



The impact of **AI on ecommerce**

"AI is one of the most important things humanity is working on. It is more profound than [...] electricity or fire."

Sundar Pichai, CEO of Google

Introduction

Artificial intelligence (AI) has revolutionized how businesses operate and created new opportunities in every industry. The e-commerce industry has embraced AI technology, recognizing its potential to enhance customer experience, streamline operations, and increase sales. From personalized product recommendations to automated customer service, AI has transformed the ecommerce landscape and opened new possibilities for growth.

This whitepaper aims to provide an analysis of the various AI applications in ecommerce. We will explore how AI is used in this field, starting before the customer knows about your store and ending with a post-purchase analysis. Additionally, we will discuss the impact of AI on supply chain management, order fulfillment, and fraud detection. Our goal is to give a comprehensive overview of the current state of AI in ecommerce and provide insights into the future of this rapidly growing field.

AI is basically nothing new. Amazon started using early AI personalization more than two decades ago, but what has changed is the availability of these tools for the Mid-market. Therefore, we at Shopware strongly believe that with the current adoption rate and the world of possibilities for each store, we are only moments away from the biggest ecommerce transformation since the launch of Google.

Ginni Rometty (CEO of IBM) once said that "[s]ome people call this artificial intelligence, but the reality is this technology will enhance us. So instead of artificial intelligence, I think we'll augment our intelligence." This is true indeed.

This change is already evident in the whole digital world, but it's fueled by people. AI is just the catalyst. What's worth noting is that with millions being spent worldwide on developing different AI-based tools, we're on the verge of a significant change. It might have already started with Bing's and Google's implementation of ChatGPT-styled responses into their search engines. That will most likely completely disrupt the SEO industry – and therefore affect almost all of ecommerce. Imagine hundreds of thousands of stores that will have to quickly adapt to the new reality to save their organic traffic (or find new ways to generate it). Imagine thousands more that will use AI to generate content to build their SEO score. All of this is coming within the next one to two years. Now consider that this is just a small percentage of disruptions being developed every day. It takes one person with an imaginative mind and some resources to change the ecommerce landscape forever.

This disruption is also a fantastic opportunity for all of us in the ecommerce space. Rarely is there a moment in time where a quick adaptation of new tools can allow us to become the leader in our niche in a matter of years. We invite you to experiment with AI in your store and see what results you can get from this amazing technology.

Kacper Gugala, AI project manager

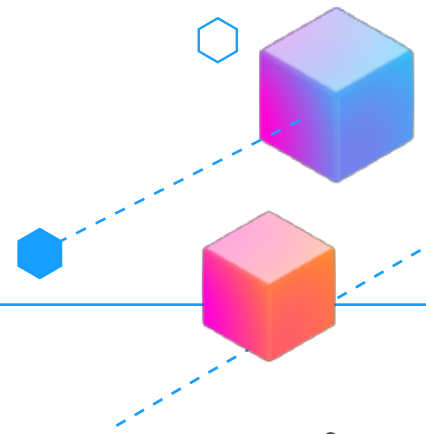
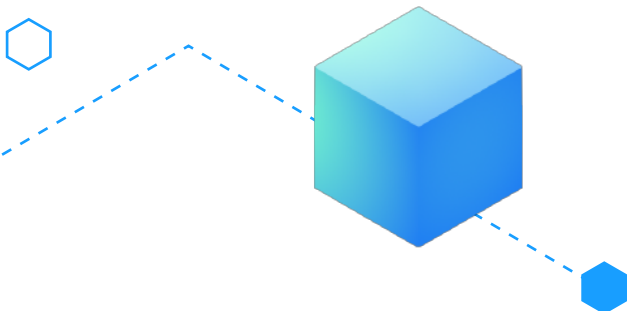


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The technology behind AI

Artificial intelligence is often used as a selling point for any system that promises to deliver innovation and a competitive advantage. The sad truth behind it is that in most cases, it has nothing to do with AI and everything to do with marketing. Often the systems/tools promoted as groundbreaking are simply fueled by advanced algorithms, which have nothing to do with artificial intelligence. Let's define what it is precisely to learn how to harness its power in the ecommerce space. Under the umbrella term AI, we can find different technical solutions:

Artificial intelligence (AI) refers to research focused on developing computer systems that mimic human intelligence. Its goal is to make computers think and act more like humans, for example, by allowing them to learn, reason, and adapt to new situations.

