

AI in India - A Strategic Necessity

A pragmatic playbook for Indian
organizations to leapfrog on AI maturity

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BCG



Brij Disa Centre for
Data Science and
Artificial Intelligence
INDIAN INSTITUTE OF MANAGEMENT AHMEDABAD



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Foreword

Artificial Intelligence (AI) has evolved remarkably since its genesis in the 1950s. Today, it permeates every aspect of our daily lives—from the phones in our hands, to the products on our supermarket shelves; from selecting the route for our commute, to suggesting the next movie on our entertainment platforms. It is equally pervasive at the macro level, assisting in tasks as varied as studying the impact of weather on crops, optimizing supply chain risk and determining the best drug molecule for diseases.

Sentient AI robots may be a while away, but AI today has the potential to transform entire industries, by redefining products, services and reshaping supply chains. Successful AI adoption is already having a profound impact on organi-

zational productivity and efficiency, changing the competitive landscape. The success of a country's businesses in adopting AI will be an increasingly crucial determinant of its competitiveness.

In light of the high stakes involved, this study aims to gauge the status of AI adoption in Indian organizations, and their success in translating it into business performance. To this end, it examines the AI Maturity of these organizations. Many have already dipped their toes in AI—for instance, the larger players in most sectors apply machine learning algorithms to make predictions on select business metrics. However, such behavior by itself does not imply high AI maturity for such organisations. In fact, some of these organisations may still end up as Laggards in AI

Maturity¹, because their AI-derived benefits are marginal at best. They have not fully harnessed AI to redesign their offerings or processes to achieve a sustainable competitive advantage or higher margins. Indeed, our findings indicate that the margins of AI ‘Maturity Leaders’ are 3-5 percentage points above their Laggard peers.

We find that AI delivers its best results when AI-driven transformation is a strategic priority. Therefore, this study is designed to inform senior decision-makers in Indian organizations on the state of AI in India, and the way forward. It is based on a structured survey and discussion with CXO-level leaders in Technology, Data analytics, Digital Transformation and Business Heads from 130 organizations across Banking, Financial Services and Insurance (BFSI), Consumer Goods (CG) and Industrial Goods (IG).

The study brings the latest research on impact of AI on organisations along with the best on-ground AI-led transformation experience. It unearths several encouraging findings—for instance, a significant number of Banking sector participants, and a smaller number of corporates in Consumer Goods (CG) and Industrial Goods (IG) have

high AI Maturity, at par with global benchmarks. However, the survey also finds that around three out of four companies in CG and IG are classified as ‘Laggards’ in AI Maturity. Given that AI adoption will be a driver of competitiveness, the low AI maturity of majority of CG and IG companies may constrain their global ambitions if the issue is not addressed soon.

The report discusses the roadmap for improving AI maturity focusing on the organisation’s current maturity level and industry. Specifically, it defines a roadmap for laggards in AI adoption to kickstart their AI transformation, build up their AI Maturity and ultimately achieve success in AI adoption. Further along the spectrum, it also offers roadmaps for players with mid-level AI Maturity (the so-called ‘Steady Followers’ and ‘Leapfroggers’) to graduate to global best-in-class AI Maturity levels. For ‘Leaders’ the report focusses on the next frontiers of AI excellence to be conquered.

This report is a joint initiative of IIM Ahmedabad’s Brij Disa Centre for Data Science and Artificial Intelligence and BCG X, the AI and Digital Transformation unit of BCG.

1. We have classified companies into four groups based on their AI Maturity – Leaders (most mature), Steady Followers (less mature but steadily catching up), Leapfroggers (less mature but recently made rapid strides) and Laggards (least mature). See pg 16 for more.



Executive Summary

The age of AI is upon us. As with previous General Purpose Technologies like the steam engine and the internal combustion engine, or more recently, computers and the internet, AI will have a transformative impact on economies, societies and civilization at large. In India alone, successful adoption of AI could add up to 1.4 percentage points annually to real GDP growth. From the perspective of corporates, successful adoption of AI is expected to add over a five year period, INR 1.5-2.5 trillion in incremental pre-tax profit for the top 500 Indian companies alone.

Investments into AI could deliver extraordinary returns but success hinges on deploying AI at scale, as opposed to restrictive incrementalism. Senior leaders must develop a more granular and precise understanding of the implications of AI for their business. For starters, organizations

must invest in significant upskilling of mid- and senior-level management on the business aspects of AI, digital transformation, 'Agile' ways of working and more. This study estimates that just the top 500 Indian companies would require at least one million hours of training.

Companies cannot assume that benefits of AI will accrue to them in due course. Companies have a choice to prioritise AI and adopt it or perish—and the nature of this technology is such that either scenario would come about very quickly. The key to success in AI is achieving an advanced level of AI maturity—the core theme of this report.

AI maturity captures the overall ability of a company to leverage AI to drive its strategic objectives and enhance its financial and operational performance. AI maturity goes well beyond the existing measures of analytical or

data maturity. It draws on the concepts of the BCG AI Iceberg and academic literature, which assert that a successful implementation of AI is one that impacts the revenues, margins and sustainability of the business. Among the key contributors of organizational success from AI adoption, algorithms drive approximately 10% of the success, while data and technology infrastructure adds a further 20%. The remaining 70% hinges on people, processes and business transformation.

This study particularly draws on the views of Chief Data Officers (CDO), Chief Analytics Officers (CAO), Chief Technology Officers (CTO) and Chief Digital Transformation Officers from leading organizations across the BFSI, CG and IG sectors. It also draws on interviews with Business Unit heads to gauge their views on the impact of AI on business outcomes. The result is a detailed, calibrated understanding of a) these organizations' plans with respect to AI; b) the investments and measures taken to operationalize those plans; c) the changes underway across technology, organization, people and procedures; and d) the observed outcome.

The study reveals that select Indian BFSI companies (particularly banks and new-age NBFCs) have very high AI Maturity, on par with global frontrunners. We have divided companies into four groups based on their maturity level—Leaders, Steady Followers, Leapfroggers and Laggards. 11% of companies in the set were adjudged Leaders. Their leadership position is facing a stiff challenge from the Leapfroggers, who make up 9% of the companies. Leapfroggers started their AI-driven transformation journey late but have improved sharply in AI Maturity in the last three years, converging with the Leaders on most aspects of AI Maturity.

However, the concern is that 2/3rds of the companies in the set remain Laggards. These are companies with some exposure and investment in AI in their Technology, Data and Analytical capabilities. But AI is not a strategic priority for them. Three out of four companies in Consumer Goods and Industrial Goods are Laggards by this assessment. Just 5% of IG and CG organizations surveyed are AI Maturity leaders. The AI laggardness could have severe implications for the competitiveness of Indian manufacturing if it remains unaddressed.

For legacy companies, size and scale alone offers little protection against deft small competitors who are mastering AI usage. We are seeing a rapid rise in mid- and small-size players (as many as 16% of the companies studied) which are well-positioned to capture greater market share. Unencumbered by legacy issues, they have thrown down the gauntlet, not only to larger more established players in their industry but also to AI maturity Leaders.

Leaders and Leapfroggers tend to adopt a 'use case-first' approach to AI adoption. They take time to identify use cases which will have a palpable impact on the balance sheet. They then deploy technology, people and processes to support those use cases. Laggards, on the other hand, take a technology-first approach. They often end up with white elephant technologies which have limited impact on business outcomes. Steady Followers lie in between these two groups. They tend to choose use cases that are tentative and small-scale, and thus rarely transform the organization to the extent required to let AI play out at scale.

The country's ecosystem plays a vital role in this endeavor, as both a supplier and enabler of essential talent. If the top 500 listed companies in India made AI a strategic priority, they would need at least 25,000 to 30,000 advanced practitioners of AI-ML in the next 3-5 years. This covers the entire gamut of AI professionals, from data scientists and data engineers to enterprise architects. But it does not include managerial and leadership talent, nor the workforce in AI vendor ecosystems and support infrastructure which must enable these AI initiatives. Even with India's engineering and science talent, the quest for higher AI Maturity requires significant training and upskilling across data engineering, enterprise architecture, product management, design thinking, domain knowledge, Agile working and management of digital organizations. Finding and training talent in requisite numbers will be a critical determinant of whether India gains competitiveness in AI.

Research shows that AI investments augmenting end-user value and topline growth could drive significant economic and wage expansion. The opportunity is India's for the taking—the challenge is now to turn the enormous potential of AI into reality.

Key Highlights of the Report



AI benefit to Indian Economy

Successful AI adoption by Indian businesses could consistently add ~1.4 percentage point to real GDP growth.



AI benefit to Indian companies

Successful AI adoption can add INR 1.5-2.5 trillion in incremental pre-tax profit, for the top 500 Indian companies, over following 5 years.



AI Maturity: key to successful AI adoption

Measures the ability of a company to leverage AI to drive its strategic objectives and enhance its financial and operational performance.



India has exemplars in AI Maturity

Select Indian BFSI companies (particularly banks and new-age NBFCs) have very high AI Maturity, on par with global frontrunners.



AI Maturity level worrisome for most

The study finds overall 2 out of 3 Indian companies are laggards in terms of AI adoption and maturity.



Future competitiveness may be impacted

In consumer goods and industrial goods sectors, 3 out of 4 companies are AI maturity laggards. Companies who strive for global competitiveness need to address their low AI maturity quickly.



Use-case first vs technology first

Even laggards invest in data and technology. However laggards take a technology first approach and often the use-cases are not detailed out. Leaders first prioritise the use-cases and then decide the optimal choice of technology, algorithms, people and processes to make the use-case successful.



Other differentiators between leaders and laggards

Leaders tend to be aware that for AI adoption success: algorithms drive 10% of the success, technology and data infrastructure drive another 20%. 70% of the success is driven by people, organisations and processes.



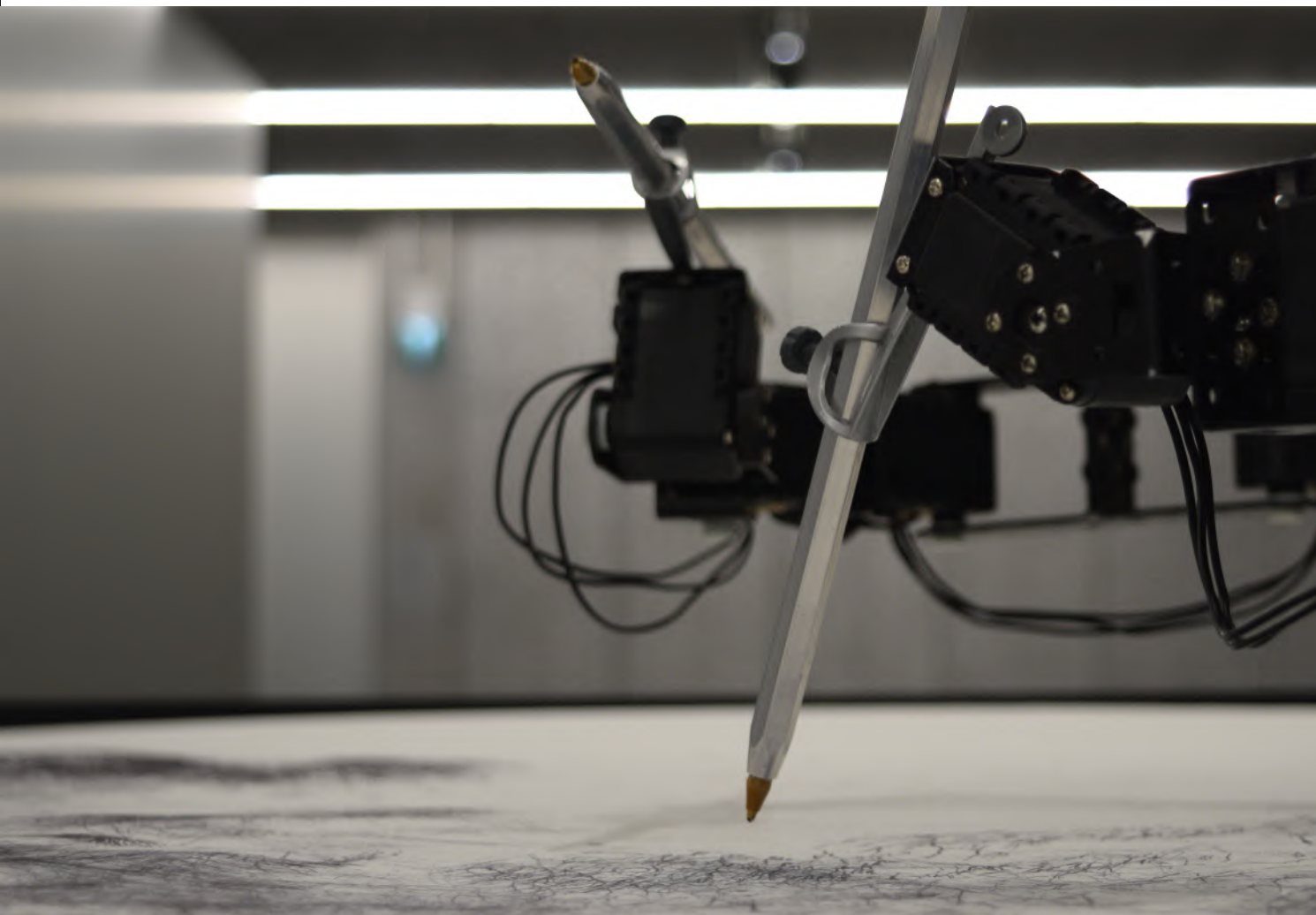
Requirement of AI specialist

Just the top 500 Indian companies they would need at least 25,000 to 30,000 advanced practitioners of AIML in the next 3-5 years.



Massive managerial upskilling required

Just the top 500 Indian companies would require at least 1 Million hours of training in upskilling mid and senior level management on the business aspects of AI, digital transformation, Agile ways of working and more.



The Evolving Global Perspective on AI

AI may have started out as a research concept eight decades ago, but it has since grown profoundly in its scope and power, moving out of the laboratory into everyday life. The last three decades have seen specialized usage of increasing intensity. Today, its potential applications cover every area of human activity, and no company can afford to ignore it. We have identified five factors that explain the increasing pervasiveness of AI in recent decades.

The democratization of AI: Originally funded for military purposes, AI was subsequently nurtured in research labs and universities. Since the early 2000s, it has increasingly been deployed in industrial and real-world applications. But till as recently as the last decade, AI implementation and adoption was limited to organizations with advanced resources, high investment in data infrastructure and

expensive computational setups. This period may be called the Pre-Democratization era of AI (PD-AI).

Since then, three factors have lowered the entry barriers in AI adoption. Firstly, rapid fall in cost of data storage and computational power. Secondly, cost effective cloud-based data and computational architecture which converts high upfront technology CapEx to more manageable and scalable OpEx. Lastly, coding platforms with low code or no code environment allowing companies to get started on basic AI use-cases. The last 5-7 years have thus been a period of Democratization of AI (D-AI). It is likely that this democratization is in its early phase and improvements in technology will further reduce costs and increase AI deployment—but this alone will not ensure success in AI.

Data Source and Analytics in the Pre-Democratization era of AI

PRE-DEMOCRATIZATION AI		
	B2C	B2B
Goods	<p>Auto, Consumer Durable: Data source: Sales & Distribution data; Production Data from ERP & Supply Chain</p> <p>Analytics: MIS, Trend Analysis, Root Cause Analysis, Linear Extrapolation, Regressions for prediction</p>	<p>Industrial & Engineering Goods: Data source: Order details & production data from ERP & Supply Chain</p> <p>Basic descriptive analytics, MIS; Trend Analytics of production data, ERP</p>
Services	<p>BFSI, Healthcare: Data Source: customer level data</p> <p>Analysis: Descriptive and trend analysis; Customer specific and transaction specific predictive models</p>	<p>Engineering & Construction Services; Data Source: Logistics, Cargo Shipping, Order data & service delivery level data</p> <p>Basic descriptive analytics, MIS; Trend Analytics of production data, ERP</p>

The data deluge: Data analysis has always facilitated decision-making at the transactional, operational and strategic level. In the pre-AI era, companies with rigor on decision quality invested heavily in extensive setups for data analysis. These efforts focused on descriptive analysis to understand the drivers and causality of past performance, with limited predictive analysis to gauge future trends and transactional events.

But the D-AI period is driven by cheap and plentiful computing power, enabling easier execution of AI algorithms. The increasing ability to capture and store large amounts of data from communication devices, ERP systems or satellite data has provided the ideal setup for such algorithms to run. This has opened up new use cases and created an enabling environment for new business models on the lines of 'X-as-a-service', where X assumes various forms—banking, payment, logistics, manufacturing and infrastructure management—limited only by market size and cost-effective execution.

Search for sustainability during uncertain times:

Stakeholders are increasingly demanding that businesses deliver sustainable profitability with social responsibility—even in a period of economic volatility and uncertainty. This has added to the challenge of operational planning and strategic decision-making. AI is well-placed to help businesses balance these difficult imperatives.

AI deployable at scale: AI is transforming the way business is conducted across industries. Companies are investing heavily in AI solutions in the hope of substantial returns. The growing prevalence of industrial robots, computerized production equipment, marketing chatbots and machine learning investment algorithms is constantly expanding the range of tasks that machines can perform.

AI's inflection point- Generative AI: The sheer public excitement generated by a Generative AI app- ChatGPT at its launch and afterwards is unprecedented. ChatGPT reached 1 million users in just 5 days after its launch. In comparison, Instagram and Spotify took an estimated 75 days and 150 days respectively. If one goes by Google search count as a measure of interest, interest in ChatGPT is 7 to 8 times higher than the peak interest in Metaverse. The hype around currently available generative AI applications could be due to their ease of access and simple yet intuitive user interface. By formulating the appropriate question in English, one can effortlessly and quickly access information derived from a vast dataset, in a user-friendly format.

Organisations in industries ranging from BFSI, Healthcare, Consumer Goods and Services, Technology to name a few, are finding powerful use-cases based on Gen AI.

Generative AI- A brief

What is Generative AI

Generative AI refers to a subset of artificial intelligence that focuses on creating new content rather than solely analyzing or predicting existing data. This new content ranges from music to art to text to software code. At its core, generative AI operates on the principle of learning

from patterns and structures present in large datasets, enabling it to generate novel outputs that closely resemble the original data. This technology draws inspiration from fields such as deep learning, neural networks, and probabilistic modeling to mimic human creativity in a machine-driven manner.

A View of Gen AI Apps



ChatGPT

CHATGPT

Natural text generation



Lexica

Browse AI generated images and the prompts that have been used



Mage.space

Prompt-based image generation



Jasper

Jasper

Creative writing (ads/ blog articles, product descriptions)



synthesia

Synthesia.io

Convert text to speaking avatar



Midjourney

Midjourney

Prompt-based image generation



runway

Runway

Image/video editing and enhancement

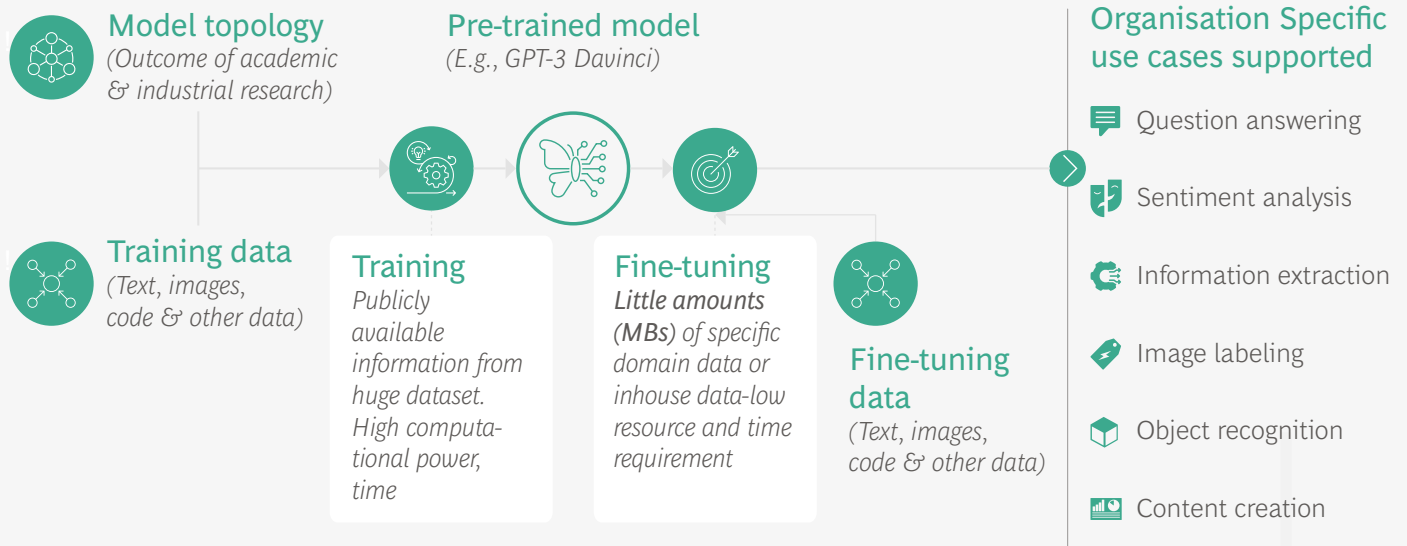


KAEDIM

KAEDIM

Convert 2D images to 3D objects

Exhibit 1 - How are companies leveraging GEN AI



On average, 1 in 3 respondents in various roles predict a 25-50% gain in productivity from using these tools.² The tasks which are currently getting revolutionised by GEN AI are:

- Writing blogs/ posts/ mails
- Marketing material
- Structured information extraction
- Client outreach
- Writing code
- Answering customer queries
- Project management

Ethical Considerations and Future Prospects

As generative AI continues to evolve and permeate various aspects of society, it is crucial to address the ethical considerations surrounding its use. Questions arise regarding the ownership and authenticity of generated content, the potential for misuse or manipulation, and the impact on employment and creativity. Striking a balance between innovation and responsible implementation is essential for harnessing the full potential of generative AI.

