Applying AI: How to find and prioritize AI use cases
“Don‘t waste time on AI for AI‘s sake. Be motivated by what it will do for you, not by how sci-fi it sounds.”

Cassie Kozyrkov, Chief Decision Scientist at Google
Applying AI

Intro

A central challenge for companies applying AI is working on the right use cases. There is a wide range of possibilities for implementing AI. But many companies struggle to find and prioritize relevant AI use cases – frequently this follows a mostly random process.

While AI experts have a good sense of applications of AI, they are typically detached from actual business problems. On the other hand there is often a lack of understanding of AI in the departments where potential use cases could be found. This might not only result in overlooking relevant use cases but also in overly optimistic expectations of what AI is capable of, or a focus on “common” use cases that employees might have seen in the media, e.g. chatbots. Furthermore, most companies have no clear strategy when it comes to defining and prioritizing use cases, and AI use cases are often prioritized without considering their business value.

The issue with this approach is that the application of an arbitrary AI use case could well have a detrimental economic effect. First, building the required model brings with it both initial costs and ongoing maintenance costs. The value of using AI - either through a reduction of costs or additional revenues - needs to be higher than these costs.

But what if these figures don’t match up, and the model costs more than it could potentially save? The company might just revert to the old process and write off the development costs of the AI solution. However, it is likely that more damage would have been done than would be immediately apparent. In most companies, at least in Europe, AI is quite often regarded with widespread skepticism. If an initial AI project fails, the danger is that the naysayers could get the upper hand, impeding any future projects.

Furthermore, companies have limited resources; in particular there is currently a shortage of AI engineers. Working on the "wrong" use cases results in opportunity costs as companies might miss the opportunity to implement more value-adding use cases.

This report aims to guide you through a sound and structured process of identifying possible AI applications, prioritizing the right use cases and building your portfolio of AI use cases.

However, working on use cases is only one part of a comprehensive AI strategy. Before you work on use cases, you should define your AI vision and address the necessary enabling factors (see next page).

What is a use case?

But let’s start at the beginning: What is an AI use case? An AI use case is a clearly defined set of activities designed to reach a specific goal from a business or customer perspective, in which one or more AI solutions are involved in reaching the respective goal.

Let’s take the following example: A chemical company uses a particular substance for one of its products. The substance has to be of a certain purity, and currently the company checks this using a time-consuming and expensive chemical analysis process.

The company might consider automizing this process and developing an AI model that is able to predict purity levels from photographs of the substance. After all, if AI is able to diagnose lung cancer from X-rays, why should it not be able to detect when this substance is contaminated? This sounds like a good idea that is worth trying – but is that the right model to start with? Let’s steer clear of detailed assessment at this point and first just review the use case definition in the light of the example.

The clearly defined set of activities could be as follows: From every delivery, a machine takes ten samples of the substance and prepares them so that the surface can be automatically photographed. The images are fed into the AI model.

The specific goal from a business perspective is the correct prediction of purity levels and perhaps also a predefined set of automated actions to prevent contaminated deliveries coming into contact with the machines used in the production process, as this could result in further costs, e.g. for cleaning the machines or due to a temporary production standstill.

An in-depth description of a use case, with at least this level of detail, is a prerequisite for making an economic assessment. And the question that arises is not only whether or not the model is feasible but also how feasible it is with respect to other potential use cases. There is a distinct shortage of data scientists and AI programmers and, as a consequence, a company might not be able to develop several projects at the same time. If the most promising projects are not prioritized, a company might not lose money, but would certainly not be maximizing its profitability.
Elements of a comprehensive AI strategy

There is little doubt that AI will become relevant for all companies, regardless of their industry or size. When it comes to creating value from AI, several pitfalls can be observed in practice – including the isolation of AI use cases, the lack of resources and capabilities, and a poor understanding of use cases and applications.

To avoid this, a systematic approach towards AI is needed. Therefore, from the very beginning, you need to be clear on the overarching objectives or purpose of your company: What is its goal? Furthermore, it is necessary to understand how AI can help to achieve your objectives.

A comprehensive AI strategy consists of three parts: an AI vision, a portfolio of AI use cases, and a clear strategy for the required enabling factors.

A company’s AI vision sets the high-level goals of any AI application to be developed or deployed. It includes an understanding of the current position of the company, its competitive position and industry dynamics, and potential changes to the industry’s business model. On this basis, it can be decided where the organization could benefit most from AI – within a specific product or service and/or by improving processes.

The vision needs to be translated into a portfolio of AI use cases. To build this portfolio, you need to identify and prioritize relevant use cases.