Machine Learning

Machine learning (ML) is an area of research focusing on developing self-learning systems. ML models are being created that enable computers to improve at a particular task without telling them how to become better. In other words, these programs learn by repeating specific actions and observing the results. Four basic approaches allow machines to learn:

Supervised learning

This is a situation where the AI system receives data and the correct results.

Imagine a simple example: you show the algorithm seeds, trees, and fruit. You then show it that the seed must be before the tree, and the fruit is the result of the tree (teaching it how fruit grows). With enough data, the system should be able to put seeds, trees, and fruit in the correct order, even if it has never seen this kind of seed or fruit.

The goal of supervised learning is for the system to learn a mapping between the input and output so that the AI can use what it has learned to make predictions on new, unseen data.

Unsupervised learning

In this case, let's imagine the same example. You give the algorithm seeds, trees, and fruit. With enough data, it should start seeing some patterns, and with some luck and AI magic, it can classify new images we provide (whether they are seeds, trees, or fruit).

Unsupervised learning is a type of machine learning where the AI system is trained on an unlabeled dataset without the correct output. Unsupervised learning aims to identify patterns or structures in the data without prior knowledge of the relationships between the data points. It can be especially useful in pattern recognition and anomaly detection.

Reinforcement learning

Have you ever played the *Hot and Cold* game? If so, you are already familiar with reinforcement learning techniques. Imagine that an AI is given a task. For example, "walk from A to B". Each try, it does something random (like moving a leg, finger, or jumping up and down), and each time it gets closer to the goal, we say, "good job". In this case, we reinforce the behavior we want the algorithm to make. After enough repetitions, the algorithm can learn to perform a task well enough to become helpful to our goal.

Reinforcement learning is a type of machine learning where the AI system learns by taking actions in an environment and receiving feedback in the form of rewards or punishments. The goal of reinforcement learning is to learn a policy, or a mapping from states to actions, that maximizes the reward over time.

Transfer learning

Now imagine you have taught your algorithm to do something. For example, identify what is and what isn't a dog based on thousands of images. You could use the same algorithm (the things it already learned) for a different task, like identifying if an image represents an animal.

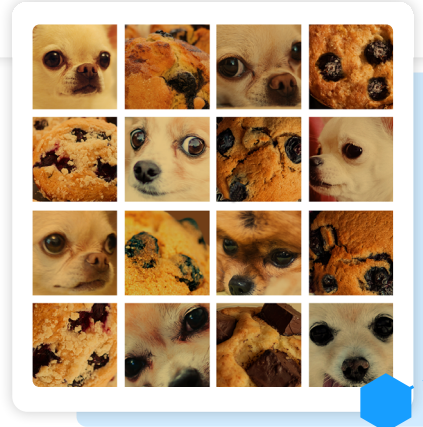
Our favorite use: deciding if an image is a chihuahua or a muffin (interestingly, this is quite a challenge for AI, even though most two-year olds should be able to do it perfectly).

Transfer learning is a type of machine learning where knowledge learned from one task is applied to another related task. The goal of transfer learning is to improve the performance of the AI system on a new task by leveraging knowledge learned from a related task.

Where is Machine Learning used in ecommerce?

Here are a few examples of how machine learning is being used in ecommerce:

- **Product recommendations:**
Analyzing customer behavior, purchase history, and preferences to provide personalized product recommendations.
- **Search results ranking:**
Analyzing the relevance of products to a customer's search query and personalizing the search results based on their past behavior
- **Predictive analytics:**
Analyzing sales data and predicting the demand for products.
- **Fraud detection:**
Analyzing transaction data and identifying patterns that indicate fraudulent behavior.
- **Customer service:**
Analyzing customer interactions and providing personalized responses based on their behavior, preferences, and history.
- **Dynamic pricing:**
Analyzing pricing data, competitor pricing, and demand data to optimize pricing in real time



Natural Language Processing

Natural Language Processing (NLP) is a branch of artificial intelligence that deals with interactions between computers and human languages. It aims to make software understand the spoken and written word. This might sound simple, but it is quite challenging as the algorithm needs to identify context and emotions, avoid "fill-in" words (like umm, right, or ha!), and even understand grammar. It also needs to handle things like polysemous words (meaning words that can have different meanings depending on context).

Where is NLP used in ecommerce?

