The Art of Building an AI-Driven Company

THE ULTIMATE GUIDEBOOK

A Step-By-Step Guide on Implementing AI Solutions in Your Business

nexocode

Executive Summary

A Quick Overview of the Ebook for a Busy Decision-Maker

The phrase artificial intelligence has been overused by marketing teams worldwide in recent years. The term has become a handy catchall for any technology that displays automated tendencies – yet it lacks real intellect. This casual usage of the phrase AI caused some uncertainty and hampered the term's significance, causing people to be ignorant of AI's current advancements.

The new advancements in the field of artificial intelligence, machine learning, and deep learning technologies have been nothing short of spectacular. Artificial intelligence algorithms are being used in a variety of industries. They are a powerful tool that can help businesses automate tasks, improve decision-making, and drive growth. However, getting started with AI and implementing AI solutions can be daunting for business owners and decision-makers.

This book provides a step-by-step guide on successfully implementing AI solutions in your business. It covers everything from identifying the right problem to solve with AI to building successful AI-based products that bring positive ROI.

As an artificial intelligence development company with a track record in deploying successful AI-based products, we are very excited to contribute our expertise to this ebook. It contains valuable insight from across industries and is a place for everyone who wants to learn about potential benefits brought by AI.

I am convinced that you will be able to take away a couple of insights from these examples, which you could apply to your own company. I believe it will be a good start for companies willing to embrace digital transformation towards automation, analytics, and AI maturity.

Radek Kamiński

CEO & Founder of nexocode

LinkedIn

With this Ebook, you will learn how to:

* Understand the basics of AI and machine learning

* Identify the right problem to solve with AI

* Understand the common pitfalls when implementing AI and how to avoid them

* Collect and prepare data for training machine learning models

* How to start and run AI projects in an agile way

* Evaluate the performance of AI models and products

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CHAPTER ONE

What is Artificial Intelligence?

UNDERSTAND THE BASICS OF
AI AND MACHINE LEARNING

In order to talk about artificial intelligence, it is essential first to understand what AI actually is. So let's start with some basic terms and definitions.

What is Artificial Intelligence?

Artificial intelligence is a branch of computer science that aims for a machine to learn from its environment and perform tasks, a skill traditionally attributed to human intelligence. In layman's terms, an artificial intelligence tool or application can be summarized as a system or software capable of performing a specific task independently.

AI encompasses many technologies such as machine learning or a subset of ML named deep learning. AI deals with a computer's ability to learn without being explicitly programmed. In particular, a machine learns from the data it processes, and through experience, it can adjust itself to perform a task.
We say AI exists when a machine mimics cognitive functions that humans associate with other human minds, such as learning and problem-solving.

Artificial Intelligence vs. Machine Learning vs. Deep Learning: What's the Difference?

Artificial Intelligence

AI is an extensive term describing computer systems that simulate human intelligence by performing human-like tasks, e.g., a program that can sense, reason, act, and adapt. Generally, we divide AI into narrow AI and general AI. Narrow AI describes AI-based solutions that are trained to be very good at a specific task.

General AI is a term for a machine that is capable of successfully handling a variety of tasks; a machine that has or even exceeds all the capabilities a human possesses.

Machine Learning

Machine learning (ML) is a subset of AI and a branch of mathematics where we give the machine a set of data and allow it to learn by itself. In short, we don't explicitly program the machine what to do but rather allow it to learn from experience. We call this process training the machine. After training, the machine can predict an outcome when given new inputs. The ability to learn on its own is what differentiates ML from traditional programming.

Deep Learning

A subset of machine learning in which multilayered artificial neural networks (ANNs) learn from vast amounts of data. Deep learning is a kind of ML algorithm that analyses data representations using artificial neural networks with several layers of nonlinear processing units. A contemporary ANN's fundamental structure consists of a structure similar to the human brain. The ANN has three base layers: the input layer, the hidden layer (multiple), and the output layer. The nodes, also known as neurons, in adjacent layers are either totally or partly connected depending on ANN. Input nodes convey input variables, and the variables are converted by hidden nodes to be measured at output nodes. An ANN is trained by iteratively modifying the network's weight values to optimize the miscalculations between expected and exact values. Deep learning is used in various fields such as computer vision, recommender engines, text analysis, and speech recognition.

Supervised Learning

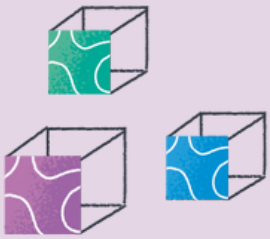
Supervised learning is a type of machine learning where the algorithms are trained using labeled data. The labels can be anything from categories (e.g., spam/not spam) to ratings (e.g., 1-5 stars). Supervised learning can be used for various tasks such as classification, regression, and prediction.

Unsupervised Learning

Unsupervised learning is a type of machine learning where the algorithms are trained using unlabeled data. The algorithms try to find patterns in the data without any guidance. Unsupervised learning can be used for clustering, dimensionality reduction, and association tasks.

Reinforcement Learning

Reinforcement learning is a type of machine learning where the algorithms are trained using a proper feedback signal (reward/punishment). The goal is to learn how to take actions that maximize the reward. Reinforcement learning can be used for game playing, robotics, and navigation tasks.



CHAPTER TWO

AI Capabilities

WHAT ARE THE DIFFERENT
TYPES OF AI?

AI is a tool to solve specific problems or answer specific questions, not a magic wand. Understanding standard AI capabilities will lay the foundation for the forthcoming implementation.

AI can sense, reason, act, and adapt. AI can understand its environment; it can identify patterns in data and make predictions based on those patterns. AI can reason by drawing logical conclusions from the data it has processed. And finally, AI can act by taking specific actions based on the conclusions it has drawn.

Predictive Analytics

Predictive analytics is the branch of advanced ML analytics used to make forecasts about unknown future events. Predictive analytics uses many techniques like data mining and deep learning to analyze current data to make predictions. The goal of predictive analytics is to take actionable insights from the forecasts. Predictive analytics can be applied to forecast supply, demand, pricing, and even quality of a manufactured product or maintenance needs.

Computer Vision

Computer vision is a field of AI that deals with how computers can be made to gain high-level understanding from digital images or videos. From the engineering perspective, it seeks to understand and automate tasks that the human visual system can do. Computer vision can be applied to a wide range of functions such as object detection, facial recognition, motion detection, and image segmentation.

Natural Language Processing

Natural language processing (NLP) is a field of computer science, artificial intelligence, and linguistics concerned with the interactions between computers and human (natural) languages. With NLP, computers are programmed to understand, interpret, and manipulate human language. NLP is used in many applications such as automatic summarization, machine translation, named entity recognition, question answering, speech recognition, and text classification.

