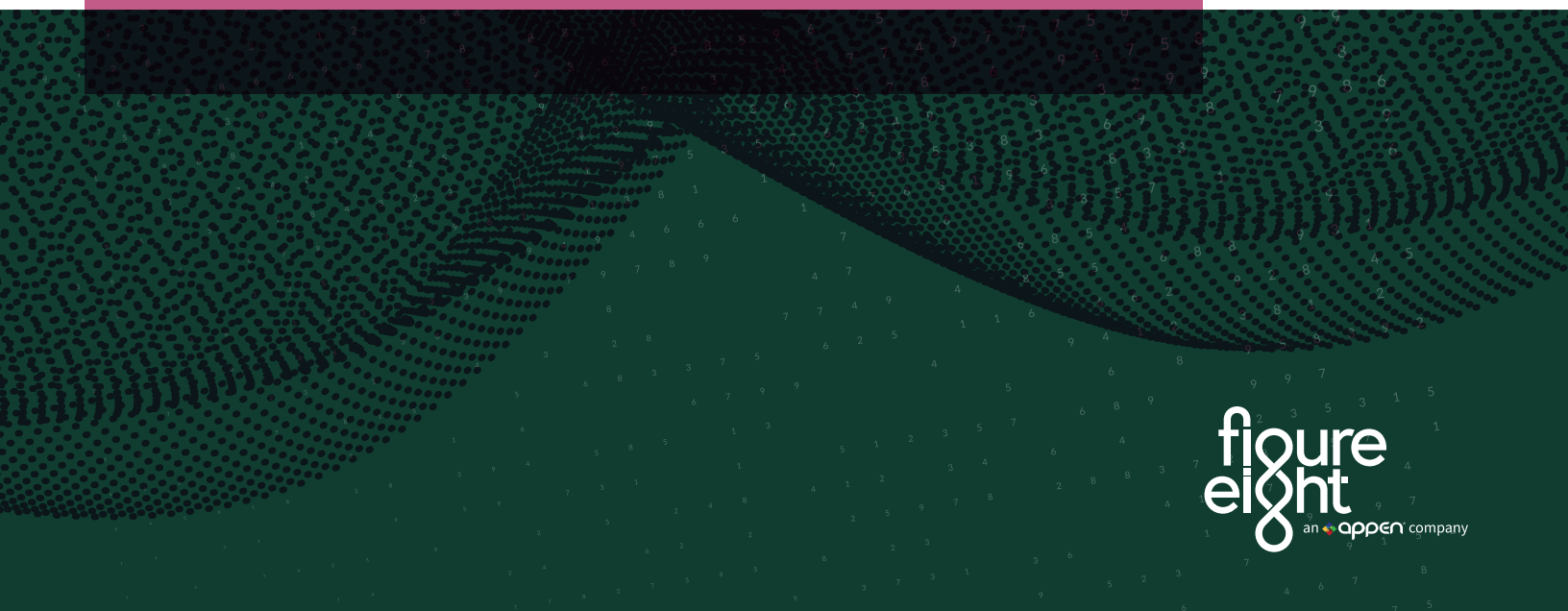
A Figure Eight Report

The State of AI and Machine Learning

Bridging the AI Gap Between Data Scientists and Line-of-Business Owners



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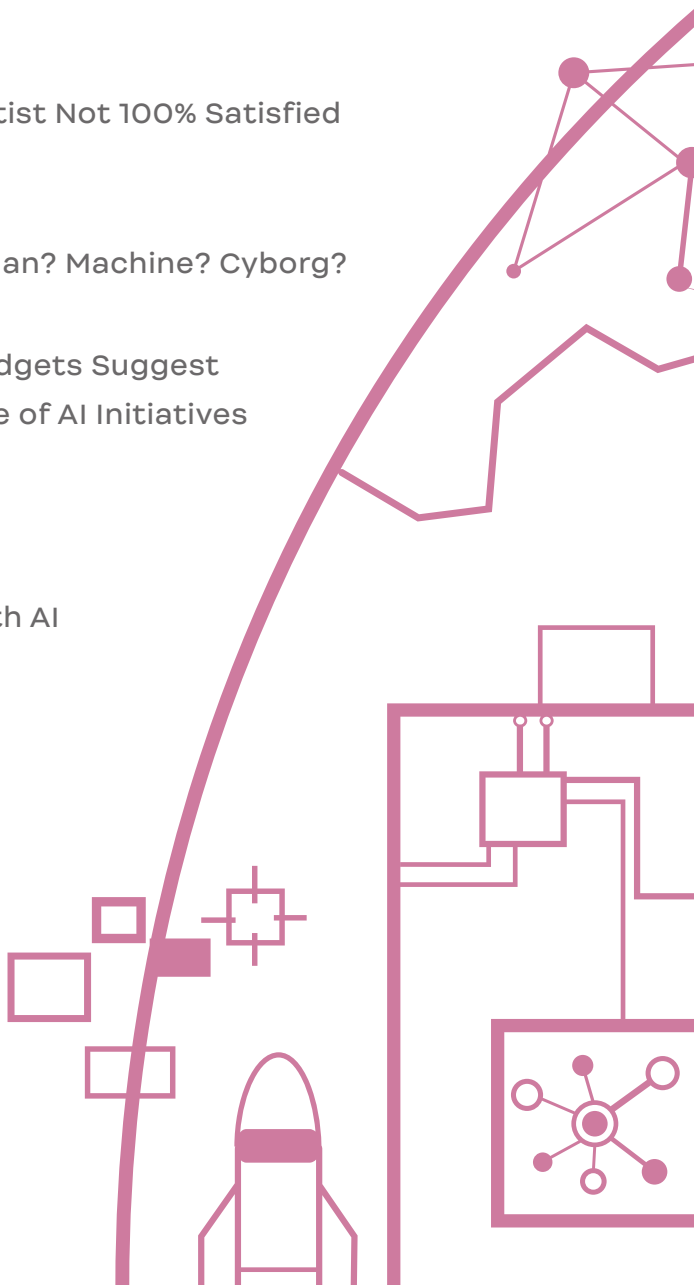