Here are some examples of how Natural Language Processing is being used in ecommerce:

- **Chatbots:**
NLP is used to create chatbots that can understand customer queries and provide accurate responses (so that you can "talk" to a chatbot as you would to a human).
- **Sentiment analysis:**
It can analyze customer feedback from various sources such as reviews, social media, and emails and provide a readable summary that allows you to improve your offer.
- **Search and recommendations:**
It can analyze search results and provide product recommendations by understanding the intent behind customer queries.
- **Voice assistants:**
NLP can power voice assistants that understand and respond to customer queries using natural language.
- **Language translation:**
Finally, NLP can be used to provide translation services – while not perfect, they often give a very good first draft that helps to decrease the time it takes to translate a whole product catalog.

Deep learning

Do you remember the example of seeds, trees, and apples, where the task for AI was to identify a pattern? Now imagine this happening in many, many dimensions. For this, we use multi-layered neural networks, which work similarly (or at least we think so) to our brains.

Deep learning is a subfield of machine learning inspired by the brain's structure and function, known as artificial neural networks. It uses multi-layered neural networks with many hidden nodes to automatically learn patterns and relationships in data.

In deep learning, the key is large sets of data. The algorithm is not only thinking of the path, but also trying to identify nodes and adjusting weights (importance) to the different elements it finds in its path. This allows the model to make highly accurate predictions and perform tasks such as image recognition, speech recognition, and natural language processing.

Where is deep learning used in ecommerce?

In ecommerce, it can be used in areas such as:

- **Visual search:**
It is used to analyze product images and provide visual search results that are more accurate and relevant to customer needs.
- **Personalized product recommendations:**
It can analyze customer behavior, preferences, and purchase history to provide personalized product recommendations.
- **Fraud detection:**
It can verify transaction data and identify fraudulent behavior patterns
- **Customer churn prediction:**
Deep learning algorithms can analyze customer behavior data and predict which customers are at risk of leaving. Imagine knowing a customer might leave even before they do. Maybe show them an exit-intent popup that has a chance to reengage them?
- **Dynamic pricing:**
Deep learning can also be used to analyze pricing data, competitor pricing, and demand data to optimize it in real time.
- **Supply chain optimization:**
It can optimize supply chain operations by analyzing demand forecasts, inventory levels, and supplier performance.

Computer vision

For us, it's quite easy to understand what we're looking at. We have no issues identifying letters and shapes and instantly classifying what we see ("yes, *this is a chihuahua*"). Computers don't have this ability (or at least it's not as developed as ours). Computer vision is a field of artificial intelligence that focuses on enabling computers to interpret and understand images and videos.

Where is computer vision used in ecommerce?

Here are some examples of how computer vision is being used in ecommerce:

- **Visual search:**
Some algorithms allow customers to search for products using images rather than text.
- **Product categorization:**
Computer vision algorithms can analyze product images and automatically categorize them, making it easier for ecommerce companies to manage their product catalogs.
- **Quality control:**
It can analyze product images to detect defects and ensure product quality before they are shipped to customers.
- **Augmented reality:**
It can provide a more immersive shopping experience, allowing customers to visualize how a product will look in their space before purchasing with the help of AR.
- **Facial recognition:**
Computer vision algorithms can be used for facial recognition to identify customers and personalize their shopping experience. This is more often used in retail but might also be used in ecommerce in the future.
- **Security:**
It can detect suspicious behavior even when someone sees nothing.

Impact of artificial intelligence on the customer journey

Now let's take a journey together into a common customer journey in ecommerce and see how a regular Shopware store owner can benefit from artificial intelligence in their business. We'll look at how to implement AI in all these different steps:



Awareness: learning about the product

Before the customer enters the online store, they need to come across the product. This is the step when the user first sees your product and searches for it. Google refers to it as the "zero moment of truth". Becoming aware of the product can take many forms. AI can be used in all these areas, from simple ads, price comparison engines, and sponsored blog posts to digital influencers!

Shopping ads with Google

This solution, implemented natively into Shopware's commercial offer, allows you to generate the feeds required by Google Merchant Center to present your products to the best possible audience. There, Google's Machine Learning algorithms ensure that your offer is displayed to the people with the best chance to buy your product.

Automated meta-data

What use is a store if nobody reaches it? A large part of any ecommerce manager's marketing activities is SEO. With the help of artificial intelligence, they can save time and effort by having SEO keywords suggested and meta titles and descriptions generated automatically. AI tools based on Natural Language Processing (NLP) are extremely useful here. They not only create the right content, but also consider formats and lengths for optimal SEO results.