Recommender Engines

A recommender engine is a system that makes suggestions for products, services, potential friends, or content. The recommendations are created to personalize and micro-target user experience. The purpose of a recommender system is to sift through all the possibilities and recommend the best ones to the user. There are two main types of recommender engines: content-based and collaborative filtering. Content-based recommenders make recommendations based on the similarity between the items. Collaborative filtering recommenders make recommendations based on what similar users have liked in the past.

Fraud Detection

Fraud detection is the process of identifying fraudulent activity. Fraudulent activity can include things like false claims, identity theft, and money laundering. Fraud detection systems based on machine learning find applications in diverse industries such as banking, insurance, healthcare, and government.

Anomaly Detection

Anomaly detection is the process of identifying data points that are unusual and do not fit the overall pattern. Anomalies can

be caused by errors, outliers, and unexpected events. Anomaly detection systems can be applied in different fields for tasks such as intrusion detection, fault, and defect detection.

Time Series Analysis

Time series analysis is a field of statistics that deals with the analysis of data that changes over time. Time series analysis can be used to make forecasts about future events or to identify anomalies. Time series data can be found in fields such as stock prices, manufacturing process analytics, economic indicators, etc.

Dynamic Pricing

Dynamic pricing is a pricing strategy that uses algorithms to set prices based on market conditions. The goal of dynamic pricing is to maximize revenue by setting prices that reflect the product's or service's actual value to the customer. Dynamic pricing can be used in various industries such as retail, logistics and transportation, and e-commerce.

Data Segmentation

Data segmentation is the process of dividing a dataset into smaller parts for the purpose of analysis. Data segmentation can be used to improve the accuracy of predictive models, identify customer segments, or understand consumer behavior.

Data Classification

Data classification is the process of assigning labels to data points. The labels can be anything from categories (e.g., spam/not spam) to ratings (e.g., 1-5 stars). Data classification can be used for a variety of tasks such as sentiment analysis, topic modeling, and document categorization.

CHAPTER THREE

Applications of Artificial Intelligence

WHAT AI CAN AND CAN'T DO
(YET) FOR YOUR BUSINESS?

Each and every industry can be impacted by Artificial Intelligence in a positive way. Through data, vision, speech, and language intelligence companies can be more automated, efficient, and accurate.

Logistics and Supply Chain Management

Dynamic pricing for freight and shipping
Predictive maintenance for vehicles
Inventory management and distribution planning
Route optimization and traffic analysis
Autonomous vehicles and warehouse/port operations

Pharmaceuticals and Life Sciences

Drug discovery and development
Clinical trial management
Predictive analytics for pharmaceutical manufacturing
Personalized medicine and treatment
NLP for analyzing EHRs, physician notes, and research publications

Chemicals

Predicting properties of new molecules and compounds
NLP for analyzing lab results and research papers
Predictive analytics for chemical manufacturing
Quality control and assurance
Process optimization for improving chemical production

Healthcare

Medical image analysis
Automated preliminary diagnosis
Treatment design and recommendations
Predicting patient outcomes
Virtual assistants for various health problems

Banking, Financial Services, and Insurance

Personalized insurance or financial offering
Fraud detection
Automated insurance claims processing
Stock market analysis
Credit scoring and risk assessment

Energy and Telecommunications

Predictive analytics for energy consumption
Predictive maintenance for power and telco infrastructure
Forecasting energy prices
NLP for analyzing customer complaints
Detecting network anomalies and network optimization

Retail, eCommerce, and Marketing

Personalized product recommendations
Generating marketing content
Targeted marketing campaigns
Automated customer service and support
NLP for analyzing customer data

Agritech and Food Production

Pest and disease control in crops
Predictive maintenance for agricultural equipment
Automated irrigation systems and soil analysis
Poultry and livestock management
Food production line optimization

Manufacturing and Industry 4.0

Minimizing energy consumption and excessive waste
Industrial robotics
Automated quality control and safety measures
Predictive maintenance
Optimizing factory operations and workflows

CHAPTER FOUR

The Risks of Implementing Artificial Intelligence

COMMON PITFALLS OF AI IMPLEMENTATION

We have high expectations for the ability of AI and related technologies to bring multiple benefits. But as with any new technology, there are risks and challenges associated with its adoption and implementation.

Implementing AI is attractive as it may bring a significant return on investment. On the other hand, research by Capgemini says that only 27% of data-related projects can be considered successful, and up to 85% of AI projects fall without bringing the expected value. This means that a failure to implement AI successfully can be costly. Below are some of the risks associated with implementing AI you should consider:

> *Up to 85% of AI projects fall without bringing the expected value.*
>
> Source: Capgemini Research

Wrong Problem Identification

First and foremost, you need to make sure you are solving the right problem. Solving the wrong problem can lead to wasted time and resources. You also need to be assured that AI is the right means to solve your problem. Businesses should not engage with AI for the sake of AI.

Lack of Experience and Talent

First and foremost, you need to make sure you are solving the right problem. Solving the wrong problem can lead to wasted time and resources. You also need to be assured that AI is the right means to solve your problem. Businesses should not engage with AI for the sake of AI.

Lack of Data or Low-Quality Data

For AI to be effective, you need data, high-quality data to be precise. It is challenging to train the algorithms and get accurate results without or with insufficient data.

No Data Strategy

In order for AI to be successful, you need a data strategy. This includes things like where to get the data, how to store it, and how to protect it. Data silos can lead to problems with data quality and availability.

No KPIs Defined

Without KPIs or other success metrics, it is difficult to measure the success of an AI project. This can lead to projects being deemed a failure even when they are not.

Waterfall Approach and Denying Failure

The traditional waterfall approach to projects can lead to denial of failure. This can be a problem with AI projects because they are often complex and require multiple experiments and iterations.

Security and Privacy Concerns

Security and privacy concerns exist with any technology that collects and stores data. With AI, these concerns are magnified because of the sensitive nature of the data that is often collected in significant volumes.

Siloed AI Expertise

AI is often siloed within organizations, with only a few people having expertise in the area. This can lead to a lack of understanding of AI and its potential. To maintain and scale AI solutions, you need to nurture internal competencies.

Scaling AI and Integrating It Into Other Systems

Deploying production-ready models and scaling AI can be challenging because of the need for a more robust ML operations infrastructure in place. Additionally, integrating AI into existing systems can be difficult and may require significant changes.