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Introduction

The number of organizations using artificial intelligence (AI) has skyrocketed[1] in recent years. Today, more than one-third of organizations use AI in some capacity, and AI deployments have grown by 270% during the last four years. More and more companies are focused on incorporating AI into their daily business processes. Companies that have already adopted AI report that[2] it has allowed them to edge ahead of competitors.

As companies determine how to effectively use artificial intelligence, two groups of stakeholders have emerged. Technical practitioners, who are often data scientists or machine learning (ML) engineers, are responsible for writing the code and creating the machine learning models that enable these futuristic capabilities. And, in many larger organizations, there are line-of-business (LOB) owners: managers, directors, and C-level executives tasked with overseeing AI initiatives. For companies to enjoy the benefits of AI, they will need to both bridge the gaps and embrace the commonality between their efforts to adopt AI.

Part of adopting and embracing AI requires obtaining the right data. Only high-quality training data — those annotated for a specific use case — can help machine learning algorithms to improve their accuracy to make AI have an impactful role in the real world. But not every company has accessible, organized, and annotated data that is ready for production. Understanding how to take raw information and turn it into something useful is paramount to getting an AI initiative moving.

When organizations develop AI that can work in the real world, it can have impressive impacts. However, these impacts are subtle and not the kind of sci-fi movie scenarios we're used to seeing. Today, AI can help businesses by automating tedious, repetitive tasks. It can make business processes more efficient, and it can augment human activity, assisting people in their tasks to improve efficiencies and responsiveness to changing business needs.

This report illustrates the current state of AI and machine learning, detailing how organizations are implementing AI within their business. From the types of data that companies leverage to the tools they use and budgets they have, this report shows the differences and commonalities between line-of-business owners and technical practitioners. For readers who might be in the midst of their own AI projects, understanding the dial turns for AI success will be invaluable.

Key Takeaways

01 Nearly one-third of respondents we surveyed have a minimum AI budget of $250,000 or more. With some spending upwards of $5 million.

02 Across all industries, companies are starting to pour resources into AI, especially as it becomes more of a differentiator and competitive advantage.

03 AI has made its way to the boardroom as a serious and necessary initiative, as vice president level roles and above are now responsible for AI deployments across most organizations.

04 60% of line-of-business owners said their organizations are behind when it comes to AI, whereas 49% of technical practitioners feel the same.

This report will shed light on why the two groups of people feel differently about their company's progress and hopefully help them to find a common ground along which they can move forward.

