

A Maturity Model for Artificial Intelligence



Based on our AI strategy approach, we have developed a maturity model for the adoption of artificial intelligence, that can support you to perform an AI assessment.

MANAGEMENT SUMMARY

Today, artificial intelligence is considered one of the most important megatrends of the new decade. In Europe alone, productivity increases of 20%-38% could be achieved by 2030 through AI [1].

To successfully establish artificial intelligence within a company, one should first understand the current status of AI adoption. At STATWORX, we have developed a model that is based on our AI strategy approach and can determine the level of AI maturity in organizations, divisions or departments based on the six dimensions (1) Data, (2) Use Cases, (3) Infrastructure, (4) Organization, (5) Team & Skills and (6) Governance. Thereby, companies can then be classified into five possible maturity levels: Aware, ad-hoc, opportunistic, integrated, or transformational.

This white paper presents both the background of the AI maturity assessment and methods for determining the specific maturity level. In addition, it outlines steps that will help you to systematically increase your AI maturity level.

WHY AI MATURITY LEVELS ARE MEASURED

Digitization has now taken root in most organizations. Large amounts of data are generated and stored every day. The opportunities of using AI to develop new products and services and increase productivity are extremely attractive for many companies. 9 out of 10 managers see AI as a business oppor-

tunity [2]. When looking at the market, an ambivalent picture emerges, despite the considerable possibilities of such intelligent technologies. While in some companies, the adaptation of artificial intelligence applications is already in full swing and strategic and operational measures are being taken to scale the technology, other companies are still lagging far behind in these areas. In accordance to the overall digital transformation, AI pioneers will strengthen their position, while other competitors will be left behind. As early as 2017, 38% of the respondents in a survey of 3000 executives already implemented an AI strategy in the company, and 23% of the respondents stated that they were piloting AI [2]. To enable a successful AI adaptation, every company must first make some internal findings: Where does the company stand in the application of intelligent technologies and artificial intelligence capabilities? Where should the application of AI lead in the short, medium, and long term?

In this whitepaper, we present our method for determining and increasing the AI maturity level. We will highlight the parameters for a successful measurement of maturity and concrete objectives that will help you define an AI roadmap.

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BACKGROUND: SIX AI MATURITY DIMENSIONS

Only few managers in organizations find it easy to classify their own company with regard to the adoption of artificial intelligence. Before measures to increase the level of AI maturity can be derived, a few guiding questions must first be answered: Which products and company functions are affected by artificial intelligence? What is the need for a successful application of AI? And accordingly: Where do we need to start to determine the degree of maturity? Based on our many years of experience in AI consulting and implementation, we have identified six dimensions that help managers derive concrete measures to increase their own AI maturity level and successfully lead the AI front of tomorrow.

DIMENSION 1: DATA

Not surprisingly, the dimension „data“ is a very important driver of the AI maturity level. Surprisingly, for most organizations, this factor is also the most significant operational challenge. It is not just about the mere accumulation of data, but also about related issues such as data quality, data availability, data cataloging, etc. Data is the foundation for the successful application and scaling of AI technology in the enterprise. Accordingly, it should be considered and treated as a strategic asset. Information about where which data is generated is just as important as the operational verification and maintenance of the data in the associated data warehouses or data lakes. Both AI experts and citizen data scientists need access to the organization's data to realize the full potential of AI solutions. During AI maturity identification, it is therefore essential to take a holistic view on the organization's data.

DIMENSION 2: USE CASES

True to the saying „artificial intelligence is not a use case“, the ability to identify and develop value-adding use cases for artificial intelligence is of crucial importance. It is essential to be aware of the potentials as well as the limitations of AI and transfer that knowledge to practical business problems. After a use case has been identified, it should be prioritized based on feasibility and success criteria. Furthermore, the systematic cataloging and organization of use cases in a roadmap is

an important part in determining the degree of maturity. Processes for identifying and prioritizing AI use cases become particularly relevant in the scaling phase when many departments and functions start planning and implementing AI projects for their business problems.