Lack of Long-Term AI Vision

AI is a long-term investment and requires a long-term vision. Lack of this vision can lead to short-term thinking and decision-making that may not be in the company's best interest in the long run.

Black Box Models and AI Explainability

AI models can be complex and opaque. It is essential to understand how the model works and what factors it takes into account. Otherwise, you may not be able to trust the results.

You Don't Always Need AI...

Don't implement AI solutions, where with cheaper standard programming you can achieve similar benchmarks and benefits.

How to Get Started with AI in Your Business?

We have listed some significant barriers to AI adoption. As you can see, there are many risks associated with implementing AI. Yet, like any other emerging technology, it can bring substantial rewards and a competitive edge.

So, how can you get started with AI in your business?

The following chapters will provide you with insights on how to initiate AI implementation projects in your business. How to identify the right problem, how to find the right AI experts, and how to define KPIs. It also provides guidance on how to create a data strategy, how to scale AI, and how to integrate it into your existing systems. These tips should help you navigate the risks and reap the rewards of AI.

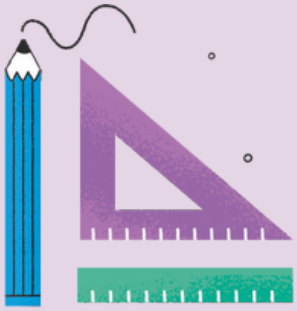
CHAPTER FIVE

Defining the Problems and Identifying an AI Opportunity

ANY BUSINESS CAN BENEFIT FROM AI
IF THE RIGHT PROBLEM IS IDENTIFIED.

To get started with AI in your business, you need to identify the right problem and find the right AI opportunity.
In this chapter, we will provide you with insights on how to do that.

As a business owner or decision-maker, you may be looking into AI because you want to increase efficiency, gain a competitive edge, or improve customer experience. But it is important to note that AI is not a panacea. It cannot solve all of your problems or magically make your business more efficient. You need to define the specific problem you want AI to solve. Once you have identified the problem, you can start to look for an AI opportunity.



The very first step business leaders should take on the path to AI adoption is to define their expectations from a specific AI system. What kind of predictions, optimizations, automation, or suggestions do you expect the algorithm to make? How will it affect your workflow processes and day-to-day activities? Which additional benefits can a machine learning system provide beyond its core functionality (it might be more cost-effective, for example)?

These are some questions that need answers before committing resources to implement a particular technology. However, even with a clear idea about what you want your artificial intelligence solution to achieve in general terms, there's still much work ahead when it comes to details – creating a feasibility assessment, choosing appropriate AI technology, of the future application, and setting up a roadmap are both essential steps towards successful project completion.

Recommended Approach

AI Design Sprint

AI presents a lot of potential opportunities for businesses. But not all of these opportunities are worth pursuing. AI Design Sprint workshops can help in finding and evaluating various AI opportunities. nexocode's AI Design Sprint is a hands-on experience where, together, we identify potential AI use-cases for your business and explore the business opportunities available to you.

We have created a set of tools for each step of the design-thinking process to help our clients turn AI into social, user, and business value. Within just two days, your team, supported by our AI Engineers and Design Facilitators, could learn and understand the power of emerging technologies, spot AI opportunities, and create new ideas and visions.

The goal of an AI Design Sprint is to come up with as many ideas as possible and then ruthlessly judge them based on feasibility, value, and desirability. This is a great way to quickly weed out bad ideas and focus on the best ones.

AI Design Sprint workshops help reduce the risk of building something that nobody needs, is not technically feasible, or doesn't work. It is also a way to get a shared AI understanding and get accustomed to AI knowledge, thanks to the deep-dive workshops and the opportunity to discuss your business problems with experienced AI Experts.

If you want to get started with AI in your business but don't know where to start, an AI Design Sprint is a great way to find out.

Book an AI Design Sprint

CHAPTER SIX

Gaining AI Expertise

HOW TO ACQUIRE THE AI KNOW-HOW

In order to implement AI solutions in your business, you need to have a good understanding of AI. You need to be able to identify the right problem to solve and find the right AI opportunity. This chapter provides insights on how to gain the necessary AI expertise.

Once you have identified an opportunity you want to pursue, you need to gain specific AI knowledge and find the right AI experts to support you. This is important because no matter how you approach your AI implementation project (buying AI tools, building them in-house, or hiring partners), you will need AI expertise to evaluate the project as it moves forward.

Educate Yourself and Your Team About AI

The next step is to educate yourself and your team about AI. This will help you better understand the possibilities and limitations of AI. It will also help you identify the right AI experts to work with. Many resources are available online, such as books, articles, videos, and courses. The goal is to gain a basic understanding of AI concepts so that you can intelligently discuss AI opportunities with experts and be confident about the decisions you need to make.

Some of the key concepts you should understand are:

- How AI works;
- The different types of AI and their applications;
- How does the AI development process look like;
- How to choose the right AI technology;
- How to measure AI performance;
- The ethical considerations around AI.

One of the challenges when it comes to AI is that the technology is moving so fast that it's hard to keep up.
There are a lot of new terms and concepts being introduced all the time. Knowing what is relevant for your business and what you should ignore can be difficult. This is where AI experts can help. They can provide guidance on what is essential and what you should be focusing on.

Building a Team of Experts for Your AI Initiative

You will need a team of AI experts to work on your AI initiative. This team will be responsible for planning, designing, and executing your AI project. The team should have a mix of technical and non-technical skills.

Technical Skills

The team should be able to build and implement AI models. They should also be able to scale AI projects and have AI product management skills.

Non-Technical Skills

The team should also have soft skills, such as the ability to communicate effectively, work in a cross-functional environment, and manage projects.

Outsourcing AI Development vs. In-house AI Team

You need to make the primary choice between building your own ML team or hiring a consultancy.
The advantage of an in-house AI team approach is that you have complete control over the project and don't need to rely on external partners. Creating your own team or a whole artificial intelligence laboratory, though, can take many years, and it's probably only the right choice for your corporate strategy if you don't need to see results urgently and if you expect ML to be the key differentiating factor between you and your competitors.

When it comes to AI, it's important to remember that you don't need to do everything yourself. You can partner with companies who have the expertise and experience to help you successfully implement AI solutions in your business. A good partner skilled in developing advanced software solutions will also be able to complement your in-house team or take over the development completely and guide you through the process of building the technical environment and setting up a full-fledged AI system within your company. The advantage of this approach is that you don't need to invest in building an internal team, and you can benefit from the expertise of the external partner.