2. <https://www.sortlist.com/datahub/reports/chat-gpt-statistics/>

Source: Exhibit 1 - "On the Opportunities and Risks of Foundation Models", Center for Research on Foundation Models, arXiv, 2021; BCG analysis

India's current AI strides

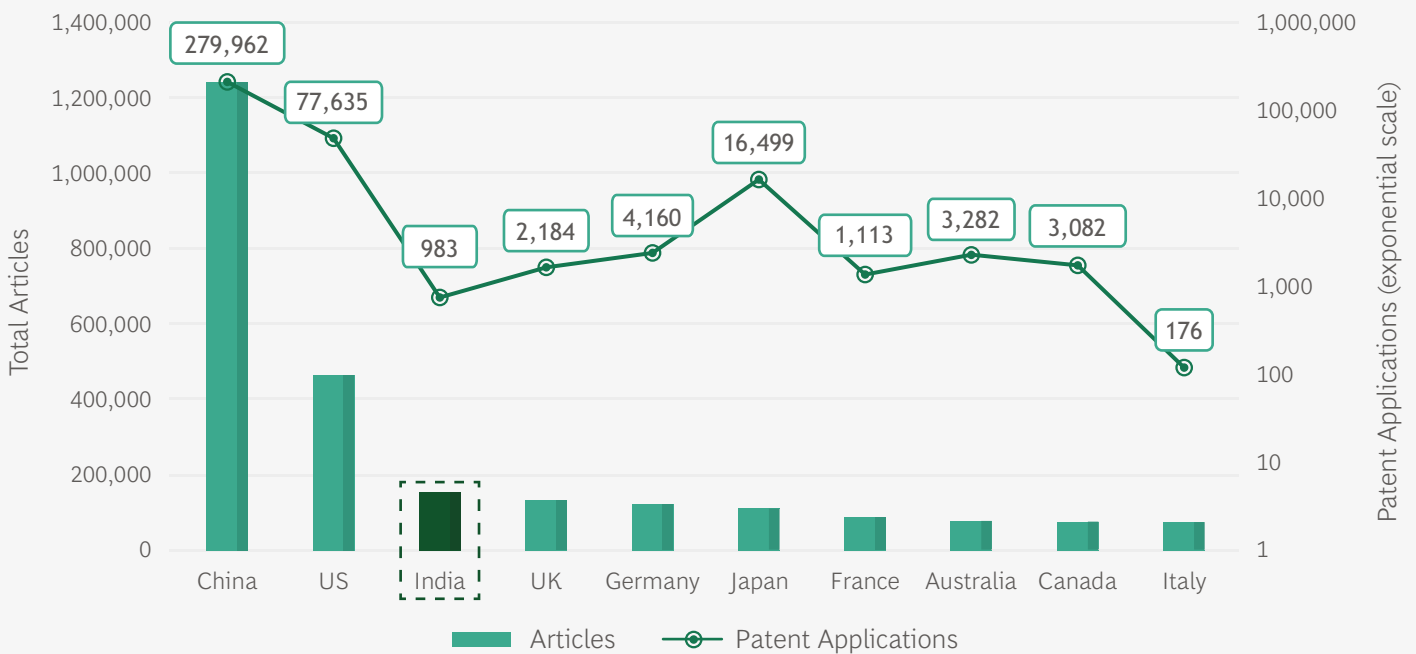
The global AI market is estimated to reach US\$450 billion in 2022, growing at a rate of more than 20%.³ In India, AI expenditure reached US\$665 million in 2018 and is expected to reach US\$11.78 billion by 2025, with a CAGR of 39% from 2019-2025.⁴

As with most new technologies, there has been concern about the impact of AI on labor markets. While these concerns are understandable, large scale job losses due to technological innovation can be averted. A case in point is India's thriving Information Technology sector and the opportunities it has created. As recently as the 1990s, there were fears of computers replacing humans – yet the sector ended up creating large numbers of new jobs. India has become a major offshoring hub for the global software industry providing Business Process Outsourcing and

Management services to global clients. Today, the IT-BPM industry is India's largest private sector employer, accounting for ~11% of the urban workforce.

With AI, a growing body of evidence suggests that the automation of repetitive tasks has led to the disappearance of middle-skilled jobs and increased wage inequality. On the other hand, there is also growing demand for labor trained in advanced technology and adept in socio-behavioral skills. Experts suggest that emerging technologies may increase the productivity of existing jobs as well as create new roles which are difficult to envisage today. These new roles may require a combination of skills such as higher technological acumen, better empathy, people connect and critical thinking.

Exhibit 2 - Global Research and Patenting in AI by Country



3. IDC: Worldwide Semiannual Artificial Intelligence Tracker

4. <https://www.ibef.org/download/AI-Revolution.pdf>

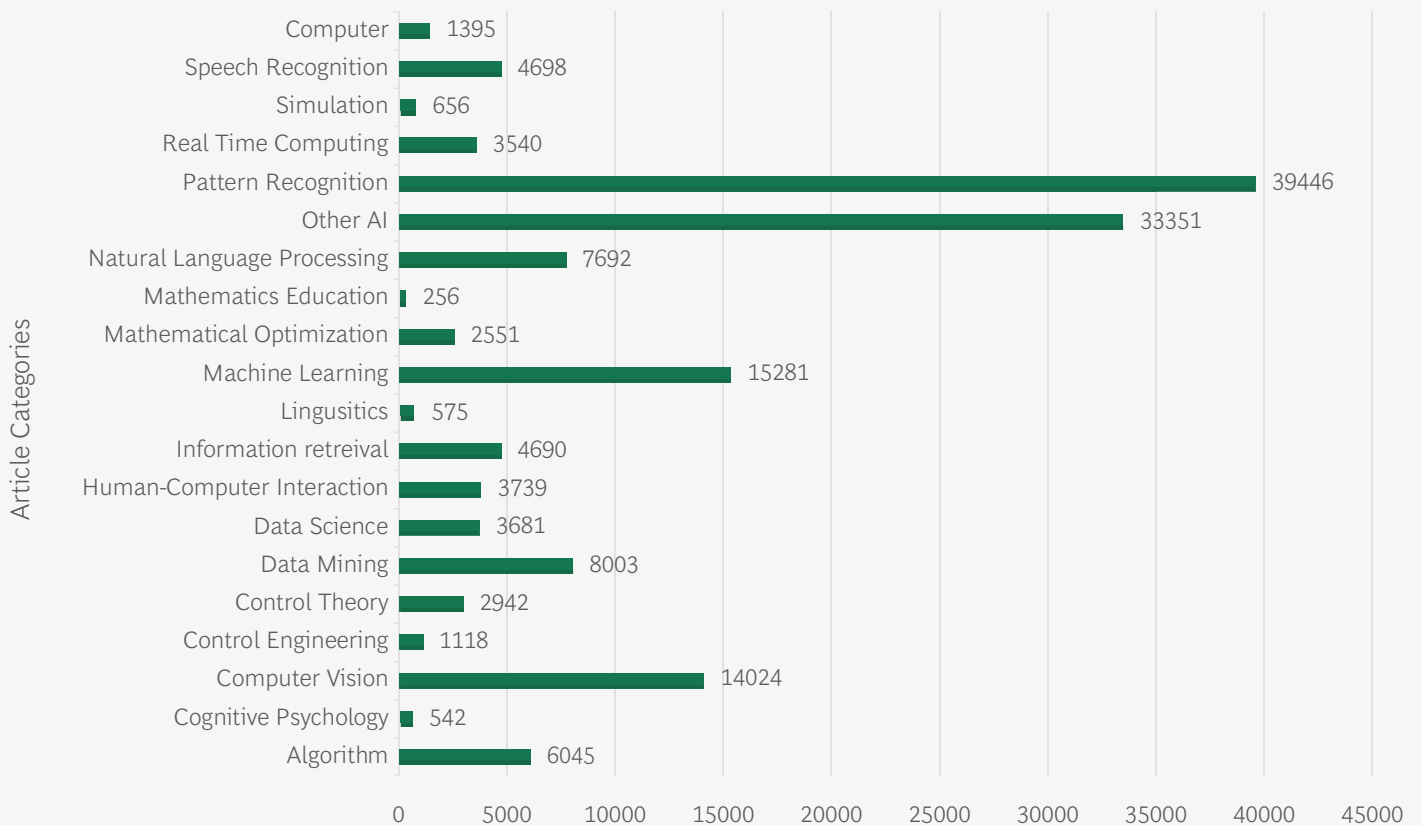
Source: Exhibit 2 - Emerging Technology Observatory's Country Activity Tracker: Artificial Intelligence: <https://cat.eto.tech/>

Ultimately, India's success in leveraging AI will be shaped by four key factors:

- Nurturing AI talent:** India only has around 4.5%⁵ of the world's AI professionals, and the talent crunch will get more acute. 76% of India's data talent is currently hired by the IT Services industry. However, companies are struggling to find AI talent with the requisite business and sector understanding. As a result, direct hire of AI talent remains low despite high demand. A NASSCOM report⁶ also projects that the demand-supply gap for digital technology talent will grow 3.5x+ by 2026 to 1.4-1.8 million. The current study estimates that core AI talent—data scientist, data engineer, enterprise architect—would be 15% to 20% of the headline number. Further just the top 500 corporates (listed corporates by revenue) would need at least 25,000 to 30,000 advanced practitioners of AIML in the next 3-5 years. To handle AI driven transformations, the existing senior and middle managements of these 500 companies would require a minimum a million hours of training!
- R&D and Intellectual Property:** While India ranks in the global top 10 for AI research and patents, the associated value being captured is relatively miniscule. The pay-off in terms of patents, products and profits remains low relative to the volume of research conducted. The reasons for this are manifold. Research in latest technologies is often limited to incrementalism in most firms. Additionally, a fledgling collaboration between industry-academia limits monetizable research and IP creation. This scenario further discourages advanced talent development. Currently, less than 3% of graduates pursue a PhD in the field.
- Investments in AI:** The last decade has seen a rapid uptick in the number of Indian startups. Indian organizations have also accelerated their adoption of data-driven use cases. However, when it comes to private investment in AI, the US and China lead the rest of the world by a huge margin.

Exhibit 3 - Published AI articles by category and application (India)

India: Published AI articles by Category



Source: Emerging Technology Observatory's Country Activity Tracker: Artificial Intelligence: <https://cat.eto.tech/>

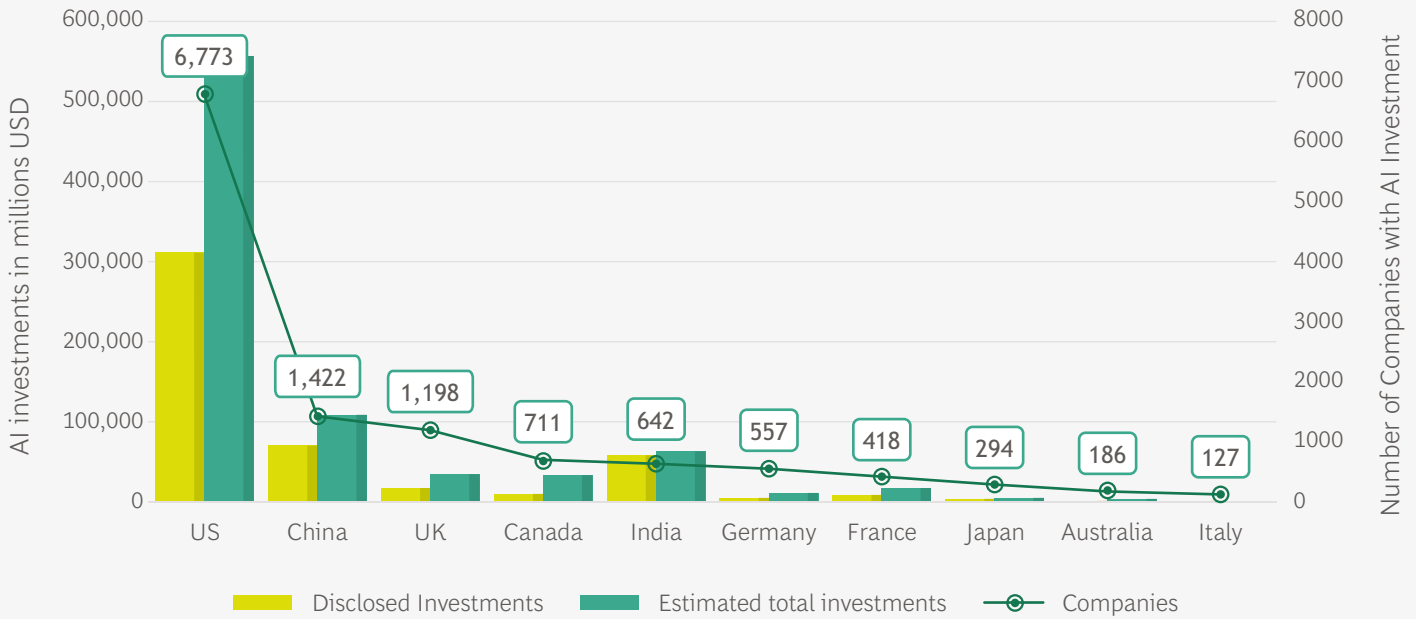
Note: Chart shows the number of AI articles published by authors from the country. Author countries are inferred from where their institutions are located.

5. OECD.AI (2023), visualisations powered by JSI using data from LinkedIn, accessed on 06/2/2023

6. <https://community.nasscom.in/communities/emerging-tech/indias-tech-industry-talent-demand-supply-analysis>

Exhibit 4 - Private investment in AI and R&D

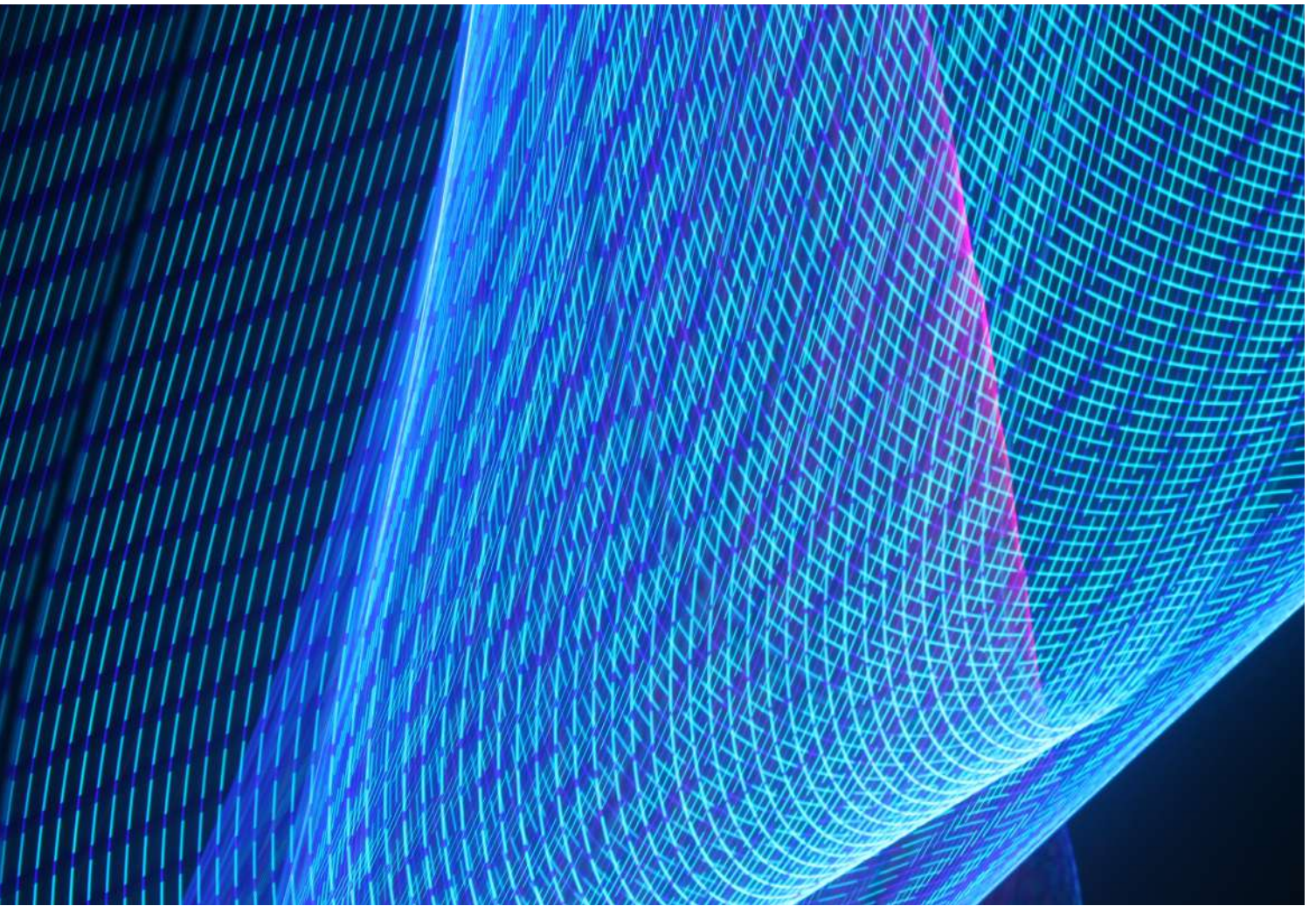
AI Investments: Companies and Amount



- Government Intervention:** Arguably the biggest and most successful digital pioneer in India is the Government of India. Its innovations at scale include Aadhaar (universal biometric ID), the Unified Payments Interface and the Open Network for Digital Commerce. The

government could nudge companies through suitable tax incentives for AI research and innovation. It should strive to upgrade the curriculum and boost the resource of India’s top institutions to focus on advanced technology education, especially in AI.

Source: “Emerging Technology Observatory’s Country Activity Tracker: Artificial Intelligence: <https://cat.eto.tech/>”



The AI Maturity Survey

Industries and companies across the board are increasingly looking at AI to deliver a long-term competitive advantage. AI is seen as critical not just to their growth, but to their very survival in the medium to long run. With the stakes this high, it is vital for companies to assess their AI capabilities and build a robust plan to harness the value of AI.

The aim of this study was to objectively measure the AI Maturity of corporate India. The participants, drawn from 130 Indian companies, included senior executives spearheading the digital, technology or AI initiatives at their companies, with designations like Chief Digital Officer, Chief Data Officer, Chief Technology Officer, Chief Information Officer, Chief Analytics Officer, Head of Digital Initiatives and Head of Data Science. The survey was based on a structured questionnaire, administered as an interview. This enabled the participants to provide high-quality responses with extensive commentary and additional insights.

Understanding AI Maturity

AI Maturity measures the overall capability of a company to leverage AI to drive the strategic objectives and the ensuing operational performance of the company. These objectives may include (inter alia) sustained growth in revenues and consistent margins to enhance shareholder value. In other words, AI Maturity assesses the ability of a company to holistically adopt and embed AI, transforming itself to gain competitive advantage. Organizations with higher AI Maturity tend to have better operational performance, because they are better able to serve and retain customers profitably, innovate continuously and maintain their competitive advantage. On the other hand, companies without significant AI competency are likely to lose market share and margins to competitors with superior AI capabilities.

AI Maturity goes beyond the existing measures of analytical and data maturity. Instead, it draws on the concept of the BCG AI Iceberg and academic literature. The Iceberg asserts that a successful implementation of AI is one that impacts the revenues and margins of the business. Approximately 10% of this success can be attributed to algorithms, and another 20% may be attributed to enabling data and technology capability. But the bulk of the success, that is 70%, hinges on people, processes and business transformation.

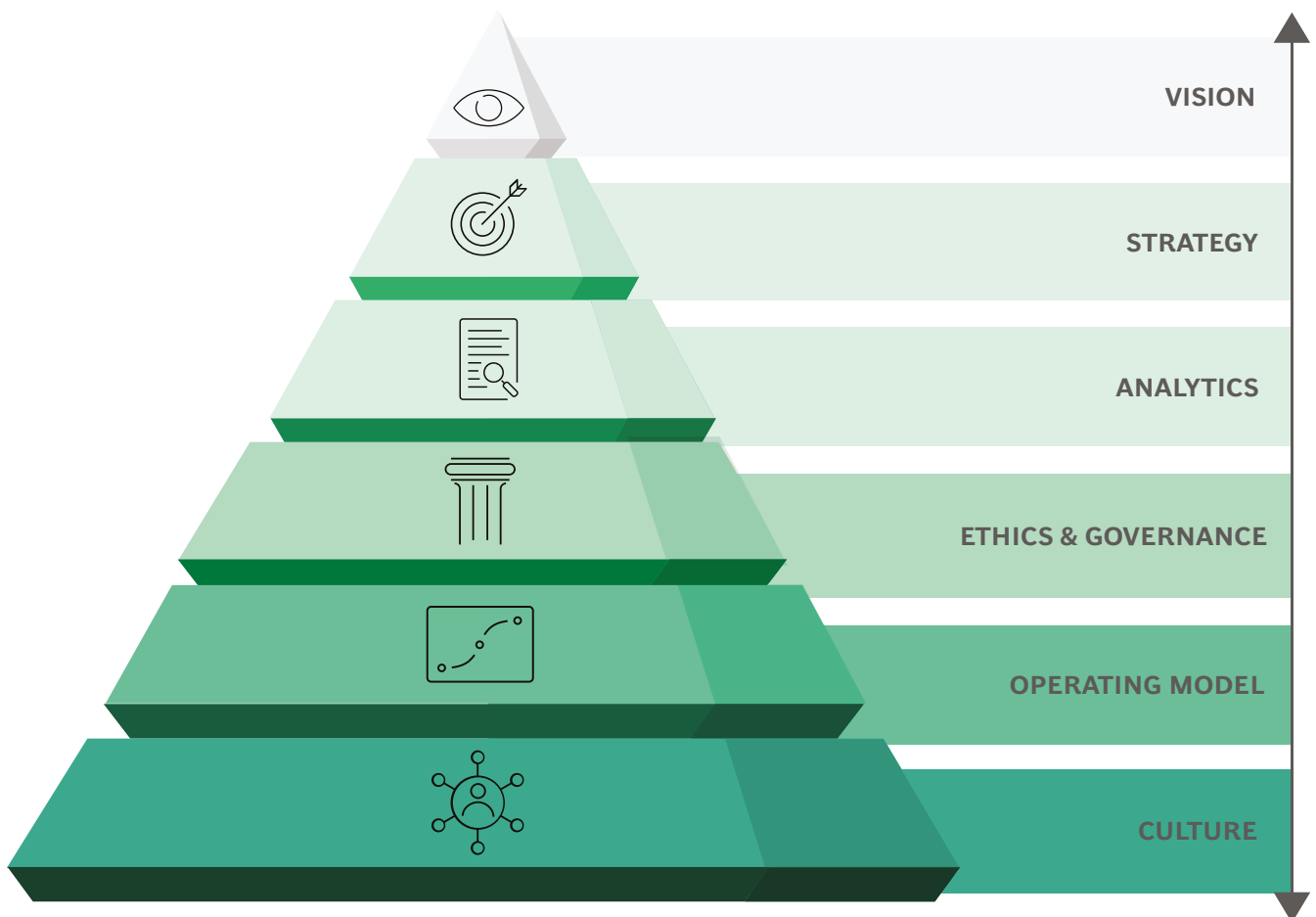
This means that simply acquiring technology or using the latest Machine Learning tools would not confer a strategic benefit by itself. For instance, a bank may have a well-built ML-driven risk score. But this will not transform the loan acquisition and underwriting process if the model scores are regularly overwritten by subjective judgment and ineffective credit policies.