DIMENSION 3: INFRASTRUCTURE

A further adjustment screw for increasing AI maturity is the design of the organization's IT infrastructure. It forms the technical foundation in which artificial intelligence applications are developed. Several essential components are required to enable cross-departmental collaboration or to ensure the scalability of internally developed services. AI experts need to have the right tools to develop their applications and also the ability to make them accessible throughout the organization. Only in this way the AI solution can have a lasting impact. Finally, cloud technology adoption is also an important factor in determining the level of AI maturity. Various infrastructure scenarios can easily be deployed in the cloud, including those for AI projects. Furthermore, the large cloud providers also provide various AI services themselves, which can be used in AI projects.

DIMENSION 4: TEAM UND SKILLS

As a further factor of the AI maturity level, the dimension „team and skills“ plays a central role. According to a McKinsey study on AI adoption, the shortage of AI talent remains one of the biggest hurdles in the implementation of AI [3]. Therefore, a systematic build-up of AI expertise should be the focus for all organizations. The success of AI initiatives is driven by internal AI know-how and related skills. The spectrum of factors to be considered when determining the level of maturity is vast and ranges from meaningful job advertisements and current role profiles to the proper management of data science teams to suitable training concepts and offers for internal employees.

DIMENSION 5: ORGANIZATION

A significant differentiator between the AI pioneers and laggards can be found at the organizational level. The transforma- ►

BACKGROUND: SIX AI MATURITY DIMENSIONS

tive power of AI can only be harnessed if organizational conditions are adapted to it. The benefits that AI teams generate macroscopically often depend on how well they are integrated at the organizational level. Thereby, different organizational models can be applied, each of which has its specific advantages and disadvantages. The adaptation of internal processes to an agile, AI-oriented approach also contributes to the initiative's success. In comparison to static planning, agile work and project management can provide a higher benefit from AI projects. Therefore, the organizational and process-related integration of AI systems and teams is a crucial point in determining the current level of maturity.

DIMENSION 6: GOVERNANCE

Just like many other processes in companies, AI projects must undergo comprehensive governance. Various factors play a role here:

Control

Both guidelines and rules for the development and application of AI solutions contribute significantly to a company's AI maturity. Faced with the great potential of AI, the resulting risks must be identified and reduced. This is achieved by translating regulations on internal policies, e.g., in the areas of data protection, verifiability, or access rights, to ensure compliance. Furthermore, monitoring the success of AI initiatives is of high importance. Only companies that continuously measure performance and the resulting impact on the company's success metrics can correctly evaluate their AI endeavors. AI can only be leveraged by organizations if success factors can be identified and potential obstacles can be removed.

Explainability

Another critical point in the context of AI governance is the explainability of AI systems. The transparency and interpretability of different methods of machine learning vary greatly. Depending on the application scenario, it should be decided whether the models' explainability is of practical relevance. In many cases, a method with a slightly higher inaccuracy is pre-

ferable to a slightly more performant, but intransparent method. The field of AI-explainability is today an active research topic and of great economic interest. Driven by various mistakes of AI in the recent past, explainability and interpretability of AI systems play an important role in the governance process.

Ethics

In recent years, „AI ethics“ become increasingly important. Self-learning systems can, under certain circumstances, learn behavior that does not comply with core ethical values. Therefore, this should be explicitly taken into account when developing AI models. For example, the term „ML Fairness“ is being used under the auspices of Google to develop tools and methods that reflect our understanding of fairness [4]. Various examples of unethical behavior of AI solutions can be found frequently in the media, such as Amazon's recruiting tool, which discriminated against women [5]. The AI maturity of a company in this area can thus be determined, by considering binding ethical standards for the development and application of AI.