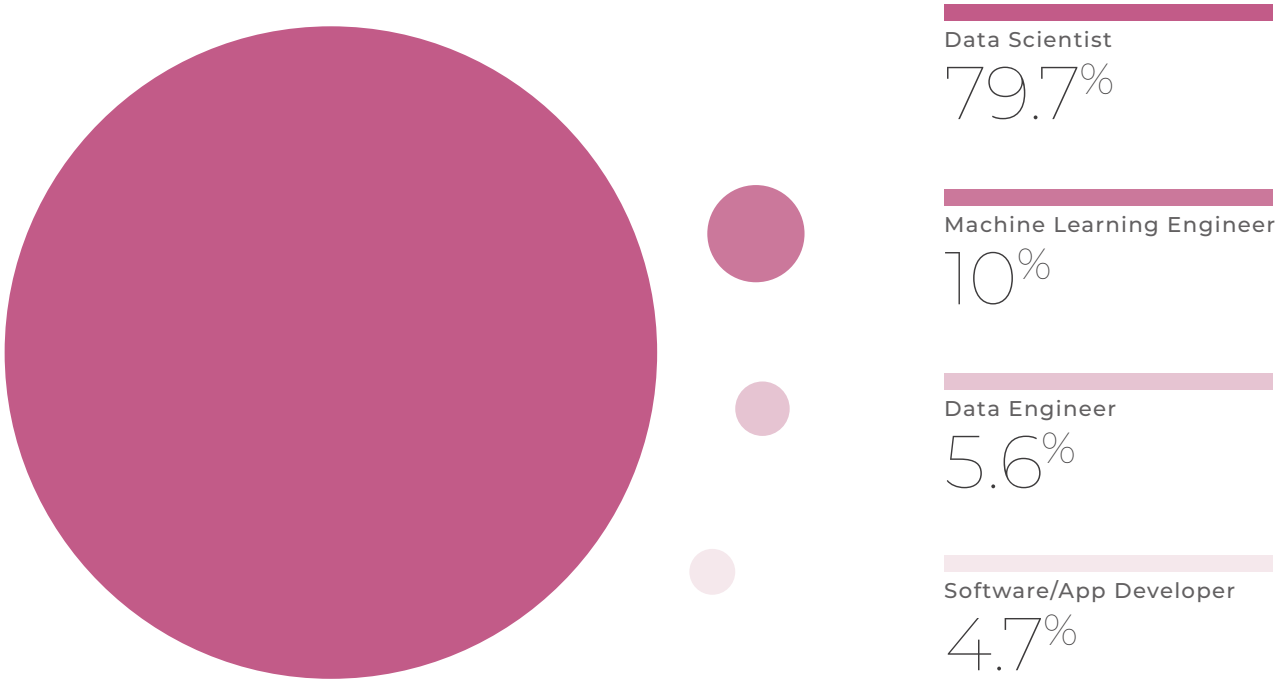
We hope this report illuminates a path forward for you and your organization. Thank you for taking the time to fully consider what it means to develop AI for the real world.

About the Survey

We analyzed survey responses from over 300 people across a variety of industries and company sizes. We grouped these 300 respondents into two groups: technical and line-of-business. Our technical respondents represent 80% data scientists with the remaining 20% representing data engineers, machine learning engineers, or software and application developers. Our "line-of-business" respondents represent over 50% of product managers or directors with the remainder representing job titles as business analyst, vice president and C-level executive.

TECHNICAL PRACTITIONERS

What is your job function/role?



(Figure 1: Technical practitioners surveyed)

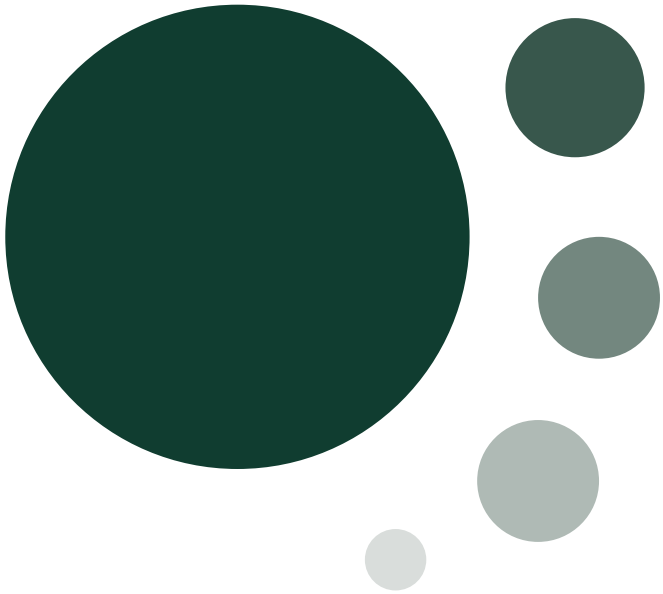
We asked questions ranging from the budgets of AI projects to the tools and frameworks teams use to develop their machine learning algorithms. Additional questions about the importance of AI for business to AI's societal impact were also asked to help broadly paint a picture of just how pervasive AI initiatives are becoming the norm. Other questions related to the data types being used for AI, as well as business-process bottlenecks related to AI adoption, help illuminate where AI business challenges still exist and how both technical and line-of-business respondents can effectively progress their AI initiatives.

