Implementing Artificial Intelligence with Business Architecture

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Introduction

With artificial intelligence (AI), machines can learn from data and mimic cognitive human functions. The impact of this technology on the business is huge and AI is beginning to play a pivotal role in business transformations. However, many organizations often don't know where to start, which capability has to be transformed first, is the most critical, is the best to beat the competition. They also don't have clear visibility into how a process or how the IT landscape should change to support artificial intelligence.

What does business architecture mean?

- As described in Wikipedia, it is a discipline that "represents holistic, multidimensional business views of capabilities, end-to-end value delivery, information, and organizational structure; and the relationships among these business views and strategies, products, policies, initiatives, and stakeholders."

- Business architecture is a part of an enterprise architecture related to a corporate business or an organization. Business architecture bridges the gap between a company's strategy and its successful execution. It helps you describe your business capabilities and connects them to your company's objectives.

What does business architecture mean?

- Let's review first some examples of artificial intelligence applications so we can get a more precise picture of the order of magnitude of artificial intelligence transformation to the business:

- In the banking industry, algorithm trading driven by artificial intelligence will enable banks to perform millions of trades in a day where humans are unable to process this amount of data. In personal finance, individualized optimization of spending and savings can be performed based on personal goals and habits. AI chatbots can also provide automated recommendations and approvals for personal wealth management or loans.

- In healthcare, artificial intelligence can be used for medical diagnosis or interpretation of medical images.

What does business architecture mean?

- In various industries, facial recognition is another artificial intelligence application with its many related security applications.

- Even though <u>artificial intelligence technology</u> is promising, it represents a real challenge for companies to develop, customize or implement. Additionally, budget and resources are often limited, and organizations are reluctant to spend some of their budgets for a hypothetical return on investment into a technology that has not yet proved its profitability.

- The implementation of artificial intelligence requires a broad understanding of the business context because lots of customizations can be needed to implement an effective AI solution that brings concrete business results. Also, there are many areas of the business that can benefit from artificial intelligence that it is often very difficult for company leaders to prioritize artificial intelligence initiatives.

Business Architecture helps in implementing AI within organizations

- Based on these aforementioned challenges, company leaders need help gaining clarity to improve their decision-making when it relates to AI. This is where business architecture comes into play with its holistic approach. As described in Wikipedia, it is a discipline that "represents holistic, multidimensional business views of: capabilities, end-to-end value delivery, information, and organizational structure; and the relationships among these business views and strategies, products, policies, initiatives, and stakeholders."

Four elements to define Business Architecture?

- Value Streams

- Business Capabilities

- Information

- Organization

#1 Value Streams

- Value streams are depicted as an end-to-end flow of activities from a stakeholder perspective. They define the required stages necessary to satisfy customers.

- Let's suppose a bank wants to understand how it can improve its loans with artificial intelligence. A business architect will define the value stream for a customer who wants to subscribe to a loan as such:

- Review all loan offers -> get advice -> select the loan -> check credit score -> get approved -> pay desired item with the loan

- By describing value streams, business architects ensure to get a true customer-centric approach integrated into the business architecture. Value streams are also easy and quick-to-use and they clearly show how value is delivered to the customer. In the previous example, the value obtained by the customer is to pay a desired item with the best loan.

#2 Business Capabilities

- A business capability map is a set of business capabilities that can be viewed as the building blocks defining the business. Business capabilities can also be tied to value streams because each stage of a value stream is enabled by business capabilities. With this tie, business architects can fully understand how business capabilities provide value to customers and work with a truly customer-centric approach.

- Then, by assessing business capabilities, business architects are able to identify and prioritize the business capabilities that can be improved.

- Going back to our last example, business architects can assess the capabilities supporting the loan approval stage in the value stream and find out how they can be optimized with artificial intelligence.

#3 Information Technology

- In AI, information is of course an important aspect because artificial intelligence is all about data, structured or not structured. In business architecture, this element is about making a glossary of business concepts used in an organization and depicting how they relate to each other in information maps. Concepts can be created through a bottoms-up approach which consists of analyzing databases and extracting metadata out of them. A top-down approach can also be performed. In such a case, business architects can identify the different concepts based on the business capability map objects.

- In our example, the approval piece can be optimized by, for example, analyzing vast amounts of consumer data and utilizing machine learning algorithms to develop credit risk models that predict a consumer's likelihood of default.

#4 Organization

- Representing the organization is key to understanding the business context. In this element, business architects describe the company organization (business units, departments, functions, people, etc.) in organizational maps. Organizational items can also be tied to business capabilities to get visibility into the business units involved for each capability.

- When analyzing how artificial intelligence will impact an organization, it becomes clear and easy to identify the business units impacted by a change in a business capability due to artificial intelligence.

- Other elements of business architecture and enterprise architecture need to be studied to fully understand the impact of artificial intelligence on an organization. Namely, the business processes that need to be redesigned because artificial intelligence will change many current processes, as well as the applications supporting business capabilities that should be redeveloped to integrate artificial intelligence.

- Based on this analysis, business architects can identify various transformation initiatives or projects, and simulate different transformation scenarios of AI implementation, such as building or buying a new AI application or adding a new AI feature to an existing application.

Building Strategic AI Roadmap for your business

- In an era when <u>many businesses are experimenting with AI</u> — and a significant number of <u>AI projects are failing</u> — it's never been more important to have a plan. Building an AI roadmap means so much more than simply trying and failing. It's about discovering, analyzing and prioritizing your AI investments to deliver business value.

- An AI roadmap is a portfolio of vetted AI opportunities prioritized to achieve strategic business goals over the short and long term. It's the first step to having a solid strategy for AI, but it's not a comprehensive plan to transform your whole enterprise. Instead, it kicks off the sequence of work laid out in the <u>four pillars of intelligent AI adoption</u>: Strategy, Data and Technology, People and Organization, and Governance.

- There's something to be said for the experimental approach to adopting AI. It's impossible to see every AI opportunity ahead of time, even for teams who are skilled at judging good opportunities from bad. By just jumping in, you learn fast by failing fast. But failing fast doesn't set you up for long-term success.

Building Strategic AI Roadmap for your business

- Learning by experiment is a critical supporting tactic for adopting AI, not a strategy. An AI roadmap is that strategy, allowing you to plan and choose the best tactics for intelligent AI adoption at your organization.

- Through our work with clients in multiple industries over the last few years, we've refined a repeatable process to build a roadmap quickly over three activity phases:

1. **Discover** AI use cases.

2. **Analyze** AI use cases and capabilities for impact, effort, and risk.

3. **Prioritize** AI use cases and capabilities, given dependencies and complements in the business plan.

Discover AI Use Cases

- In the Discover phase, the outcome is to build a portfolio of AI use cases to evaluate in the subsequent phases.

- Discovery is about looking beyond the mechanics of AI, the "how-to" questions, and instead looking at the business opportunities. What can your business do better by using AI? What can it do that's new? What value should you create next, and why?