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SOLUTION: AI MATURITY

To capture the current status of AI maturity, we have developed a model that serves as a guideline for maturity testing. The individual maturity levels and their central characteristics are described in the following section. A more detailed examination of the dimensions presented above is provided: The objectives of the respective areas are clearly defined to enable the derivation of measures to increase the maturity level.

DETERMINING AI MATURITY

When creating the framework model, it was important to us that the determination of the AI maturity level takes a manageable period of time. Furthermore, the model was designed to be suitable independent of industry and function. Also, the size of the company is not essential for maturity assessment.

Level 0: Aware

At the initial stage, AI and data analysis is no part of the company. No analytics processes are carried out and AI technology does not exist. If data is generated, it is not stored because the corresponding infrastructure and competence in the company is missing. For this reason, the topic of AI is deprioritized, despite the awareness of it. In addition, the company is characterized by traditional, hierarchical, structures. Cooperation between business units takes place only sporadically. There are no guidelines for privacy and security.

Level 1: Ad-hoc

In the initial stage, the organization is still in an inactive state of AI adoption. Knowledge and awareness of AI technology

are scarce, and if so, only available or concentrated within silos. Data is available but is mainly stored in fragmented systems and with a strong focus on past. Planning is mostly done manually, and decisions are rarely data-based. Training initiatives focus on simple analytical topics and tools. Artificial intelligence is not yet systematically considered in corporate strategy. Many organizations are still at this level or in transition to the next level of AI maturity, which is often connected to underestimating the potential of artificial intelligence. As a consequence, AI initiatives are often less prioritized at the decision-maker level in these organizations.

Level 2: Opportunistic

The second stage of the AI maturity model is called opportunistic. Companies in this stage have identified AI as an important future topic and have taken the first steps towards exploiting the potential of AI. In departments or divisions, analysts with AI skills or AI experts are hired to independently implement smaller projects. Tools and know-how are available at an operational level to a certain extent. At the decision-maker level, a few stakeholders push AI initiatives – for example, by financing smaller use cases or AI labs. In some cases, AI models have made it to near-production stages, but there is no centralized management or operation of these models. A central platform for AI does not exist at this stage.

Level 3: Integrated

At this level of AI maturity, artificial intelligence is applied in most areas of the company and already integrated into exist-

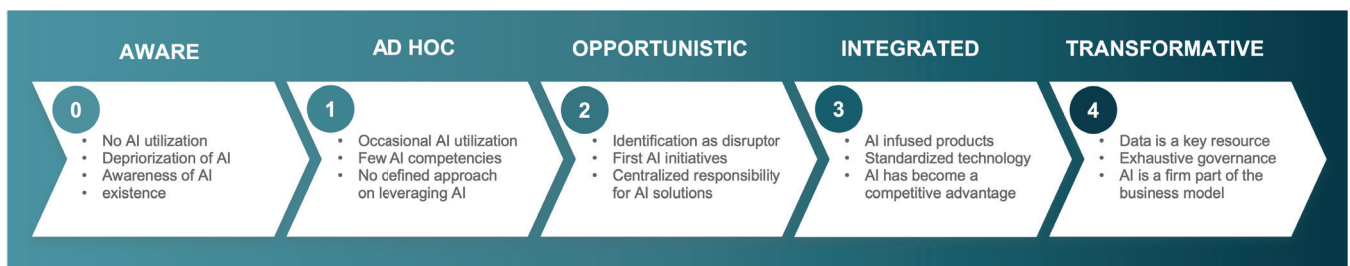


Figure 1 - AI maturity levels: In the course of AI adoption, organizations transition various stages of maturity. Based on our experience, we have developed a five-level maturity model that reflects the most important stages of an organization's AI maturity.