To execute the use cases a set of enabling factors is required concerning the organization, the people, the technology, and the AI ecosystem.

All of these aspects need to be taken into account when it comes to the development of a comprehensive AI strategy and are further detailed in our report “Elements of a comprehensive AI strategy”
A systematic approach towards use case ideation and prioritization

To avoid the aforementioned problems, companies should follow a systematic and rigorous approach to finding and prioritizing their use cases. This process should consist of four steps.

1. Find the relevant cases

First of all, the use cases need to be identified. You can identify use cases that build upon strategic goals as well as existing strength. To do this effectively, you need to bring employees with relevant business knowledge of the specific domain as well as with knowledge of AI together. It is helpful to have a clear problem in mind that can be solved by AI – AI is a solution, so you need to define the right problem.

2. Define the use cases and make an initial assessment of each use case

However, finding use cases is not enough. It is also essential to clearly define each use case and make an initial assessment of both its value and its complexity. It’s quite easy to overlook some of the potential problems or questions, in particular when employees from a number of different departments, and hence with a wide range of knowledge from different domains, are involved in identifying and describing use cases.

3. Prioritize use cases

Given a set of cases, how can you be sure to address them in the correct order? How do you set priorities? Overall, use cases should be prioritized based on the value they deliver and how easy they are to implement. However, there is more to prioritizing use cases than this. When a company starts using AI, it should first try to find a good “starter use case”, while companies with more experience in applying AI should strategically build their use case roadmap by addressing use cases that rely on the same data assets and/or the same technology.

4. Execute the use case

Before executing the prioritized use cases, it is necessary to make an in-depth assessment of each case and any assumptions that have been made. Once you are certain which use case should be implemented, you have to decide how this should be done: Do you want to implement the use case yourself? Are there “off-the-shelf” solutions that could be (wholly or partly) used instead? Or would it be more feasible to contract out the implementation to an external company?

Further details on these four steps are provided in the following sections.
Identifying relevant cases

The first challenge is to identify relevant use cases. In almost every company there are dozens of potential AI use cases, but companies frequently struggle to identify those that are most relevant – beyond the most obvious cases. One reason for this is a disparity in the knowledge base. Employees with relevant business knowledge typically lack AI knowledge, while those with AI knowledge tend to be detached from actual business problems. In short, the problem doesn’t know that a solution exists, and the solution does not know that there is a problem; the two never come together.

To overcome this problem, use case ideation should follow a structured process. There are two comprehensive perspectives that you should combine to identify all relevant use cases:

- **Identify use cases that support your business** - either by making your processes more efficient or improving your products - and advance your company's AI vision. Your AI vision answers the overarching question of how AI can help to achieve your corporate objectives. It also sets high-level goals for AI applications and defines the use case search focus, i.e. in which product (lines) or processes should you look for use cases? Focus on your existing strengths and consider how AI could help you in these areas.

- **Identify use cases that build on existing data assets or AI capabilities.** These are use cases that could be feasible given the data assets or AI capabilities that are available at your company. Here, the focus is on how you can use your resources to profit from AI.

The combination of these two perspectives will ensure that all relevant use cases are identified. The first perspective can be used to identify two kinds of AI use case:

- **Product/service-centric AI**: Using AI to improve existing products or create new AI-driven products
- **Process-centric AI**: Using AI to improve or redesign internal processes

To identify product/service-centric AI use cases, you should prioritize your products/services by the highest value (e.g. share of revenue) and/or the highest importance. For those products, think of customer needs: How can AI be used within the existing products, or for new products, to address unmet needs of your current or potential customers?

Entirely new AI-driven products and business models can be generated by assessing potential uses of AI. Equally, to find process-centric AI use cases, the existing processes within your company need to be analyzed and prioritized. The best starting point is processes that are costly and/or important to your business. Once you have identified these processes, you can begin to ask questions...
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such as: Can AI make these processes more efficient, more automated, or more precise?
In doing so, you should be aware of the following: AI can be used to either support existing processes or to disruptively transform an entire process. While the first means using AI to change a sub-process, the later refers to using AI to completely rethink a process. One example of a disruptively transformed process would be an insurance company using image recognition to automatically assess car accident claims without involving human decision-makers. This would drastically lower the cost of claims handling as well as reducing cycle time.

One way to identify process-centric AI use cases is through a systematic breakdown of your processes. Break each process down into its isolated elements and see if any parts of the process can be automated using AI – think of automating tasks not jobs. There are three indications whether a task can be automated by AI:

• First, if the task is currently repetitively done by a human with less than a second of thought;
• Second, if a task is based on (many years of ) experience that can be codified;
• Third, if the task can be completely described by rules and it is executed within a “closed” system.

