explore additional choices on an extra screen. A carousel design could provide a compact way to display multiple previews without occupying too much screen space.
- Categorizing alternatives worked well, though “Also an alternative” might be a bit unclear.
- Showing the location of an alternative would be nice but was not yet clear at this stage.

#### *Other stores*

- This component was very clear to all participants. Distance was very much appreciated. When a product would be out of stock they would still expect the store to be there.

#### *In general*

- The hierarchy regarding the “out of stock” status, when the product will be back in stock, and the apology is not immediately clear.
- The navigation was well understood, including where to find it in the Albert Heijn app.
- The option to order was noticed by most respondents, though it wasn’t considered a primary need.
- It was appreciated that the app immediately shows which store the user is in.
- The name and apologies for a few participants were appreciated but not essential for everyone.
- All participants expressed curiosity about the recommended products, acknowledging that the relevance of the suggestions would heavily depend on the specific out-of-stock item.



## F. Test round 3 with AH customers

### Questions

#### *In general*

- What are your thoughts on the shelf label scanner functionality? When standing in front of an empty shelf, do you find it logical, clear, and easy to use?
- Is it clear that the information is specific to the store you are in, or could this be communicated more clearly?

#### *Overview screen*

#### *Apology*

- What are your thoughts on a personal approach and an apology for the out-of-stock product? Do you find it necessary?
- What kind of information do you expect to see about the initial product (when it is unavailable)? Besides the picture, title, and price, would you expect any additional details? Should click on it?

#### *Inventory*

- Is the distinction between in-store and online stock helpful and clearly displayed?
- Would you prefer an online order option as a small “+” symbol or as a separate button?
- What do you expect to happen when you click on the “Order Online” button or icon?

#### *Alternatives*

- Are the alternatives specific to this store clearly indicated? Should the carousel include information about the availability of alternatives (e.g., “in stock”)?
- Do you like the carousel format for viewing alternative products? How many previews feel ideal?
- Is it clear that you can click through to a detailed page for alternative products?
- When you click on an alternative product, what do you expect to see?
- Should it display stock availability (and location in the store) or just a general product detail page (with general information)?

#### *Other stores*

- How many previews for other stores feel appropriate?
- Is it clear that you can click through to a detailed page for more stores? And would it be nice to go to the next page or a button with a popup and search

#### *Alternative screen*

- What is important for you when displaying alternative products?
- When you click on an alternative product, what do you expect to see?
- Should it display stock availability (and location in the store) or just a general product detail page (with general information)?
- Are you willing to provide input if this would be processed when searching for alternatives?

#### *Other screen*

- Would you find it useful to have the option to apply additional filters (in addition to sorting by distance) for products available in other stores?

#### *Extra features*

- Would you find it useful to receive a notification when the product is back in stock?
- Would you appreciate knowing the reason why the product is currently unavailable?

### Insights

#### **Scanning the shelf**

- All respondents quickly found where this feature would be in the Albert Heijn app, namely behind the scan icon. However, the functionality, especially if it is new, could be made more visible, for example, under ‘My Albert Heijn’ or ‘My Store’.

#### **Offering apologies**

- All respondents found this feature nice and personal. It also serves as a confirmation that the product is indeed unavailable. Some participants read over it quickly and are more functionally oriented than others.

#### **Store inventory**

- Seeing the store status is useful and also acts as confirmation. Being able to see when the product will be available again is helpful if you don’t need it immediately.
- Displaying online stock was seen as logical but might not be useful for everyone. Participants who regularly order online recognized its value more. However, it was noted that a minimum purchase of €50 is required for an online order, so people wouldn’t place an order just for a single product. Additionally, one participant mentioned that if it were just for one item, they would rather cycle to another store.
- One participant saw added value in being able to get a Bonus offer online if it was out of stock in-store, as this situation often occurs.

#### **Preview alternatives**

- It is nice to see a selection of up to five alternatives. The quality of these suggestions is important.
- For alternatives, the majority considered the price-to-volume ratio the most important factor; it should be somewhat comparable. One participant also suggested a ‘best deal’ label as a helpful addition.
- When choosing an alternative, it is useful to know where it is located in the store.

#### **Preview other stores**

- Displaying stock availability in other stores was seen as a good addition by most participants.
- When expanding the map, it would be helpful to see the route or estimated travel time immediately.
- If the product is urgently needed, one participant suggested that this feature should be placed higher up in the interface.

**Alternative page**

- The existence of a separate page for alternatives was not highly noticeable. Users were very focused on the previewed alternatives.
- Filters were received positively. Most respondents would use them, as it saves them the trouble of doing the calculations themselves. 'Most affordable' and 'previously purchased' were understandable filters, while 'organic' was not relevant for everyone.
- Opinions on the assistant were mixed. Some participants would use it if they were unsatisfied with the suggested alternatives, while others found it too much effort and expected Albert Heijn to determine the best alternative automatically. It was also noted that this feature would function like a chatbot, which could deter some users unless the quality was very high.

**Other store page**

- Sorting the stores by distance was appreciated.
- It is useful to have the option to search manually, and participants were willing to type in their search.

**Overall impression**

- All respondents recognized this problem and found the proposed solution helpful and valuable.
- Scanning the shelf label was also seen as clear and easy.
- For alternatives, it is crucial that they align with customer expectations. If a customer is unsure, they should be able to rely on the feature.
- Showing product availability in other stores could save time by preventing unnecessary trips, making it a valuable addition.