Finding the right AI experts can be a difficult task because there is a lot of hype around AI, and there are many people who claim to be experts in the field. Developing AI is not the same as building standard IT software. Working with an experienced partner can help you avoid some of the pitfalls associated with implementing AI. However, as AI development is a long process, you need to choose wisely for long-term and fruitful cooperation.

Here are some tips on how to find the right AI experts for your team:

- Look for companies with experience with the specific problem you want to solve.
- Look for companies that have a track record of delivering successful AI projects.
- Make sure that the company you choose understands your business and your industry well.
- Look for companies with AI Experts on board that evangelize about AI technology.
- Look for companies that will treat you not as a client but rather a partner and that they will be open to knowledge transfer to your team.
- Agile approach is a must. The company should be able to show you how they work and that they are using an agile approach.

Once you have selected a few companies, make sure to meet with them through a series of online or in-person meetings to understand better their culture and way of working.

CHAPTER SEVEN

Defining the Scope and Goals of Your AI Project

HOW TO ESTABLISH PROJECT OUTCOMES?

The next step in implementing AI solutions in your business is to define the scope and goals of your project. You need to be clear about what you want to achieve with your AI project.
What outcomes do you want to see?

When defining the scope and goals of your project, it is essential to keep the following factors in mind:

Your Budget

You need to be clear about how much you are willing to spend on your AI project. You must also understand how AI projects are budgeted and what constitutes a cost (data access, computational power, software, hardware, experts, etc.).

Your Timeline

You need to be realistic about how long it will take to implement your AI project. Your roadmap should highlight various milestones and the value you expect to see at each stage.

Your Team

You need to clearly understand who will be working on your AI project and their roles. You also need to understand the skillsets required for each position.

Your Ideal Benchmarks and KPIs

You must set realistic benchmarks for your AI project. These benchmarks will help you measure the success of your project and determine whether it is achieving its objectives.

Your Risks

You need to be aware of the risks associated with your AI project and make sure you have a plan to mitigate these risks.

How to Define the AI Project Scope?

The first step in defining the scope of your AI project is to define the objectives of your project.

Mapping Out the Functionalities

What outcomes do you want to see? How will the AI model function within a wider customer or service journey? What supportive functionalities need to be developed in order for the AI model to be useful?

Once you have answered these questions, you will have a clearer understanding of the scope of your AI project.

It is always valuable to map out the features that need development with a dedicated canvas. To be successful at this stage, make sure to include in the process domain experts and (or) users that will help you in the value assessment of each feature.

For UI-heavy systems iterating on mockups and product prototypes is a must. AI is no different – you should create prototypes that would showcase how your AI model will operate once integrated into other systems and processes. This will enable you to keep track of the project requirements and make sure that all stakeholders are on the same page.

Creating a service schema or a more advanced prototype will also help you assess whether the project is feasible within the given constraints (budget, timeline, team skillset, etc.).

Thanks to this step you will be able to understand what data is needed and how it should be structured, as well as the algorithms that need to be implemented.

Data Considerations

The second step in defining the scope of your AI project is to understand the different types of data that you will need to train your model on. What kind of data do you have? Is it possible to get or buy additional data? Where is this data located? How can you access this data? This might include customer data, product data, transactional data, financial data, etc.

You also need to consider how you will access this data and whether there are any GDPR compliance issues that need to be taken into account.

Selecting Technical Approach

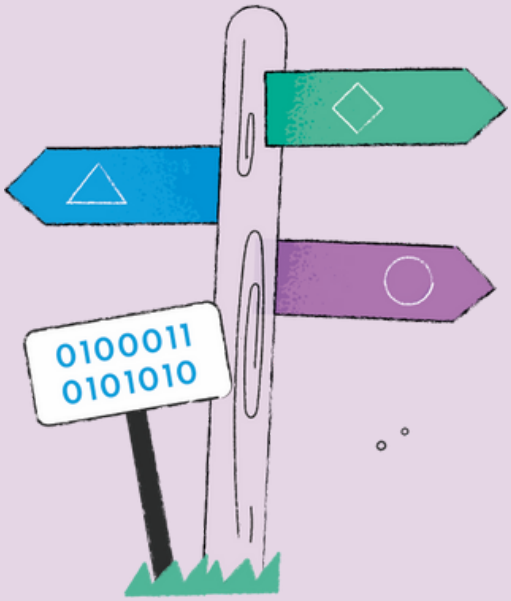
The third step in defining the scope of your AI project is to understand the different types of machine learning technologies that you will need to use. What are the different types of algorithms that you can use? What are the different types of tools that you will need to use? This might include supervised learning, unsupervised learning, deep learning, reinforcement learning, etc. You also need to consider how you will implement these algorithms and what type of platform you will need to use.

Establishing the Goal Infrastructure

The fourth step in defining the scope of your AI project is to understand the different types of infrastructure that you will need. What are the different kinds of infrastructure that can be used to train and deploy your model? Which infrastructure is best suited for your data and your objectives?

This might include on-premise servers, cloud-based servers, GPUs, etc. You also need to consider how you will set up this infrastructure and whether there are any integrations that need to be developed before deploying a production-ready model.

It is important to remember that the scope of your AI project should be aligned with your business objectives. Your AI project should not aim to solve every problem in your business but rather focus on solving specific problems that will have a positive impact on your business.



CHAPTER EIGHT

Custom AI Solutions or Ready-To-Use Products?

CHOOSING THE RIGHT APPROACH
FOR YOUR NEXT PROJECT

Once you have defined the scope and goals of your project, you need to select the right AI approach for your project. There are many different types of AI technology, each with its own strengths and weaknesses.

When it comes to AI technology, you can either develop a custom solution or use a ready-to-use product.

Custom AI Solutions

Custom AI solutions are developed specifically for your business and your specific needs. The advantage of this approach is that you can tailor the solution to your exact requirements. However, the disadvantage is that custom solutions can be expensive and time-consuming to develop. In reality, custom AI solutions are also usually based on pre-trained AI models, which can significantly lower the costs and allow you to achieve higher benchmarks.

Many innovative companies simply cannot afford to stick with a ready tool. How can you stand a chance against your competitors if you're using the same tools? By identifying emerging problems and trends in the industry, innovative companies look for new ways to solve problems - ahead of the competition and offer cutting-edge solutions that are different from most other players. By using a ready-to-use product, you just lose the edge.

Also, while many AI products are marketed as innovative and unique, they are anything but. By using ready-to-use products, you put yourself at the whim of the company behind the product. There is little control over the features it offers and the development roadmap.