- To begin, the ideal place is to scope the work at the level of a business line — not the whole business, nor a single process or task. The former is too big to create meaningful plans, while the latter is too granular. At financial institutions, for example, we would look at use cases in wealth management or credit lending rather than banking as a whole.

- After choosing your focus, educate change leaders on how to recognize a good AI use case. A use case should have data that describes both the input and expected output for a business task — like the detailed product descriptions available in multiple languages that enabled eBay to specialize performance of its machine translation AI using back-and-forth examples.

- Finally, work across teams to design new possibilities, matching AI capabilities (such as natural language processing) to use cases (such as translation of product listings). Ideas do need to be practical, for example: what prediction will be made, using what data, and how will the predictions be applied to create value? However, imagination and ambition pay off, too — among early adopters of AI, more than 60% reported discovering a new business model according to an IDC survey.

- To generate the best ideas, balance top-down and bottom-up insights. Interviews with employees and customers, for example, can help create early buy-in as well as a deeper understanding of on-the-ground business operations.

- At the conclusion of the Discovery phase, your team should have a set of use cases estimated to be of high impact that still require detailed validation.

Analyze AI Use Cases and Capabilities

- After assembling a set of potentially high-impact use cases, the Analysis step means determining the impact, effort, and risk of each one — paying special attention to AI capabilities that can be reused across multiple scenarios.

- When estimating the impact of an AI use case, look at more than just incremental improvements to accuracy or efficiency. It's about working smarter. Let's look at two examples from an investment banking context to help clarify.

- For a portfolio manager who reads corporate reports and analysts notes, an AI capability like natural language processing could provide them with summaries and key information more quickly than combing through everything themselves. The initial metric for this use case could simply be time saved. Another use case might be optimizing a trading strategy using a deep learning model. For this use case, the metric could be an improvement in what traders call the alpha, the active return on investment above the market benchmark.

Analyze AI Use Cases and Capabilities

- These two use cases translate into cost savings for their initial metric, but if a portfolio manager has two extra hours in their day to do other high-value work, then cost savings alone is hardly the only impact. The portfolio manager might be able to manage a larger portfolio, spend more time building client relationships, or other tasks as determined by the distinct business line strategy. Similarly, an improvement in ROI might unlock new opportunities for the business at a certain tipping point.

- Each use case and capability then requires development, integration, and change management. To estimate this effort, consider the use case in the context of Strategy, Data, Technology, People, and Governance. What data and technology infrastructure might you need for this use case to work? In the banking example, do you have the trading data to drive optimization, in the right state for it to be used at the right speed to make an impact?

- Finally, AI systems must be safe, reliable, trustworthy, and accountable. To estimate risks in each of these areas, a system-level perspective is critical. For each use case, what is the potential physical, economic, or psychological harm for employees, customers, and other stakeholders? Are the model and process sufficiently explainable?

- At the conclusion of the Analysis phase, use cases and capabilities have the data necessary for decision-makers to come together around a common vision and plan.

Analyze AI Use Cases and Capabilities

Analyze AI use cases and capabilities

| Priority | = | Impact | - | Effort | ÷ | Risk |

Prioritize AI Projects

	Impact			Effort			Risk		
	Financial	Human	Strategic	Development	Integration	Change	Safety	Trust	Accountability
Use case 1									
Use case 2									
Use case 3									
Use case 4									
Use case 5									

Analyze AI Use Cases and Capabilities

- In the Prioritize phase, align your team to sequence AI investments for maximum impact, balancing three goals:

1. Setting up immediate next steps with valuable, actionable projects.

2. Setting up bigger wins downstream with a deliberate plan for building and scaling capabilities over time.

3. Unlocking support and budget by aligning executives and change leaders around a common vision.

- The first two goals are about balancing short- and long-term value. The third is about unblocking progress by securing buy-in from leadership about the realistic costs and benefits of AI investments.

- The work of the initial phases should provide the details for you to use in decision-making, but in this final phase, be sure to build in time for evaluating any remaining critical dependencies and uncertainties. In particular, AI capabilities are reusable in ways that previous technologies are not, expanding the possibilities for ROI for a given project — as well as possibilities for risk.

AI Maturity Models

- Recent progress in artificial intelligence may represent the most significant technological advancement in a generation, but progress is uneven. Our recent industry survey confirms that most enterprise organizations still have not graduated beyond their first AI experiments and pilot projects. Progress is slow at most enterprises because implementing AI depends on technical as well as organizational factors—and few resources exist to help leaders plan and strengthen their organizational foundations for AI. In this presentation, I'll present a comprehensive AI Maturity Framework to close that gap. The AI Maturity Framework is designed to help leaders understand and prioritize the actions that will have the greatest impact on AI in their unique context. It catalogs five key dimensions that must be aligned to create and scale business impact with AI: Strategy, Data, Technology, People and Governance. It also explains how these dimensions define an organization's maturity across five stages: Exploring, Experimenting, Formalizing, Optimizing and Transforming.

- At a macro level, our survey confirms that fewer than one in ten organizations (7%) are mature enough to operationalize and scale AI. About twice as many (14%) are aligning Strategy, Data, Technology, People and Governance to join this vanguard. Another 52% are working through experiments to validate specific business cases for AI.

- Using the framework, and guided by insights from our cases and survey, business leaders can learn how the five organizational dimensions need to evolve in the age of AI, and quickly assess their own progress in each dimension. Then, they can target the best next steps for impac
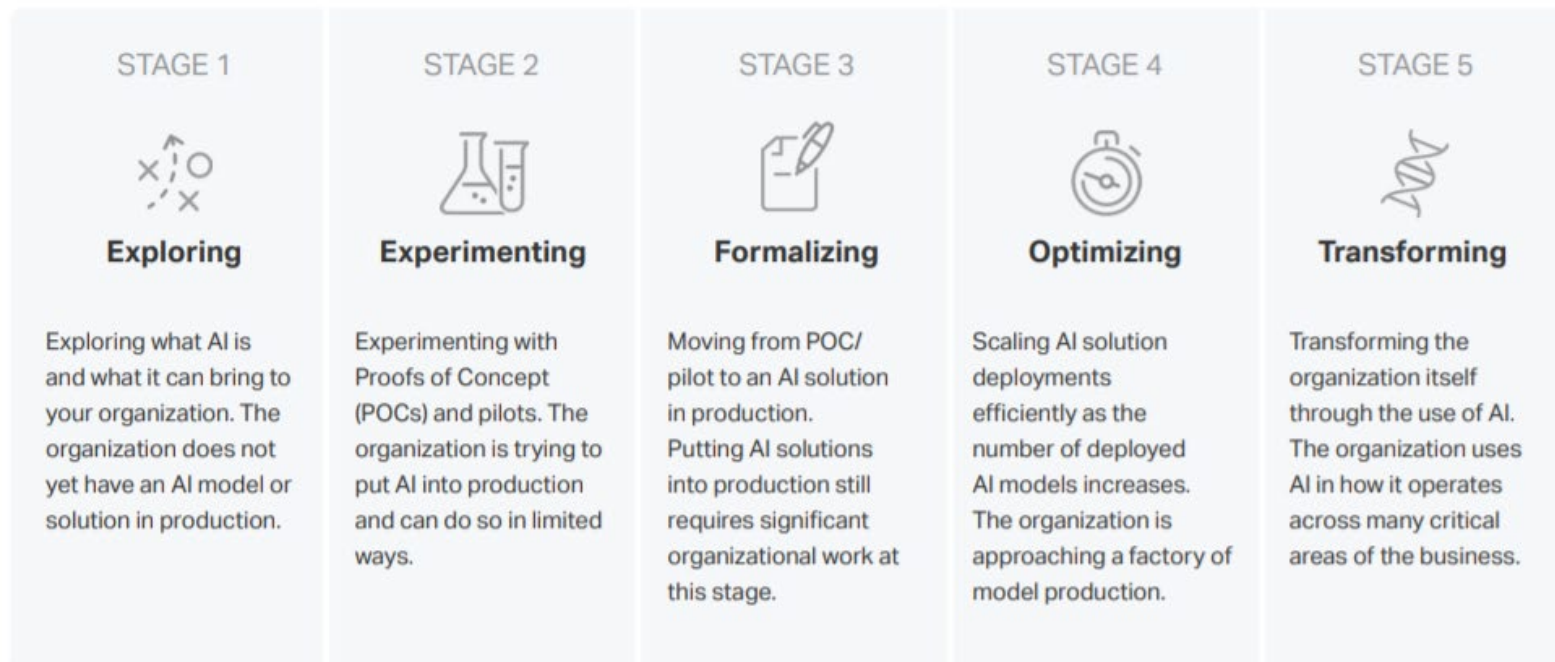
AI Maturity Models

