Vitrine AI Québec

Powered by Forum IA Québec

Artificial Intelligence Maturity Framework and Assessment Tool

Is your organization ready for AI?

An adaptation of Element AI's AI Maturity Framework
by the Forum IA Québec and the Institute Intelligence and Data (IID)

Updated in 2022

Online Assessment Tool

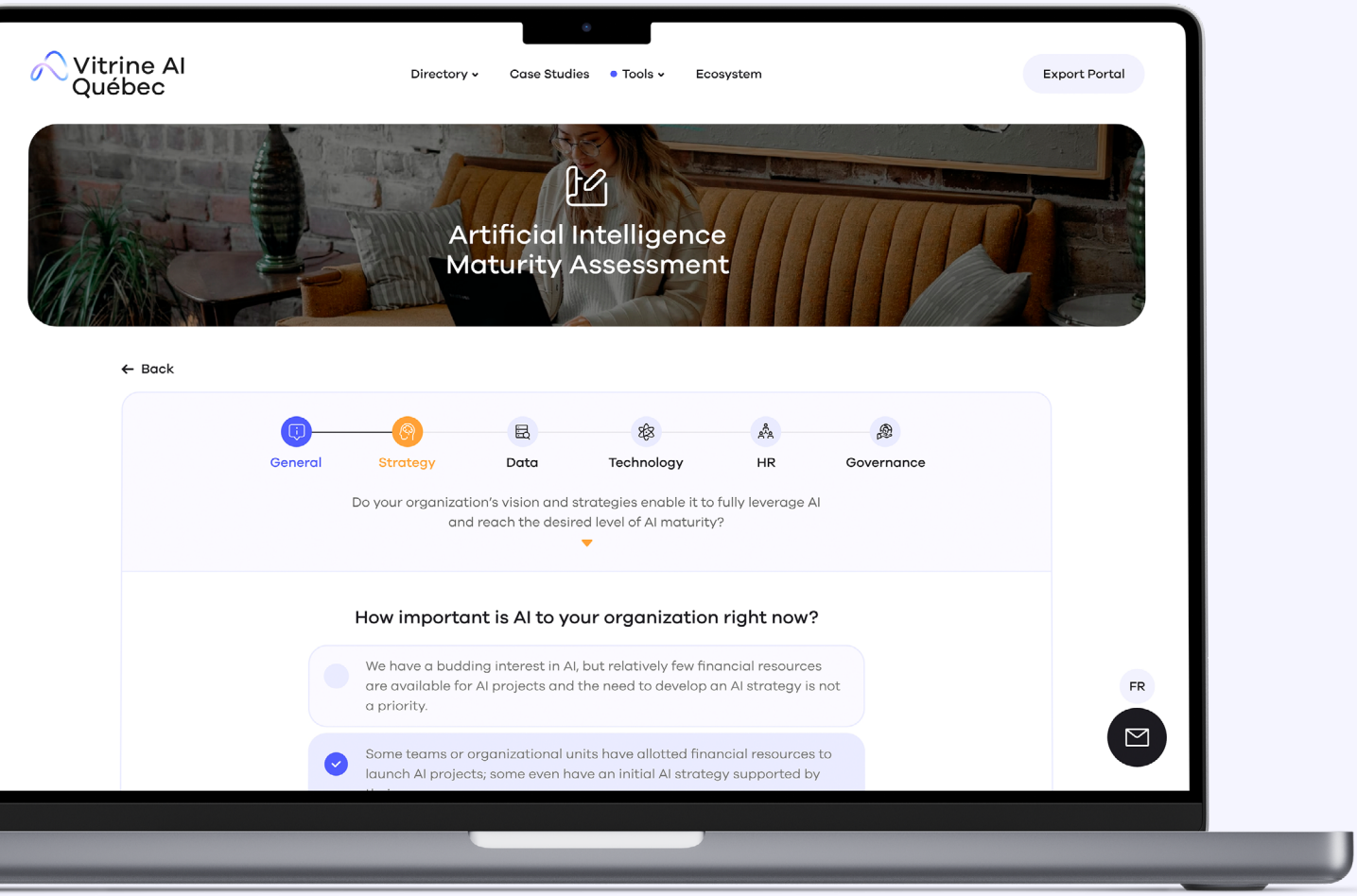
This report is accompanied by an online assessment tool, which allows you to obtain a personalized profile of your organization.

You can access it online at the Vitrine IA Québec (https://vitrine.ia.quebec/en/maturity) to obtain tailored recommendations to move your organization forward.

By answering the questionnaire, you will obtain in a few minutes :

- your overall artificial intelligence maturity level,
- your personalized profile along five key organizational dimensions,
- customized advice on how to advance your AI maturity.

Answer the questionnaire to assess your AI maturity



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About the report

The Artificial Intelligence Maturity Assessment Framework and its accompanying online assessment tool are an adaptation of the AI Maturity Framework developed in 2019-2020 by Element AI. The Framework was designed based on the results of a survey of approximately 200 senior leaders of organizations, most of which were North American.

The Framework and the Assessment Tool have been updated by the Forum IA Quebec, in partnership with the Institut intelligence et données (IID) at Université Laval, to better reflect the reality of Quebec organizations. The update focused first on improving the recommendations offered to organizations in order to prompt them into action and then consisted in developing an online tool able to measure how AI maturity of Quebec organizations evolves over time.

The project leveraged IID's experience in supporting businesses in their adoption of AI and incorporated the valuable learnings that the Forum IA Quebec has gained through its discussions with AI solution and service providers, small and medium-sized businesses interested in adopting AI, AI ecosystem supporting organizations, as well as research and technology transfer institutions across Quebec. The Framework and Assessment Tool have also been reviewed and validated by several members of the AI ecosystem, including Mila, IVADO, CRIM and Productique Québec. The assessment tool has also undergone review and auditing by several members of the AI ecosystem, including Mila, IVADO, CRIM and Productique Québec.

Acknowledgments

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Introduction

What is artificial intelligence (AI)?

Artificial intelligence is a term used to describe computer programs (algorithms) that can mimic human problem-solving and decision-making abilities.

To achieve this, algorithms must first analyze vast amounts of data related to the problems they seek to solve. This data can be textual, visual, mathematical, geographical, etc. This is what is known as big data.

Algorithms detect patterns, sequences and relations within this data, which they use to develop models in order to make predictions, propose optimized recommendations to help meet specific goals, decode and reproduce language or solve complex problems.

One of the most successful AI techniques today is deep learning. Breakthroughs in this area include spectacular advances such as the development of increasingly powerful machine translation tools, image recognition software that can spot skin cancer as accurately as a doctor, robots that operate off voice commands, self-driving cars, applications that can predict the cost of a ticket from Montréal to Paris three months in advance, automatic filters of hateful Facebook messages and much more.