This might seem somewhat obvious, but by developing a custom artificial intelligence solution, you own the software forever. This opens many possibilities which are not available to you when using a ready-made third-party solution. For one, you can potentially sell the technology to third parties. That's especially important if this is part of your core business.

Custom artificial intelligence solutions are always the better choice when you're considering integrations with existing software. With ready-to-use products, it's mostly hit, or miss – support for specific integrations can be missing or fail to cover the scope you require.

Again, this stems from the lack of control over the product's functionalities and roadmap. Integration with further customized applications and developing dedicated visual interfaces might bring the most significant benefits for the business.

Ready-To-Use AI Products

Ready-to-use products are off-the-shelf AI solutions that can be implemented in your business with little or no customization. The advantage of this approach is that it is usually cheaper and faster to implement than a custom solution. However, the disadvantage is that you may not be able to get the exact functionality you need from a ready-to-use product.

The initial cost of buying ready-made AI software will be significantly lower than building your product from scratch. Before engaging in custom development in artificial intelligence, it always makes sense to do thorough research and find out if relevant software already exists on the market.

The ready-made AI solutions available today offer excellent capabilities for many generic use cases. For example, for recognition of handwriting, analyzing invoices, or basic chatbots, an off-the-shelf AI-based solution will do just fine, and there is no need for custom development.

The scope of features offered by ready-to-use products is often confusing. With the number of AI products available on the market today, choosing one that best meets your needs is difficult, even for a seasoned engineer, not to mention a business decision-maker. As a result, identifying and selecting the right AI tool becomes a daunting and time-consuming task. At the end of the day, when picking a ready-made AI tool, you will end up with several features which you don't need but still have to pay for.

In many cases, ready-to-use products also need some level of customization, setup, or integration, for which you will undoubtedly need the help of a professional. These added services can quickly eat into any cost savings that you might have gained by choosing a ready-to-use product in the first place.

When considering a ready-to-use AI product, always look for one that offers a free trial period. This will allow you to test the tool and see if it meets your specific needs before committing to a purchase.

The use of commercial AI solutions usually entails some degree of vendor lock-in. This can take many forms and shapes but should be considered when deciding as it may influence your future.

Specific vendors may implement tactics to make their customers dependent on their products and services, making switching to another vendor difficult or excessively expensive due to the need for large-scale refactoring.

Because so much is changing in artificial intelligence technologies today, you may not afford to lose your wiggle space - especially if the service doesn't meet your needs or the cooperation goes sideways.

When deciding whether to develop a custom solution or use a ready-to-use product, you need to weigh the costs and benefits of each option. If you have the budget and the time to develop a custom solution that will be an essential part of your company, then this may be the best option for your business. However, if you are working within a tight budget and timeline and are targeting a generic case, then a ready-to-use product may be the better option.

Talk to your AI Experts openly and evaluate the available options if you are unsure whether to develop a custom solution or use a ready-to-use product for your AI needs.

Investing in some quick consultations at this point may save you a lot of time and money in the long run.

CHAPTER NINE

Embracing Experimentation and Graceful Failure

GIVE YOURSELF SPACE TO EXPERIMENT DON'T BE AFRAID TO FAIL

In business, as in life, there will always be times when things don't go according to plan. This is especially true for those who are brave enough to experiment with new technologies like AI. In order to be successful, it's important to accept this fact and be prepared for pivots and failures.

In our experience, the biggest mistake that companies make when trying to implement AI is not embracing experimentation. Many businesses want to see immediate results from their AI initiatives and are unwilling to experiment.

The second mistake is not having a plan for graceful failure. Every experiment will not be successful, and there will be failures along the way. The key is to learn from these failures and use them to inform future experiments.

In some cases, over a series of experiments, you may learn that ML is not for you; it may be the case that the data simply does not hold the insights you were looking for, or the benchmarks you achieve are not satisfactory enough to invest further.

> *Failing fast is crucial to success when implementing AI, and it is essential to communicate this to all stakeholders from the beginning.*

AI is a new and evolving field, and there is no one-size-fits-all approach to implementing it in your business. The best way to find out what works for your company is to experiment and iterate on the solution under development.

Recommended Approach

AI Proof of Concept

Creating a proof of concept can perfectly demonstrate the business value for all the stakeholders and decision-makers. In this approach, you don't need to develop the whole project but verify your idea and the idea possibilities on a tight budget and in a short time. A PoC helps you determine if what you're trying to achieve is feasible and if doing it with AI is worth it in the first place. It might also have a limited amount of features, but enough to prove that the final project will work and bring the expected value.

For AI development, it is crucial to embrace the culture of iterative experiments. Each experiment focuses on evaluating data haves and creating an AI model. When building an AI Proof of Concept, you will start with a small sample dataset and use AI to prove the value that lies within.

AI Proof of Concept helps consider the benchmarks and the possibilities of a full-grown model working with new data at scale. It lets you decide early on whether AI on production would give you the desired value and is worth the investment.

A Proof of Concept is a critical stage in implementing an AI-based solution. It serves as a showcase of the potential of AI and helps to determine whether or not the AI solution will be successful. What's important, PoC always uses actual data to solve a real problem.

A PoC is like trying on clothes before buying. The first-hand experience of touching the fabric and looking in the mirror can answer many questions that a product description can't.

This is important, especially if there is a degree of uncertainty about whether a solution will work. An AI proof of concept will help you evaluate your data and tell you whether a solution can provide the value you expect and, if so, how much benefit it would bring. This way, you can determine whether the benefits are worth the investment.

If you want to kickstart your AI Project the right way, we recommend doing an AI Proof of Concept first. This will help you validate your ideas, inspect your data, and test your assumptions. After the PoC is complete, you'll have a strong business case for the production implementation of your AI project.

Develop Your AI Proof of Concept

CHAPTER TEN

Building a Data Infrastructure for Your AI Projects

MACHINE LEARNING DATA OPS FOR BEGINNERS

To successfully implement AI projects in your business, you need a data infrastructure that can support the volume and variety of data necessary to train AI models. Here we briefly outline how to build such a data infrastructure.

Data is the foundation of every AI project. Without data, there is no AI. When planning to implement AI in your business, it is vital first to assess the data that you have available and identify any gaps. Once you clearly understand the data landscape, you can begin to build a data infrastructure that will support your AI projects. It is also essential to consider how you will store, access, and manage your data going forward.

Data operations in place will help ensure that you have the necessary data to train your models and that your data is of high quality. It will also help you avoid any potential bottlenecks during the implementation process.