- Fundamentally, organizations need to become digital at their core. This is what unlocks the organization's potential to operate without the constraints of traditional enterprises, to compete in new ways, capture unprecedented value and alter the very industries in which it operates. What we are really seeing with AI is a redefinition of what an organization can be—how it operates, strategizes and competes. What is AI? The goal of the field hasn't fundamentally changed since its inception in the 1950s: to create machines that exhibit human-like intelligence. In seventy-odd years, methods for achieving this goal have proliferated. The field is now a dynamic hybrid of hard science and practical engineering, with dedicated research programs for applications such as machine vision and natural language processing; techniques such as neural networks and reinforcement learning; and social implications such as Fairness, Accountability, and Transparency (FAccT). Now, AI systems perform at or above human-level for many specialized tasks. This includes tasks that were never before possible or practical to address with written rules or traditional software, such as intelligently recognizing and categorizing millions of images. There are even more creative applications of AI, such as generating new images, text and other data. And fundamental AI research activity is still on the rise.

- What is AI maturity? It's a measure of an organization's ability to achieve and scale impact from AI systems. Our recent industry survey confirms that in January 2020, fewer than 1 in 10 organizations are mature enough to put AI into production. But about 1 in 7 are actively clarifying their strategy for AI, developing their data and technology infrastructure, aligning their teams, and setting governance practices to scale responsibly.

- The central topic is our detailed framework for assessing AI maturity and focusing on the right actions to levelup. We also include results from our recent survey of senior decision-makers in multiple industries and cases from our advisory practice.
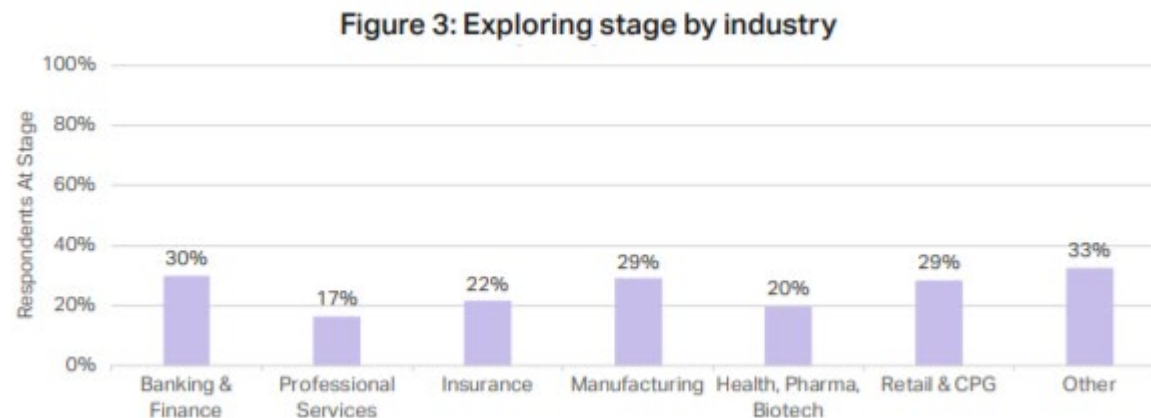
5 Stages of AI Maturity

- An organization's stage of AI maturity determines the business value it can unlock from AI solutions. Although this stage is determined by the combined progress of five organizational dimensions, each stage shares similar challenges and opportunities that cut across dimensions. Understanding the five stages helps you put your organization's current AI capabilities in context, including what your capabilities can help you achieve now (and what they can't) as well as what to anticipate for how those capabilities should develop in the future.

The five stages are:

| STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5
Exploring	**Experimenting**	**Formalizing**	**Optimizing**	**Transforming**
Exploring what AI is and what it can bring to your organization. The organization does not yet have an AI model or solution in production.	Experimenting with Proofs of Concept (POCs) and pilots. The organization is trying to put AI into production and can do so in limited ways.	Moving from POC/ pilot to an AI solution in production. Putting AI solutions into production still requires significant organizational work at this stage.	Scaling AI solution deployments efficiently as the number of deployed AI models increases. The organization is approaching a factory of model production.	Transforming the organization itself through the use of AI. The organization uses AI in how it operates across many critical areas of the business.

Exploring

- In this stage, your organization is exploring what AI is and what it can bring to you. Your organization does not yet have an AI solution in production, but organizations with greater technical ability may start pursuing first Proofs of Concept (POCs) with AI.

- First Organizations start Exploring when they make the shift from general awareness of AI to targeted questions about problems or opportunities that it can help them address. This might start with zero budget or with a formal charter for adopting AI. Either way, teams are still learning about specific benefits of AI for their industry and are unsure of how to realize them.

- Next Exploring tends to be driven by ambitious individuals or teams who focus on building informed interest and buy-in. They make progress by evaluating business use cases, costs, and benefits. Technical teams might start on AI experiments, but mostly as a tool for learning and creating internal awareness and excitement.

- Later Organizations reach a tipping point when they gain the ability to recognize good AI opportunities from bad ones. This allows teams to start building a roadmap of what work is required to define compelling AI solutions.

Figure 3: Exploring stage by industry

| Industry	Respondents At Stage
Banking & Finance	30%
Professional Services	17%
Insurance	22%
Manufacturing	29%
Health, Pharma, Biotech	20%
Retail & CPG	29%
Other	33%

Experimenting

- In this stage, your organization is experimenting with Proofs of Concept (POCs) and pilots. The goal of these efforts is no longer to experiment, but to drive measurable business impact. Successful experiments help teams to build momentum for AI and create limited business value along the way

- First Organizations enter the Experimenting stage when they start testing hypotheses about what value can be created from specific AI solutions, and how. Usually, this is done with a Proof of Concept (POC). POCs might start with an AI software vendor or a single internal team able to operate independently.