When used to solve business problems, AI has the potential to improve the productivity and competitiveness of Québec organizations. It can also support the creation of new products, services, processes and even new business models.

Why assess your AI maturity level?

AI is a powerful driver of productivity and innovation for organizations that own data and invest in leveraging it. However, integrating AI into an organization's operations, products and services is no simple task. Successful AI deployment depends as much on organizational factors as technical ones, and there are still relatively few resources available today to help leaders plan and build their organizational capabilities for integrating AI.

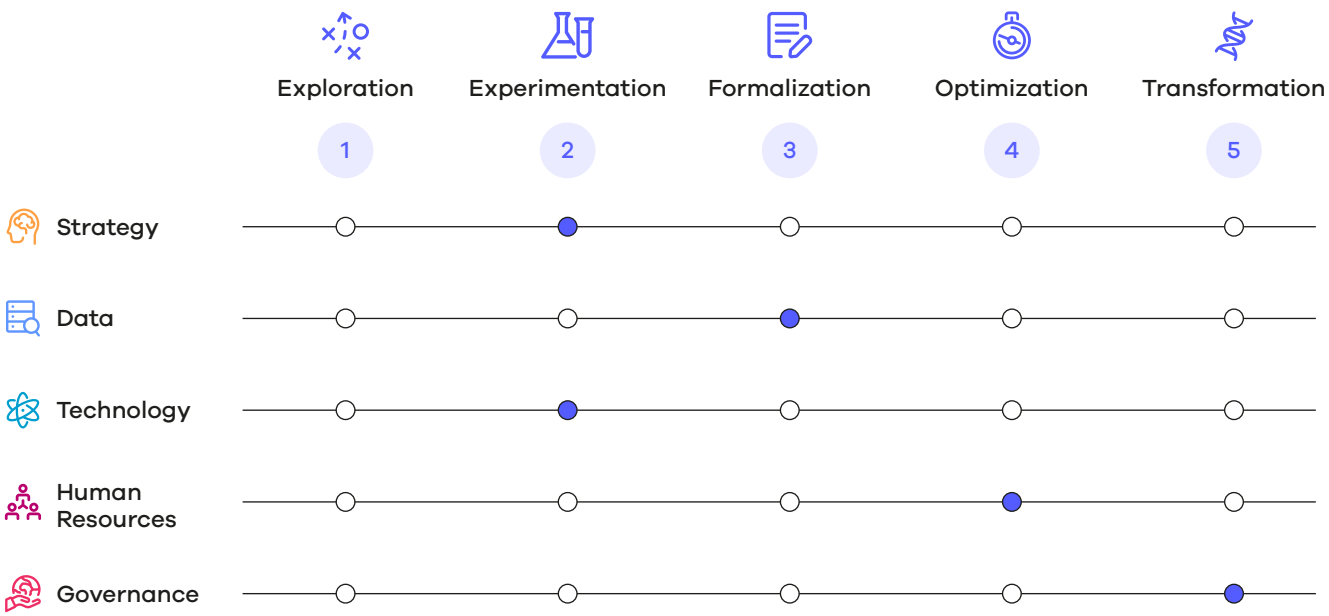
Assessing your organizational AI maturity is one such useful tool—it will allow you to better understand your organization's strengths and weaknesses, compare yourself to your peers and better target your priority goals in the short and long term. This assessment is the first step toward adopting an overall AI strategy that aligns with your needs and business context, so you can develop a solid action plan to reach the level of maturity you require.

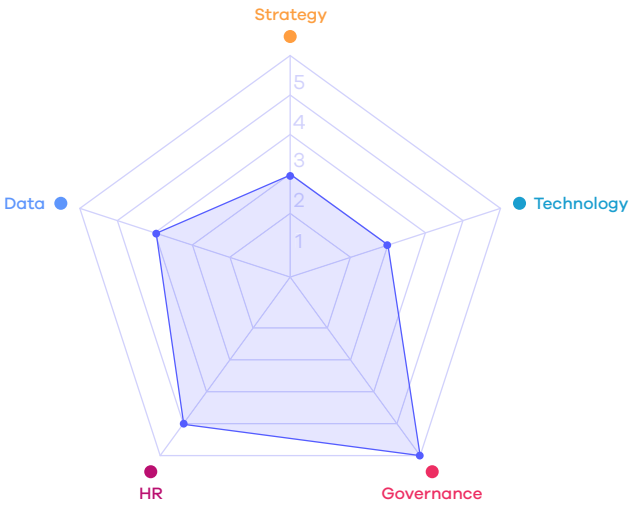
This report outlines the framework for an AI maturity assessment tool. It is designed to help leaders understand, prioritize and implement specific actions to guide the AI integration process. The tool looks at five key dimensions: strategy, data, technology, people and governance. Aligning these dimensions will maximize the impact of AI. The tool also specifies how these dimensions contribute to an organization's maturity over time through five levels of progress: exploring, experimenting, formalizing, optimizing and transforming. Finally, this report contains a set of recommendations for actions to facilitate progress in each of the organizational dimensions critical to AI success.

The AI maturity framework

To assess your organization's AI maturity, we invite you to use the following framework. It connects the five most critical organizational dimensions required to make AI a reality in your organization to five maturity levels through which your organization can progress as it makes improvements in each of these dimensions.

An organization's overall AI maturity level is determined by its combined progress within the five organizational dimensions. However, the weight of each dimension varies from level to level and different combinations can lead to a unique overall level. For example, an organization that scores high in terms of data, technology and strategy may have reached Level 3 – Formalizing, while remaining relatively immature with respect to governance and lacking in human resources. Levels may include similar challenges and opportunities that cut across several dimensions. Nevertheless, each journey to maturity is unique.





Overall maturity level **Formalization**

The five levels of AI maturity

Understanding the five levels of AI maturity will help you assess your organization's actual AI capabilities in its specific context. This will allow you to better understand which goals you can achieve right now and which ones you will need to defer. This will make it easier to prioritize actions and ensure that your AI capabilities continue to develop in the future. Let's explore what each level could mean for your organization!

Level 1

Exploration

- Understand what AI is, what this technology can accomplish, and what it can do for your organization

At this level of AI maturity, your organization is already well into its digital transformation and has begun to collect and structure its data. This is why you have realized that AI could be a significant driver of success. You have begun to explore what AI is and what it can do for you. In general, the opportunities for applying AI across your organization have not yet been clearly defined, but some employees have taken the initiative to learn about the specific benefits that AI offers in your industry and environment, even if they don't quite know how to take it to the next level just yet. Your organization is working to identify the most promising use cases based on the business context in which it operates.