Such an implementation of the risk model may offer limited benefits to the organization. However, large-scale

benefits will accrue only through fundamental changes to the policy, operating processes, and behavior of the entire loan origination setup to enable digital workflow and data driven decision making. In the absence of such transformations, even organizations with a bespoke AI model will be deemed to have low AI Maturity.

On the other hand, consider a Consumer Goods company that has begun to embrace AI by adopting a reasonable (though not cutting-edge) demand forecasting model for its products. The organization has expedited the adoption of this model at the district level to ensure consistency in supplies. It closely tracks any divergence of the actual demand from predicted demand. These gaps are then fed back into the system to improve the predictions. The front-end decision makers are trained to identify the 5-10% instances where they will overwrite the model results, but these human interventions are also tracked for quality of decision making. An organization like this is exhibiting higher AI Maturity than the financial institution in the previous example.

Exhibit 5 - How we measure AI Maturity—the seven components



Mapping the dimensions of AI Maturity

1. Vision: This dimension deals with the ‘tone-at-the-top’ and how that is translated at the ground level.

The survey gauges senior managements’ ambition on how and where they want AI to impact their organization—whether at just a transactional level or at a deeper strategic level. It also delves into the action being taken to realize the ambition, including specific plans and execution minutiae to achieve the target end-state. Further, this dimension also considers the extent to which leaders are trying to change their culture to focus more on data analytics-driven decision-making vis-a-vis purely subjective decision making.

2. Use Case: This dimension deals with the specific business problems that AI can potentially solve for the organization.

The survey assesses the level of awareness about AI use cases across functions and business units. It also examines the organization’s approach to prioritizing use cases at the outset. The scale and scope of these use cases is the de facto measure of an organization’s AI ambitions. The extent to which pro-

cesses and people strategies are transformed to ensure the success of the use case will determine the success of the AI transformation initiative.

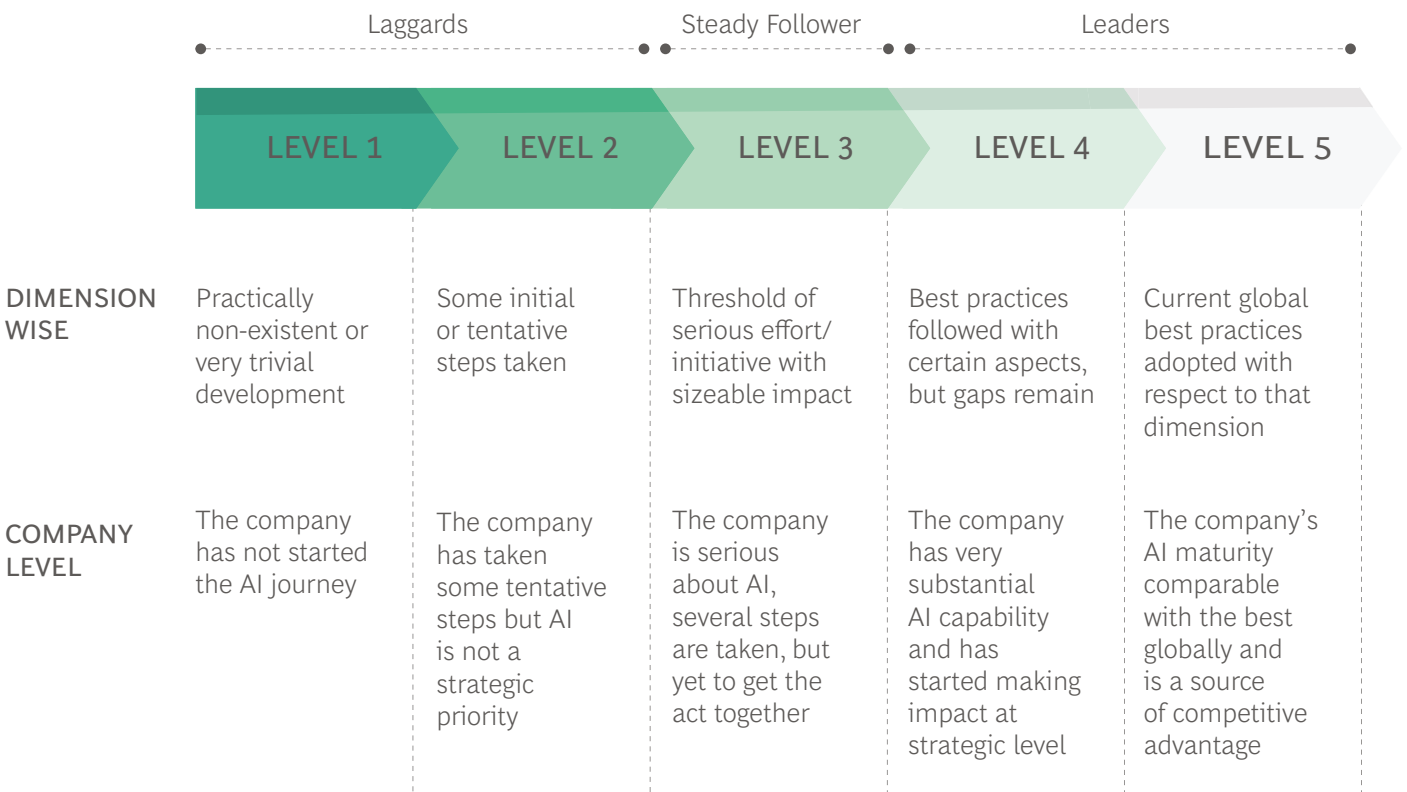
3. People Operating Model: This dimension is focused on the organizational structure and people aspects of AI-related deliveries.

This dimension explores the quality and skill diversity of the analytical team, its alignment with business objectives, its culture, and how the overall organizational culture, HR policies and practices impact the team(s) responsible for AI-related deliveries.

4. Setup Process: This dimension deals with the systems and processes that enable the AI and related teams to give a consistently high level of performance.

This dimension covers four areas: a) standardization, innovation, and maturity in the analytics process b) organizational features that enable better coordination between business, analytics and technology c) measurement of the value or impact of AI efforts and d) process assurance in translating POCs to full-scale implementation.

Exhibit 6 - What does the maturity level imply?



5. Data, Algorithm and Ethics: This dimension covers data quality, management, ethics, governance of data, and analytical aspects. With respect to data, it examines the maturity of data processes and data governance. With regard to analytics, it looks at the extent of usage of analytics—descriptive, predictive and prescriptive—as well as the assurance, quality and sophistication of the analytical process itself.

6. Change Management and Value: Firstly this dimension delves into the processes and approaches used to ensure the adoption and acceptance of AI output into decision-making. This dimension assesses the ability of the business to generate value from the AI output, and to measure the value generated. The value generated further nudges the company to adopt more changes to enable AI. It also looks at the level of training required to prepare and sensitize large organizations to AI, and the typical steps taken to transform each function.

7. Technology: This dimension examines the IT and people capability used to support AI development and implementation. This deals with the organization's data architecture, its computational infrastructure and its flexibility to develop, deploy and maintain AI.

The survey covers seven dimensions, with 27 questions delving into 130 aspects of AI Maturity. During the interviews, leaders were invited to classify the behavior of their respective organizations with respect to each dimension of the survey. They were probed on how their AI aspirations, planning and behavior evolved across three points in time three years before, i.e. pre-COVID, the current level, and the target level (three years hence). The behaviors were pre-mapped to the maturity levels and subsequently mapped to the overall maturity of the organization.

The wider purpose of the exercise is to benchmark Indian companies with respect to AI Maturity and prepare them to compete globally in an era of AI. As such, the dimension-wise maturity thresholds are comparable to global benchmarks. We found that companies identified as 'Leaders' currently have an average maturity score of 3.9. Of these, the subset of companies with a score above 4 are globally comparable in terms of their AI Maturity. This includes several financial institutions and few players in the industrial and manufacturing space. On the other hand, a maturity level of 3 is an absolute threshold, i.e. companies with an overall maturity level below 3 need not be considered as serious players who could gain any meaningful benefit from AI.

To recap, companies with a maturity score over 4 are comparable globally in terms of AI Maturity, while those

with a score below 3 lack a meaningful plan or on-ground action to enhance their business decision-making and overall functioning by integrating AI. The latter companies are likely to struggle with market share and margin improvement even in the short to medium term, unless they get back on the AI track.

Classifying companies by maturity level

The aggregated score from each dimension determines the maturity level of the company during that period. Based on their current maturity levels, the surveyed companies have been divided into four groups:

- **Leaders:** This is the top 10% of the set, characterized by consistently high maturity levels across all dimensions in the current period. Even though the maturity level is based on the current period, we found that these companies were leading the pack across dimensions in the pre-COVID period too.
- **Aspiring Leaders (Steady Followers and Leapfroggers):** Close on the heels of the Leaders are these two sets of companies, whose current maturity scores are very similar. What differentiates them is the path they have followed to reach the current maturity level. Steady Followers will have had a constant gap to Leaders across different points in time. On the other hand, Leapfroggers had almost the same level of maturity as Laggards in the pre-COVID period. However, they have made significant progress over the last three years and now rub shoulders with the Steady Followers, and may even have higher maturity scores than them in some dimensions.
- **Laggards:** These are companies whose current aggregated maturity level is well below 3—the threshold for a company to be considered as seriously pursuing AI in terms of strategy, planning and on-ground execution.

Understanding movement across maturity levels

Even making the jump from Management Information Systems (MIS) to descriptive analysis and then to predictive requires enablers such as data quality, technology infrastructure and analytics acumen. But this journey requires a certain maturity and evolution in senior management ambition on how to drive the business. It also requires a commitment to embed data and analytics in decision-making at various levels, from transactional to tactical and eventually strategic. In turn, this requires suitable processes and an organizational setup to generate high-quality analytical outputs and to ensure that the business actively uses them.

The findings of the survey

The overall AI Maturity of Indian companies across industries is steadily improving. The digital push necessitated by the COVID-19 pandemic may have contributed to this accelerated take-up, and this trend is likely to continue.

India's AI Maturity Leaders have further consolidated their position, and some of them are even comparable globally in terms of AI Maturity. The Steady Followers have also

improved, although the gap between them and the Leaders remains. Most interestingly, the Leapfroggers have not only improved their AI Maturity significantly but also reduced their gap with the Leaders. Going forward, we believe some of these Leapfroggers will not only leave behind the Steady Followers, but even challenge the Leaders over the next 3-5 years. The Leaders must raise their game and watch out for the Leapfroggers in their respective industries.

Exhibit 7 - Maturity gaps with leaders are narrowing

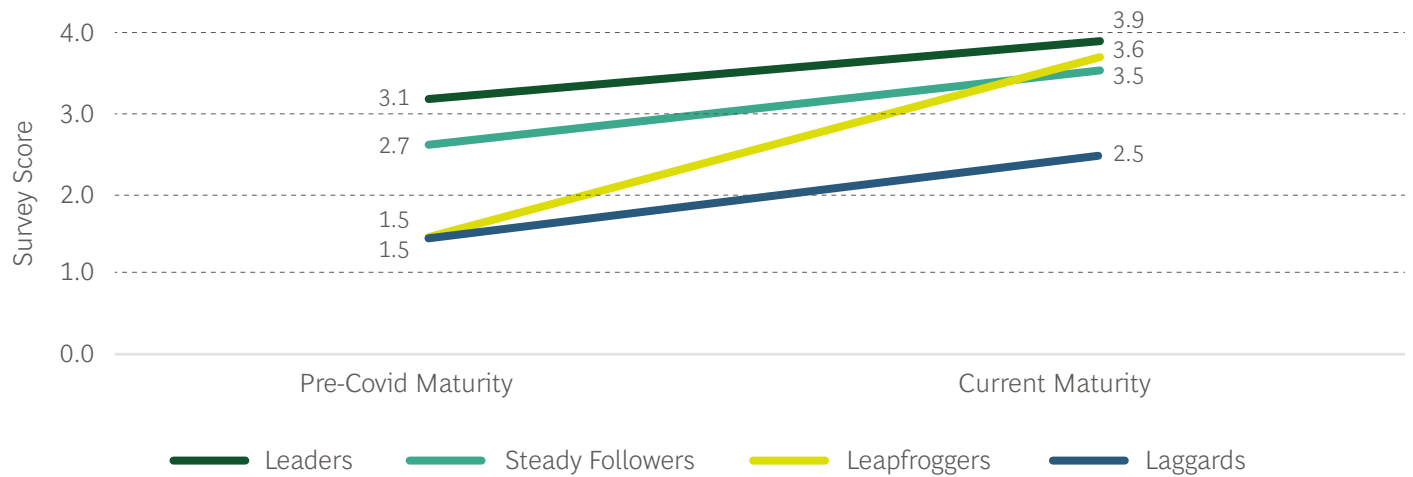


Exhibit 8 - Pre-covid distribution of AI maturity dimensions across categories

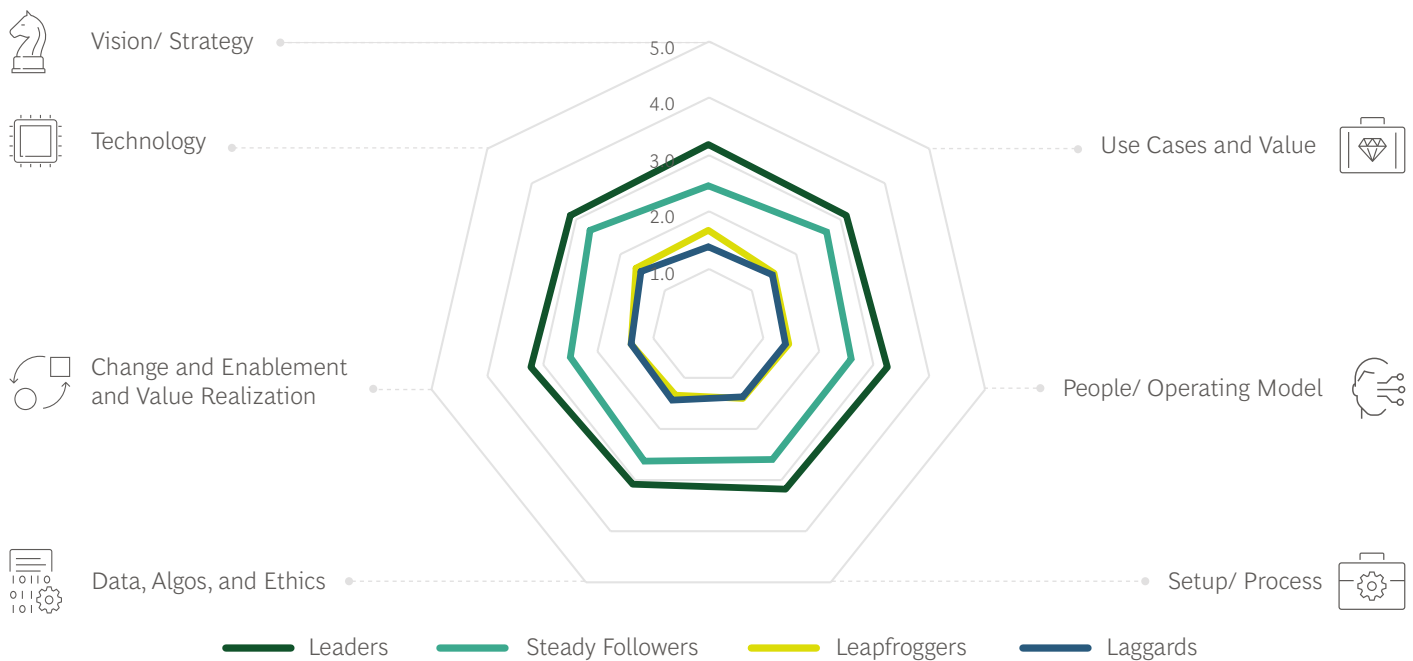
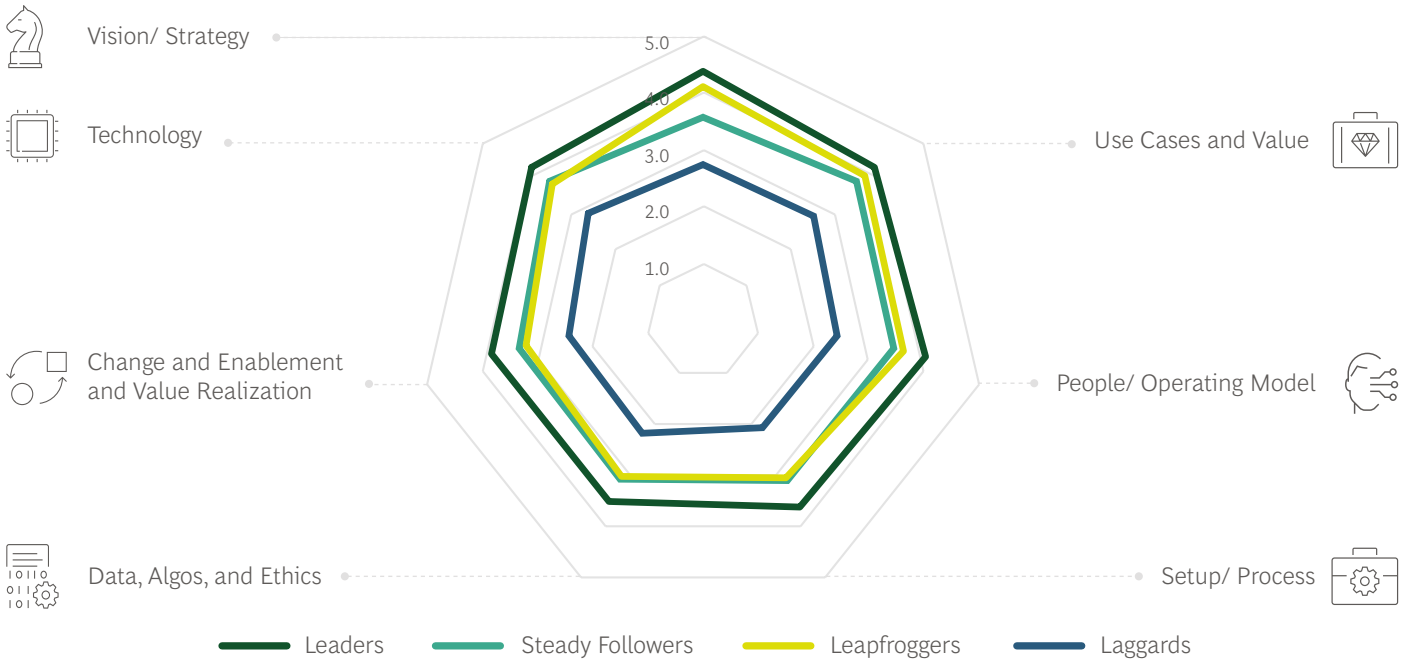


Exhibit 9 - Post-covid distribution of AI maturity dimensions across categories



Despite India being home to select set of companies who are likely to be AI Maturity leaders globally, the overall picture is concerning. 67% of companies in this survey are AI Laggards, with current maturity well below 3.0. 75% of Consumer Goods (CG) and Industrial Goods (IG) organiza-

tions are Laggards in AI Maturity. While the maturity of the Laggards has inched up on an absolute level, AI is not their strategic priority. Where AI projects exist in such companies, they are associated with either peripheral or ancillary functions and the management is not focused on scaling up AI.