SOLUTION: AI MATURITY

ting products, services or processes. Furthermore, dedicated processes exist that institutionalize the identification and prioritization of use cases. Moreover, rules for the governance of productive AI models are defined and followed. The application of AI is no longer a specialty, but a standard technology applied when needed. There are solid AI competencies within the departments or in cross-departmental AI teams. AI supports the automation and optimization of internal processes and serves as a basis for decision-making by senior management. The use of AI is seen as a competitive advantage. AI solutions are centrally managed, deployed, and maintained within or across departments.

Level 4: Transformative

At this stage of AI maturity, artificial intelligence is part of the business model and is firmly anchored within the companies' DNA as well as the corporate strategy. Products, services, and internal processes have been adapted permanently by applying intelligent systems. At this stage, own products based

on AI may be marketed. AI initiatives have been successfully implemented and interconnected within almost all corporate divisions. AI competencies and training initiatives are widespread and are systematically built up and cultivated. Data is seen as both raw material and product simultaneously and is given a high priority within the company. AI is fully exploited, in compliance with regulatory and ethical standards, and has become an integral part of daily business. Teams have central access to data. AI solutions are developed, deployed, and maintained on the organization's own AI platform(s). There are standardized processes for monitoring AI models.

SOLUTION: AI MATURITY

ACTUAL VS. TARGET MATRIX

How the individual levels manifest themselves concretely in the dimensions described above can be seen in our actual vs. target matrix. Comparing the status quo with the examples presented allows you to quickly classify your organizations within the six dimensions. In our maturity model, a company can achieve different levels of maturity for each of the individual dimensions. It should be noted that the company's overall maturity is not necessarily determined by the dimension with the lowest / highest maturity. However, the interaction between the individual factors is still of importance.

INCREASING AI MATURITY

Once the organization's status quo has been identified, the question arises: What steps should be taken to increase our AI maturity? This can be achieved through the following steps:

- Prioritization of the levers
- Definition of an action plan
- Formulation of an AI strategy

In the following section, we will shed some light on the three steps in more detail.

	Data	Use Cases	Infrastructure	Team & Skills	Organization	Governance
Level 0	Data is generated within some processes but not stored.	There is no development of AI use cases throughout the company.	There is no infrastructure to sufficiently handle AI solutions.	There are no DS / AI competencies and / or there is no awareness of existing skills.	Traditional hierarchical team structures and processes separate the business units from one another.	There is no, or only few knowledge of security regulations or governance measures.
Level 1	Data is collected and stored in various locations within the company.	Spontaneous and uncoordinated AI applications are being developed in separate areas.	No cross-departmental infrastructure and no scalable system exists to deliver AI applications.	Minor AI competencies are spread throughout the company.	Some approaches attempt to break up hierarchical team structures and processes.	Usual regulations regarding data security are adhered to, but AI does not constitute a separate governance issue.
Level 2	Data is collected in a structured manner, but further processed and analysed in a decentralized manner in the departments.	Knowledge of AI use cases is available and ideas for business-related use cases are generated.	Modern AI technologies are used in the company and departments are already partially interconnected.	AI competencies are increasingly available and sporadic AI training is offered to employees.	The application of agile methods takes place in an uncoordinated manner in some AI project groups.	Individual concepts regarding quality and explainability are in place, but the holistic focus is still missing.
Level 3	Central data management exists and all data sources are available to employees.	A structured procedure for the definition of use cases and a central use case portfolio exists.	Cloud technologies are replacing on-premises hardware and an advanced scaling concept for AI has been defined.	Several AI experts are in place and a concept for teaching data literacy to all employees is in place.	Interdisciplinary project structures and alignment of processes with AI development is taking place.	AI applications are regularly evaluated in terms of safety, quality but also fairness, transparency and risk.
Level 4	Data collection and quality assurance is automated and data provides real added value.	In collaboration with the business unit, data-based business models are developed from the defined use cases.	The interconnectedness of all business areas is enabled by a dedicated AI platform and creates a high degree of scalability.	Diversified AI teams are established in the company as internal service providers and product developers.	AI development processes provide a framework for both business strategy and action across all levels of the employees.	AI ethics and risk management are established in control processes and are regularly applied and evaluated.