Level 2

Experimentation

- Make calculated bets by carrying out proofs of concept to determine which AI models are ready for production

At this level of AI maturity, your organization is conducting proofs of concepts and experiments that you have prioritized according to your business needs. You seek to measure what AI can concretely bring to your organization. Indeed, your goal is no longer to explore the feasibility of AI initiatives, but to demonstrate, through real-world experiments, that these initiatives can have a measurable business or organizational impact. Successful experiments help teams build momentum for AI adoption and create value in the process. However, you can only achieve limited AI production and integration. And although some AI governance mechanisms might have been put in place, they are not yet very advanced.

Level 3

Formalization

- Deploy your first AI solutions and prepare the organization to move forward

At this level of AI maturity, your organization now has one or more AI solutions into production. This requires significant effort while the return on investment remains generally low. However, it anticipates that this return will improve in the future. Your organization is therefore looking to formalize its AI efforts by turning successful proofs of concept into larger projects. It is adequately preparing for AI integration with a user adoption plan and has targeted performance indicators to ensure proper monitoring of its actions. The goal is no longer to simply understand what AI can achieve in your organizational context; you want to use it as a lever to generate measurable and lasting impact in priority areas. Despite your successes, your organization is likely just beginning to formalize how it ensures governance for its AI projects, which can be a barrier to scaling.

Level 4

Optimization

- Leverage past learnings to industrialize AI production and deployment and integrate AI at all levels of the organization

At this level of AI maturity, your organization is able to quickly put new AI solutions into production and scale them up efficiently, so that they generate stable positive benefits. You are leveraging AI both in your internal operations and your products or services, or in other interactions with your customers and suppliers. The multiple AI solutions deployed are producing value and a clear return on investment. Your organization can move quickly from discovering a need to producing and deploying an AI system or model that serves to fill that need. It is starting to look like an AI model production factory. Tools and processes are used to ensure the safe and responsible use of AI across the organization.

Level 5

Transformation

- Actively and profoundly transform your organization with AI

At this level of AI maturity, your organization uses AI in its operations in many critical areas. AI gives it a competitive advantage. It is a true driver of innovation and transformation. You are exploring new frontiers and operating cutting-edge AI. You not only use AI to automate and optimize your processes; you also use it to support new business models or launch new products or services. Your organization has eliminated organizational silos to integrate its data and rethink how it creates value with it. AI guides decisions throughout the organization. Its deployment is supported by interconnected systems that learn and adapt over time. You have solid AI governance practices. You proactively address issues of responsible AI development and deployment.

The five organizational dimensions critical to AI adoption

Organizations must change how they think, act and learn in order to take full advantage of AI and make steady progress from one AI maturity level to the next. The five dimensions presented below represent the critical organizational areas where management practices, operations and infrastructure need to evolve to get the most out of AI.

To successfully increase an organization's overall AI maturity level, each of these dimensions must mature individually as well as together. The weakest link limits overall progress. By improving capabilities in less mature dimensions, leaders can accelerate their overall organizational maturity and ensure the success of their AI projects.

This section will give you a better understanding of these five dimensions and the roles they play in moving your organization toward better AI integration.

Strategy

The organizational vision and action plan to maintain momentum toward AI maturity

Data

Reliable data to train, put into production and improve AI

Technology

The hardware and software infrastructure to power AI throughout a solution's lifecycle

Human resources

Roles and responsibilities, skills and KPIs for operating more intelligently with AI

Governance

Policies, processes and structures to ensure the development of responsible and safe AI

Dimension 1

Strategy

The organizational vision and action plan to maintain momentum toward AI maturity

An organization's strategy consists of all the actions and means it implements to achieve long-term objectives, i.e., its mission. The strategy serves as a guide for making decisions, coordinating people and allocating resources throughout the organization.

A solid AI strategy will allow you to develop an organizational vision of AI's role in achieving your business goals, and then determine which actions are needed to achieve that vision.

To be effective, your action plan should specify which actions are needed to implement AI into your operations, defining "where," "when," and "why" these actions should be taken. It should include clear success indicators and balance short- and long-term goals. It should also take into account your current level of AI maturity, your competitive landscape, your business's strategy and ambitions, and your desired speed of change. Ultimately, your action plan must be designed to build the momentum that will move your organization to a higher AI maturity level.

When organizations neglect the strategy dimension, their AI experiments can become disconnected and lacking in relevance. Without a strategy, it will be difficult to overcome the obstacles that inevitably arise during the production and deployment phases.

In developing your AI strategy, ask yourself the following questions:

1. **AI Maturity Level:** What is our current level of AI maturity? Do we have any distinctive strengths when it comes to data, technology, people and governance?
2. **AI Trends:** How might AI be beneficial for the organization or create disruptive challenges down the road? Are there specific opportunities to explore in any particular area?
3. **Horizontal and Vertical Alignment:** Do decision makers at all levels of the organization have a common understanding of AI and a shared vision of the benefits that it can offer?

Dimension 2

Data

Reliable data to train, put into production and improve AI

When we talk about data as an organizational dimension of AI maturity, we are referring to the importance of collecting the data needed to train the AI models that an organization would like to deploy. Successful AI models are impossible without good data. But how much is enough? And what data is needed?

Not only do different AI applications require different types of data (audio, video, text, structured, etc.), but different AI techniques require varying amounts of data. For example, simulation-based modelling does not require vast sums to start, and synthetic data can be used to augment undersized data sets. In contrast, certain deep learning algorithms require massive amounts of data and use millions of parameters.

While the potential of an organization's available data will have an impact on its AI strategy, the type, quantity, and quality of data used will nevertheless be defined by a given AI solution's requirements.

Today, the main challenge for most organizations is not a lack of data, but a lack of accessible and useful data for the AI solutions they wish to implement. As a general rule, data must be clean, complete, labelled (if using supervised machine learning techniques), integrated, secured and free of harmful bias. These requirements apply throughout the full lifecycle of AI development, deployment, and retraining. Technical and business teams must properly manage data to ensure the success of any AI implementation.

To adequately prepare your data for AI, ask yourself the following questions:

1. **Volume:** Do we have access to sufficient data to support the AI techniques outlined in our action plan?
2. **Accessibility:** Is the data we need accessible for development and production environments? Or is it compartmentalized?
3. **Representativeness:** Do we have sufficient data to populate all the use cases found in our action plan? Are they representative of our business reality?
4. **Quality:** Is the data well structured and free of gaps and errors? Is it complete, up-to-date and valid?
5. **Labelling:** If we are using supervised learning techniques, is our data properly labelled so that AI models can understand the examples provided to them?

Dimension 3

Technology

The hardware and software infrastructure to power AI throughout a solution's lifecycle

Technology as an organizational dimension of AI maturity refers to the tools, technology infrastructure and workflows required to support the entire AI solution lifecycle—from creation and training to deployment, production and retraining over time.