Exhibit 10 - 2/3rds of Indian companies are AI Laggards

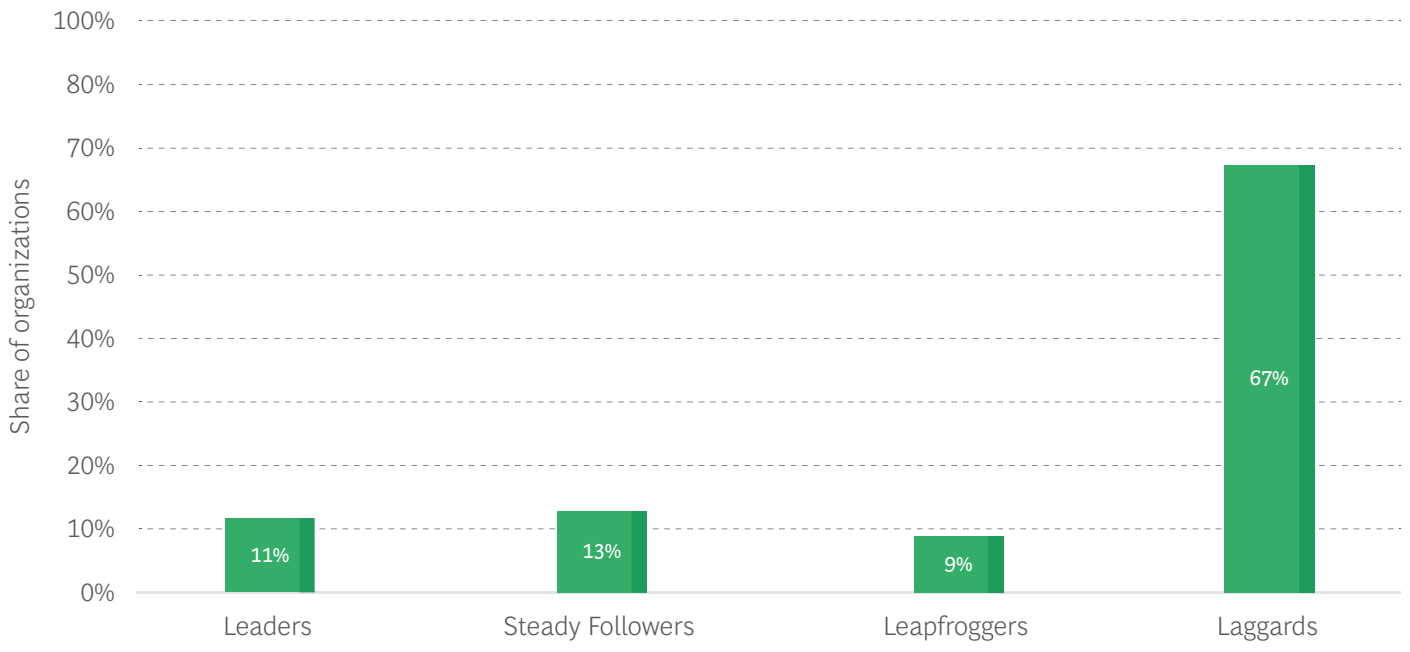
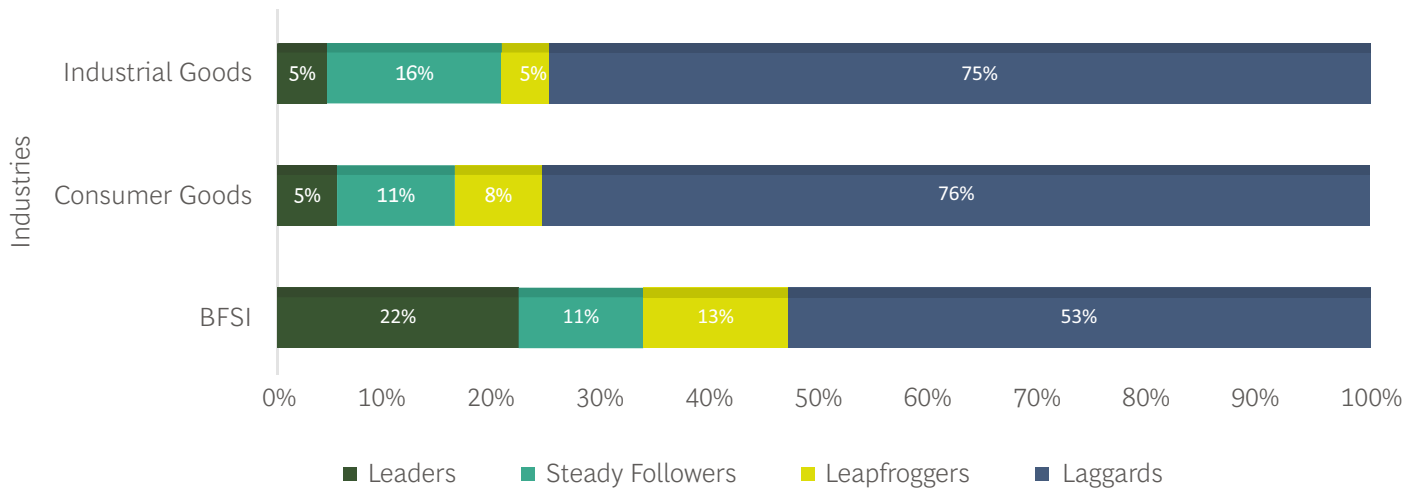


Exhibit 11 - Three-quarters of CG and IG players are AI laggards



As expected, 71% of the Leaders and 55% of the Leapfroggers are from the BFSI industry—in large part due to its data-centric approach, necessitated by stringent regulatory requirements.

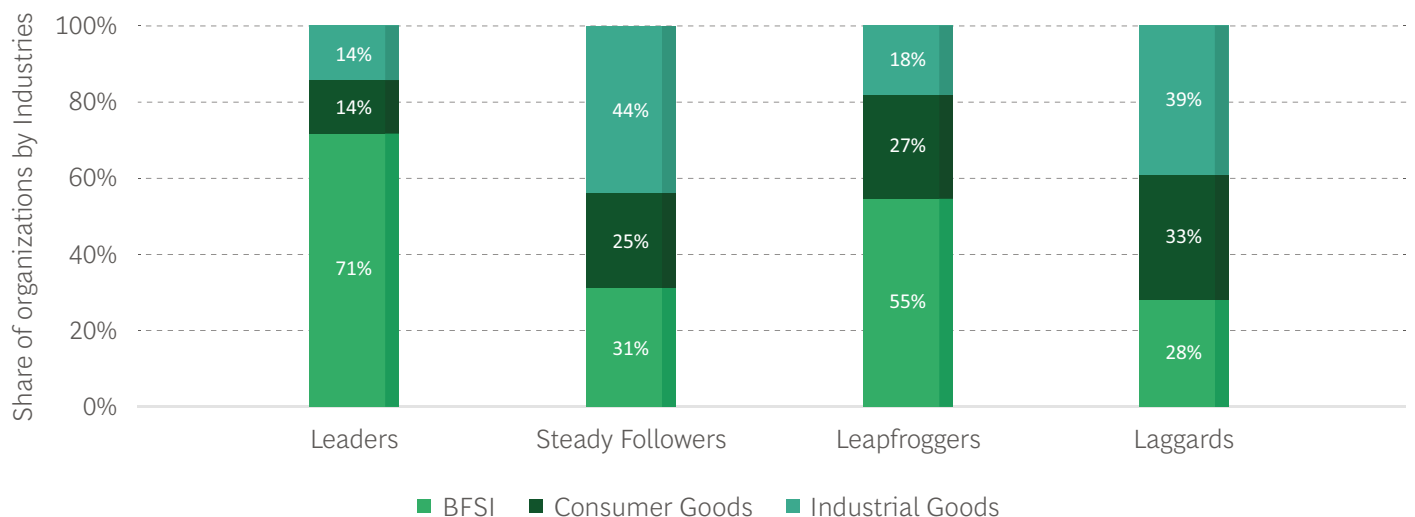
Leadership traits vary by industry

There are significant differences in Leaders' approach to AI readiness dimensions across industries. BFSI leaders continue to focus on sharpening their Vision. However, CG leaders and IG leaders were late adopters of AI, and thus focus more on improving their people practices, processes and culture.

As the Head of the Business Intelligence Unit at a new-age NBFC put it, "Our goal is 'Everyday AI'—we begin by asking how data and analytics can be incorporated in every aspect of the business". Compared to BFSI, CG and IG use cases are fragmented with less academic and AI community support.

A similar trend can be observed with the Leapfroggers. BFSI Leapfroggers are also focused on sharpening their Vision while CG Leapfroggers place greater emphasis on improving their People Operating Model. IG Leapfroggers are clearly distinct from their Leaders, focused more on specialized use cases over general adoption.

Exhibit 12 - 71% of Leaders and 55% of Leapfroggers are from BFSI



Note: values may not add up to an exact 100% due to rounding off.

Similarities in Laggard behavior across industries

Laggards across industries tend to adopt a technology-first approach in their AI transformation journey. During deep-dives, we found that the problem wasn't so much the technology or algorithm chosen, but the sub-optimal adoption of the AI output in business processes. Such companies often find it difficult to create and measure value from their AI initiatives. As Exhibit 13 shows, Technology and Data & Algorithms are relatively minor constituents of overall AI success. The biggest factors are people, operations and practices to enable AI-driven transformation.

AI Maturity and operating performance

On average, total shareholder returns (TSR) over a 5-year period are 4-6 times higher for Leaders than for other maturity groups. Meanwhile, Laggards have the lowest TSR across industry classes. AI Maturity is just one of the reasons for superior TSR. Others include the quality of business leadership, superior business models and better understanding of their respective markets and customers. It is not surprising that leading businesses, with enlightened leadership, decide to focus on AI Maturity to maintain their leadership position.

Size is no bar to AI Maturity

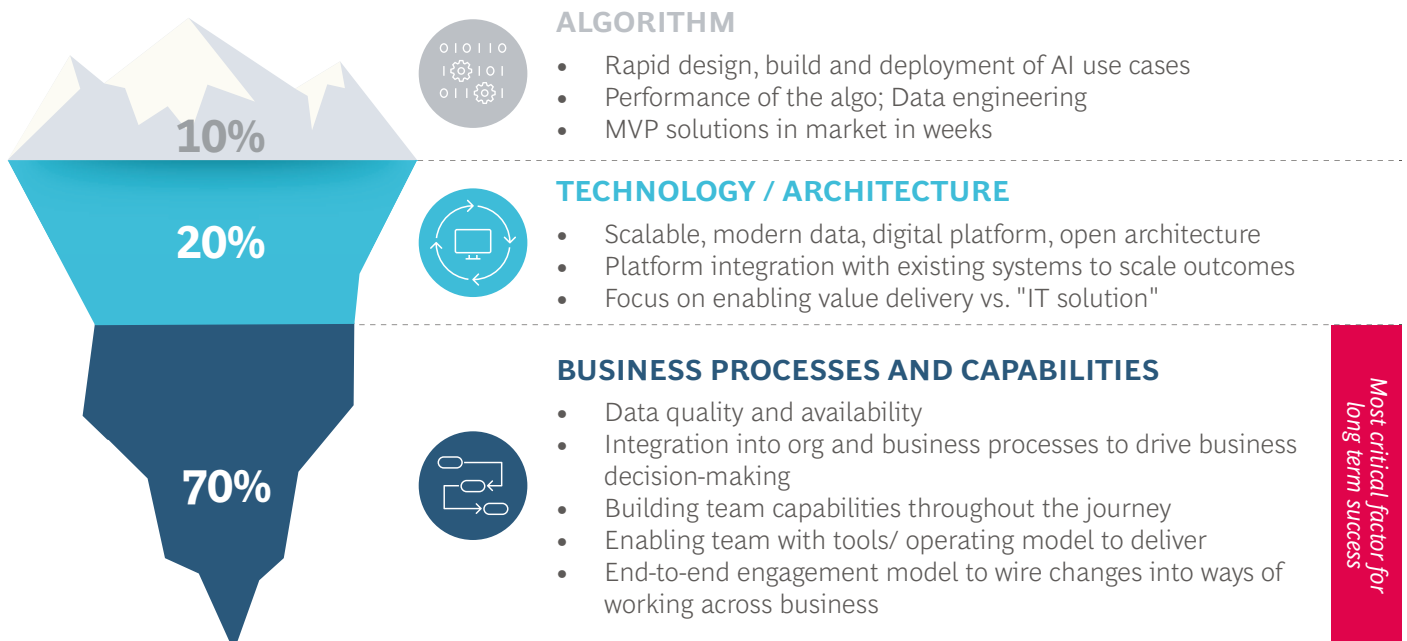
AI Maturity can be driven by vision, planning and execution, regardless of the existing size of the organization. The survey found that companies with a smaller scale of operations were also capable of exhibiting high AI Maturity. Thus, nimbler organizations with better policies and processes, unconstrained by legacy systems, have a chance to wrest market share and higher margins from larger players with lower AI Maturity.

The democratization of technology has significantly reduced entry barriers and created a level playing field for new entrants. Cloud computing, elastic storage and open-source software have significantly lowered the 'capex' investment, reducing the cost of AI setup for smaller players.

There are plenty of Leaders and Steady followers among the large and mid-sized BFSI players. However, it is heartening to note that almost half of small BFSI players are in the Leapfrogger category.

These Leapfroggers will continue to be the ones to watch as they begin outperforming much larger competitors. The Chief Digital & Marketing Officer of a mid-sized bank, which also happens to be a Leapfrogger, highlighted the inevitability of AI adoption thus: "Organizations use AI not necessarily to gain competitive advantage, but to avoid competitive disadvantage".

Exhibit 13 - Successful programs must address all three components of the value equation



Industry-wise Review: BFSI (Banking, Financial Services and Insurance)

The BFSI industry has a long association with data-driven decision making. The industry's AI leadership is attributable to factors that have been prevalent for at least two decades in India. Early on, it attracted the attention of analytics and data-oriented professionals due to the availability of large datasets of customers, transactions and markets. Regulatory requirements also pushed the sector to take a more data-centric approach to decision making. AI's initial forays were in risk management and measurement of capital adequacy. Customer targeting and product offers were next uses cases for analytics. Currently, India's top financial institutions are adopting AI-facilitated decision-making in functions ranging from digital marketing, human resources, operations, optimization and finance.

AI Leaders in BFSI rule the roost

BFSI is home to the largest number of Leaders in terms of AI Maturity. BFSI Leaders tend to have significantly better operating metrics than the rest of the industry. In terms of credit growth, they are a solid 3 percentage points ahead of the Leapfroggers, while Steady Followers and Laggards languish at the bottom of the table.

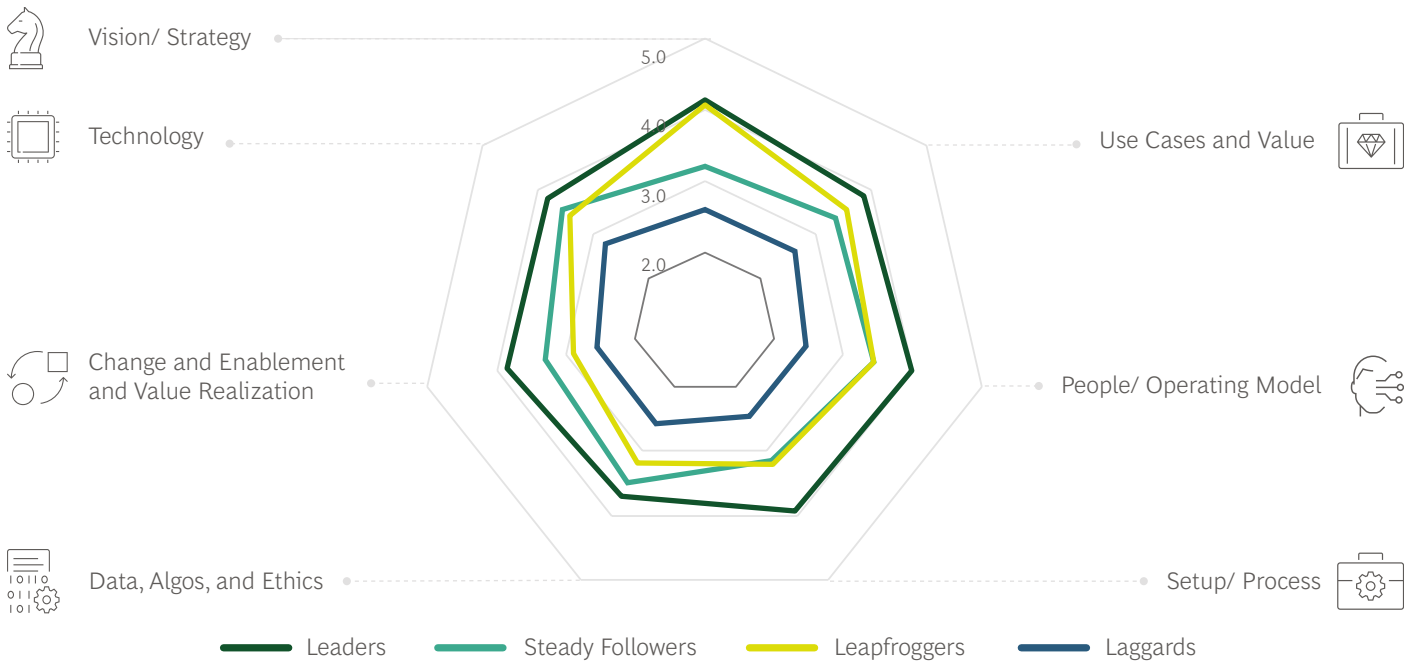
Three years ago, the sector had a reasonable score of 3.2 in AI Maturity, and this has now improved to 3.9.

The Leaders are already operating at maturity levels of 4 or higher on the Vision and People Operating model dimensions, and are close to 4 on other dimensions.

Financial Operating metrics for BFSI organizations by Categories

	CREDIT GROWTH (3 YEAR CAGR)	RETURN ON EQUITY	GROSS NON- PERFORMING ASSETS (3 YEAR AVERAGE)	COST-TO-INCOME
Leader	16.0%	14.5%	2.7%	37.0%
Leapfrogger	12.0%	11.1%	3.0%	44.1%
Steady Follower	10.0%	8.0%	3.7%	40.0%
Laggards	10.0%	9.0%	5.1%	46.1%

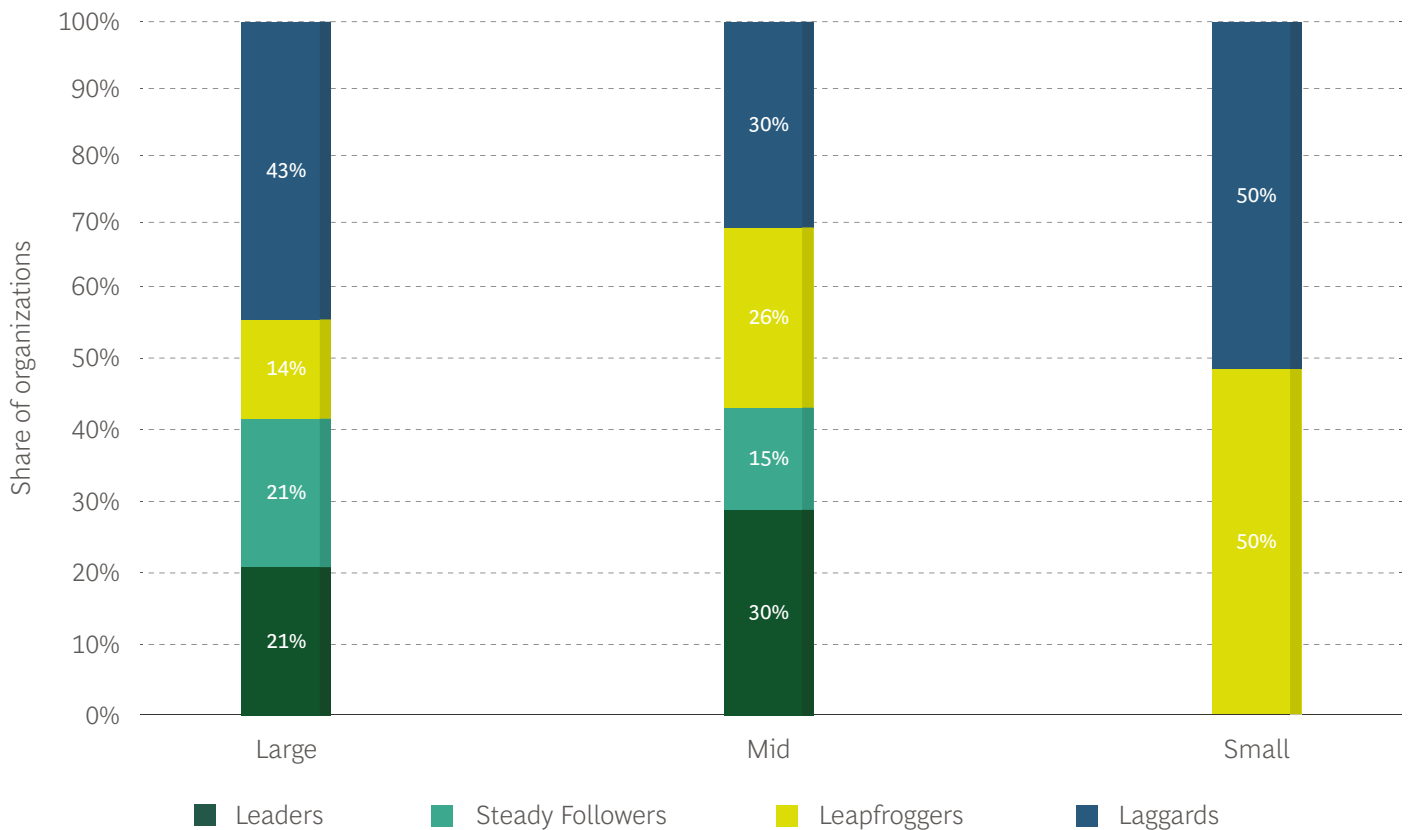
Exhibit 14 - Current distribution of AI maturity dimensions across categories (Sector – BFSI)



The Leapfroggers have worked exceptionally hard to bring themselves back into the AI adoption race. Their maturity level of 4 on Vision is reflected in a significant improve-

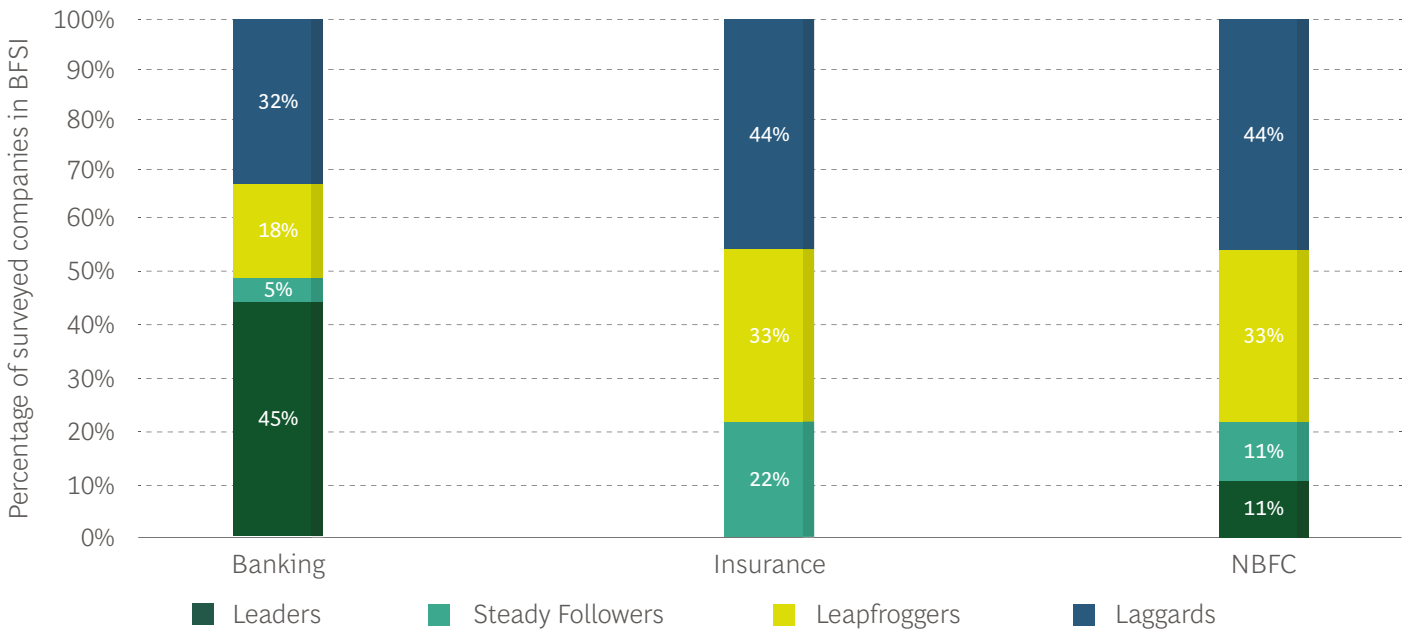
ment on Use Cases and People Operating Model. This has helped them converge in maturity with Steady Followers and even give serious competition to the Leaders.