- Next Experiments yield progress as their results clarify how to create business impact with AI out of the unique resources, opportunities, and challenges of the organization. This iterative learning approach is as much about verifying what AI can actually do as it is about clarifying what else is required to achieve impact. Teams that make the swiftest progress are careful to maintain focus on identifying blockers and enablers for AI models in production, especially AI governance topics like reliability, safety, trustworthiness, and accountability.

- Later Experiments might yield business value when deployed as a calculated risk into a limited application area. It's more important in the Experimenting stage for teams to develop a good handle on which projects should be put into production and how they will measure success.


Figure 4: Experimenting stage by industry
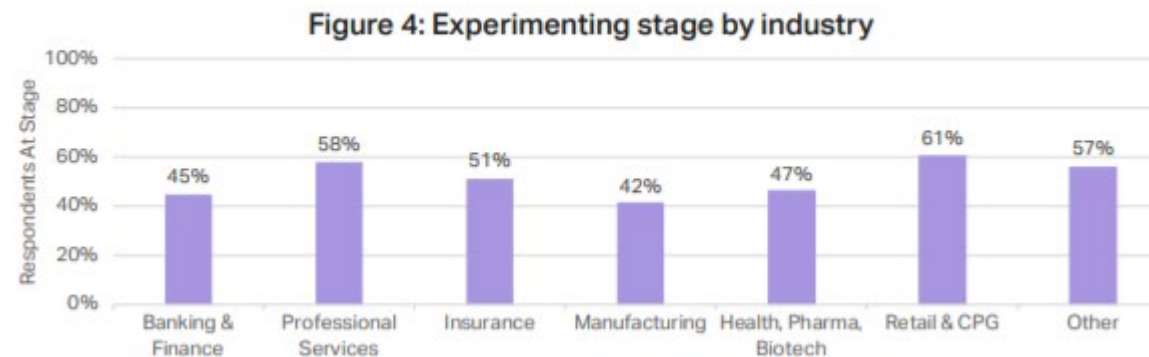
Formalizing

- In this stage, your organization is formalizing its efforts in AI by deploying pilot projects into production with a user adoption plan for achieving target performance metrics. The goal of these efforts is no longer to discover what AI could do in the environment, but to drive measurable business impact with it.

- First Organizations enter the Formalizing stage when they successfully deploy their first AI projects into production, usually as limited pilots. The goal is no longer to experiment to find what will work, but to leverage the lessons and outcomes of the experiment for measurable business impact. Putting AI solutions into production requires significant effort at this stage, so each solution must have a clear business case with agreed-upon performance metrics. Additionally, internal risk policies and industry regulations simply won't allow AI projects to go live without adequate processes and relevant software tools to ensure their responsible use. If the organization has not yet matured in AI Governance, it quickly discovers gaps at this stage.

- Next Initial AI solutions might be budgeted, developed and deployed in an ad hoc manner to start, but Formalizing organizations use their experience to refine future plans for standardizing or streamlining AI delivery. This focus guides the organization to confront any dimensions that it has not yet developed. For example, the data required to run an AI solution in production might necessitate expensive, bespoke system integrations, raising awareness about the need for more integrated data strategy

- Later To adopt more complex applications of AI in critical business processes, executive-level sponsorship helps to increase budgets, mandates and plans, with special attention paid to ensuring AI models are safe, responsible and maintainable over time.

Figure 5: Formalizing stage by industry
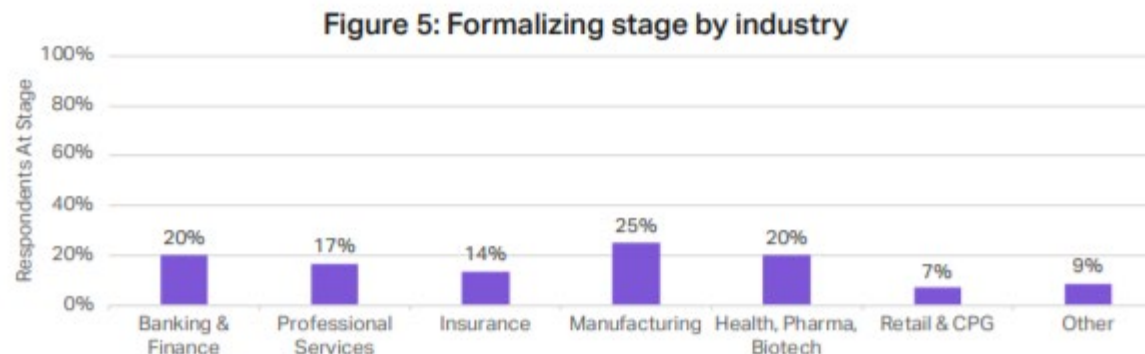
Optimizing

- Scaling AI and integrating it across the enterprise In this stage, your organization is applying AI both in internal operations and in products, services, or other interactions with customers and suppliers. Multiple AI solutions are delivering business value with clear ROI. The organization can also move quickly from needs discovery to deploying in production. As a result, technical enablers and business processes are being put in place to safely govern AI at scale.

- First Organizations start to enter the Optimizing stage when they have at least one AI solution production and can reliably select, deliver, and manage additional AI projects with positive ROI.

- Next As the number of deployed AI solutions increases, new opportunities arise to improve the efficiency of delivering AI projects. For example, reusability of AI solution components and alignment between different organizational roadmaps allows for greater cost savings and faster deployment. At the same time, new challenges arise around the complexity of supporting AI models in production. New infrastructure and programs are needed to integrate data, train users and to measure and control AI model performance at scale.

- Later The organization has completed investments to streamline the development and management of AI systems and has formalized policies and guidelines for using AI responsibly. Typically, C-level sponsorship has been involved to help drive integration across the organization.

Figure 6: Optimizing stage by industry
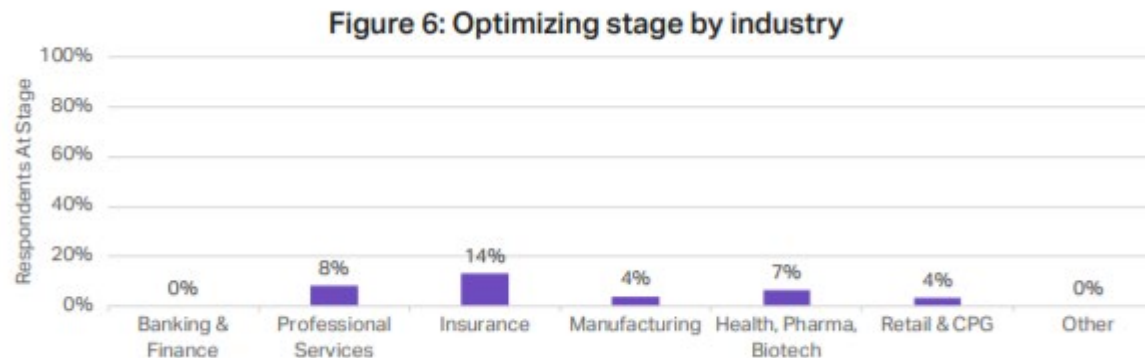
Transforming

- Actively shaping the organization with AI in new and profound ways In this stage, your organization is pushing the boundaries of your industry and producing state-of-the-art work using AI. Your organization is not only applying AI to automate and augment business processes, but also to bring new business models, products or services to market. The organization has broken down organizational silos to integrate data and reimagine how value is created. AI drives decisions across the organization, supported by interconnected systems that learn and adapt over time.