Pick the best price for your customers

As a store owner, you might want to experiment with prices to see which ones convert best while keeping the biggest margin. Doing this manually takes a lot of time and is virtually impossible with a larger number of products. With repricing tools, which are usually based on machine learning algorithms, you can check the impact of different prices on the sales of your products and have price adjustments made in your online store automatically and in real time. You only determine the basic parameters, e.g. which price thresholds should not be exceeded or undercut. Significant sales increases are possible through this price individualization.

Browsing: checking the product catalog

Once you enter the store, you start looking for the "one" product. Users sometimes spend a few minutes checking hundreds of options, reading about them, and comparing their features. This is until they find something that screams, "*that's it*" And AI can help them find "*it*".

Change the way your store behaves for every Customer

Imagine that your store would change for every Customer. Individual product sorting in categories improved search results and AI-powered product recommendations. AI-based personalization and recommendation engines make this happen today. This way, browsing through your store already feels like the perfect shopping experience of tomorrow.

Personalize all content

Personalized product recommendations aren't enough for you? How about a completely individualized and dynamic storefront? Customer experience platforms can make it happen. A customer data engine works in the background and assembles personalized page layouts and content for each visitor based on their preferences via a "headless" CMS.

Can you pass the turing test?

For customers who need a little help while browsing your store, AI chatbots are an option. They access product information and can use natural language processing (NLP) to understand and answer customer questions. The good thing is: chatbots are never off duty. They help store visitors find the right product day and night. That's how you can take your customer service to a new level. And if the quality of the answers provided by the AI chatbot is not good enough, customers can be connected to your support team immediately.

Selection: choosing the right product

Imagine your store has tens of thousands of products. Finding the right one can be challenging. Not only is there no way of manually going through such a vast catalog, but the product that catches your eye must have the optimal product images, detailed description, and correct price. You can either spend years making sure your products have ideal data or use AI to your advantage.

Find, not search

The search bar is one of the most frequently used functions in online stores. But the search engine behind it is not always very smart. You can quickly fix this with artificial intelligence. Make life easier for your customers by displaying the correct search results despite incorrect spelling, e.g. of brands. In addition, an AI-based search bar can display products with the highest purchase probability when entering more generic keywords (e.g. "sports shoes").

One size fits all?

Shopping for shoes online is not always easy. Especially the selection of the right size is a problem for many customers. Every foot is different, and shoes come in different sizes. This is where computer vision, a subfield of artificial intelligence, can help. For example, your store visitors can simply use a smartphone app to scan their feet and, based on that, have the right shoes displayed in the store. This makes sneaker shopping fun – and reduces the number of returns in your store.

Purchase: buying the product

Even when the user has selected the product he wants to buy, things can still go wrong. The average cart abandonment rate in ecommerce is over 69%. This means that you are still 2x more likely to lose a sale than you are to win one. Why not use artificial intelligence to your advantage and improve your chances?

Be my protector

There is no way of manually checking every order and payment for malicious intent. The good news is: This is exactly where AI models are highly efficient and reliable. Many payment service providers specializing in ecommerce offer "fraud protection". This makes it possible to evaluate in real-time whether the person currently trying to place an order in your online store is real and creditworthy. As a result, you can also identify and prevent malicious bots unleashed on your store by competitors at an early stage.

Stop them all

Some stores are heavily under attack from bots. One example is placing empty, unpaid orders (or worse: placing orders only to return the product). A captcha can help you tackle this problem. But bots are also getting smarter and smarter. That's why choosing a powerful and up-to-date captcha solution is especially important. The leading tools in this field offer an optimal mix of bot detection and puzzles that are easy for humans to solve.

Automate everything

Marketing automation is one of the most efficient ways to get the most out of your online store with minimal resources. With automated campaigns, you can bring back dropouts, send personalized product recommendations to your shoppers via individualized newsletters, and keep track of performance via a central dashboard. Some tools also offer AI features like "voice commerce". This allows customers to talk to your website as if they were talking to store employees. Natural Language Processing (NLP) makes it possible.

Delivery: getting the product to your door

If you think about the modern warehouse, you probably imagine autonomous robots gathering products at lightning speeds. When the products are collected, a person packs them, and then another machine moves them to the desired location, where a different system stacks them in the most efficient means of transport. After that, the car that takes your package to your door also uses AI to calculate the best route for the package delivery process. Fascinating, isn't it? But there are countless other ways Artificial Intelligence can aid this process.