When building a data infrastructure for AI, there are four key considerations:

Data Collection

You need to have a plan for how you will collect the data required to train your models. This may involve working with internal teams, external partners, or both. In some cases, you will need to build dedicated pipelines for real-time data collection (e.g., from the manufacturing processes) or get your data from external data sources (open source or paid datasets).

Data Preparation

To train your models, you must prepare your data. This may involve cleaning and pre-processing your data, as well as creating training and testing sets. Data preparation can be time-consuming, but it is essential for ensuring the quality of your models.

Data Storage

You need to have a place to store your data. This may be a relational database, a NoSQL database, or some other type of storage system. It is essential to consider how you will access your data (e.g., via an API) and how you will keep it secure. Cloud environments can be a good option for data storage, as they provide scalability and flexibility. Big cloud providers also have services for AI model development that will be handy (e.g., Amazon SageMaker, Google AI Cloud Platform, Azure ML).

Data Management

You need to plan how you will manage your data. This includes everything from labeling your data to ensuring that it is of high quality. It is also important to consider how you will approach version control, access and updates, and security.

Building a data infrastructure is a complex task, but it is essential for any business that wants to implement AI. Without a strong foundation of data, your AI projects will not succeed.

nexocode can help you with all aspects of data infrastructure, from data collection and preparation to storage and management.
We have a team of experienced data scientists and engineers who can help you build a data infrastructure that is tailored to your specific needs.

CHAPTER ELEVEN

Training and Deploying AI Models in Your Business

MOVING TOWARDS PRODUCTION
WITH YOUR AI MODELS

Training the model is one thing. Deploying an AI model in a production environment is another, and it can be a daunting task. There are many things to consider, such as the infrastructure requirements, scaling and performance issues, security, and monitoring.

Once you have a data infrastructure in place and promising outcomes from your AI Proof of Concept, you can begin to train and deploy AI models in your business. This process will require close collaboration between your domain experts, data science, and engineering teams.

Operationalizing the PoC entails connecting the PoC with other systems. This may require writing APIs for the systems, embedding the PoC into a more extensive pipeline, or another approach to bringing the PoC online.

These efforts will have an associated cost, and the costs should be able to be quantified based on the metrics gathered during the implementation of the PoC.

Many AI-based products heavily rely not only on the sole model but on various additional features and functionalities that support user needs. Once you're past the first implementation phase, you might want to focus on those.

In order to do that, it is vital to understand how the users use your product and what their needs are. User research and design thinking methodology will help you with that. It can be conducted through surveys, interviews, or focus groups, and then, thanks to the common availability of design and prototyping tools, tested and iterated on.

Don't forget that the success of an AI project does not only depend on the technical aspects but also on how well it is received by the users. Make sure to involve them in the development process as early as possible and get feedback at each stage.

Monitoring and Maintaining AI Models

Once your AI models are deployed, you need to monitor them to ensure they perform as expected. This includes tracking the accuracy of the predictions and the performance of the system as a whole (e.g., accuracy, precision, recall, and speed). You also need to be able to detect when there are problems with your models so that you can take corrective action.

Retraining and fine-tuning the AI model is an essential aspect of operationalizing AI in your business. As data changes over time, your models will need to be retrained on new data to maintain their accuracy.

Retraining should be done regularly, and you should have a plan for how this will be done. This process is usually handled by Data Scientists and ML Engineers that are responsible for the maintenance of the AI models.

When problems are detected with your AI models, you need to be able to take corrective action. This may involve retraining the model on new data, changing the algorithms or parameters used, or even replacing the model entirely. It is crucial to plan how you will handle these situations to take action quickly and effectively.

CHAPTER TWELVE

Tips for Success When Using Agile Methodologies With AI

BEING AGILE IN AN AI WORLD

Agile methodology is a popular and effective way to manage software development projects. But can it be used successfully with AI projects? The answer is yes, but there are some things you need to keep in mind. In this chapter, we will discuss the key considerations for using agile methodology with AI projects.

Artificial Intelligence projects are usually far more complex, expensive, and multi-disciplinary than traditional software development. They are considered one of the most challenging projects in the project management world.

The product discovery process is usually more intricate and takes much more time. The teams are also more diverse – connecting people with different skills (also from outside IT-bubble) and responsibilities like data scientists, developers, designers, psychologists, and user experience specialists.

Moreover, many of those projects operate on a high level of innovations where many factors and end results are unknown. This is why the Agile AI project management approach should be adopted by combining it with the traditional software development process.

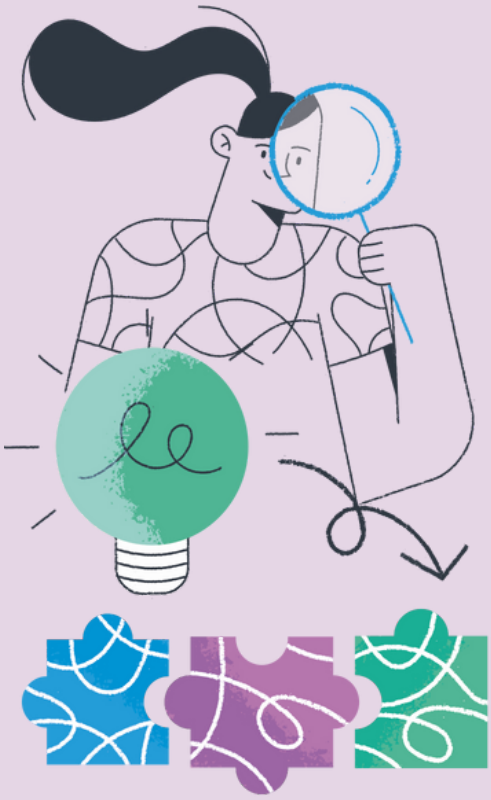
Even though agile principles are originally designed for IT teams – there is no reason to ignore them in AI projects. The only difference can be found in its interpretation: some practices may need different implementation and adjustments than they would have when applied to a typical IT project.

To succeed in AI, companies need to adopt agile project management techniques, but they need to match the particular needs of AI projects. As mentioned earlier, AI projects require a lot of experimentation, and it's not easy to use old-fashion product development methods with this level of uncertainty – like, for example, clean Agile.

Agile methods such as short iterations and continuous testing are required to ensure that the AI model is developed according to the requirements of customers and business needs.

A custom approach should be applied when it comes to AI projects - they require a particular culture within an organization, new skillsets for developers who will work on them, and well-defined processes around product development.

So, what should be done differently when applying agile methods to AI projects?



10 Tips for Successful AI Initiative

1. Gain AI knowledge and understand the complexity of AI projects and plan accordingly.

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2. Start small by running quick AI Design Sprint workshops and running a pilot with AI Proof of Concept.