- First Organizations enter the Transforming stage when all organizational enablers are in place for AI and the majority of business decisions can be made with or by artificial intelligence. Widespread AI literacy and successful communication of the AI vision and roadmap have enabled support for working across teams and breaking down silos to build next-generation AI solutions.

- Next The organization is using AI to actively define or redefine business models, products and services, in addition to operations. AI is a key budget priority. Executives base the majority of their decisions on AI-driven insights and the strategic direction of the company is closely linked with its use of AI. Organizational silos are breaking down further integrate data, infrastructure, talent and operations for AI.

- Later Once transformative AI maturity is fully realized, the technology is pervasive in business operations and across whole value chains, making it fundamental to how new strategic opportunities are ideated and implemented. Organizations that want to continue transforming must continue to advance the science and engineering of artificial intelligence as well as its ethical use in society
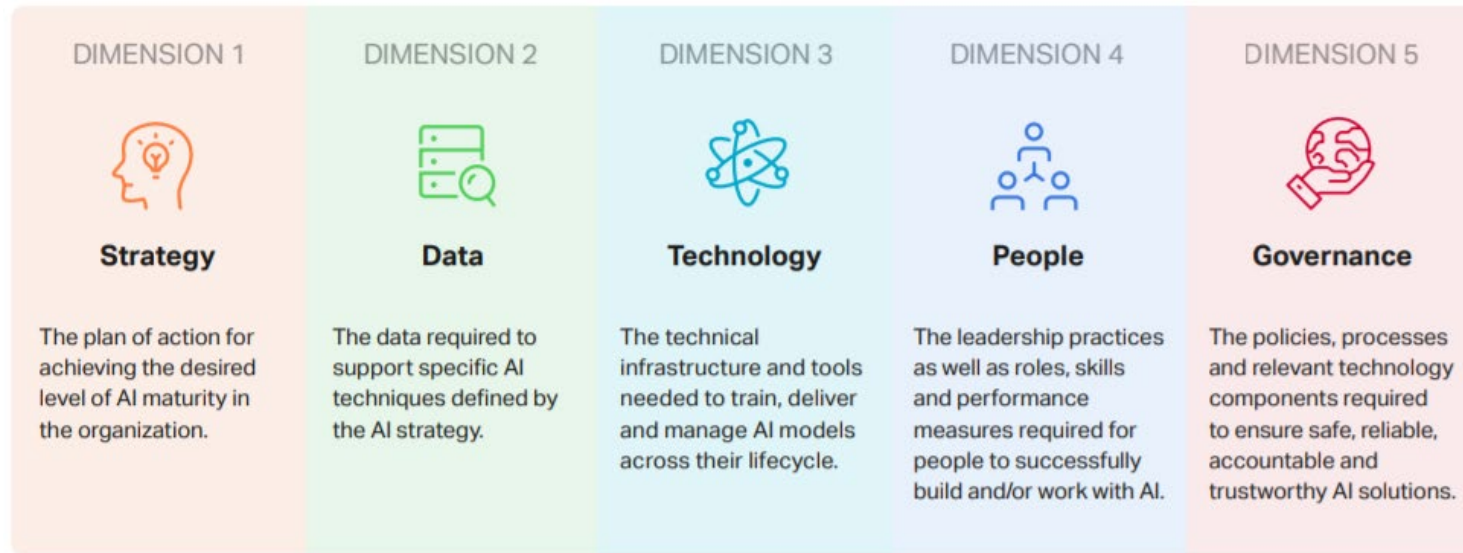
Figure 7: Transforming stage by industry

The 5 Dimensions of Enterprise AI

- Organizations must change how they think, act and learn in order to take advantage of AI. The five dimensions represent the key areas of any organization where management practices, operations and infrastructure need to evolve to realize this change. To successfully increase an organization's overall stage of maturity for AI, each of these dimensions must mature individually and together. The weakest link limits overall progress. By improving capabilities in less mature dimensions, business leaders can unblock progress for AI projects as well as accelerate their overall organizational maturity.
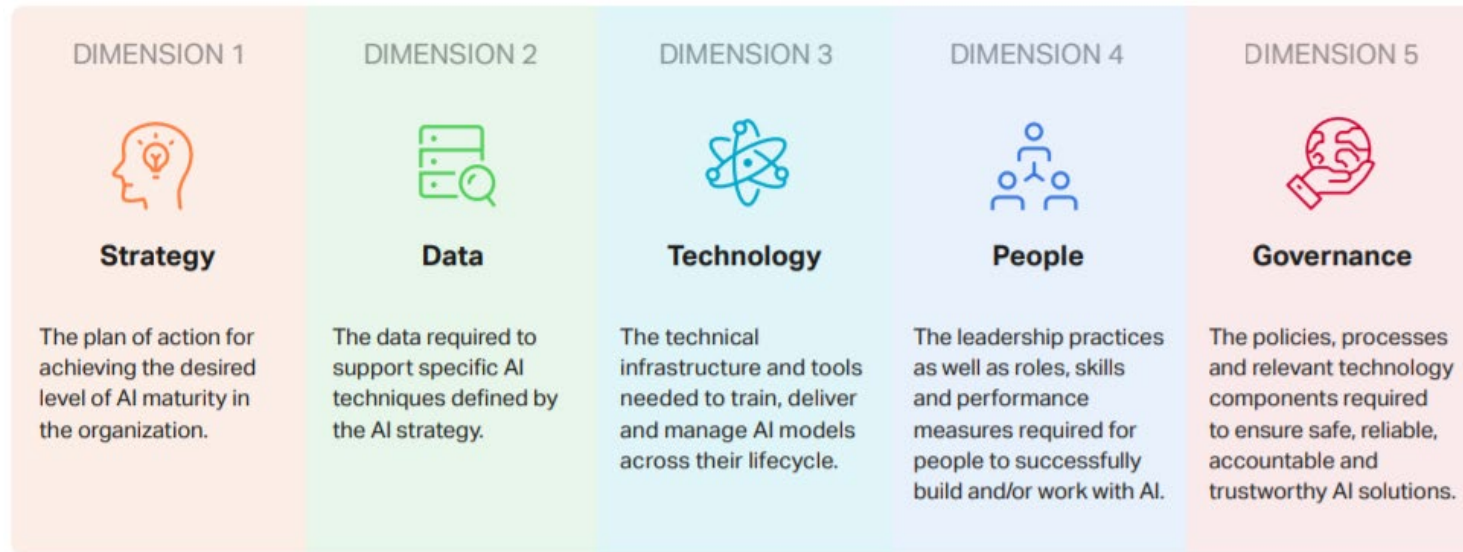
The five dimensions are:

DIMENSION 1	DIMENSION 2	DIMENSION 3	DIMENSION 4	DIMENSION 5
Strategy	**Data**	**Technology**	**People**	**Governance**
The plan of action for achieving the desired level of AI maturity in the organization.	The data required to support specific AI techniques defined by the AI strategy.	The technical infrastructure and tools needed to train, deliver and manage AI models across their lifecycle.	The leadership practices as well as roles, skills and performance measures required for people to successfully build and/or work with AI.	The policies, processes and relevant technology components required to ensure safe, reliable, accountable and trustworthy AI solutions.