The second perspective involves trying to identify use cases based on existing assets or capabilities. Which data assets do you have that are unique and could be the source for potential use cases?

• Start by assessing these unique data sources
• Generate use cases that utilize these data assets:
  How can you utilize the data in a useful way internally or for adjacent businesses.

Furthermore, if a company has already developed its AI capabilities, for example in image recognition, related use cases should be identified that build on these strengths:

• Start assessing your existing use cases/AI capabilities
• Identify use cases that utilize the same data sources and AI capabilities

Given the need to combine both domain expertise and technical capabilities, AI use case ideation is a task that should be carried out jointly by a central AI expert team (e.g. the AI Center of Excellence) and the respective business unit. Both groups have clearly defined roles. The central unit provides AI expertise as well as a link to the overall AI strategy, while the business unit should train dedicated business-side employees to understand AI and carry out use case ideation. It should also be the owner of the idea, as this helps to ensure that the application will be accepted by the potential users later on; when people feel that a use case is “their” project, the application is more likely to be successful.

The more diverse a group that can be set up, in terms of the different tasks group members have within a company, the better. Of course, there should also be some AI experts – but they can clearly be in the minority.

The formats that can be used to identify use cases are similar to “traditional” ideation sessions. These often involve classic brainstorming techniques – but there are other options:

• Process observations can be carried out jointly by the process owners and AI experts.
• You can involve your customers in so-called customer clinics.
• Hackathons can help to quickly generate and test new ideas.

To prepare a use case ideation session, it also helps to look at the use cases that are already being implemented internally, what your competitors are using, and which use cases are being implemented in other industries – the appliedAI use case library helps to find those (see next page)

If you feel you don’t know much about the possibilities of AI or use cases implemented in other companies or industries, we have collected a library of AI use case families that may be useful. This collection is intended to help business leaders and decision-makers quickly evaluate some of the real applications for artificial intelligence. Based on discussions with our partners, experts in the domain of AI, and our own work, we have grouped AI use cases into 77 families. Each of these use case families contains a multitude of in-company use cases. Since the field is evolving rapidly, this library is not complete and will be constantly updated as the field develops.
Assessing use cases

Once you have a good list of potential use cases, you are confronted with the second challenge: How to understand what a feasible use case is. To do so, you will need to assess each of the ideas on your list. A prerequisite for this is a precise description of each of the cases. Ask yourself the following questions:

• What is the objective of the use case?
• Where does AI come into it, i.e. what is predicted or learned by the AI model?
• Which products or processes could it be applied to?

The following would be more useful: “Use AI to reduce customer service costs by predicting customer intentions and automatically handling the most frequent requests via a chatbot interface in the online customer service process.” Similarly, you can use the “AI use case statement” structure below to clearly describe any use case:

“Use AI to [Objective, KPI] by learning/predicting [role of AI] in/within/on [the related product/process]

After defining your use case, you should make an initial assessment of its value and complexity. The following aspects should be assessed:

Value
• Business value: What is the economic potential of the use case, i.e. in terms of cost reduction, additional sales, quality improvement, customer contentment?
• Customer value: How does the use case help a customer or user?
• Strategic alignment: How does the use case fit into the strategic goals of the company?

Ease of implementation
• Data: What data do you need for the use case? Is this data available? Where could you gather additional data if your database is too small?
• Algorithm: Are there other implementations of the use case already up and running – within your company or elsewhere, i.e. in other companies or even other industries?
• Process/Systems: Which processes and systems are affected? Do you need to make changes to any of your processes?
• Required expertise: Do you have the necessary technical and domain knowledge?

This might sound rather complex, but it will help tremendously with the initial assessment of the complexity of the application, as well as of the potential value.

appliedAI has developed an AI use case canvas that facilitates the creation of a clear description and first assessment of a use case. This canvas enables even non-AI experts to make an initial assessment of the complexity of an AI use case.
Use Case Canvas

Capability

- Vision
- Audition
- Linguistics
- Mathematical machines
- Interpersonally intelligent machines
- Motion robotics

Owner

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Description

Use AI to...

Requirements

- Safety critical
- Very high accuracy
- Auditable

Value

Estimated business value (€ p.a.)

Affected KPI

Customer value

In line with AI vision?

- Yes
- No

If yes, how?