All AI solutions go through this lifecycle, whether they are purchased or built by internal teams. An organization's leaders need to understand how technology supports every step of the AI lifecycle and what trade-offs may be necessary at each level, as the organization matures and plans its growth. For example, a server environment that supports one particular AI model may not scale to multiple different models in combination.

For most organizations, the two biggest areas of technology change are development tools and computing hardware. New development tools include AI frameworks like TensorFlow and PyTorch. They also include software categorized with terms such as DevOps (development and operations), MLOps (machine learning and operations) and AIOps (AI for IT operations).

The industry is seeing a strong trend toward enabling closer collaboration between engineering and infrastructure management practices. The need for iterative development in AI model training is accelerating this trend. New computing infrastructure, including purpose-built GPUs (Graphical Processing Units), leverage chip architectures that are better suited to AI algorithms than traditional processors.

Today, while it is increasingly easy to start AI experiments on personal computers or using commercially available cloud solutions, many organizations have dedicated servers for AI. More and more tools and solutions can also be integrated to monitor AI models for governance issues such as concept drift.

When choosing technology to support your AI strategy, consider:

1. **Requirements:** What are our current technology needs and how fast will those needs evolve?
2. **Flexibility:** How can tools connect to different types of data and support different types of modelling approaches and AI frameworks?
3. **Scale:** Can the technology scale to our different production scenarios?
4. **Policies:** What policies and procedures are needed for this technology to function and succeed?

Dimension 4

Human resources

Roles and responsibilities, skills and KPIs for operating more intelligently with AI

An organization's successful implementation of AI has an important human dimension. It is crucial that leaders understand and buy into the strategy to determine an organization's AI maturity level, and the organization must have the necessary expertise to effectively carry out its AI action plan. Change management for teams affected by AI deployment is key to the success of AI in any organization. Even the most powerful AI solutions will fail if people are not trained and motivated to use them. It is the executive leaders' responsibility to help business and technical teams take ownership of AI projects and ensure their success.

In practical terms, leaders need to help teams bridge their expertise so they can generate the best possible strategy, action plan and day-to-day tactical decisions for AI. This means helping people at all levels to make a real cultural shift, from an environment where employees do work to one where they collaborate with AI systems that participate in work. An organization that has relied on rule-based systems, with known and circumscribed development processes, must evolve to adopt continuous learning systems that require iterative development. Accordingly, leaders themselves must have a good grasp of AI and its potential impact on the organization, so they can guide teams in the right direction and help them make the right decisions.

For employees to successfully build and work with AI solutions, they also need to be trained, supported and included in the design and deployment process in a meaningful way. Training should address the business and technical aspects of AI so that employees can understand and help shape the organization's unique AI vision. Support also means communicating frequently about the progress of the AI action plan and helping people to improve and develop their professional skills. Involving users in the design and deployment of AI solutions builds trust and ensures that solutions leverage the best available information at every step of the decision-making process. Across the whole organization, this is about separating AI myths from realities.

When preparing people for AI, consider:

1. **Leadership Team:** Who is leading the effort to implement or scale AI? Is the right leader positioned and sufficiently informed to make the decisions required? Do we have executive and board members buy-in for the AI strategy?
2. **AI Literacy:** Do employees have the ability to learn and actively adapt to AI and its impacts (both technical and non-technical)?
3. **Job Skills and Resources:** Which people or parts of the organization need to reskill or upskill to adapt to changing demands and roles brought about by AI? What other resources will employees need once they start working with AI?
4. **Talent strategy:** What new talent will be needed? What partners or other outside help should be sought?
5. **Operating Model:** Who will manage AI resources, projects, and solutions over the course of the AI action plan? Should AI management be centralized or decentralized?

Dimension 5

Governance

Policies, processes and structures to ensure the development of responsible and safe AI

Trust is the foundation of every interaction at your organization and AI governance is the foundation of trustworthy AI. Governance as a dimension of AI maturity refers to the policies, processes and relevant technology components required to ensure safe, reliable, accountable, and trustworthy AI solutions.

When designing governance practices, teams must focus on these four pillars: reliability, safety, trustworthiness and accountability. To effectively manage all four of these qualities, the organization's legal, technical, business and risk management teams will need to embrace new forms of cooperation, which means it is essential to clarify roles and responsibilities.

To properly govern its AI projects, an organization must have clear policies, processes and controls in place throughout its AI lifecycle—from collecting data to designing solutions to assessing models, which may also require certain technology components. Monitoring specific performance metrics, involving relevant stakeholders and ensuring strong accountability at each level of the lifecycle are essential elements of good governance.

When developing AI governance in your organization, consider:

1. **Risk:** What are the potential risks at each level of maturity as the chosen AI solution scales to more data, users, and possible impacts?
2. **Regulation:** What relevant regulations do you need to pay attention to and follow in each country and jurisdiction where you operate?
3. **Safety:** Does your AI protect the safety of your systems and data? As you implement AI, how can you ensure that the protection of personal information remains one of your organization's top priorities?
4. **Explainability:** How can you communicate to users or to the public the reasoning that led your AI systems to make a particular prediction or decision?
5. **Stakeholders:** What processes do you need to put in place to identify, consult and update relevant stakeholders at the right time in the AI lifecycle?

Set of all recommendations for taking action

Operationalizing AI is not simple. Many organizations either fail to anticipate hurdles in strategy, data, technology, people or governance, or they over-prepare in a single dimension. Both errors slow down progress. Losing too much time can be detrimental to successfully competing with AI in the long run.

But perseverance pays off. Using AI, leading organizations have already undergone dramatic transformations, yielding incredible benefits for their bottom line, for society and for the future. The key is to start, one use case at a time, and stay the course until the organization can scale its operations and explore new products, services and business models for transformative impact.

There is a systematic path to progress. In this report, you have learned about the five levels and five dimensions of AI maturity. Each organization is different and progresses at its own pace within the organizational dimensions critical to AI adoption. These dimensions function as levers for improvement.

In this final section, for each dimension and level you will find a description of a typical situation followed by suggestions for concrete actions to reach a higher level of maturity. This section will help you understand how a typical organization evolves in a particular dimension as its AI maturity progresses, which in turn will help you better plan your own progression from one level to the next.

To better map out the path forward, we invite you to first use the online Assessment Tool that accompanies this report. The Assessment Tool will provide you with a personalized profile, allowing you to target the recommendations best suited to your context.

Assess your AI maturity

Dimension 1

Strategy

S-1 The Exploration level in Strategy:

Your organization doesn't really know what it wants to achieve with AI yet or how to get there. Usually, you take your first steps in AI when experts or enthusiasts begin studying use cases or start experimenting on their own. Your organization's initial vision for AI tends to be either too narrow (e.g., focused on non-strategic aspects for the organization) or too broad and unrealistic (e.g., the organization embarks on AI without a true value proposition or without all the resources required to move forward).