#1 Strategy

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#1 Strategy

- Strategy at its core is about the choices that a business makes to win. Strategy for AI maturity focuses on the plan of action designed to achieve the desired level of AI maturity in your organization. Your plan needs to offer clarity about what needs to happen to implement AI, where, when and why—including how the organization intends to win with AI once implemented. The choices required to make this plan need to balance short- and long-term goals, taking into account the current stage of AI maturity, the competitive landscape, the business's strategy and ambitions, and leadership's desired velocity for progress. When organizations overlook the Strategy dimension, AI experiments lack the business direction and justification to overcome hurdles to deploying in production or staying relevant to the business after deployment.

- The following sections describe the Strategy dimension at each stage of maturity and what organizations can focus on to level-up.

- 1-1 Exploring Strategic alignment does not yet exist for what the organization wants to achieve with AI or how to achieve it. Usually, internal experts or enthusiasts are studying use cases or experimenting with personal side projects. These early visions for AI tend to be either too narrow (focused on non-critical parts of the business) or too broad and unrealistic, leaving projects without the value proposition or resources to proceed. To move forward to Experimenting:

- • Align business and technical leaders on the need for AI strategy to move forward

- 1-2 Experimenting Organizations still have not aligned on an overarching strategy or vision for AI, but they are starting to do so in two ways: first, by planning how to use AI in a subset of the organization, such as a business unit or team; second, by refining and testing hypotheses about what business problems AI could solve using trials and Proofs of Concept (POCs). Typically, some executive sponsorship exists to unlock budget for POCs but the burden is on project owners to prove opportunities are worth investment.

- To move forward to Formalizing:

- • Align and galvanize leadership on AI investments using successful Proofs of Concept (POCs)

#1 Strategy

- 1-3 Formalizing Executive sponsorship helps business teams to define the AI strategy for their organization. This sponsorship usually comes from a VP-level executive or above. With a clear strategy in place, little return may yet be realized from AI investments but the organization is able to make clear projections of ROI into the future. This enables the organization to unlock the budgets and mandate to execute their strategy.

- To move forward to Optimizing:

- • Document AI strategy for the organization to secure shared understanding

- • Gain budget and C-suite sponsorship for AI project

- 1-4 Optimizing The organization starts executing against a clear AI strategy and mandate. C-level sponsorship usually exists to integrate AI across the broader enterprise. The AI roadmap is getting aligned with digital transformation, innovation, research and development, human resources, and other strategies. As a result, budgets are pre-approved and earmarked for AI initiatives across most business units. ROI for AI solutions is measured with formal metrics and recognized in the fiscal planning process.

- To move forward to Transforming:

- • Align AI strategy with other organizational roadmaps

- • Discover opportunities to coordinate AI efforts across functions for greater impact

- 1-5 Transforming AI is seamlessly embedded into overall organizational strategy. Budget schemes and indicators for both business and AI technology are integrated, enabling organizations to readily discover and act on new AI-based operational improvements and business models. The organization has the experience required to envision major innovation to their work, products, and services over longer time horizons of multiple years.

- To keep moving forward:

- • Sustain momentum to keep innovating and transforming

#2 Data

- Data for AI maturity refers to the enablement of usable data required to train AI models. No data, no AI. But how much is enough? In fact, different AI techniques require different types and amounts of data. Simulation-based modeling does not require vast sums to start, and synthetic data can be used to augment smaller datasets. Therefore, opportunities found in the organization's data should influence the design of the AI roadmap, but formal data requirements should be defined by AI solution requirements, not the other way around.

- Typically, data requirements include considerations for being clean, complete, labeled (if using supervised machine learning techniques), integrated, secured, and corrected of harmful bias. These requirements apply across the full lifecycle of AI development, from training and testing to maintenance and retraining in production. They also enlist both technical and business ownership to successfully manage. For example, business users of systems that generate data must understand the downstream effects of using systems differently over time.

- 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. To move through the Experimenting stage, most (69%) are struggling to gather data or are collecting and cleaning it in an ad hoc manner (Figure 11). In the Formalizing stage, a smaller majority (58%) have learned from this experience to build dedicated practices and infrastructure to support multiple AI solutions (Figure 11). For example, one in five Formalizing organizations have a standard

- The following sections describe the Data dimension at each stage of maturity and what organizations can focus on to level-up.

- 2-1 Exploring Three main challenges impact the use of data for AI: visibility of internal datasets is low, special expertise is often required to understand data once it is found, and no standard infrastructure or process is in place to ease access to data. For example, structured data is often stored transactionally in databases and records, and it is siloed across the organization's different departments. Furthermore, the organization is not able to define data requirements for AI effectively and does not have clear plans to consolidate 1 2 3 4 5 86% 23% 0% 0% 0% 10% 49% 46% 11% 2% 0% 20% 35% 0% 0% 0% 4% 15% 56% 2% 0% 3% 4% 33% 100% 0% 20% 40% 60% 80% 100% 1. Exploring 2. Experimenting 3. Formalizing 4. Optimizing 5. Transforming % by Stage Is accessible data cleaned and consolidated for use with AI? 1. We don't know if our data is ready to use 2. We perform some cleansing and consolidation for specific use cases 3. We have begun to standardize data cleansing and consolidation across the organization 4. We have a standard data cleansing and consolidation pipeline, supported by efficient infrastructure and tools 5. We are actively evolving our data cleansing and consolidation efforts, supported by automated infrastructure and tools 35% 33% 27% 24% 33% 48% 36% 20% 33% 40% 43% 50% 33% 25% 29% 17% 13% 11% 8% 13% 29% 5% 0% 7% 16% 8% 2% 7% 15% 17% 13% 5% 0% 4% 0% 0% 20% 40% 60% 80% 100% Banking & Financial Services Consultancy & Professional Services Healthcare, Pharmaceuticals & Biotech Insurance Manufacturing Other Retail & CPG % by Industry Figure 12: Is accessible data cleaned and consolidated for use with AI? WHITEPAPER 24 The Five Dimensions of Enterprise AI data. For example, leaders do not have a good sense of

#2 Data

- Data for AI maturity refers to the enablement of usable data required to train AI models. No data, no AI. But how much is enough? In fact, different AI techniques require different types and amounts of data. Simulation-based modeling does not require vast sums to start, and synthetic data can be used to augment smaller datasets. Therefore, opportunities found in the organization's data should influence the design of the AI roadmap, but formal data requirements should be defined by AI solution requirements, not the other way around.