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3. Be flexible in how you define and scope your AI projects, still have a clear vision for your project, and make sure everyone is on the same page.

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4. Make sure that you have a good understanding of the data before starting to build models.

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5. Use short iterations to test hypotheses and benchmark your models.

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6. Experiment with different approaches and algorithms until you find what works best.

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7. Be prepared to retrain your models on new data as it becomes available to maintain their accuracy.

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8. Monitor your AI models closely, and take corrective action when necessary.

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9. Make sure you have a plan for how you will handle retraining and corrective action.

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10. Always involve your users in the development process, and get feedback at each stage.

CHAPTER THIRTEEN

Measuring the Success of Your AI Implementation

METRICS FOR BENCHMARKING AI PROJECTS

It's not always easy to tell whether an AI project is successful or not. In fact, the success of such projects can be quite difficult to measure. This is because there are many different factors that can contribute to the overall success of an AI implementation.

There are a few ways to measure the success of your AI implementation. One way is to look at the business results that you achieved. Another way is to look at how well your AI solution performed against specific objectives or goals. And finally, you can also look at how your AI solution was received by users. And remember, just like any other software product, in AI projects, it is essential to look at the outcomes, not the outputs.

Business Results and the ROI of AI

Costs

As previously said, building a custom AI system is almost always a significant investment. You need to invest your resources to bring you profit. High costs of development will influence your ROI. Don't forget about including the costs of team, licenses, security, platforms, algorithm, model design, data, etc.

Savings

This might be one of the most important ways to measure the ROI of AI. Sometimes the AI project can bring you profit in reduced costs of your company's daily activities instead of a pure income in cash.

Soft Profits

Not only profits or savings can be the benefit of a machine learning project. With the support of AI, you can improve your company in countless areas like, for example, productivity, product quality, and customer satisfaction, and this can lead your company to increased profits later.

Goals and KPIs

Try to predict the purpose of your project, especially from the financial perspective. We suggest you think about the point in time when your investment in the AI project will be equal to your benefits from it.

Future Profits

Very often, the implementation of AI in the company generates a new revenue stream, so you should also consider them before predicting the ROI of AI investment.

Objective Model Performance

Accuracy

This is the most critical metric for many machine learning models. You should track the error rate of your model and try to improve it over time. The goal is to have a model that is accurate enough for your needs. There are different ways to measure accuracy, and you should choose the one that is most appropriate for your project.

Confusion Matrix

True positives, true negatives, false positives, and false negatives. These terms represent accuracy rates for binary classification.

Precision

Precision measures the number of correct predictions out of all the predictions that were made.

Recall

Recall measures the number of correct predictions out of all the possible correct predictions.

F1 Score

F1 score is a combination of precision and recall, and it is a good measure to use if you want to balance precision and recall.

Specifity

Specificity measures the number of correct negative predictions out of all the negative predictions that were made.

Speed

In some cases, speed is more important than accuracy. For example, if you are building a real-time system, you need a model that can make predictions quickly.

Scalability

Scalability is essential if you want to use your AI solution on a large scale. For example, if you're going to use your machine learning model on a website with millions of users, you need to make sure that your model can handle the load.

User Experience

Satisfaction

One way to measure satisfaction is to ask users how satisfied they are with your AI solution. You can also look at factors such as how often users use your AI solution or how long they spend using it.

Adoption Rates

Another way to measure satisfaction is to look at adoption rates. This is the percentage of users who adopt your AI solution.

Time Spent

You can also measure user experience by looking at the amount of time that users spend using your AI solution. If you were looking to optimize a process, lower time rates, and if you were looking to build engagement, then look for higher rates.

The Number of Errors

Another way to measure user experience is to look at the number of mistakes that users make when using your AI solution. You can use this metric to compare different AI solutions or to track the performance of your AI solution over time.

General Feedback

You can also ask users for general feedback about your AI solution. This can be done through surveys or interviews.

The Benefits of Becoming an AI-Driven Company

The benefits of becoming an AI-driven company are many and varied. In this section, we will explore some of the most significant advantages that you can enjoy by implementing AI solutions in your business.

Increased Profits

One of the essential benefits of AI is that it can help you improve your earnings. By using AI to automate repetitive tasks or to make better decisions, you can free up time and resources that can be used to generate more revenue. In addition, AI can help you improve your customer service, which can lead to increased sales and higher customer satisfaction rates.

Improved Decision-Making

Another benefit of AI is that it can help you make better decisions. Using data and analytics, AI can help you identify trends and patterns that you might not be able to see on your own. This information can be used to make better decisions about your business, such as where to invest your resources or how to allocate your budget.

Increased Efficiency

AI can also help you increase the efficiency of your business. By automating tasks or processes, AI can help you free up time and resources that can be used more effectively elsewhere. In addition, AI can help you streamline your operations by identifying inefficiencies and bottlenecks.

Improved Customer Experience

One of the most important benefits of AI is that it can help you improve your customer experience and service. Using chatbots or virtual assistants, you can provide 24/7 customer service without needing human intervention. In addition, AI can help you personalize your customer service to each individual, leading to increased satisfaction rates.

More Sustainable Solutions

Another significant benefit of AI is that it can help you develop more sustainable solutions. For example, by using predictive maintenance, you can reduce the amount of downtime for your equipment. This not only saves you money but also helps to protect the environment by reducing the need for new resources.

A Competitive Edge

Finally, one of the most significant benefits of AI is that it can give you a competitive edge. In today's marketplace, businesses are constantly looking for ways to gain an advantage over their rivals. By implementing AI solutions, you can give your business a leg up on the competition and stay ahead of the curve.

These are just some of the benefits that you can enjoy by becoming an AI-driven company.

Implementing AI solutions in your business can help you increase your profits, efficiency, and customer satisfaction while also freeing up time and resources that can be used more effectively elsewhere.

Discussing AI solutions is a great place to start if you want to improve your business.

Closing Words

Going From AI Vision to a Successful Product

We've seen in this ebook how success with AI is driven by three key ingredients: the right team, the right data, and the right agile process.

If you are looking to implement AI solutions in your business, then remember to keep these three key ingredients in mind. Build a strong team of AI experts in-house or by hiring AI development partners who can help you design and implement AI solutions that are tailored to your specific needs.

Make sure you know your data and have access to high-quality data that can be used to train and test your AI models. Always start with a thorough data investigation to ensure you have the right data for your AI project. Whenever needed, build appropriate data collection infrastructure to get the data you need.