To progress in this dimension:

- S-1.1 In consultation with your management teams, organizational units, IT people and other key contributors, consider whether you should have an AI strategy.
- S-1.2 Identify the most promising AI use cases in your industry and business environment and assess the feasibility of potential projects and the associated costs and benefits.
- S-1.3 Overall, redouble your efforts to accelerate your digital transformation to create an environment conducive to AI deployment.
- S-1.4 Identify funding sources (government programs, calls for projects, innovation loans, accelerator programs, etc.) that could help reduce the risks associated with your early AI experiments.

S-2 The Experimentation level in Strategy:

Your organization does not yet have an overall AI strategy or vision, but it is starting to make progress in this regard. It does this first by planning the use of AI in a sub-unit, such as an organizational unit or a team. It then refines and tests hypotheses about how AI might solve certain business problems. In general, your leaders have demonstrated their support for AI by allocating a budget to conduct proofs of concept or pilot projects, but they expect those in charge of AI initiatives to prove that they are worth greater investment.

To progress in this dimension:

- S-2.1 Identify a limited number of AI hypotheses for testing and make sure they are well aligned with your business problems.
- S-2.2 Focus on targeted, low-complexity proofs of concept that can be carried out quickly but are important enough to your organization that they will pique the interest of its members.
- S-2.3 Invest in a single type of use case or AI technology first to consolidate your learnings and define metrics to clearly measure the return on your investments.
- S-2.4 Leverage your successes to demonstrate the need to develop an organizational AI investment strategy and gain executive support.
- S-2.5 Plan for the future: assess early on whether your digital and technology transformation projects will eventually lend themselves to AI integration.

S-3 The Formalization level in Strategy:

Formal executive support helps teams formalize your organization's AI strategy. A clear strategy is in place, the will to execute it is clear, but initial AI investments may not yet have generated the expected return. That said, the organization is able to make clear projections about the expected value of that return and is allocating the budgets that are needed.

To progress in this dimension:

- S-3.1 Adopt a formal AI strategy, ensure it has the full support of management and the board, and develop a shared understanding of its content, scope, and targets across the organization.
- S-3.2 Set aside a dedicated AI budget and develop an initial roadmap for AI implementation that is well aligned with your overall organizational strategy.
- S-3.3 Have all organizational units assess the potential of AI to improve their processes, products, or services and develop a repository of well-documented AI use cases and potential projects.

S-4 The Optimization level in Strategy:

Your organization executes its AI strategy deliberately and effectively. Senior leadership support is assertive and overall supportive of AI integration across your organization. Your AI roadmap aligns with your organization's targets with respect to digital transformation, innovation and R&D. As a result, the AI budgets for most units are pre-approved. The return on investment in AI is formally measured and factored into the financial planning process.

To progress in this dimension:

- S-4.1 Align your organizational units' individual technology roadmaps with your overall AI strategy.
- S-4.2 Seek to coordinate AI efforts across your organization to maximize their impact.
- S-4.3 Involve AI leaders in all your organization's strategic decisions.
- S-4.4 Proactively examine how AI could help you create or consider new products, services, or markets; strengthen or reinvent your processes; and support innovation in each of your divisions.

S-5 The Transformation level in Strategy:

AI integrates seamlessly with your organization's overall strategy. Your strategic and AI investments are fully aligned as are your performance indicators. This allows your organization to easily discover AI use cases that will provide high value, make improvements through AI, and develop new AI-based business models. Your organization has the necessary AI experience for you to consider relying on it for major innovations in your operations, technologies, products, and services.

To progress in this dimension:

- S-5.1 Use AI as a driver to innovate and transform your business model, products and services.
- S-5.2 Make sure AI remains a budget priority.
- S-5.3 Use AI to help improve executive decision-making.

Dimension 2

Data

D-1 The Exploration level in Data:

You need digital data to use AI, but you face three major challenges: the available datasets within your organization are not well understood; the expertise needed to understand this data and its potential is lacking; and no infrastructure or standardized processes have been put in place to facilitate access to existing data. For example, structured data is stored in silos within your organizational units' databases and records; your organization is unable to effectively define its data needs for AI and lacks a clear plan for consolidating its data; or your leaders don't have a good sense of the internal sources of unstructured data that could be used for AI.

To progress in this dimension:

- D-1.1 Map the structured and unstructured digital data that exists in your organization.
- D-1.2 Determine how your organization's various activities are generating or could be used to generate quality digital data.
- D-1.3 Learn about the data needs you'll need to address to deploy a promising AI solution, employ a technique, or explore a use case.
- D-1.4 Define what high-value insights your data allows you to extract or could be used to extract, to help define your organization's AI strategy.

D-2 The Experimentation level in Data:

By learning more about the data requirements for AI, your teams have been able to gather some data in a usable and accessible format. Some efforts may be underway to create common data warehouses or data lakes. However, overall, we see that only a few data sources are connected that your data is only updated periodically and that users have limited access to it. Specialized tools for data preparation, e.g., for data labelling, are beginning to be tested.

To progress in this dimension:

- D-2.1 Make sure you have the data you need to solve the problems you have prioritized and make investments to better prepare or improve that data.
- D-2.2 Look for ways to link multiple data sources together to unleash their potential.
- D-2.3 Use your initial AI projects to gain support and start breaking down organizational silos of data storage.
- D-2.4 Develop processes or acquire technologies that allow you to cleanse and consolidate your databases in a standardized way.

D-3 The Experimentation level in Data:

The organization has quality data sets, which are accessible for developing AI solutions. This success owes less to a generic strategy involving the collection of all organizational data and more to a targeted, prioritized collection that is based on the AI use cases most relevant to the organization. However, ensuring access to data is recognized as a strategic priority. Budgets have been made available to accelerate the development of common infrastructure (such as a data warehouse or data lake) or to grow the stock of available data (e.g., to tag existing data or install sensors for new data capture). Your organization is able to measure how well its data can be used to apply specific AI techniques or create promising use cases.

To progress in this dimension:

- D-3.1 Continue to break down organizational silos that limit the integration of available data.
- D-3.2 Invest in technologies that allow you to automate and improve the collection, management, and cleansing of data critical to your AI projects.
- D-3.3 Define metrics, processes, and techniques to manage the quality of the data you need to do AI, and hunt down incomplete or inaccurate data.