- Typically, data requirements include considerations for being clean, complete, labeled (if using supervised machine learning techniques), integrated, secured, and corrected of harmful bias. These requirements apply across the full lifecycle of AI development, from training and testing to maintenance and retraining in production. They also enlist both technical and business ownership to successfully manage. For example, business users of systems that generate data must understand the downstream effects of using systems differently over time.

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- To move forward to Experimenting:

- • Learn about the data requirements for different AI techniques

- • Look for unique elements of the organization captured in data to help inform the strategic AI roadmap

#2 Data

- 2-2 Experimenting By learning more about data requirements for AI, teams have been able to assemble some data in a usable and accessible format. Some efforts may be underway to create common data stores or data lakes, but typically only limited data sources are connected, data is only refreshed periodically, and users have limited access. Specialised tools for data preparation, such as for data labelling, make a more immediate impact on preparing data for AI models.

- To move forward to Formalizing:

- • Use first AI experiments to build support for breaking down data silos and consolidating data 2-3 Formalizing The organization has a core set of usable data that is accessible to build AI solutions. This success owes less to a generic strategy of gathering all data across the organization than to targeted, prioritized data collection based on a strategic roadmap of AI use cases. However, data enablement has been identified as a strategic priority, unlocking budget for building or growing common infrastructure (such as a data store or data lake) or for obtaining new data (such as by labelling existing data or installing new sensors for data capture). The organization can reliably measure the quality of data for specific AI techniques and use cases.

- To move forward to Optimizing:

- • Continue to break down data silos with AI use cases in mind

- • Define metrics, processes and technologies for managing data quality for AI

- 2-4 Optimizing Organizations have extensive, up-to-date, usable data to build complex AI solutions across the business. A majority of strategic systems are connected to a common data platform and are actively synchronizing information to the platform and between each other. The data platform is widely socialized within the company and accessible using intuitive graphical interfaces. Visibility and expertise on all internal datasets is Data strategy proceeds from organizational strategy An insurance company wanted to scale up their AI capability in order to make their products more valuable to customers in an increasingly digital world. They were in the midst of undertaking a major initiative to overhaul IT infrastructure and double the size of their data science team. They worked across multiple departments to define an AI Data Strategy that would lay the foundation required to embrace disparate data sources in alignment with best practices, ensure scalability, accelerate implementation and maximize the value of AI within the business. This collaborative approach created buy-in and alignment between business and technical stakeholders to drive rapid progress, with some recommendations implemented only weeks after the strategy was defined. WHITEPAPER 25 The Five Dimensions of Enterprise AI significant, and streaming data pipelines allow real-time access for priority use cases. The organization starts to actively clean and prepare data based on quality metrics aligned to the AI roadmap.

- To move forward to Transforming:

- • Further automate, aggregate and make accessible data as efficiently as possible

- • Identify new technologies, processes or partnerships needed to acquire new data

#2 Data

- 2-5 Transforming The data platform is fundamental to how the core functions of the business operate, therefore, the infrastructure and tools to consolidate data are highly automated and empower teams to easily ingest new datasets. Data is well documented and both internal and external datasets have high visibility. Strategic investment ensures a self-service process for accessing data, from data ingestion to data consumption. Health monitoring of the central data repository is highly automated and provides real-time, reliable monitoring with minimal human intervention.

- To keep moving forward:

- • Get the most out of existing data with new AI techniques

- • Continue to look beyond existing systems for new sources of actionable data

#3 Technology

- Technology for AI maturity refers to the tools, infrastructure and workflows required to support the entire AI solution lifecycle, from training and testing, to deploying and running in production, to monitoring and retraining over time. All AI solutions share this lifecycle, whether purchased or built by internal teams. Leaders need to understand how technology is supporting each step in this lifecycle and what trade-offs are being made along the way as the organization matures. For example, a server environment that supports one AI model in production may not scale at a reasonable cost to multiple AI models.

- The following sections describe the Technology dimension at each stage of maturity and what organizations can focus on to level-up. 3-1 Exploring Organizations typically don't have specialized AI or machine learning solutions in place, even when investments in adjacent technologies like DevOps, robotic process automation (RPA), or advanced analytics already exist. Business leaders are unsure of what's needed. Any initial experiments are conducted on personal computers or cloud-based environments.

- To move forward to Experimenting:

- • Determine what technology you need to conduct first AI experiments, starting with personal computers and cloud development environments

- 3-2 Experimenting Data scientists and developers start using cloud infrastructure to share know-how and results, and to leverage GPU power beyond the confines of their laptops. Cloud-based or on-premise servers can be provisioned. AI model training happens manually with no automated resource management facility. If the organization has a DevOps team, they are likely not yet used to .There is no standard process or deployment architecture.

#3 Technology

- To move forward to Formalizing:

- • Formalize deployment architectures and look for ways to automate their use

- 3-3 Formalizing In order to fully enter production, technical controls exist to allow any "human in the loop" and explainability features defined by AI governance practices. AI deployment architecture and development tools are standardized and implemented. Access and resource allocation for computing power is managed by an automated system. As the process of developing and deploying AI becomes more standardized and scalable, departments experiment with more complex AI solution designs. For example, the organization has an approach to reusing an AI model trained in one part of the business for a similar task in a different part of the business.

- To move forward to Optimizing:

- • Continue to streamline development tools and computing resource management

- 3-4 Optimizing As the number of deployed AI models increases, organizations invest in new infrastructure to manage AI development, deployment, and management more efficiently. Management of deployed models includes retraining on new data. Solving these challenges involves centralizing tasks such as monitoring and auditing AI models for compliance, performance management, or troubleshooting purposes, or supporting reuse of models and other code.

- To move forward to Transforming:

- • Invest in a centralized platform to track, deploy, and retrain AI models

- 3-5 Transforming AI deployment architecture is standardized and efficient. As AI becomes more central to the organization's overall strategy, new use cases drive the organization to push the boundaries of technological capabilities to build state of the art AI solutions; for example, scaling to new locations might require specialized edge hardware, or personalization of AI models for individual customers and suppliers might require automatic provisioning of computing environments. These needs push the organization to use AI to manage the technology infrastructure itself. For example, the AI computing environment optimizes resource provisioning automatically.

- To keep moving forward:

- • Define innovative new use cases that push the boundaries of existing technology

#4 People

- The People dimension of AI maturity focuses on aligning leadership and change management to ensure people are ready, willing and able to use AI. Even the most intelligent AI solutions will not succeed if people are not organized and motivated to use them. And it is the responsibility of executive leaders to help business and technical teams deliver AI and work successfully with it.

- The following sections describe the People dimension at each stage of maturity and what organizations can focus on to level-up.