Exhibit 15 - Category distribution by company size (Sector – BFSI)



Note: values may not add up to an exact 100% due to rounding off.

Exhibit 16 - A leader in insurance is awaited



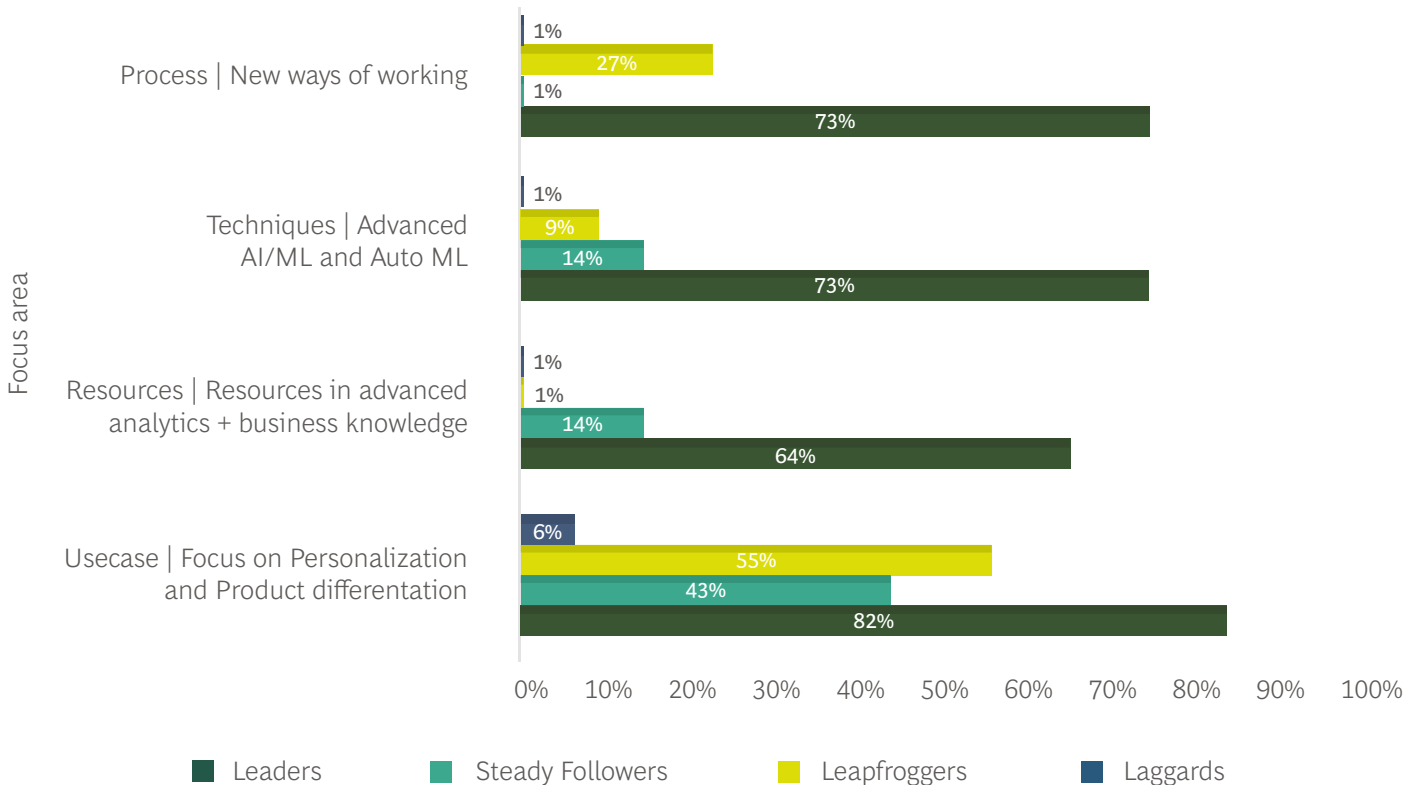
Note: values may not add up to an exact 100% due to rounding off.

Lenders lead the way

There is large divergence in AI Maturity within BFSI. 90% of Leaders are from the banking space, but we also see

strong potential in Insurance and NBFCs, where over 30% of players are Leapfroggers. Laggards, meanwhile, exist homogenously across all sub-sectors.

Exhibit 17 - Key differentiating qualities of a leader vis-à-vis other profile categories (Sector – BFSI)



Learnings from Leaders

Leaders have focused on balanced development across all dimensions. They have decisive leads in four key areas, which require a significant investment of time and capital to achieve



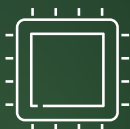
PEOPLE

- Senior data specialists with business knowledge and ability to innovate use cases
- A thriving R&D community of domain experts, data engineers and data scientists working harmoniously across business functions and external vendors to derive maximum value from data



PROCESS AND OPERATING MODEL

- Cross-functional teams from business, operations and technology working closely to create a strong feedback loop
- A value-realization team that goes beyond project office scope, measuring and feeding back to continuously improve the data-driven systems



TECHNOLOGY

- Advanced ML tools and automation capabilities allowing faster and more effective feedback loops, significantly crashing the period of streamlining of models



USECASES

- A decade of evolution in data-led innovation has led to moving from cost- and optimization-based use cases to a differentiating customer experience through product and service personalization

Learnings from Leapfroggers

The Leapfroggers were at a similar level of maturity to the Laggards three years back—yet they have now pulled far ahead, coming within striking distance of the Leaders. Their incredible resurgence has essential learnings on how to kickstart the AI journey.

The Leapfroggers took a use case-centric approach and supported it with Process and People initiatives to expand the scope of the overall AI initiative.

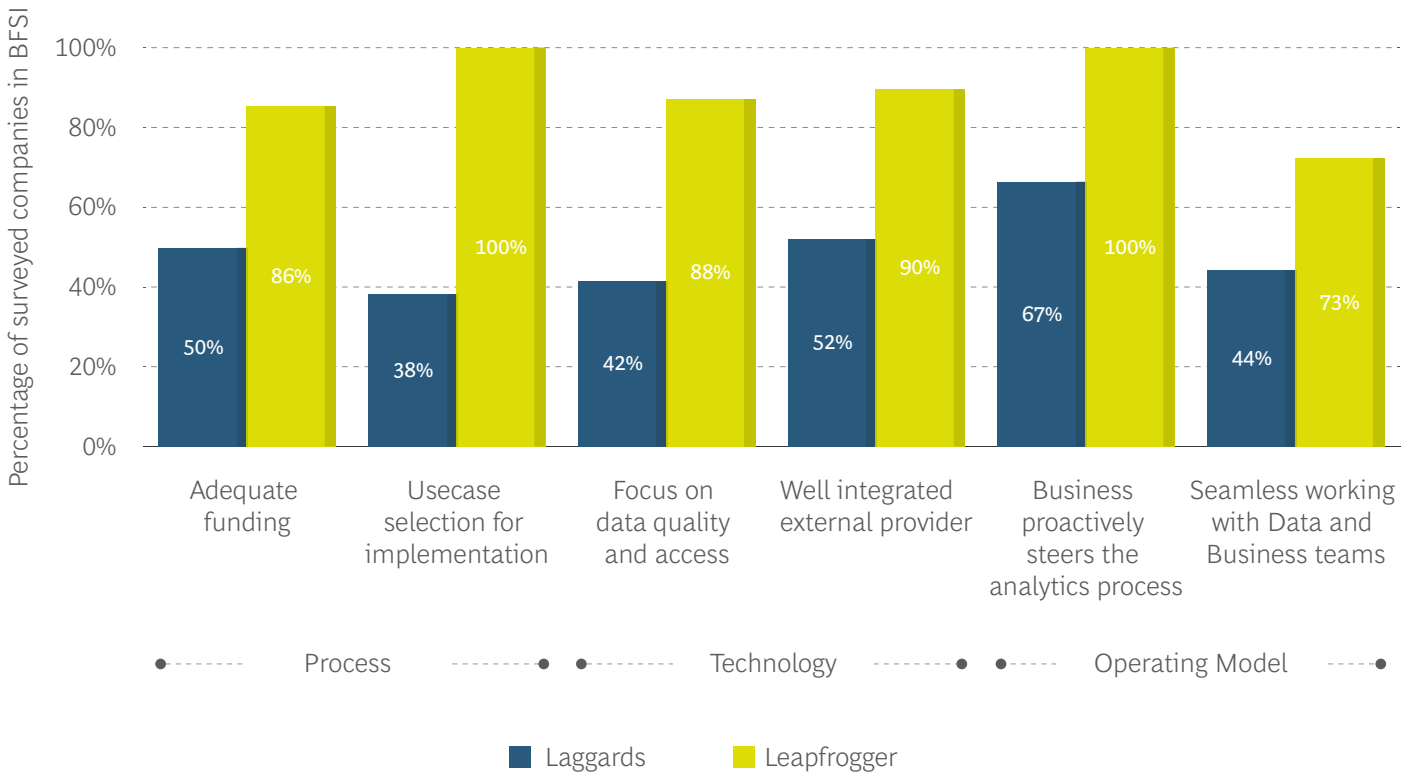
Their playbook for kickstarting AI includes:

- Dedicated funding and milestone-based planning
- Tech-enabled data capability with a focus on quality, ease of access and usability

- Careful selection of use cases, with optimal balance between the size of impact and ease of execution
- Embedding partnerships wherever required
- Business ownership of analytical processes and outcomes, providing greater impetus to ensure usage and adoption across the organization, as opposed to siloed analytics development
- Seamless working between Data and Business teams

These organizations now aim to continue their momentum of investment in digital and data infrastructure, with over 64% aiming to catch up with the Leaders in these aspects.

Exhibit 18 - Key growth drivers for Leapfroggers as compared to Laggards (Sector – BFSI)



The outlook for BFSI

We believe an end-to-end personalized experience across the value chain is one of the key offerings from new-age competitors. Analytics in optimizing core banking operations can be a key differentiator in ensuring excellence in customer service. Finance function, which has been amongst the largest consumer of legacy data for MIS, uses surprisingly low level of analytics. There are value unlocks possible in each of these functions.





Leaders must prepare for faster innovation amidst multiple disruptions from competitors, technology and regulations.

The Steady Followers will continue to follow the Leaders with a time lag. Their focus should be on completing the digital overhaul by bringing the complete customer journey to an agile platform that would allow for a seamless and personalized experience. While iterative improvements in core banking capabilities should continue to reap rewards in the foreseeable future, the growth and relevance of offerings will require a much larger disruption from business-as-usual. A decisive leadership that is willing to continuously disrupt and re-invent its business models will benefit from this robust data leadership.

Value Expected by Customer from the Sector⁷

	TRUST	Building risk and compliance procedures into products and services when they are designed (rather than adding them later) is a best practice. Risk and compliance teams should jointly solve problems and develop user-friendly and efficient control solutions
	VALUE CONSCIOUSNESS	Tying technology, digital and data investments to use cases eliminates duplications across silos and helps integrate the design and delivery of products and services to reduce waste
	CUSTOMER SERVICE & FEATURES	Redesign processes and solutions from scratch (as opposed to trying to adapt those currently in use) and use digital and artificial intelligence (AI) tools to eliminate work and duplication of capabilities across products and customer segments

Key Growth Drivers

	EFFICIENCY	Optimizing processes across sales, operations and service functions simplifies work and eliminates rework Using end-to-end metrics, instead of siloed functional or service-level agreement metrics, helps ensure visibility and coordination at the top of the organization
	CROSS-SELLING PRODUCTS	Lead generation, improved conversion rate, short TAT, increasing LCV
	M&A, EXPANSION TO NEW GEO	Setting ambitious targets, rather than objectives for incremental improvements
	CAPTURING UNDER-BANKED "BHARAT"	Novel data collection and under-writing methods Innovative and cost-efficient outreach and collection

7. <https://web-assets.bcg.com/89/ee/054f41d848869dd5e4bb86a82e3e/bcg-global-retail-banking-2021-the-front-to-back-digital-retail-bank-jan-2021.pdf>

Food for thought for the Laggards

As the BFSI sector aggressively invests in data, Laggards will struggle on almost all levels. The silver lining is that

the Cloud has significantly lowered barriers to adoption. Over a 3-year timeframe, these organizations can still transform themselves into Leapfroggers, following the template set by the current Leapfroggers.

Industry-wise Review: Consumer Goods

The Consumer Goods (CG) sector is India's fourth-largest, comprised of FMCG, Retail, Consumer Durable Goods (CDG), Travel and Quick-Service Restaurants (QSR). The sector has been expanding at a healthy rate in recent years, thanks to rising disposable income, the world's largest youth population and improving brand awareness among consumers.

Despite the global slowdown and nationwide lockdowns, the sector has clocked impressive growth figures, buoyed by consumption-led growth and value expansion from higher product prices:

- The retail market in India is estimated to reach US\$1.1 trillion by 2020, up from US\$840 billion in 2017.⁸

- The FMCG market in India is expected to grow at a CAGR of 14.9% to reach US\$220 billion by 2025, up from US\$110 billion in 2020.⁹
- The Indian processed food market is projected to expand to US\$470 billion by 2025, up from US\$263 billion in 2019-20.¹⁰

The CG sector is also receiving strong government support on the investment and policy front:

- The union government's production-linked incentive (PLI) scheme gives companies a major opportunity to boost exports through an outlay of US\$1.42 billion.¹¹

Challenges to AI adoption (Sector – Consumer Goods)

STAGES	CHALLENGES	WAY FORWARD
Production	<ul style="list-style-type: none"> Cost pressure due to sustainability issues Frequent macroeconomic disruptions Cost pressure due to weather disruptions 	Multilevel Forecasting Model leveraging external datasets
Distribution	<ul style="list-style-type: none"> Over-reliance on brick-and-mortar distribution Rise of e-commerce Lower bargaining power against marketplaces Inventory mismatch Supply chain issues 	<ul style="list-style-type: none"> Digital Command Center, Bid Optimization, Product Display Benchmarking Demand Forecasting for short-run and medium-run at SKU/ Geo/ Channel
Consumer	<ul style="list-style-type: none"> Customer spoiled for choice Rapid rise in brands Erosion of margins Reduction in customer loyalty Faster technological evolution Social media has made brand reputation vulnerable to small disruptions 	<ul style="list-style-type: none"> Carving a niche to win the volume through deep understanding of customer behavior Digital Command Center, Sentiment Analysis, Product Review Analysis

8. <https://indbiz.gov.in/britannia-eyeing-new-international-markets/>

9. <https://www.ibef.org/industry/fmccg-presentation>

10. <https://www.ibef.org/industry/fmccg-presentation>

11. <https://www.ibef.org/industry/fmccg-presentation>

- The sector has witnessed healthy FDI inflows of US\$20.11 billion from April 2000-March 2022.¹²
- The National Logistics Policy aims to lower the cost of logistics from its current 14% of GDP to less than 10% by 2022, and bring it to global benchmarks by 2030.¹³

Overall, the structural aspects of the Indian economy are highly conducive for CG sector growth—but the industry must also overcome multiple challenges across the value chain. There are viable solutions to all these challenges, and data lies at the heart of them.

The Consumer Goods industry, unlike BFSI, has limited AI Maturity. The current maturity level stands at 2.7, up from 1.6 three years ago. Only 5% of CG organizations are Leaders in the AI adoption race, while 76% are still Laggards.

Market leaders are focusing on:

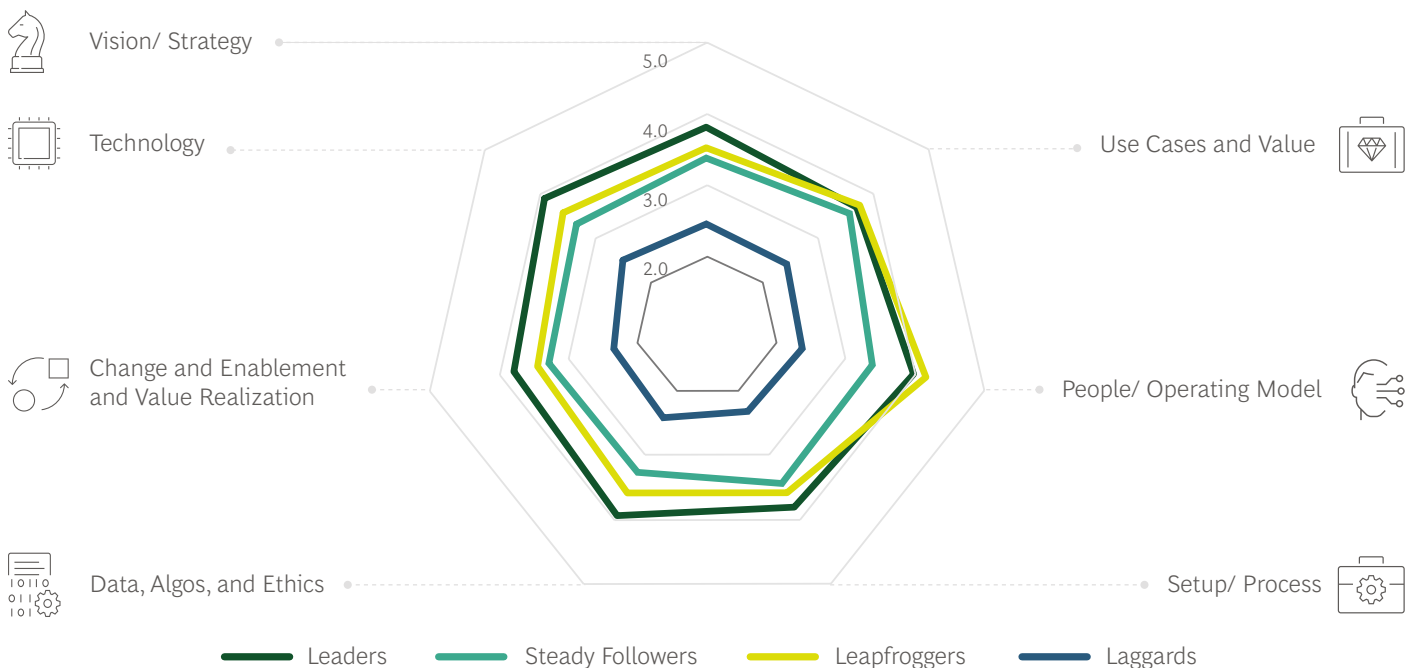
- Winning with brands and innovation
- Winning in the marketplace
- Winning through continuous improvement
- Winning with people

The industry’s Leader maturity level stands at 3.9, but this is not a formidable position. Leapfroggers have already surpassed Leaders on the Use Cases and People dimensions. This situation is unique to the Consumer Goods Industry as it faces organic challenges like the vast variety of use cases, limited literature and fewer skilled data scientists. It has also increased dependence on external vendors for delivering use cases.

AI adoption requires a cultural shift and agile thinking along with investment in technology. While small organizations are limited by their size, large organizations are finding it difficult to adapt to the changing AI landscape. The Head of the Digital Lab at one of India’s largest conglomerates said, “People are reluctant to change processes even when the data is telling them to do so. They have identified use cases and have basic technology in place, but they lack proper process and training programs for business users”.

The AI adoption race is most intense among mid-size Consumer Goods companies and it is not surprising that People Operating Model is the strongest dimension for these organizations.