And finally, the most critical ingredient of all, be prepared to iterate and experiment, embracing lean practices. AI is a constantly evolving field, and the only way to stay ahead of the curve is to adopt an agile process that allows you to test and implement new AI solutions rapidly.

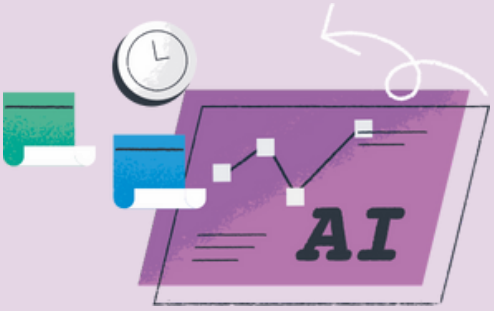
Following these tips can set your business up for success with AI. Implementing AI solutions in your business can help you increase your profits, improve your customer service, and give you a competitive edge. So what are you waiting for? Start building your own AI-driven company today.

Our Services

What Can nexocode Offer as a Boutique AI Development Company?

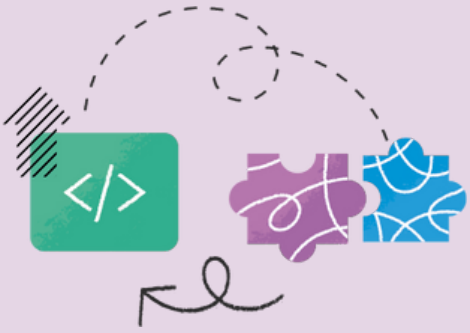
Find AI opportunities for your business and bring them to life. nexocode team serves clients at every level of AI maturity.

AI Design Sprint



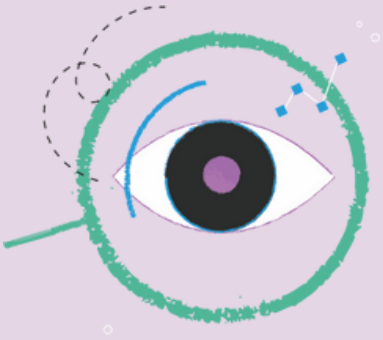
AI Design Sprint workshops are a hands-on experience where, together, we identify potential AI use-cases for your business and explore the business opportunities available to you. We have created a set of tools for each step of the design-thinking process to help our clients turn AI into social, user, and business value. Within just two days, your team, supported by our AI Engineers and Design Facilitators, can learn and understand the power of emerging technologies, spot AI opportunities, and create new ideas and visions.

AI Proof of Concept Development



Move from the AI Design Sprint towards your first deployment. nexocode will develop a competitive AI-based solution that solves your company's problem, covers your business needs, and collects and analyzes feedback from testers. Proof of Concept guarantees a much smaller risk of failure, as it only takes a couple of weeks to develop. Still, you can quickly observe what AI brings and decide whether the achieved results look promising enough to follow up with further investment so that you can define your next key goal.

Data Quality Audit

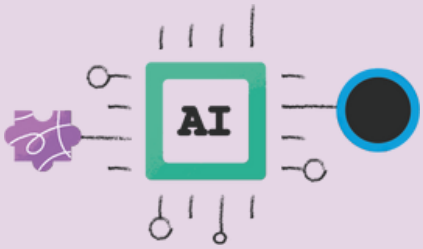


Data represents a new frontier for competitive differentiation. nexocode offers professional data analysis for your model proposal. We will suggest a data collection strategy that will make your model more accurate and provide value to your company. With your data house in order and a transparent process for data management, you will be able to shape your data into a true business asset.

Building Data Systems & Integrations

Unlock the value of data with a clear data strategy, process, and technology that supports it. nexocode will support you in applying professional MLOps. The practices we apply will help guarantee that you can reliably build and operate your artificial intelligence solution at scale.

Custom AI Software Development



If your goal is to implement your own dedicated AI solution linked to your other services and products, nexocode is the company to choose from. You can rely on nexocode's AI team, composed of data scientists, ML experts, MLOps professionals, and software engineers. Our project managers, experienced with AI, will lead the implementation efforts in an agile way.

AI Consulting Services

With vast expertise in implementing AI solutions, the team at nexocode reviews your problem and provides consultations on approaching further steps to complete your business goal and making an impact. We will help you grow beyond the proof of concept stage and implement AI at scale.

About the Author

Dorota Owczarek is a Product Lead working on AI products that build resilience and business results. For over ten years, she has supported different industries, developing AI products to help businesses achieve their goals.

At nexocode, she helps clients go smoothly through an organizational transformation with digitization and the introduction of AI-based solutions. She guides them on how to make the changes necessary for a successful transition to becoming an AI-focused entity.

For clients at more mature stages of AI adoption, she acts as a Product Manager, covering the ongoing process of AI agile development processes and operationalizing AI throughout the business. She oversees the AI lifecycle to ultimately allow nexocode clients to scale AI across the organization through various workflows.

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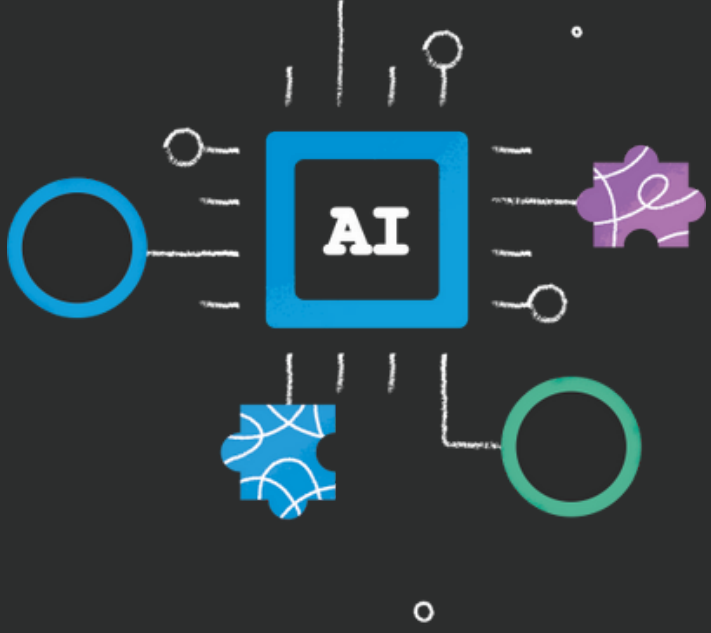

Thank You!

Ready to get started with AI?

Try our unique human-first approach to artificial intelligence and find out how technology can deliver results for your business.

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Schedule a Call >