D-4 The Optimization level in Data:

Your organization has comprehensive, up-to-date, and easy-to-use data to build complex AI solutions. The majority of your strategic systems are connected to a common data platform and actively synchronize the information contained on both sides. The data platform is widely distributed within your organization and accessible through highly user-friendly interfaces. Your organization displays a fine-grained understanding and expertise with respect to its internal data sets. Channels set up to continuously collect data are accessible in real time when AI priorities demand it. Your organization is actively cleaning and preparing its data based on quality metrics aligned with its AI roadmap.

To progress in this dimension:

- D-4.1 Automate and optimize your data collection, integration, and distribution processes as much as possible.
- D-4.2 Democratize your data by ensuring that employees at all levels of your organization can access it.
- D-4.3 Identify the processes, technologies, or partnerships needed to acquire new data.
- D-4.4 Explore the potential of data sharing with partners in your industry. This could help you exploit new opportunities.

D-5 The Transformation level in Data:

Your data management platform plays a crucial role in the smooth operation of your organization's core functions. Your data consolidation infrastructure and tools are highly automated and allow teams to easily produce and use new data sets. This data is well described and the available internal and external data sets are easy to discover. All organizational units can access and use the data in a self-service mode. Integrity monitoring of the central data warehouse is highly automated.

To progress in this dimension:

- D-5.1 Make the most of existing data with increasingly advanced AI techniques.
- D-5.2 Continue to look beyond existing systems for new sources of actionable data.
- D-5.3 Participate in industry-wide data sharing initiatives.

Dimension 3

Technology

T-1 The Exploration level in Technology:

Your organization has not yet deployed specialized AI solutions, even though it may have invested in AI technologies and techniques (e.g., it may already be performing advanced analytics or robotic automation of some processes). Your leaders aren't sure what's needed to make organizational investments in AI pay off. Initial AI experiments are conducted on personal computers or in cloud environments.

To progress in this dimension:

- T-1.1 Determine what technology infrastructure will be needed to conduct your first AI experiments.
- T-1.2 Assess your technology infrastructure to determine if it has the capacity to support your AI projects and plan to invest in targeted improvement projects.
- T-1.3 Launch small experiments with AI, first and foremost to learn from them and educate staff.

T-2 The Experimentation level in Technology:

Data specialists and AI developers are using cloud infrastructure to share knowledge and results and to expand their computing capabilities far beyond the limits of their personal computers. Local or cloud servers can be made available to them. The training of AI models is done manually, without any automated resource management features. The organization may have an AI development and operations team, but it likely does not yet have experience deploying AI models. There is no standard deployment process or architecture.

To progress in this dimension:

- T-2.1 Formalize architectures for deploying and operating your AI models and look for ways to automate the use of these architectures.
- T-2.2 Develop a technology roadmap to put in place the prerequisites for successful AI exploitation.
- T-2.3 Start thinking about the entire life cycles of your AI systems, including the processes and resources that will be required to maintain them.
- T-2.4 In general, identify processes that could be automated across your organization.

T-3 The Formalization level in Technology:

In order to properly deploy models in production, technical controls have been put in place and expectations and criteria for explainability have been defined. Your organization has standardized AI development tools and deployment architecture. Access to the required computing power and the allocation of resources needed to do AI are managed by an automated system. Your organization is testing increasingly complex AI solutions. You are probably thinking about the possibility of reusing an AI model deployed in one unit of the organization to perform a similar task in a different unit.

To progress in this dimension:

- T-3.1 Continue to standardize your development tools and IT resource management.
- T-3.2 Reap the rewards of your successes by deploying successful proofs of concept at scale and determining the reusability of different components of your AI solutions.
- T-3.3 Make sure your models are reliable, accountable, secure, and easy to maintain.
- T-3.4 Don't build everything in-house, improve your procurement processes and forge new partnerships to take full advantage of the tools, financial support and expertise offered by the AI ecosystem.

T-4 The Optimization level in Technology:

As the number of AI models deployed in your organization increases, you invest in infrastructure to manage AI development, deployment and management more effectively. Model management involves refining and retraining models with new data. This requires centralizing tasks such as monitoring and auditing AI models for compliance, performance management or troubleshooting purposes. The reuse of existing models should also be supported as much as possible.

To progress in this dimension:

- T-4.1 Invest in a centralized platform that helps track, deploy and refine existing AI models.
- T-4.2 Modernize your systems to be conducive to good data and AI management, while also leveraging cloud computing.
- T-4.3 Plan for the growth of your computing power needs.

T-5 The Transformation level in Technology:

Your AI deployment architecture is standardized and efficient. As AI becomes more central to your organization's overall strategy, new use cases are driving your organization to increase its technology capabilities for building cutting-edge AI solutions. For example, the scaling of solutions to serve new locations may require the use of embedded hardware. Similarly, customizing AI models for specific customers and suppliers may require continuous data sourcing and ingestion. These needs drive the organization to use AI to manage its own technology infrastructure.

To progress in this dimension:

- T-5.1 Define new and innovative use cases that will force you to push the boundaries of existing technology.
- T-5.2 Establish new collaborations, including with leading research centres, to develop tools that are even more adapted to your specific needs.
- T-5.3 Integrate complex AI systems into easy-to-use tools and disseminate them widely throughout your organization to further democratize AI.

Dimension 4

Human resources

H-1 The Exploration level in Human Resources:

Your organization hasn't yet defined roles and responsibilities for AI, and it doesn't yet know what expertise it will need to make the shift. Your organizational units need help developing meaningful AI use cases, including understanding the technical literature and extracting what is applicable to their environment. Your data science teams need help from external consultants or partners to properly determine which AI techniques will enable them to tackle the real-world challenges your organization faces. They may also need help in understanding how to apply these techniques.

To progress in this dimension:

- H-1.1 Build AI knowledge in your organizational units and technical teams to increase their AI confidence level and help them support each other.
- H-1.2 Seek expert help to identify and fill your knowledge gaps about AI and its impact more quickly.
- H-1.3 Encourage the flow of AI knowledge throughout your organization to engage your entire management and staff in this journey.
- H-1.4 Support the participation of your leadership teams, organizational units, and IT people in AI training.

H-2 The Experimentation level in Human Resources:

You've started to define the roles and responsibilities of the people working with AI, but your organization is still experimenting to discover the right way to organize in order to leverage AI effectively. Small teams of in-house experts in data science, business intelligence, or advanced analytics may have begun to build proofs of concept. However, your organization must resist the temptation to let these teams work in isolation. Proofs of concept should help your organization discover what additional knowledge (technical and non-technical) it will need in AI. For example, leaders should start communicating the AI vision and roadmap to employees. Individuals at various levels and serving different roles should be recruited to help plan and conduct AI experiments.

To progress in this dimension:

- H-2.1 Create cross-functional, flexible and connected teams that will take ownership of AI projects.
- H-2.2 Host AI learning events, such as conferences, coding marathons, or training sessions. Encourage the development of communities of practice.
- H-2.3 Identify AI-centric competency profiles and career paths and assess their potential impact on human resource planning.
- H-2.4 Develop partnerships with AI specialists and researchers to expand your AI capabilities.