Wish you were here

When it comes to delivery, the single biggest frustration is sending a product to a location that does not exist. In addition to shipping and return costs, this may also cause customer service expenses. This can be avoided by validating the address during the order process. Tools check the address data entered by the buyer and suggest corrections. This can significantly reduce the number of shipments to the wrong address and it's particularly relevant for online stores that offer perishable goods.

Wait, machines can write?

Personalized customer engagement is a key factor in modern e-commerce - and not just before and during the order process. Even if the customer has already completed the purchase, there are ways to put a smile on their face with personalized content. For example, through automatically generated messages enclosed in a high-quality envelope with the shipment, congratulating the customer on the purchase. Individual coupon codes for the next orders can also be placed on them. Corresponding tools can be quickly and easily integrated into the online store.

Advocacy: from customer to product-ambassador

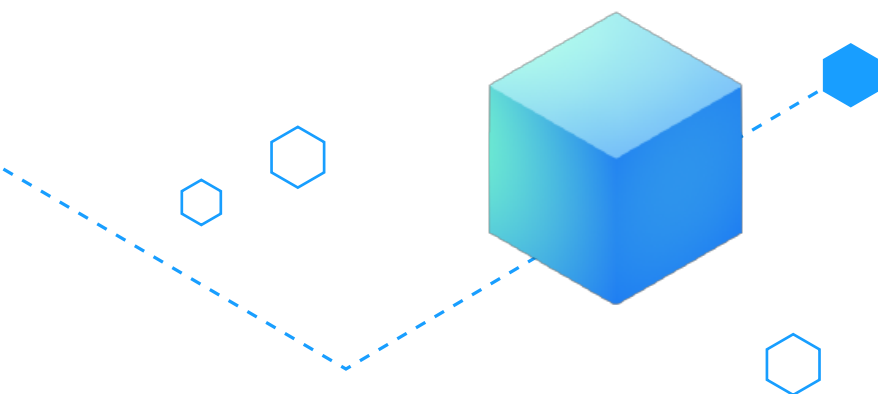
Once the user buys from your store, they get to experience the product. If it's good enough, there is a chance they recommend it to others, voice their review or simply let other people know that your store exists. To make your store a success, you need to transform customers into brand ambassadors. This can also be achieved with AI.

More data than you can handle?

Every online merchant knows that customer reviews are the golden nuggets of ecommerce. The more positive and trustworthy reviews a store and product receive, the greater the sales potential. But whether a customer really gives your store a positive rating depends on many different factors, such as product prices, store layout, and of course, ultimately, product quality. AI-driven monitoring tools can help you analyze reviews and draw the right lessons from them. The tools do the hard work for you via machine learning and natural language processing (NLP). The findings are then presented in an easy-to-understand dashboard.

Customer sentiment

A way of growing your store is to work on branding constantly. You need to keep track of all possible mentions and analyze them to see if you need to react/respond. Impossible to do so manually, especially if you are a large brand. Now imagine that with some magic (hint: it's AI-powered), you could analyze all mentions of your brand and automatically decide if a comment is positive, neutral, or negative. And every time there is a spike in negative comments, you get notified immediately so that you can react and protect your brand. Brand monitoring tools automate this for you. You just enter your brand name, and the tools reliably screen the Internet for mentions.



How did AI help to create this whitepaper?

As a company consistently looking for innovation, especially in AI, we decided to see how we can use it for this whitepaper. No worries – we took a skeptical approach toward the results, and experts have verified all the texts in this report. The content creation and ideation process with AI is quite interesting and might help you understand how to use AI in your business currently. We used OpenAI's ChatGPT tool to generate elements of this report.