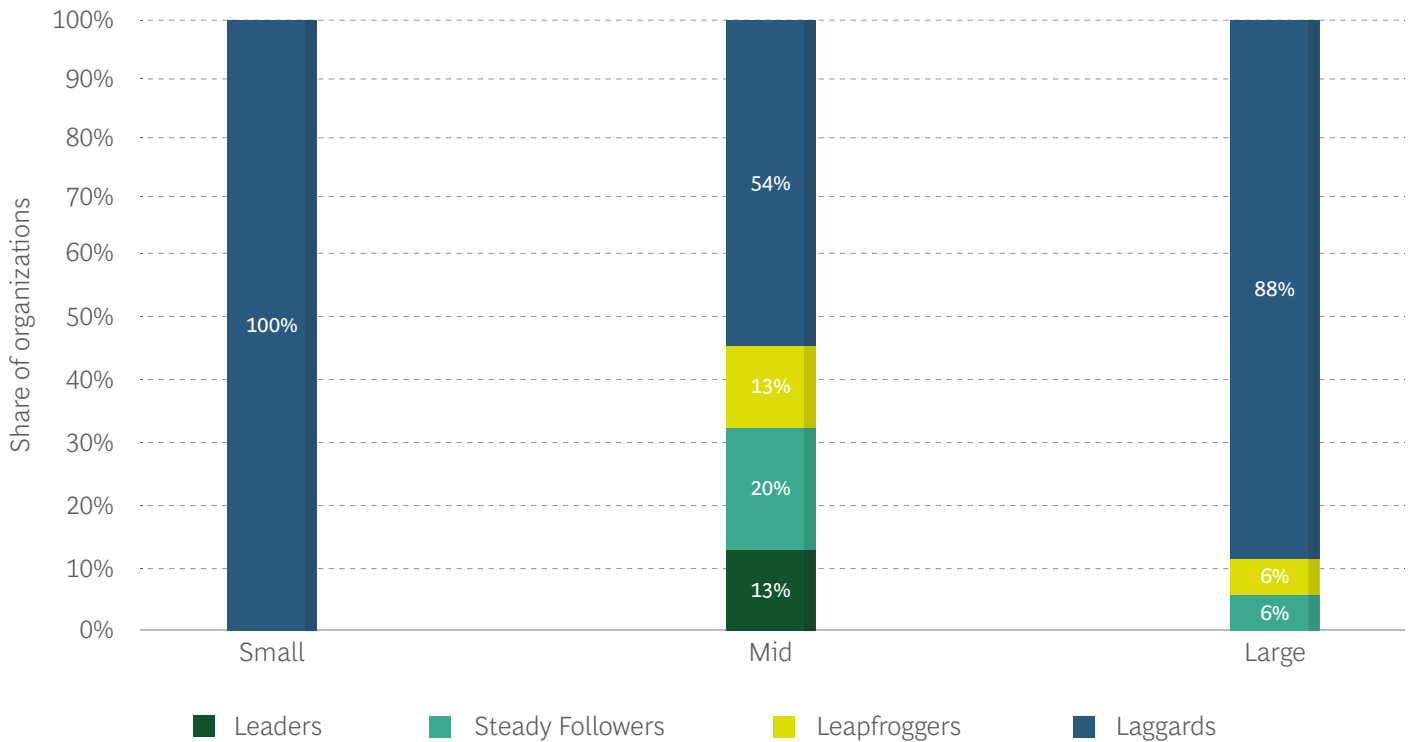
Exhibit 19 - Current Distribution of AI Maturity Dimensions across categories



12. <https://www.ibef.org/industry/fmcg-presentation>

13. <https://commerce.gov.in/press-releases/national-logistics-policy-will-be-released-soon-policy-to-create-a-single-window-e-logistics-market-will-generate-employment-and-make-msmes-competitive-nirmala-sitharaman/>

Exhibit 20 - Category distribution by Size (Sector – Consumer Goods)



Learning from the Aspiring Leaders*

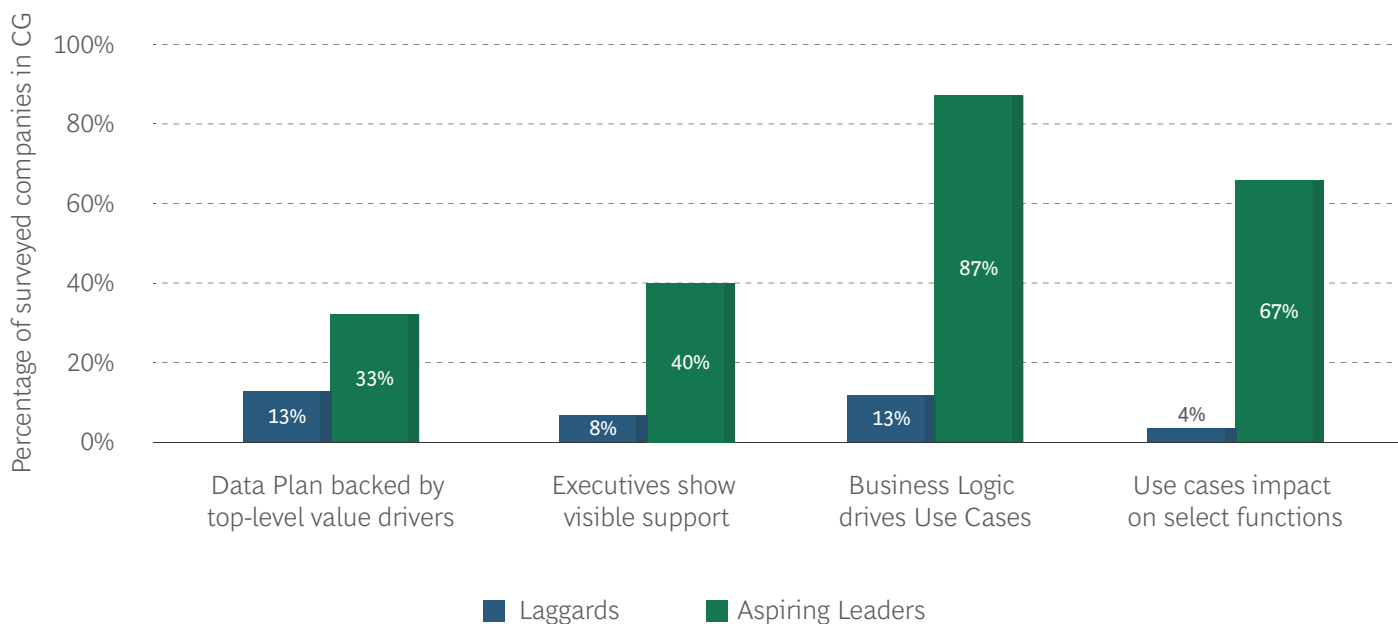
Leapfroggers and Steady Followers make up about 20% of the organizations in this sector, with an AI Maturity level of 3.6. These organizations have not only overhauled their strategy to implement data and analytics, but have also invested in development and scaling of AI use cases. Over one-third of these organizations have a rigorous organization-wide data analytics plan, and executives show visible support for data and analytics initiatives by sponsoring use

cases for different functions. They have also been constantly improving on their People Operating Model and Process to sustain adoption. Aspiring Leaders are leveraging the digital ecosystem to solve various supply chain problems, such as using Crop Analytics to improve crop yields, thus reducing cost and ensuring supply continuity. Most of these organizations have heavily invested in IoT analytics for continuous monitoring and improvement of manufacturing processes.

Note: values may not add up to an exact 100% due to rounding off.

* Aspiring Leaders is a pooled category which includes both Steady Followers and Leapfroggers.

Exhibit 21 - Compared to aspiring leaders, laggards lack a sound vision and strategy, don't focus on developing use cases (Sector – Consumer Goods)



Little improvement on pre-COVID scores in most cases

Laggards in this sector have an AI adoption level less than 2.5. These companies do not have a clear vision or a well-thought-out action plan on how to use data and analytics, and severely lag in the development of AI use cases. Around 85% of Laggards have no detailed data analytics plan—at best, it only exists for limited use cases in select functions.

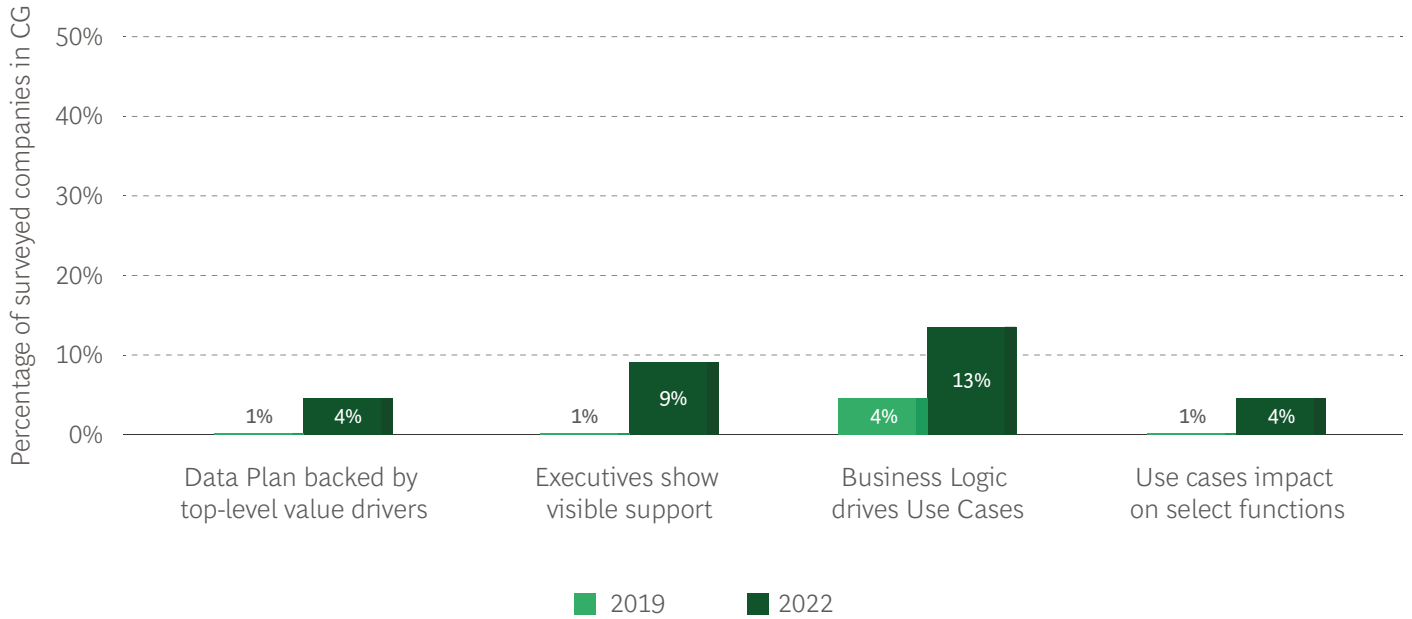
Besides, in more than 90% of such organizations, executives lack an adequate understanding of data & analytics. There has been no improvement in this regard since 2019.

While the Laggards fared poorly across all dimensions, the Process and People dimension has received the least attention. According to the business leader of a leading hospitality and leisure travel major, “building the right team size is a challenge due to difficulties in finding the right talent.”

Surprisingly, the Laggards have not even achieved a basic maturity level of 3 on Technology, despite ease of access. Moreover, 70% of them limit their focus on use cases to cost reduction and process automation, which have limited gains.

Laggards are also significantly behind Aspiring Leaders when it comes to talent acquisition and acquiring the resources to develop data and analytics capabilities. Only 30% of Laggards say that they have adequate analytics resources to meet business demands, compared to around 75% of Aspiring Leaders. A dearth of talent limits the ability of Laggards to scale models or create effective working prototypes, which depend on collaboration between data scientists and data engineers. This has also limited their ability to code in modern languages and restricted them to the off-the-shelf tools, which have a higher subscription cost. On the other hand, most Aspiring Leaders have managed to develop respectable ability to scale models.

Exhibit 22 - Little improvement by laggards in vision and strategy and use cases (Sector – Consumer Goods)

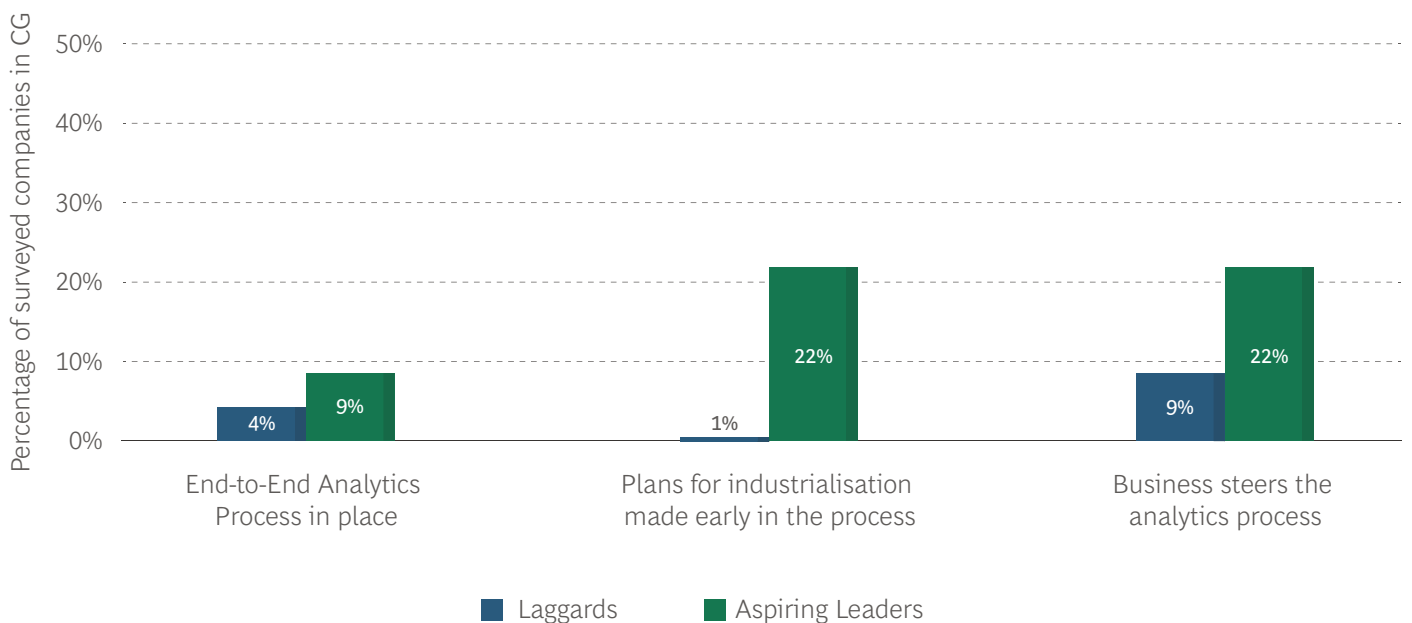


Where Aspiring Leaders fall short

Even though Aspiring Leaders have made substantial headway in Vision, Strategy and Use Cases, they have not made a significant leap in planning early for industrialization or developing an end-to-end analytics process. Their

use cases have been limited to working prototypes. Unlike BFSI, the Consumer Goods industry does not have customer and transaction level data, yet they are not aggressively looking to leverage external data for a customer-centric view. Another area of concern is training of business users, which is an essential link for AI adoption.

Exhibit 23 - Difference between laggards and aspiring leaders in Setup Process (Sector – Consumer Goods)



Industry-wise Review: Industrial Goods

Global manufacturing growth decelerated considerably to 1.5%¹⁴ in Q4, 2022. ‘Higher technology industries’ group is the only sectoral group still expanding (3.6%). Manufacturing of electrical equipment has seen a rapid growth (8.9%) which complements automation and digital technologies. Ongoing challenges for global manufacturing, such as high energy prices, rising global interest rates and persistent disruptions in the supply chain of raw materials and intermediate goods, have led to weakening confidence and mounting uncertainty.

There is a strong deceleration in manufacturing activity in North America and Europe. Vietnam (11.2%), Indonesia (5.2%) and Malaysia (4%) far exceeded the global average in manufacturing output and India’s output in Q4,2022. The forecasted rise in investment to bolster India as a manufacturing hub after China is not a foregone conclusion. Prior to the pandemic, the Indian manufacturing industry accounted for around 16-17% of India’s GDP, however its contribution towards the GDP has remained largely unchanged in the last decade. While the push for greater supply chain resilience by industrial economies

of the world bodes well for India, the uncertainties and current state of Indian manufacturing cannot be ignored. Significant investments in cost efficiency, adoption of latest technologies, investments into product and process R&D and a development of a stronger supply of essential parts, equipment and raw materials is a necessity.

It is projected that the manufacturing sector in India has the potential to reach a value of US\$ 1 trillion by 2025 from \$412 B¹⁵ in FY22. The Indian government, through initiatives like the National Manufacturing Policy, is gradually progressing towards Industry 4.0. The goal is to increase the manufacturing sector’s contribution to GDP to 25% by 2025.

- Since April 2020 – September 2022, 2 sub-sectors have registered strong FII inflows: automobile sector (US\$ 33.7 B) and chemical manufacturing sector (US\$ 20.76 B)
- In H1, 2022, the top 10 major commodity exports from India, including engineering goods, petroleum products, gems and jewelry, chemicals, pharmaceuticals, electronic goods, textiles, rice, and plastics, totaled US\$ 187.2 billion.

Challenges to AI adoption (Sector-Industrial Goods)

	CHALLENGES	WAY FORWARD
Sourcing	<ul style="list-style-type: none"> Quality of raw materials Vendor management Procurement planning Payments & Contracts 	<ul style="list-style-type: none"> Forecasting and Analysis in Supplier management Quality Commodity risk management AI in Strategic Sourcing
Production	<ul style="list-style-type: none"> Rising power and input costs Safety Research and Development 	<ul style="list-style-type: none"> AI in manufacturing Robotic Process Automation Safety Green Initiatives
Distribution	<ul style="list-style-type: none"> Over-reliance on brick-and-mortar distribution Inventory mismatch Supply chain issues 	<ul style="list-style-type: none"> AI in Supply Chain Demand Forecasting for short-run and medium-run at SKU/ Geo/ Channel levels
Businesses / Customer	<ul style="list-style-type: none"> Compliance to global quality standards, ESG Security 	<ul style="list-style-type: none"> Quality Assurance Carving a niche to win the volume through deep understanding of customer behavior Digital Command Center, Sentiment Analysis, Product Review Analysis

14. <https://www.unido.org>

15. <https://www.ibef.org/industry/manufacturing-sector-india>

The Industrial Goods (IG) sector has a significantly lower overall AI maturity at 2.2, up from 1.7 in 2019. While there are multiple point solutions in use in production and core areas, the value harnessed from these are restricted to key areas. Approximately 75% of the organizations in this sector are laggards while leaders constitute only 5% of the entire sector.

Though Leaders are concentrated among the large players, an assessment of companies by size shows that Laggards are present across all organizational sizes. However, while Steady Followers and Leapfroggers are seen in greater numbers among companies with revenues above INR 10,000 crore.

Exhibit 24 - 75% of Industrial Goods organizations are Laggards

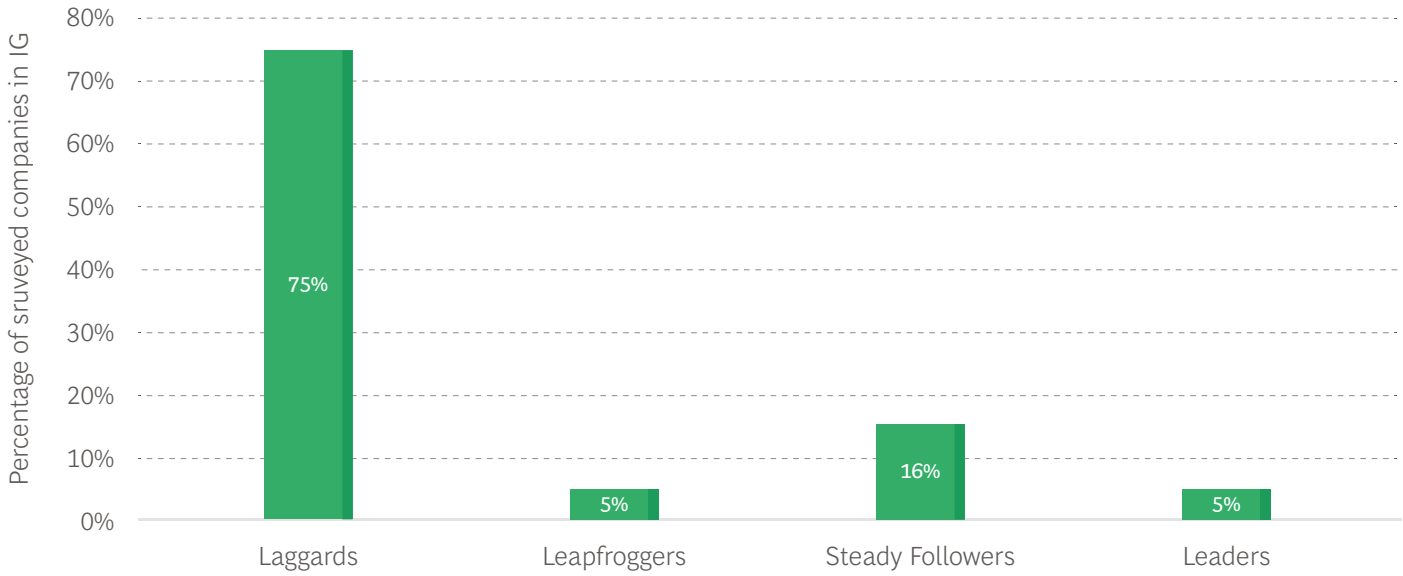
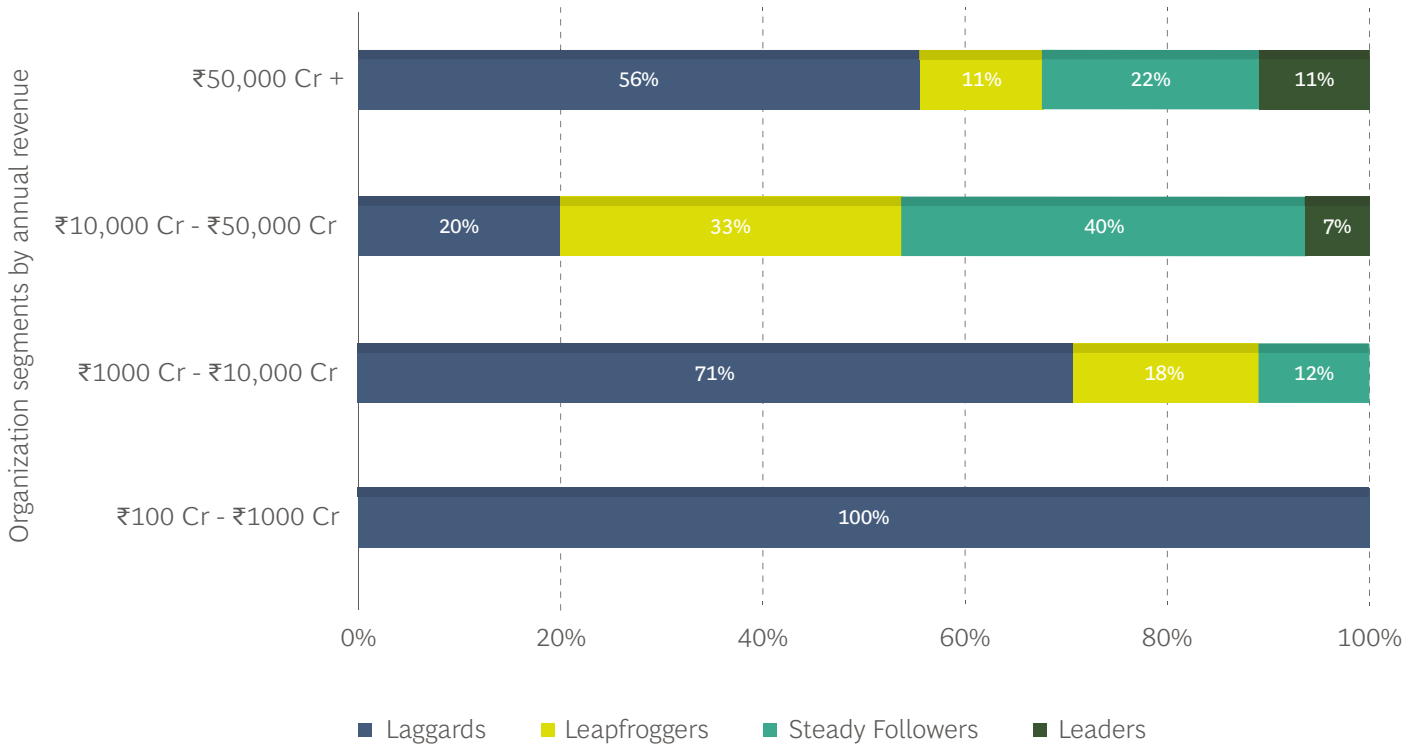


Exhibit 25 - Distribution of companies by size (Sector – Industrial Goods)



What the Leaders have got right

Leaders integrate data initiatives across organization. Leaders are using advanced Machine Learning techniques to create unique and innovative applications of AI. These applications have played a crucial role in transforming operations when supported by realigned processes. By selecting and prioritizing these use cases, leaders have developed a robust data roadmap, supporting high-impact applications. They have effectively used the tangible business outcomes to motivate internal stakeholders to change their processes, organization, and culture.

However, Leaders still have some headroom to improve their Setup Process and Technology. The use of ML-Ops is still limited among these organizations and the analytics process has not been optimized. None of them has yet developed the ability for real-time data processing to ensure seamless transfer of information.