H-3 The Formalization level in Human Resources:

New AI roles, such as machine learning engineer or data architect, have been introduced into your organization, which is looking to better define their contours. AI performance indicators are beginning to be defined, but they are not yet integrated into the organization's routine performance management processes. AI communities of practice have been created to develop employees' knowledge and skills and to provide them with resources to carry out their roles effectively. Leaders actively communicate the vision they have for AI and its potential for the organization and motivate and train their staff to ensure that they share that vision and can implement it.

To progress in this dimension:

H-3.1 Define the AI responsibilities of the leadership's team members and define the structure, tasks and budgets that will enable the execution of your organization's AI plan.

H-3.2 Update your performance goals and talent recognition systems in a way that allows you to attract and retain good AI employees.

H-3.3 Establish an AI centre of excellence to support and streamline AI deployment in your organization to a high standard.

H-3.4 Develop your change management skills to ensure you can adequately support teams that will be using AI or that will be affected by the deployment of new AI systems.

H-4 The Optimization level in Human Resources:

Your organization has clearly defined responsibilities in IA and has identified key performance indicators that everyone should observe. Your talent strategy includes deploying a professional development pathway that increases employees' level of AI knowledge and boosts their ability to adapt to the changes introduced by AI. The strategy also includes plans to build specific AI capabilities and upgrade the AI skills of existing staff, as needed. Leaders actively help the organization adapt to change. Organizational structures such as AI communities of practice or the AI centre of excellence are formalized and their mandates are expanded to include managing the organization's relationships with the AI ecosystem, including vendors.

To progress in this dimension:

H-4.1 Ensure that the AI lead sits on the executive committee to ensure oversight and compliance with AI KPIs.

H-4.2 Establish realistic learning paths for those responsible for AI development and deployment.

H-4.3 Give all your employees a foundation in AI—don't limit your training efforts to your technical employees.

H-5 The Transformation level in Human Resources:

All teams and employees have a high degree of AI knowledge and support a culture that encourages collaboration with AI systems. AI is integrated into all roles in some way, including at the executive level. The human resources team is likely to use AI in planning recruitment. As a result, the organization's delivery model is being transformed, changing the way roles are defined and how employees do their work.

To progress in this dimension:

H-5.1 Make sure you support AI skill mastery within your teams and foster the development of different AI expertise.

H-5.2 Develop a true culture of innovation, with AI at its core. Invest in continuous improvement of your innovation management.

H-5.3 Encourage your employees to actively participate in external communities of practice on AI advances and issues.

Dimension 5

Governance

G-1 The Exploration level in Governance:

Your board members, management teams, or some employees involved in your AI efforts are just beginning to learn about AI in order to understand the benefits of deploying it responsibly, as well as the obligations and risks associated with its production or use. AI is not yet a responsibility assigned to a specific individual or group within your organization. No specific governance mechanism has been put in place at this stage.

To progress in this dimension:

- G-1.1 Familiarize yourself with discussions about the importance of producing and using AI responsibly (e.g., issues related to AI ethics, reliability, or transparency)
- G-1.2 Learn about new risks associated with AI deployment and the legal rules around data management, especially personal data if you collect it.
- G-1.3 Put a specific senior leader in charge of AI. This will ensure that your organization produces and uses AI effectively and responsibly.

G-2 The Experimentation level in Governance:

Your business and technical teams and risk management experts succeed in establishing a common understanding of the risks to be avoided, the legal obligations to be observed, and the compliance criteria to be met throughout the lifecycle of an AI solution. But your AI governance processes remain complex. Their implementation is usually ad hoc and often leads to delays. Your organization has begun to develop high-level principles for AI that go beyond the minimum legal requirements. To increase their confidence in AI, internal stakeholders who will use or be impacted by it are involved in efforts to test and refine new models, but these parties are not always consulted upstream. The organization is beginning to explore techniques like explainable AI that increase user trust.

To progress in this dimension:

- G-2.1 Form an advisory committee with the various stakeholders involved in your organization's AI to get a full view of challenges and opportunities.
- G-2.2 Adopt principles to guide the responsible development and use of AI and to define a governance structure, roles and responsibilities, processes, and metrics that will ensure organizational adherence to these principles.
- G-2.3 As you experiment with AI, document the factors that block or facilitate the release of your models into production, so that you can make continuous progress in this area.

G-3 The Formalization level in Governance:

Governance is seen as a critical component of your overall AI strategy. Practices that build AI trustworthiness and confidence in AI are an integral part of the standard development cycle for AI solutions. The evaluation of models and their quality is most often done by a team separate from the AI modelling team. Accountability is centralized and transparent. Discussions centered on the ethics of AI receive input from external experts who can help the organization resolve issues that may arise when its performance goals conflict with important principles like privacy. The guiding principles of AI governance are well integrated into teams' daily practices, tracking specific performance indicators in areas such as AI safety or reliability.

To progress in this dimension:

- G-3.1 Take inventory of the algorithms created and implemented by your organization and conduct a review of the effects and risks of all kinds associated with their deployment.
- G-3.2 Design policies and rules for your organization's development and deployment of AI. In particular, ensure that the ethical issues raised by the use of AI are adequately considered.
- G-3.3 Formalize processes, roles, and responsibilities for AI deployment to comply with applicable regulations and minimize the overall risks (e.g., reputational risks) that the use of AI may pose to your organization.
- G-3.4 Standardize your AI project performance evaluation processes and improve the way you report to your employees and external stakeholders.

G-4 The Optimization level in Governance:

As the number of AI models launched into production by your organization increases, so does the complexity of the interactions between those models, making it more likely that regulators and others will scrutinize your AI practices. To keep pace, your AI governance practices are steered by formal guidelines that are systematically implemented through increasingly centralized processes or technologies. Your organization assesses the risks associated with each AI model and its portfolio of models with a deep understanding of its AI operations and business environment.

To progress in this dimension:

- G-4.1 Establish structures, such as an AI ethics council, to oversee and develop your AI practices and governance across the organization.
- G-4.2 Properly monitor the implementation of internal policies and guidelines that ensure responsible use of AI across your organization and publicize these policies and guidelines.
- G-4.3 Implement proactive engagement practices for internal and external stakeholders affected by your AI systems.
- G-4.4 Monitor and stay abreast of best governance practices in your industry.

G-5 The Transformation level in Governance:

Strong governance has enabled your organization to go beyond current regulations. Multiple lines of defence against risk are in place, building stakeholder and user confidence and giving your organization a competitive advantage. Your organization faces new challenges related to AI ethics or to equity, accountability and transparency; it tries to respond proactively by openly discussing the interests of different stakeholders or the trade-offs that must be made between the pursuit of organizational or financial performance and the principles of responsible AI. This can lead to the development of new managerial and technological approaches.