Figure 2 - Actual vs. Target Matrix: Matrix representation of the different degrees of maturity and maturity dimensions. The description of the individual dimensions in the five different degrees of maturity should help to determine the current degree of maturity.

SOLUTION: AI MATURITY

Prioritization of the levers

To increase the degree of maturity, weaknesses and strengths must first be identified with regard to the six dimensions. The next step is to reduce weaknesses and build up strengths. While individual dimensions exist separately, there are strong interdependencies between them. Example: It is difficult to build a successful AI team if it does not have access to the companies' data sources. Similarly, a fully functional AI platform is not useful if the solutions developed on it cannot be successfully integrated into business processes. To ensure sustainable success through the use of AI, it should be ensured that the individual dimensions do not differ too much in their maturity. Often, an increase in the level of one dimension facilitates the advancement into another. Thus, a focus should first be placed on underdeveloped dimensions to not become persistent bottlenecks that hinder the progress of other dimensions. In addition, the effort required for each maturity level increase should be estimated and compared to the potential success. It is important to note that increases in AI maturity, for example, in the areas of infrastructure and team, often bring synergy effects with them, which are noticeable in other corporate functions.

Definition of an Action Plan

After assessing the priorities, measures of action have to be defined, that push a maturity level increase according to plan. Here it is especially important for companies with low AI maturity not to take too many steps at once. For example, pilot projects in protected sandbox environments are advantageous for companies on levels 1 and 2, so that success factors and challenges of AI projects can be identified without major risks. Use case surveys or workshops can be conducted in individual departments to identify possible applications and generate promising project ideas. The systematic provision of further training for employees and managers leads to increased awareness within the company and builds competence for AI initiatives. For companies with higher levels of maturity, scaling up existing AI assets is essential. In addition to clearly defined processes and roles, this includes scalable IT systems and

tools for the development, deployment, and operation of AI solutions within the company. An internal inventory of existing processes and AI adoption can be a useful step to identify further potential for improvement. Also, clear rules and governance mechanisms should be defined and consistently pursued for optimal scaling of AI. The action plan should contain clear tasks with measurable results. „Low-hanging fruits“ can be prioritized for quick successes to promote positive visibility of the initiative.

Developing an AI strategy

Ideally, all measures to increase the level of AI maturity are carried out as part of a holistic AI strategy on the organizational level. An AI strategy sets the stage for a systematic implementation of AI within the organization. The formerly mentioned dimensions data, use cases, infrastructure, organization and governance can also be employed as key elements of an AI strategy. Thus, all measures to increase the level of AI maturity are pointed towards the dimensions of the organization's AI strategy. The AI strategy itself should be aligned with the general strategic direction of the organization to avoid potential conflicts of interest. This ensures that all measures derived from the AI strategy are compatible with the overall corporate strategy. This illustrates the importance of considering artificial intelligence as a strategic element in the corporate context. By formulating an AI strategy, the increase of the maturity level can be accelerated significantly.

„An AI strategy sets the stage for a systematic implementation of AI within the organization.“

CONCLUSION AND OUTLOOK

While it often seems difficult to make clear statements about the status of AI in one's own company, our model helps determine the level of maturity, both for entire organizations as well as individual departments. If the different AI maturity dimensions are considered in the assessment, a holistic picture can be drawn quickly and easily. When increasing the maturity level, attention should be paid to clear AI weaknesses and concretely defined action steps should serve as an action plan.

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#ai #strategy #cycling



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ABOUT STATWORX

STATWORX is a consulting and development company for Data Science, Machine Learning and AI with headquarters in Frankfurt am Main and Zurich. We support organizations end-2-end in the data-driven optimization of their products, services and processes.

Thereby, we draw on a wealth of experience from more than 200 cross-industry and cross-functional AI strategy and development projects, from which you benefit in terms of best practices and experience.