- 4-1 Exploring The organization hasn't defined roles and responsibilities for AI and doesn't yet know how to do so. In the short term, business teams need help absorbing the applicable takeaways from technical literature so they can build valid use cases for AI. Data science teams need help from business partners to connect AI techniques to a meaningful business problem or opportunity; they may also need help understanding AI techniques at a technical level.

- To move forward to Experimenting:

- • Develop AI literacy of business and technical teams to build confidence and support

- • Encourage knowledge sharing between teams to ensure AI is accessible to all

- • Enlist help from AI specialists to identify and address knowledge gaps faster

- 4-2 Experimenting

- Some definitions exist for roles and responsibilities of individuals working with AI, but the organization is still experimenting to discover the right way to organize for AI. Typically, small teams with internal experts in data science, business intelligence (BI) or advanced analytics start experimenting with Proofs of Concept (POCs). However, organizations must resist the temptation to allow these teams to work in isolation. Instead, POCs should help the organization discover what additional AI literacy (both technical and nontechnical) is needed. For example, leaders should start communicating the AI vision and roadmap to employees, and people from different levels and functions should be enlisted to help define and conduct AI experiments.

- To move forward to Formalizing:

- • Assign cross-functional, flexible, networked teams to own AI experimentation

- • Organize learning activities for AI, such as education, hackathons or secondments

- • Identify AI career paths and implications for workforce planning activities

#4 People

- 4-3 Formalizing

- New roles for AI, such as machine learning engineer, have emerged and are being defined at the Enterprise level. Performance metrics are being established but are not yet used in formal performance management processes. Typically, organic Communities of Influence (CoIs) or a dedicated Center of Excellence (CoE) have been created to provide skills and resources for new roles, guidance on acquiring outside talent, and education for others in the organization. Business leaders are communicating the AI vision and helping to motivate and educate employees to share in that vision.

- To move forward to Optimizing:

- • Define AI accountabilities for executive leadership, team roles, structure and budgets to deliver against the AI roadmap

- • Update rewards, recognition and performance standards in place to attract and retain AI talent

- • Cultivate Communities of Influence (CoIs) or a Center of Excellence (CoE) to engage individuals outside the formal AI organization

- 4-4 Optimizing

- Organizations have clearly defined responsibilities and KPIs for new roles associated with AI. The broader talent strategy supports the learning journey of all employees to increase AI literacy and adapt to changes in work introduced by AI. The talent strategy includes plans to build specific AI capabilities and upskill or transition existing workforce as required. Leaders are actively involved in helping the organization adapt to change. Organizational structures like CoIsPs or a CoE are formalized and their mandates expanded to include managing the organization's relationship with the broader AI ecosystem, such as through vendor and partnership management.

- To move forward to Transforming:

- • Include representation of the AI organization at the executive table with accountability for Enterprise KPIs for AI

- • Establish sustainable learning journeys for individuals responsible for delivering and using AI

#4 People

- 4-5 Transforming

- All teams and employees possess a high degree of AI literacy and promote a culture of working in complementary or collaborative relationships with AI systems. AI is integrated in some way for all roles, including at the executive level, and is likely to be used to help HR and talent teams to plan and operate. As a result, the organization's delivery model is transformed, changing how roles are defined and how people are expected to do their work.

- To keep moving forward:

- • Communicate self-driven career paths for AI to guide professional development in different areas of AI expertise

- • Empower HR/Talent teams to use AI as a business transformation tool

#5 Governance

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

- The following sections describe the Governance dimension at each stage of maturity and what organizations can focus on to level-up.

- 5-1 Exploring

- Board members, management teams and employees are beginning to educate themselves about responsible AI so they understand new or heightened risks, obligations, and opportunities. When teams work together on a strategic roadmap, they can identify major risks associated with priority use cases.

- To move forward to Experimenting:

- • Understand new risks from AI such as model bias and model drift

- • Identify specific risks along your AI roadmap and any new governance practices that might be needed above and beyond existing practices

- • Start to develop high-level principles to guide responsible AI use moving forward

- 5-2 Experimenting

- Business, technical and risk teams have a shared understanding of what's required for AI models to be compliant with any legal obligations related to AI across the solution lifecycle. The organization has begun to develop high-level principles to provide guidance on AI usage that goes beyond minimal legal requirements. To build trust, internal stakeholders who will use or be impacted by the AI system have a role in testing and refining the AI system design. To enable complex models to graduate to production, the organization starts exploring techniques like explainable AI (XAI) that help secure trust with users.

- To move forward to Formalizing:

- • Understand current debates about AI ethics and Fairness, Accountability and Transparency (FAccT)

- • Involve different stakeholders to gain a complete view of potential challenges and opportunities for reliability, safety, trustworthiness, and accountability

- • Translate principles into concrete role responsibilities, processes, and metrics

#5 Governance

- 5-3 Formalizing

- Guiding principles for AI governance are being translated into daily practices that track specific performance metrics for areas including safety, reliability, trustworthiness, and accountability. Reporting is centralized and key stakeholders have access to the data. Typically, a dedicated model evaluation function exists separately from AI modeling, similar to a QA team. The commitment to AI governance is formalized as a critical part of the overall AI strategy. Everyday practices that increase reliability and trustworthiness are part of the standard development cycle. External voices have been incorporated appropriately into discussions about AI ethics.

- To move forward to Optimizing:

- • Synthesize existing practices into guidance that generalizes to more use cases

- • Investigate supporting technology for governance such as reporting tools

- 5-4 Optimizing

- As the number of AI models deployed in production increases, so does the complexity of interactions between these models as well as the scrutiny from stakeholders and regulators on AI practices. To keep pace, responsible AI practices are guided by standard guidance and enforced through increasingly centralized and auditable processes, policies and technologies. The organization considers risk at the model and model portfolio level thanks to sophisticated understanding of the dependencies and feedback loops between people, different AI applications that are running in production and the business environment.

- To move forward to Transforming:

- • Build organizational structures to manage the strength and scalability of AI ethics and governance across multiple parts of the organization, such as an ethics board

- 5-5 Transforming

- Strong governance has enabled the organization to go beyond regulatory compliance. Its multiple lines of risk defense and stakeholder trust are a competitive advantage for applying AI in powerful ways. This puts the organization in contact with novel challenges related to AI ethics or Fairness, Accountability and Transparency that may not have been confronted yet in their industry. The organization may formally invest in capabilities to drive multi-stakeholder agreement about how to navigate these challenges for shared benefit. This can include disseminating the technologies and approaches it has developed.

- To keep moving forward:

- • Engage with the broader AI ecosystem to help shape AI governance at the level of industry standards and best practices

Conclusion

- 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 make the difference in successfully competing with AI over time. But perseverance pays off. Using AI, leading organizations have already dramatically transformed, 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 their operations and explore new products, services and business models for transformative impact. And there's a systematic path to progress. In this document, you've learned about the Five Stages and Five Dimensions of AI Maturity. Across the five stages, from Exploring to Transforming, the dimensions act as levers to level up.

Thank You!