Outline

We used the prompt "Propose an outline for a report about Artificial Intelligence in ecommerce". The results were as follows:



- I. Introduction
 - A. Overview of AI in ecommerce
 - B. Purpose of the report
- II. The impact of AI on ecommerce
 - A. Improved efficiency and cost savings
 - B. Enhanced customer experiences
 - C. Increased sales and revenue
- III. AI use cases in ecommerce
 - A. Personalization
 - 1. Product recommendations
 - 2. Customer segmentation
 - B. Customer service
 - 1. Chatbots
 - 2. Voice assistants
 - C. Fraud detection
 - D. Supply chain optimization
- IV. The technology behind AI in ecommerce
 - A. Machine learning
 - B. Natural language processing
- V. Deep learning
- D. Data analytics
- V. Market growth and trends
 - A. Market size and projections
 - B. Adoption rate by ecommerce companies
 - C. Key players in the market
- VI. The challenges of AI in ecommerce
 - A. Data privacy and security
 - B. AI biases and ethical concerns
 - C. Integration with existing systems
- VII. Conclusion
 - A. Summary of key findings
 - B. Outlook for AI in ecommerce
 - C. Recommendations for ecommerce companies
- VIII. References

As you can see, we decided to use only parts of the outline for our whitepaper (marked in blue). We also never used it as proposed but decided to treat it as an inspiration for our outline.

Quotes and data

We then gathered quotes and statistics about AI use in ecommerce in one place to have a good idea of what we could use for our report. We used prompts such as "Write down 10 interesting quotes about Artificial Intelligence use in ecommerce", "Write down 10 interesting quotes from books/movies about Artificial Intelligence", "List interesting research about AI in the ecommerce space" or "List interesting ecommerce statistics".

We quickly learned that these results couldn't be trusted. In early drafts of this whitepaper, we had two quotes provided to us by AI:



»AI isn't about how smart machines are, it's about how smart we are.«

- Steven Spielberg, A.I.



»AI will change the world more than fire.«

- Jeff Bezos, CEO of Amazon

While they would be amazing for content, we couldn't find any indication that either of these people said this. Therefore, we decided to fact-check all the data we used to ensure it was trustworthy.

Main content

ChatGPT has allowed us to work internally in a similar way you would work with an external researcher. For example, large blocks of text in the "Technology behind AI" section were originally written by AI. They were again fact-checked by experts and rewritten to fit the report's structure of what we wanted to achieve.

One interesting observation is that even though the output from our prompts was "good enough", it was often written in a way that failed to captivate us. It was often vague and/or too technical. To give a good example: "*In supervised learning, the algorithm is trained on a labeled dataset, where the correct output or label is already known.*" – this is all true, but if somebody is new to AI, this information might be written in a language that is too complex. Therefore, we spent a lot of time "*simplifying*" the answers or at least providing examples to help visualize the complex nature of the algorithms.

Where AI shined was lists. For example, listing possible general uses of a particular technology in ecommerce. Prompts such as "*Provide examples of machine learning uses in ecommerce*" usually gave good results, which only had to be tweaked slightly and verified.

It was also important to know the limitations of the system. For example, it was trained on data ranging up to 2021. We were writing about a new area and where breakthroughs happen every week. So even in a field as innovative as AI, most examples given by ChatGPT were already outdated. This is where good old manual research comes in. It is worth noting that at the time of writing this whitepaper, other competitors were about to launch their own AI solutions which deliver results including current data. Therefore, in the future, as the algorithms become better and better, this process can become far more useful.

Summary

As we are reaching the end of this whitepaper, we believe that the current state of AI allows us to treat it as a helping tool. We cannot trust it fully, and it is not a magic solution that will generate content for you. It can be treated as an inspiration and a base for something larger, but it still requires the human touch in terms of readability as well (and, most importantly) expertise. We could have created this whitepaper entirely with AI, but it would have been filled with nonfactual data, wrongful statistics, and errors. The human experts who verified the written text were a key component. Having said that, this report was written in Q1 2023. It might look much different in a year or two. If you treat AI as a tool to grow your business and not a silver bullet, you can do wonders for your business. We encourage you to experiment with it as much as you can. Be the Innovator. Be the leader of your niche.

We're here for you!

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About Shopware

Shopware, founded in Schöppingen in 2000, offers a holistic omnichannel digital commerce platform for sophisticated mid-market and lower enterprise merchants, with high flexibility and various options for B2C, D2C, B2B, as well as service-based use cases. Shopware is well-positioned and one of the market leaders in its segment, especially in the DACH region, with a fast-growing business in North America.

The solution is headless, API-first, and uses an open source architecture, allowing merchants to individually customize and scale the product offering, creating a strong customer experience. Furthermore, Shopware relies on a global network of 1,600 sales, technology and solution partners, securing a stable ecosystem. Shopware merchants currently process a combined GMV of more than 20 billion USD across the global Shopware platform.