Where the Laggards stand now

With limited adoption since 2019, the Laggards have fallen further behind the Leaders. They are yet to develop a comprehensive strategy and hence have limited ability to undertake meaningful development of Use Cases.

73% of Laggards do not have a company-wide data ambition and strategy. Moreover, in around 70% of these companies, executives rely on external vendors for the development of analytical capabilities.

Executives and Middle management in over 80% of IG companies lack a comprehensive understanding of the use cases that can impact them. So far, they have only managed to progress a limited number of use cases to a production stage. This limits the impact of such use cases on organizational performance. As seen from the study, most use cases currently revolve around low ticket automation and cost reduction initiatives for around 70% of the companies.

Exhibit 26 - Negligible improvement across Vision and Strategy by laggards

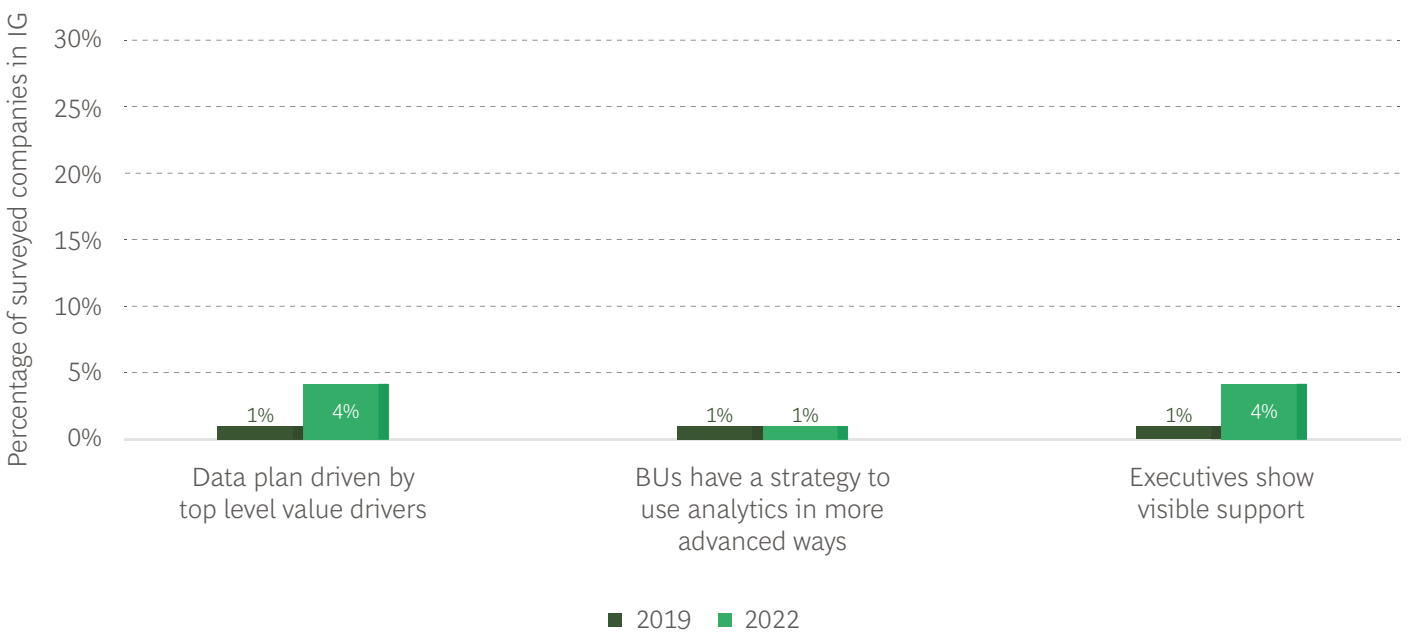
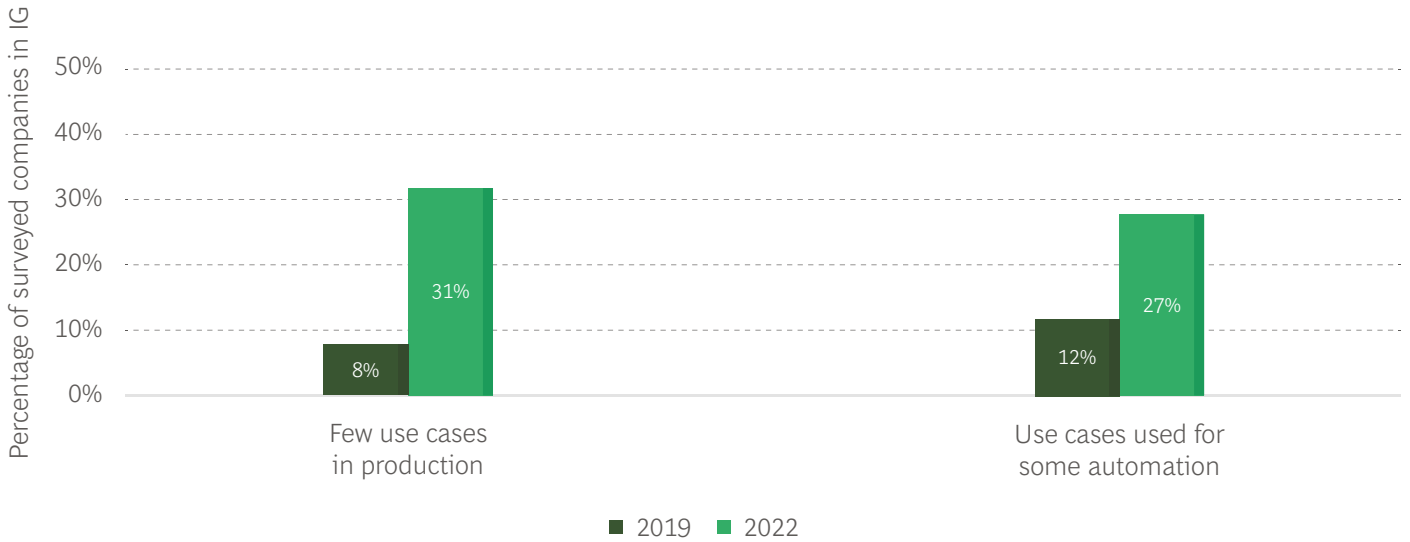


Exhibit 27 - Little improvement in Use Cases by laggards (Sector-Industrial Goods)

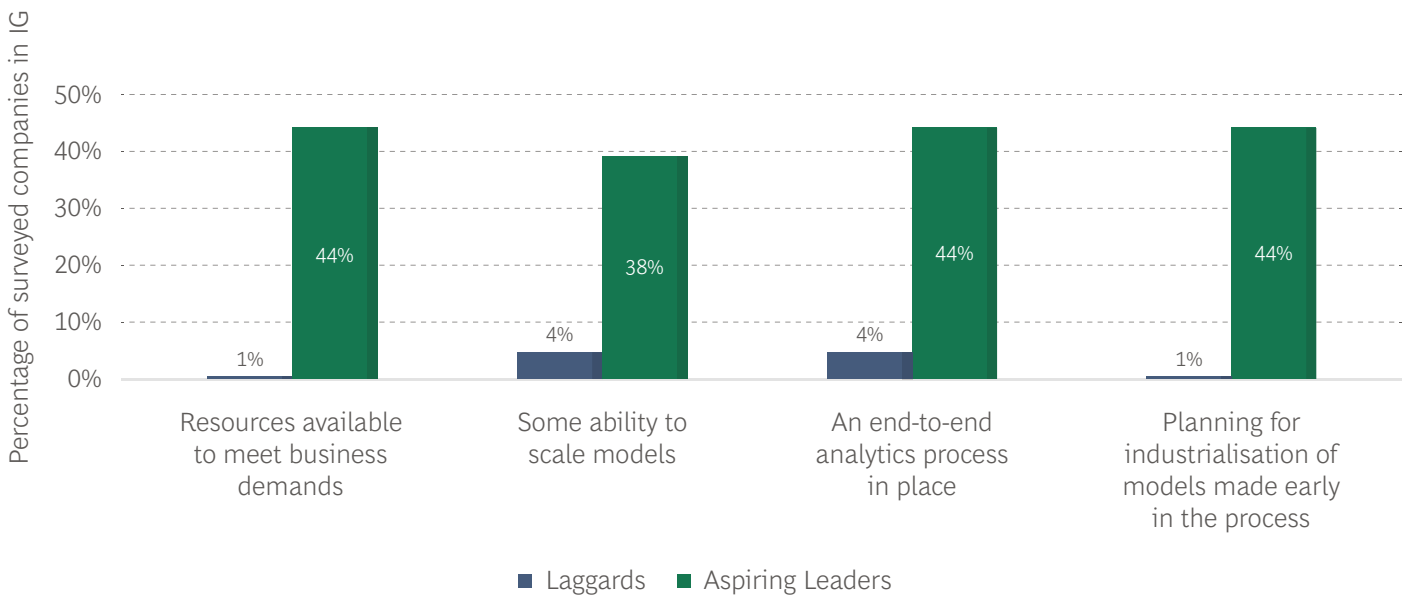


Laggards vis-à-vis Aspiring Leaders

Laggards lack robust data-centric process and operating models as compared to Aspiring Leaders. They do not have the resources to deploy models at scale, and they have negligible analytics resources to meet business

demands. In around 80% of these organizations, the IT department is responsible for delivering analytics needs. Further, in around 60% of respondents, the data scientists available do not have business experience. Finally, 96% of companies have no clear path to industrialize solutions and take them forward from the POC stage.

Exhibit 28 - Key areas for Laggards to invest (Sector – Industrial Goods)





Strategic Planning in the Era of AI

Despite the much-touted strategic advantages of analytics, it has been a challenge to adopt it as a process or competency in many organizations. The skillset required to fully leverage its advantages is usually a complex combination of data management skills, statistical and data processing prowess and business acumen. Resources with the ‘right mix’ of abilities (see Exhibit 29, ‘The Constituents of an Analytics Process’) are in high demand and short supply.

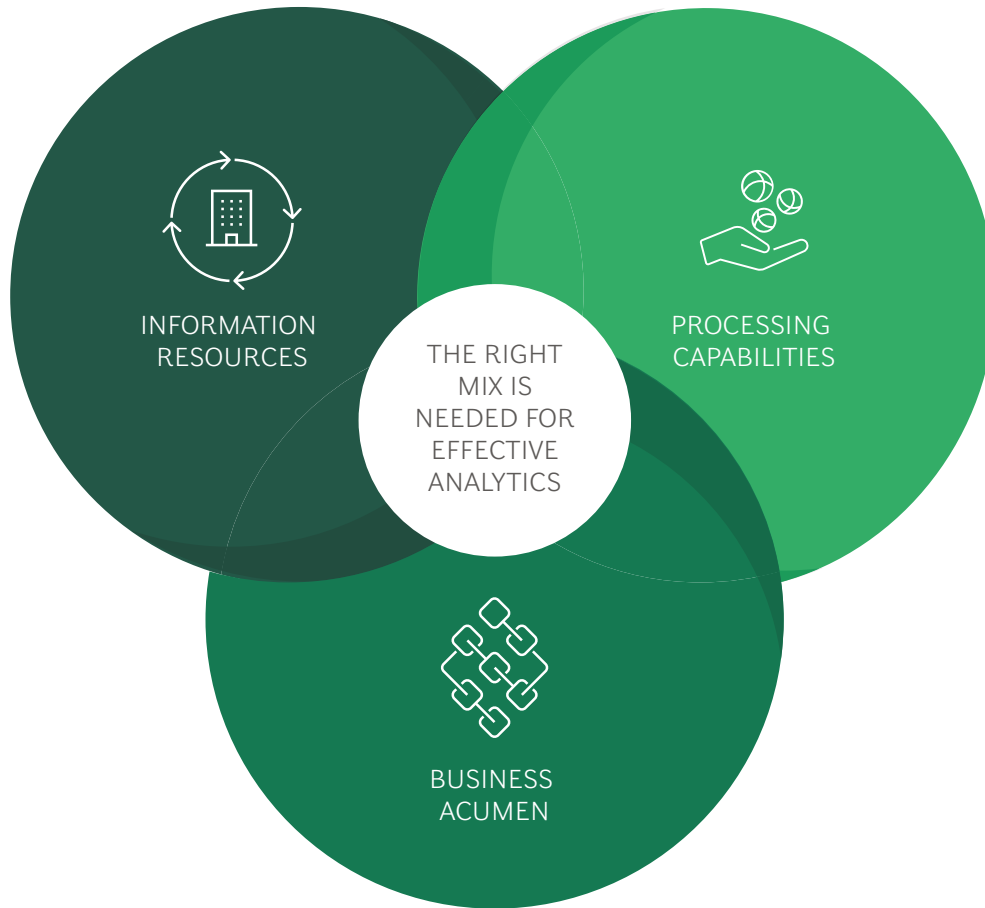
Many organizations have evolved their Analytics processes around a mix of resources with varying strengths in more than one of the three key strengths. The champions in the analytics-driven organizations of the future will have to evaluate using the following blended capabilities:

1. Information Resources (the data inventory in the organization, and crucially, the quality of that data) Scientific enquiry requires data formats that allow relatively easy evaluation of (in) consistency

in patterns among the data (this is a basic requirement for high-quality analytics). Any evidence of significant deficiencies in the information—such as large data gaps, irregular recording, unstandardized formats and non-numeric formats—could necessitate additional investments of time and cost for organizations to enable easy analysis.

Industries vary in their degree of automated processes, methods of doing business and maturity in preserving information. This reflects significantly in the availability (or lack thereof) of information in easy formats for seamless analysis. Some external-facing functions such as Marketing and Sales are severely challenged in gathering reliable information from external sources on new customer acquisition. Although Marketing Analytics is a developed science, it is mostly confined to analyzing internally sourced data on existing customers, and thus largely focuses on the operational aspects of marketing issues.

Exhibit 29 - The Constituents of an Analytics Process



2. Processing Capabilities

These capabilities are relatively operational in nature, a blend of data management and analytical capabilities (statistical and computational abilities). Of the many necessary investments, this is perhaps the easiest to acquire, and many educational hubs provide training to equip human resources for these responsibilities.

The effectiveness of these feedback loops also has to be considered. Specialized ML/ AI-based use cases rely strongly on multifaceted feedback loops to derive maximum value. Effective models require not just high-quality data, but also a supportive organizational ecosystem:

- AI learns from human feedback (customer and internal)
- Humans learn from AI (including understanding its behavior, how to leverage it, right ways to feedback)
- AI learns autonomously (from data and from historical feedback)

Our study¹⁶ indicates that improved change management processes and a robust operating model could deliver up to 6x higher value.

16. BCG-MIT SMR analysis

3. Business Acumen (business insight development)

This is a critical capability, second only to the availability of high-quality data. Organizations wishing to reap the benefits of data insights must encourage executives with high business acumen to acquire data-driven insight development skills. They must be comfortable reading data insights and develop the knack of connecting these to their business relevance (also known as the “So what?”). However, unlike processing skills (which can be imparted), this is a peculiar mix of data literacy and creative business acumen, which develops through exposure to various business problem contexts where data inputs are pertinent.

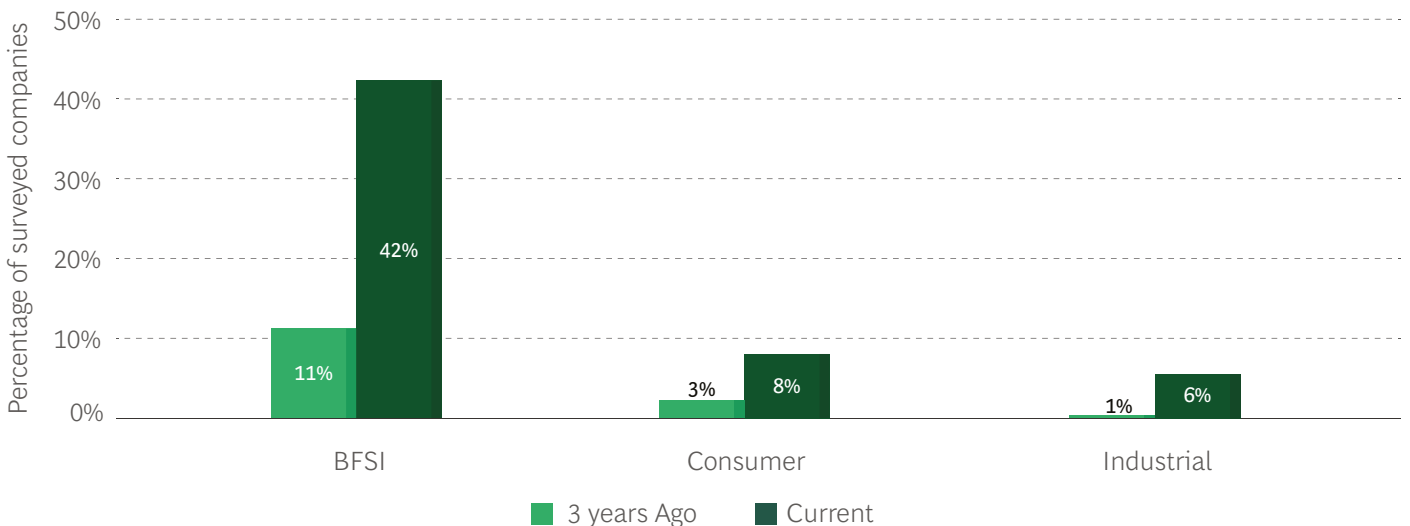
A future-ready organization will have to develop embedded skills where policy development groups have complementary skills in basic data processing and management. Usually, the career graph of employees in such analytically savvy organizations will see them transition from data processing responsibilities to policymaking, with opportunities to move back and forth as required. They do not usually depend on specialists to manage mainstream business objective-driven analytical tasks. Analytics is part of the policymaking culture in such organizations. This kind of evolution may happen over time and a proper organizational culture must be instituted to bring it about successfully.

Maturity of data collection/storage across industries

	BFSI	CONSUMER	INDUSTRIAL
Accuracy (Closeness of captured data to reality)		Medium	Low
Completeness (Comprehensiveness of data captured across value chain)	High (End to end digitized systems, robust change management, data sourcing programs)	(Multiple sources, databases and digital systems)	Low (Data is collected in some areas but with limited integration)
Consistency (Single Source of truth, across databases within organization)		Low (Data collection from diverse sources, mechanisms and digitally and manually too)	Medium (High from equipment and control systems, but Low in supporting digital systems and functions)
Timeliness (Realtime, near real time etc. matching business requirement)			
Uniqueness (Minimal data / database duplication)	Medium (3rd party data programs, diverse datasets, key to generating disproportionate competitive advantage)	Medium	Low

Exhibit 30 - Executive Participation in AI Adoption

% Orgs with active executive participation in usecase adoption cycle and driving data narrative





The Road Ahead: The Process for Adoption of Analytics in Organizations

Setting the Analytics Culture in Organizations

Decision-making in an organization often flows from the structure of the organization. Companies using AI in decision-making must ask themselves—“what are we using AI for?” AI may not be able to substitute managerial decision-making, yet its inputs may improve the quality of decision-making. But for AI to do that, organizations will have to make it an integral part of their structure. As they try and prepare for the next wave of AI-based solutions, they must focus on developing broad competencies in their employees. We provide a snapshot of what these competencies could be in the table below. AI in India has developed by leaps and bounds, and there

is enormous potential still untapped. Our research has identified three themes that will shape AI in organizations in the future:

- 1** Deeper focus to win with AI
- 2** Newer set of teams—
introduction of Analytics Pods
- 3** Amalgamation of new technologies
to drive new value creation

Stakeholder centric focus areas in managing AI initiatives

STAKEHOLDER	RECOMMENDED FOCUS AREAS TO MANAGE THE NEXT GENERATION OF AI
Managers	Think of AI and human workers as a team Transform jobs to be more people-oriented Shift emphasis in hiring from analytical ability to people skills
Employees	Increase emphasis on feeling intelligence and people skills Learn to work with AI

Source: Prof Aditya C Moses, Assistant Professor, Human Resource Management, IIM Ahmedabad

Theme 1: Deeper focus to win with AI/ AI@Scale:

In coming years, organizations will be pushing hard to win increasingly greater value through AI programs. Our research has identified several promising ways to win with AI:

- Integrate AI strategy with business strategy:** AI leaders look backwards from strategy, not forward from AI. They ask, “what are our business objectives—and how can AI help us meet them?” Companies that approach AI in this way are more likely to take it beyond automation and cost savings—and take the impact of AI further, too.
- Take on large projects with big impact:** Our analysis reveals that companies do better with AI if they place carefully calculated bets. Of the companies that invest in higher-risk AI projects, 50% have seen value to date. Among those that invest primarily in low-risk projects, just 23% have seen gains. Tellingly, the willingness to take risks appears to increase with an organization’s AI Maturity level. Quick wins can also bring an added bonus. By validating AI’s ability to spark value, they can keep the momentum—and the funding—going for longer-term projects.
- Align the production of AI with the consumption of AI:** Getting the most out of AI requires a team effort. A good rule of thumb is to consider AI to be 10% about algorithms, 20% about technology and 70% about business process transformation. Companies that focus solely on the production of AI—leveraging data, technology, and tools to build solutions—are less likely to derive value than those that enable the consumption or usage of AI. The idea is to bring together the technical side and the business side so that both can better understand what solutions are needed, what solutions are possible, and how to build for usability as well as functionality.
- Treat AI as a major business transformation effort:** AI doesn’t thrive in a vacuum. Companies that generate value from AI treat it as a major business transformation initiative that requires different parts of the company to come together and work as one. For AI to work well, companies need to integrate it into their fabric and into

the individual processes that power the core of the business. They need to tap into the right data sources, create the right processes (or reengineer existing ones), and develop the right feedback loops, so that AI can keep getting better. They also need to ensure that the users of the AI solution are very actively involved in the design of that solution from Day 1.

Theme 2: Newer set of teams—introduction of Analytics Pods/ Squads

As AI@Scale shapes up, several key roles will be needed to develop, deploy and sustain AI use cases from a business, change and technical perspective. All of these roles and cross-functional teams will be part of Analytics Pods/ Squads, who will be responsible to deliver products with 100% capacity. Here are some of the key roles involved, and their desirable attributes:

- Business Owner:** Credibility to mobilize business users and lead change management; transversal view of business issues and capacity to define a long-term view.
- Business Analyst:** Rigorous and organized; capable of synthesizing complex issues; sound knowledge of the organization’s internal functioning.
- Business Contributor:** Sound understanding of business issues and related root causes and business processes; open to data science approaches, focused on real business solutions, not gimmicks.
- Analytics Project Manager:** Experience in project management in short cycles (e.g. black belt); drive, resilience and capacity to anticipate problems and proactively propose solutions.
- Data Engineer:** Sound understanding of internal data systems and repositories; capacity to anticipate data science problems and proactively propose solutions.
- Data Scientist:** Keen to address concrete business issues, with capacity to critically examine own work and strive to improve continuously; excellent knowledge of modern approaches, tools and libraries.