Ease of implementation

Input data

- Readily available
- Data to be cleaned
- Data not available

Algorithm/Solution

- Known solution
- Solution used in other domain
- Not known

Affected processes/systems

- No proc./syst. affected
- Syst. affected but no proc.
- Proc. & syst. need to be changed

Know-how required

- Technology & domain know. available
- Domain know. available
- No knowledge available
Prioritizing use cases

Once a set of use cases has been identified and assessed, you still have to make sure that you focus on those that are most relevant – the potential applications of AI are endless, in order to apply AI most effectively, use cases must be prioritized.

There are three aspects to be considered before you can make a decision:

- What value does the use case add to your company?
- How easily can the use case be implemented?
- Are the use cases related? Do use cases share the same data and/or the same technology?

Often, companies focus on only the first two aspects (value and complexity). However, AI use cases are not independent of each other. Building up and cleaning data assets can require a high level of investment; equally, it is costly to build up talent and infrastructure in a specific domain. Completing an AI use case will lower these costs for subsequent use cases that use similar data and infrastructure. Thus, use cases should be evaluated in clusters. To prioritize use cases, first map them onto a prioritization matrix, evaluating strategic value and ease of implementation. Once that has been done, cluster the use cases by the following parameters:

- The required input data type,
- The AI capacity it will require,
- And the product(s) or process(es) to which it could be applied.

Prioritize those clusters that have a large number of use cases with high value and at least some use cases that are relatively easy to implement.

Within the prioritized clusters, pick one or two cases for validation; this will mean you are dealing with three to six cases in total. Good candidates can have different characteristics; for example, it might be possible to implement them quickly and hence ensure “quick wins.” They could have a high strategic value or high marketing relevance. Or they could be easily scalable, for example to other products or processes. These use case clusters are the base for building your use cases roadmap.

Prioritizing use cases works a little differently in companies that are just getting started applying AI. Here, it is especially important to select a good first use case. It is best to pick a “kick-off” use case that is likely to succeed rather than the most valuable use case. Success is likely if the data and the solution are already known (e.g. because it is a standard application already in use within other organizations). It should also be “visible” in order to generate attention within the organization as a whole. This is most likely to be the case if the use case is related to the core business. Visibility can be enhanced by the internal communications department, which should also ensure that the technical solution is explained in non-technical language to the staff, and the value it adds to the business made clear. It is also important to explicitly explain the goal of a use case. Is it about addressing a particular process or rather for exploring new fields of technology? Expectations must be set accordingly.
Getting started: Execution

Before you tell your AI engineers to start coding (or contract an AI company to do so), there is one last thing you need to verify. You need to validate the assumptions you have made – both from a business as well as from a technical perspective. Among others, you should answer the following questions:

• Which factors are driving the value of the use case?
• How much data is needed? Do you really have the data and is it accessible?
• Which level of accuracy is needed and is it achievable?

Furthermore, you should do an ethical and legal due diligence of the use cases: Make sure that the use case is not doing harm and is in compliance with the laws of your country.

At this stage of the process, you need to balance a further detailing of the use case with speed. When developing a rough business case for an AI application, insisting on a detailed business plan is not always helpful. But when you are just about to start the execution phase, there should be no more doubts or open questions. After this detailed assessment of the use cases, you might have to re-prioritize your use cases and use case clusters – this is mostly an iterative process. Based on your prioritized use case clusters, you can build your use case roadmap: Start with your prioritized use cases within the clusters and think of interdependencies.

Once you’ve built your use case roadmap, you will need to make a decision that crops up every so often within a company in relation to many different types of project: Do you want to do it (in this case: develop it) yourself – or purchase it from an external company.

If you decide to develop a use case internally, you should start with a hackathon-like approach to reduce uncertainty, which is your biggest enemy. Uncertainty is an intrinsic part of any AI system. Some use cases seem easy at first, but if they are only slightly altered to address the needs of your company, they can turn out to be far more difficult than expected. Fortunately, the opposite is sometimes also the case. If a project runs into difficulties, your time-resource estimation will need to be adjusted.

It is very important to include data exploration as a fundamental initial element. Otherwise, you will be unable to understand whether the available data is sufficient to solve the problem at hand.

Lastly, be sure to follow the golden rule: Start small and then grow. Continue experimenting with prototypes – if the proof-of-concept phase delivers the desired results, you can work on the actual product on a bigger scale.
About appliedAI

The appliedAI Initiative, Europe's largest non-profit initiative for the application of artificial intelligence technology, aims to bring Germany into the AI age and offers its wide ecosystem of established companies, both large and small, researchers, and startups neutral ground in which to learn about AI, implement the technology, and connect with each other. NVIDIA, Google, MunichRe, Siemens, Deutsche Telekom, and many more are partners of the initiative, which started in early 2018.

You can find more information about appliedAI at: www.appliedai.de
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