To progress in this dimension:

- G-5.1 Conduct audits of your organization's AI systems to ensure that they are performing as intended, with the expected impacts, and without negative fallout for your customers or partners.
- G-5.2 Get involved in the AI ecosystem. Contribute to discussions about AI governance and ethics and help shape industry standards and best practices to maintain your leadership status.
- G-5.3 Conduct public outreach and education on the use of AI in your industry to build lasting trust.
- G-5.4 Go beyond regulatory requirements and periodically review your internal practices to ensure they remain the best in the industry.

Appendix
The Artificial Intelligence Maturity Assessment Questionnaire

How to answer the questions

To provide you with the most relevant recommendations possible, we need to understand where your organization stands with respect to each of the dimensions that determine AI adoption readiness.

For each question, the answers are ordered from the lowest level of progress (A) to the highest level of progress (E). Please select the answer that corresponds to the highest level achieved by your organization.

1 Strategy

- The organizational vision and action plan to maintain momentum toward AI maturity

Q1 How important is AI to your organization right now?

a. We have a budding interest in AI, but relatively few financial resources are available for AI projects and the need to develop an AI strategy is not a priority.

b. Some teams or organizational units have allotted financial resources to launch AI projects; some even have an initial AI strategy supported by their manager.

c. An AI strategy has been developed for the organization that addresses the key organizational factors necessary for success.

d. We have strong management support for integrating AI across the organization and our business unit managers are now aligning their human, financial and material resource planning with the AI strategy.

e. AI is seamlessly and comprehensively integrated with the organization's overall strategy.

Q2 How widespread is AI in your organization right now?

a. We have just discovered AI and don't know how to apply it in our organization.

b. We have identified promising AI use cases for our organization and are looking to establish their value by conducting simple experiments or proofs of concept.

c. We have successfully put at least one AI model into production while conducting an experiment or proof of concept.

d. We have deployed one or more AI-based products or services to our customers or have successfully applied one or more AI models to improve our internal operations.

e. AI sits at the core of our business model; it is a key driver of productivity, efficiency and innovation in many facets of our organization's operations.

2 Data

- Reliable data to train, put into production and improve AI

Q1 Are you able to access all the data you need for AI?

a. Our data collection or access is very difficult; this is a barrier to our AI initiatives.

b. Some of the data we collect to meet our minimum business requirements is accessible and can be used to begin developing proofs of concept.

c. We systematically collect key internal data for analysis and this is accessible to create AI models.

d. An extensive data set is readily available to many of our organizational units, allowing them to create AI models.

e. We treat data as a valuable asset and make it available to all parts of the organization in a proactive and efficient manner.

Q2 Is the data cleaned and consolidated in a way that can be easily leveraged by AI?

a. We don't know if the data we have is of good quality and ready to be used.

b. We perform some data cleansing and consolidation for specific use cases.

c. We have begun to standardize data cleansing and consolidation across the organization.

d. We have implemented a standardized data cleansing, consolidation and enrichment process, supported by efficient infrastructure and tools.

e. The process of cleansing, consolidating and enriching our data is not only standardized, but it is also automated.

3 Technology

- The hardware and software infrastructure to power AI throughout a solution's lifecycle

Q1 What are the technological foundations on which your organization bases the development of AI?

a. We are using our personal computers or cloud environments to conduct our first AI explorations.

b. We have dedicated AI servers and tools for training AI models (although we may not have enough to meet all our needs).

c. We have powerful servers dedicated to AI and tools that allow us to optimize the training of our AI models or the allocation of our AI computational resources.

d. We have equipped ourselves with a full range of equipment and tools to automate the lifecycle management process of our AI models.

e. We use AI itself to optimize our AI infrastructure, automatically predict variations in workloads and review how our resources should be allocated.

Q2 How do you perform maintenance on the AI models deployed by your organization?

a. To this day, we have not deployed any AI models to date.

b. The lifecycle of our AI models ends after their initial deployment.

c. Some of our models are in production and we use performance indicators to monitor them (e.g., processing time, CPU or GPU consumption, availability).

d. We continuously monitor our model's development for emerging problems (e.g., conceptual drift, data drift, adversarial attacks).

e. We have defined a comprehensive procedure and sought to automate it to update our AI models and ensure their retraining.

4 Human Resources

- Roles and responsibilities, skills and KPIs for operating more intelligently with AI

Q1 What level of AI knowledge and expertise does your organization have?

a. Some of our employees have expressed interest in AI.

b. AI specialists have been hired or external consultants recruited to support our teams' execution of AI proofs of concept and pilot projects.

c. Our organization has a plan in place to develop the talent and skills required to use AI internally; it has also clearly defined roles and responsibilities for everyone in AI.

d. A centre of excellence has been created or guidelines issued to help our teams and organizational units deal with the changes that AI brings.

e. All our teams have a high level of AI knowledge.

5 Governance

- Policies, processes and structures to ensure the development of responsible and safe AI

Q1 What governance mechanisms have been put in place to support AI deployment in your organization?

a. We have not created any AI governance mechanisms and no employees have formal AI responsibilities.

b. Our business, technical, legal and other teams work together to ensure legal compliance and manage the risks associated with our AI projects.

c. A multi-stakeholder committee oversees our AI projects and develops controls throughout their life cycles.

d. Policies, rules, or guidelines have been put in place to help our organization produce and use AI responsibly; we do a thorough analysis of the risks associated with having our AI systems in place; and we have developed binding AI accountability mechanisms.

e. Our strong governance structure allows us to address the new challenges associated with responsible AI deployment in a proactive—not merely reactive—manner.

Q2 What importance does your organization place on the principles of responsible AI?

a. The quest for better organizational or financial performance is the sole principle that guides all our AI projects.

b. We are beginning to learn about responsible AI, particularly the risks associated with AI deployment and its legal aspects.

c. Our organization follows principles of responsible AI production or use that go beyond the minimum legal requirements.

d. The principles of responsible AI, such as privacy and respect for individual autonomy, are reflected in our daily practices and are subject to accountability.

e. The quality of our responsible AI practices is publicly recognized and gives us a real competitive advantage.

The Artificial Intelligence Maturity Assessment Tool is available in interactive format on the Vitrine AI Québec (https://vitrine.ia.quebec/en/maturity). Answer the questions online to get your personalized profile.

Access the online tool

Visit the Vitrine AI Québec website (https://vitrine.ia.quebec/en) for more information on the Quebec AI ecosystem and the resources available to accelerate your progress in AI.

Visit the Vitrine