- **Analytics Production Manager:** Data Scientist or Data Engineer in charge of models in the run phase (i.e., post-industrialization); assumes first line of service and liaises with the relevant Data Scientists for more important problems.
- **Data Architect:** Excellent coding skills ensuring models can be efficiently deployed globally; need to make sure that tech choices made are synced with the rest of the IT environment.
- **Human Centric Designer and Behavioral Science Experts:**
- **UI/ UX Designer:** The design of the customer interface and overall customer experience during those interactions are taken up by UI and UX designers respectively
- **IT Project Manager:** Core member of IT; has credibility and seniority, capable of mobilizing internal IT resources; open to modern IT solutions and architectures.

- **IT/Technical Contributor:** Core member of IT or Digital, with capacity to anticipate problems and proactively propose solutions in their domain of expertise.

Theme 3: Amalgamation of new technologies—5G, Metaverse, ChatGPT, AutoML, Explainable AI

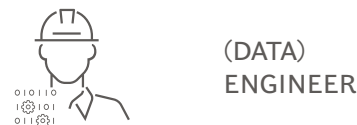
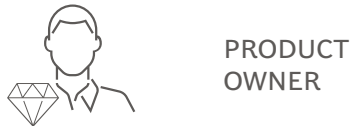
- **A culture of curiosity:** Awareness of emerging technologies that could be deployed in the business.
- **Specialized roles:** Chief Innovation Officer, Chief Scientist roles
- **Sandbox for new tech:** enabled by cutting-edge cloud tech, with the ability to run POCs and trials at scale, convert to production and more.
- **Startup engagement program:** with secured open API

Project based supporting roles



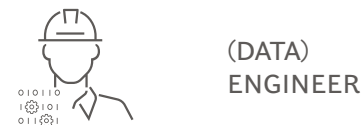
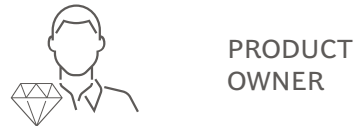
PRODUCT SQUAD 1 (E.G. BI)

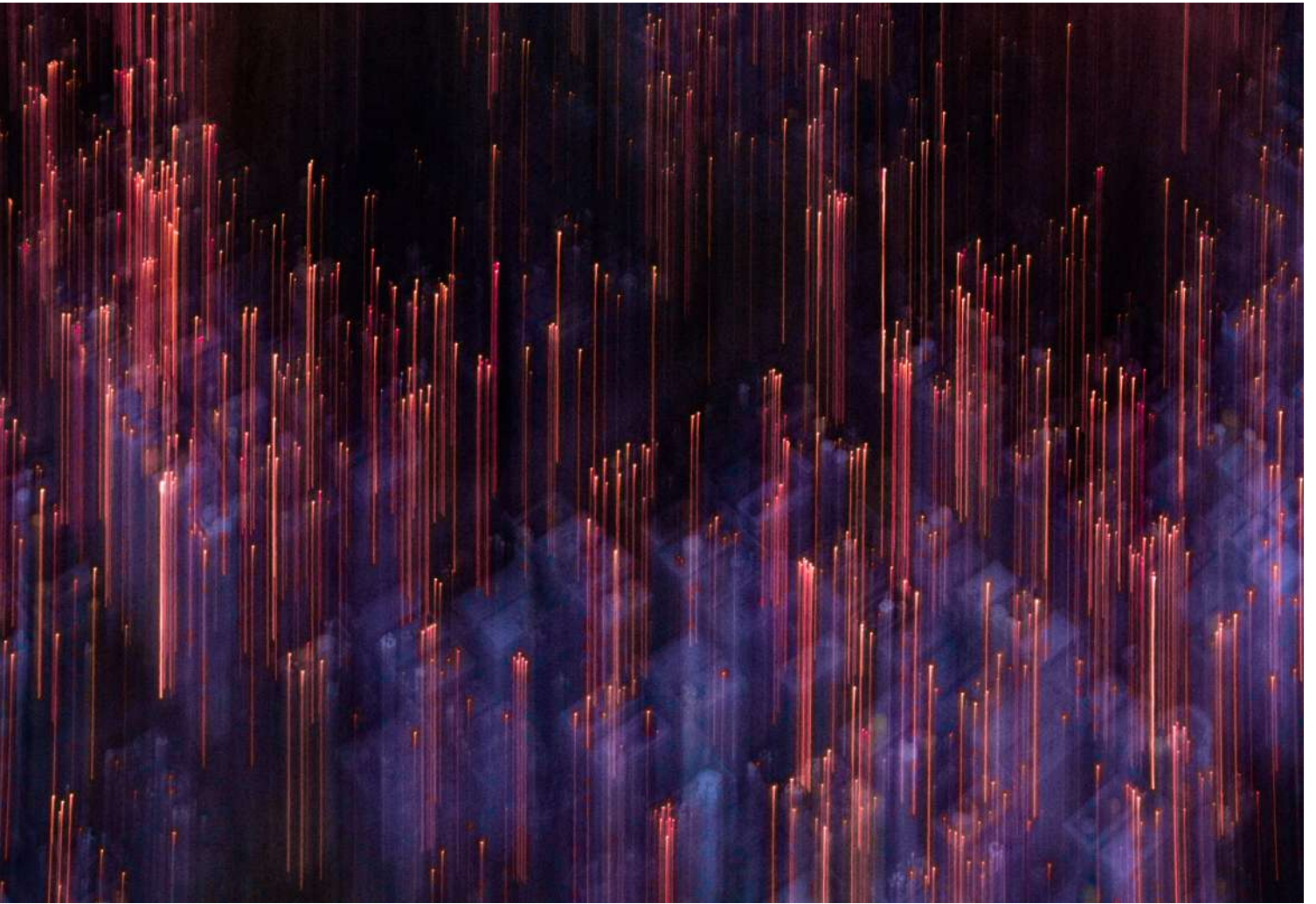
**SUPPORTING ROLES:
BUSINESS/ IT SPONSOR AND USERS**



PRODUCT SQUAD 2 (E.G. ADV. ANALYTICS)

**SUPPORTING ROLES:
BUSINESS/ IT SPONSOR AND USERS**





Responsible AI: A foundational pillar in India's growth

Responsible AI (RAI) means developing and operating AI systems that align with organizational values and widely accepted standards of right and wrong, while achieving transformative business impact. It is a critical enabler for the sustainable development and scalability of AI, helping companies achieve operational and financial efficiencies without legal and reputational risk.

Looming regulation globally will accelerate the demand for this capability, and failure to implement RAI could expose entities to significant regulatory and legal risk. In the event of lapses, the ensuing customer and societal disapproval could be severe enough to destabilize the core business.

When RAI falls short – learning from real-life lapses

- **Biased outcomes:** Credit decision-making system offers different interest rates to demographic groups despite similar financial profiles, due to bias in training data
- **Privacy violations:** Data breach with names, financial data and other sensitive information exposed due to poor system security
- **Unintended side-effects:** An AI-powered vacuum cleaner knocks over furniture while cleaning, due to second- and third- order effects not being considered

- **Limited availability:** Extreme markdowns on new products by AI promotion engine due to unfamiliar training data
- **Malicious use:** Users trigger discounts by exploiting known patterns in the pricing engine, due to a lack of testing and safeguards
- **Failure to augment human controls:** Chatbot starts using profane language in interactions with users due to insufficient monitoring and auditing

Failure to address concerns around RAI deployment could raise organizational risk and limit scale. Organizations may face significant challenges including litigation, financial losses, reputational damage and regulatory compliance.

On the other end, adopting RAI persuades companies to be more thoughtful and human-centric in their AI initiatives, leading to better gains. In other words, RAI makes eminent business sense. This movement is gaining momentum as organizations transform their capabilities, and AI Maturity leaders are unsurprisingly at the forefront. However, many organizations struggle to adopt and deploy RAI. Our research suggests that 85% of organizations have defined RAI principles, but only 20% have fully operationalized or implemented them.





Key questions and considerations in implementing RAI

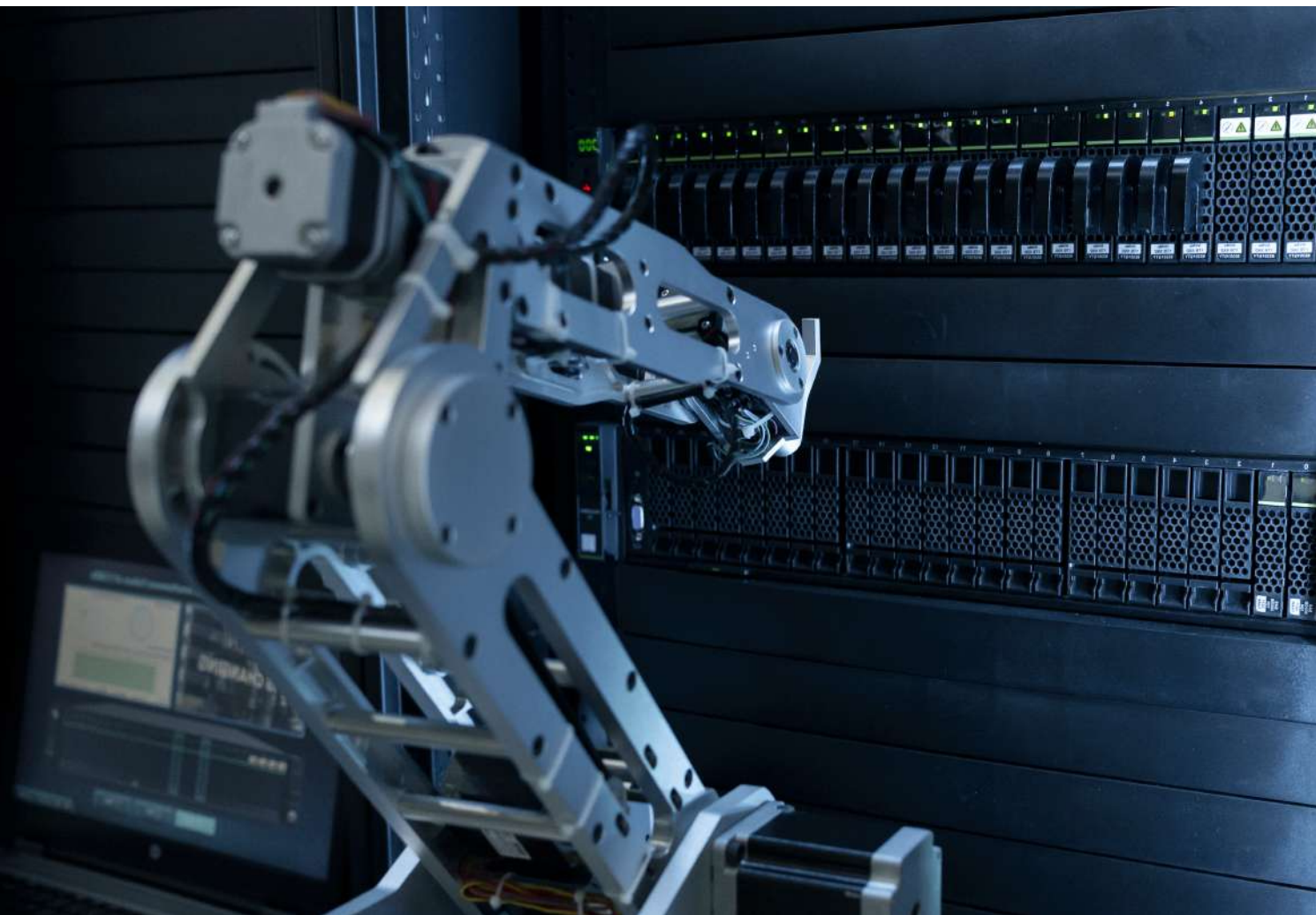
Leaders must answer questions in five key areas as they pursue effective RAI implementation:

- **Strategy:** Is there an articulated RAI strategy and does it tie into the organizational strategy?
- **Governance:** Is there defined leadership and an established escalation path to identify and mitigate risks? Is the RAI strategy vetted against ethical principles and endorsed and adopted by senior management and the board?
- **Processes:** What processes are in place to monitor and review products and services to ensure that RAI guidelines and guardrails are being honored?
- **Technology:** How is the data strategy articulated and does it align with RAI ambitions, including a corresponding toolkit?
- **Culture:** Are AI ethics experts included in strategic conversations and used to guide key decisions? Are the RAI guidelines and its operating procedures well understood by the wider organization?



1. RESPONSIBLE AI STRATEGY

	AI Ethical Principles	Risk Taxonomy	Risk Appetite & Tolerance		
2.  GOVERNANCE	3 Lines of Defense	Governance & Committee Structure	Organization Roles & Responsibilities	Talent plan & Training	Policy & Guidelines
3.  KEY PROCESSES	Product Development & KPIs AI Product Building Playbook AI Product Design and KRIs AI Product Assessment	Portfolio Monitoring & Controls Responsible AI Portfolio Reviews Reporting Control Monitoring	Program Steering & Design Regulatory Intake Vendor Management Emerging Risk Detection		
4.  TECH & TOOLS	Data Strategy	Code Libraries & Software Tools	Technical Playbook	Technology Platform & Resilience	Architecture
5.  CULTURE	Tone from Middle & Top	Awareness & Code of Conduct	Whistleblowing & Speak-up Culture		



India's AI Policy: The Current Position and the Way Forward

The Global South has lagged in the development and adoption of AI-driven technology. With some technologies, countries that take a fast-follower approach to adoption tend to benefit from the learnings and mistakes of leader countries. But for rapidly and constantly evolving technologies such as AI, the downside of slow adoption may be higher than the upside.

In the context of AI, the failures are not necessarily in the form of production losses when the technology malfunctions. They could also be in the form of substituting existing production technology, reconfiguring supply chains, skill sources and capital providers.

In the post-COVID world, AI-driven solutions have made targeted interventions possible, due to the collection of a wide range of data. While processes have been made more robust, the new mode of production and supply chain simultaneously creates and eliminates the role of labor. New jobs are created while old jobs are lost. In an economy with labor market friction, this necessitates upskilling and re-skilling of labor.

As a social planner, the government's role is to formulate the rules of the game—in this case, creating an ecosystem for sustainable implementation and adoption of AI-driven technology. As the saying goes, to have a bright future ahead, one needs to survive the present. Letting creative

destruction, à la Joseph Schumpeter, work¹⁷ its way into an economy is useful only when creation supersedes that destruction.

As we see in our study, many firms are in the process of transitioning from low to higher level usage of AI-driven technology. Clear benchmarking of the technology frontier—and assessment of the heterogeneous positioning of firms across that frontier—would provide a valuable overview of the potential challenges and prospects of robust economic growth and the corresponding welfare consequences.

At present, the Bureau of Indian Standards (BIS) and the Department of Telecommunication (DoT) have both set up committees to harness AI.





DoT Focus: AI standardization, interoperability, developing an India framework.

BIS Focus: Standardization of projects revolving around cybersecurity, legal and ethical issues in the IT sector, technological mapping and leveraging AI for national missions.¹⁸

Government support could lead to healthy, sustainable growth of AI. In this regard, it will be essential to balance labor interests and capital investment towards automation and efficiency. Challenges remain in measuring the impact of technology investment. For instance, it is still difficult to measure and differentiate AI use cases and initiatives. There is also insufficient understanding of how cognitive technologies interact with broader economic dynamics and institutional mechanisms.¹⁹ For instance, investment in digital systems should lead to improvements in efficiency — but investment in RPA and AI chatbots will also lead to a reduction in manpower requirement.

Exhibit 31 - The need to encompass global best practices in the national AI policy

TOWARDS AN EMPOWERED NATIONAL AI POLICY

01 	02 	03 	04 
<p>Assessment</p> <p>Setting actionability and accountability across key metrics for comprehensive AI ecosystem development</p>	<p>Multistakeholder participation</p> <p>Active multiple phased consultation plan with strategic advisory</p>	<p>Mechanisms to support implementation and operability</p> <p>Canada has instituted a set of 'Approved AI' vendors</p> <p>EU is considering 'RAIL' (Responsible AI License)</p>	<p>Global acceptability</p> <p>Active participation in OECD, FPAI to frame standards</p>
<p>Actionable principles within that particular environment (geopolitical, societal, legal etc.), as well as identification of blind-spots or practical difficulties before they arise</p>	<p>Feedback from industry, academia and those adversely affected due to the development, deployment and application of certain AI systems</p>	<p>Actionable policy with establishment of mechanisms including monitoring and certifications</p>	<p>Interoperability, participation and contribution to Global AI initiatives and establishment of national standards and AI-Ethics guidelines</p>

17. AI, firms and wages: Evidence from India* by Alexander Copstake1, Ashley Pople2, and Katherine Stapleton3

18. <https://link.springer.com/content/pdf/10.1007/s11948-020-00277-3.pdf>

19. <https://www.tec.gov.in/pdf/Studypaper/AI%20Policies%20in%20India%20A%20status%20Paper%20final.pdf>

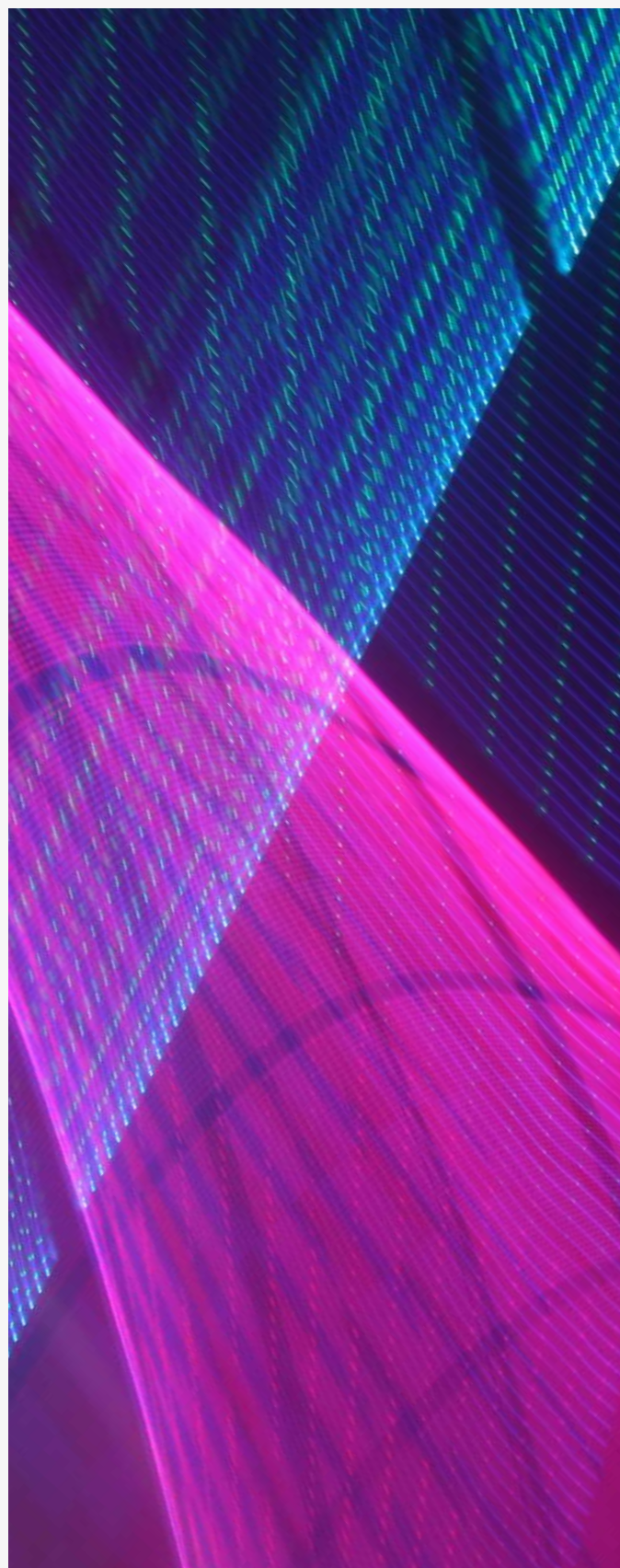
MSMEs stand to gain from AI

The MSME sector in India employs 120 million people, or around 40% of the workforce, and contributes around 29% to the country's GDP. Small- and medium-sized enterprises, with a turnover of up to INR 250 crore,²⁰ could be a fertile ground for AI adoption. Limited availability of resources and capital has hitherto made it difficult for such organizations to leverage AI at scale. Expensive enterprise technology and substantial licensing fees have kept SaaS adoption to a minimum in the MSME sector.²¹ However, all that is quickly changing after the pandemic, and IT vendors have become more willing to provide cost-effective and flexible solutions to these enterprises.

MSMEs now have access to shared environments and API-based micro-services. The use of AI in this sector has been accelerated by on-demand access to business software and the availability of services like digital payment gateways, fraud detection systems and CRM. Experts believe that mass adoption of SaaS will be the tipping point for AI usage in India.

Many start-ups have also emerged to provide accounting, customer management and marketing solutions to MSMEs. Time-consuming manual tasks such as tallying accounts, filing tax returns and GST can now be done more efficiently with advanced AI accounting platforms. Given that these organizations conduct most of their business on credit, their debt collection efforts have also been significantly boosted by enhanced risk and predictive analytics, using AI-based platforms to identify high-risk credit. Meanwhile, dynamic analytics dashboards are also being used to study customer behavior and for inventory and supply chain management.²²

Large organizations tend to have multiple layers of management and slow response times, whereas the unique characteristics of small organizations can help them become innovation pioneers and achieve an experimental edge over larger rivals. Power centralization (under a single leader), learning orientation and entrepreneurship are some of the factors that researchers have identified as critical for the adoption of digital technology.²³



20. <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1744032>

21. https://www.nber.org/system/files/working_papers/w30528/w30528.pdf

22. <https://www.emerald.com/insight/content/doi/10.1108/ER-12-2019-0452/full/pdf?title=automation-ai-and-the-future-of-work-in-india>

23. <https://web-assets.bcg.com/89/ee/054f41d848869dd5e4bb86a82e3e/bcg-global-retail-banking-2021-the-front-to-back-digital-retail-bank-jan-2021.pdf>

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