This is the fourth survey of its kind that Figure Eight has conducted, analyzed, and distributed. In previous years, the survey was known as the "Data Scientist Report." This year, we realized the survey and report needed to evolve. The goal in issuing the survey is to better understand the challenges of getting an AI and ML initiative off the ground from the perspective of the technical individuals working on the projects and the managers who oversee larger teams and even entire companies. As such, it became clear the survey was not simply about data scientists but about understanding the growing application of AI in the real world.

TL;DR: Though many organizations already support AI and ML initiatives or are excited to get their particular AI efforts off the ground, there still remain key differences on how technical employees and LOB owners approach AI.

LINE-OF-BUSINESS

What is your job function/role?



Product Manager/Director
53.7%

Business Process/Dept Owner
14.5%

Program Manager/Director
12.7%

VP/C-Level Executive
12.7%

Business Process/Dept Owner
6.4%

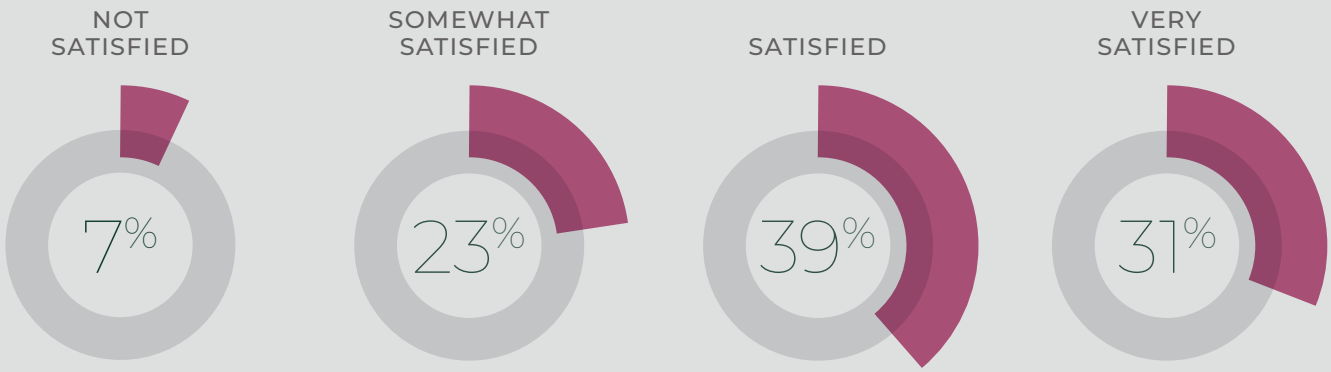
(Figure 2: Line-of-business owners surveyed)

Why are Data Scientists Not 100% Satisfied in Their Jobs?

Of the 15 fastest-growing jobs on LinkedIn in 2018[3], five were machine learning or data science-related roles. The ability to turn data into something useful is in high demand, and companies are willing to pay for these skills. A data scientist in the U.S. can expect to make, on average, nearly $120,000[4] annually. Despite the pay and demand, not all data scientists are 100% satisfied with their jobs.

30% of data scientist and ML engineer respondents replied that they are only somewhat satisfied in their job role, and nearly 9% said they are not satisfied altogether. Respondents highlighted some of the barriers they encounter when attempting to perform the tasks their job title asks of them.

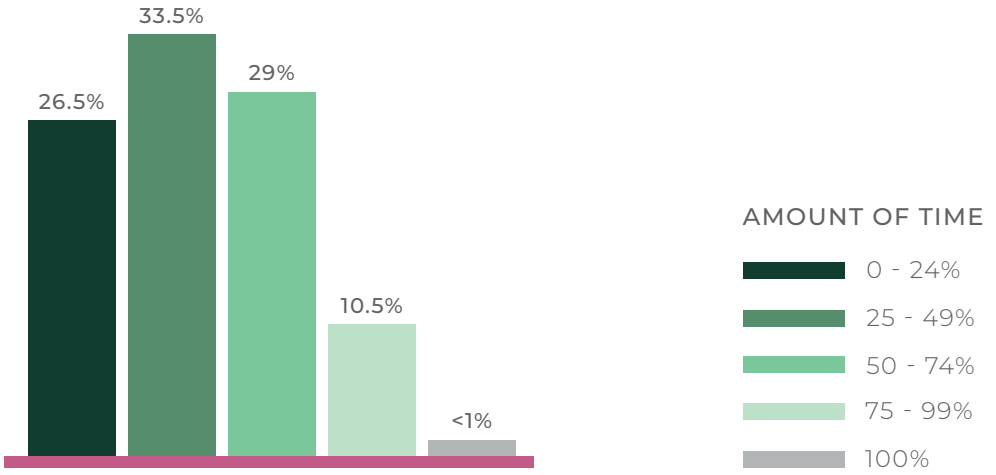
How satisfied are you in your current job role?



(Figure 3: How satisfied technical respondents are in their job)

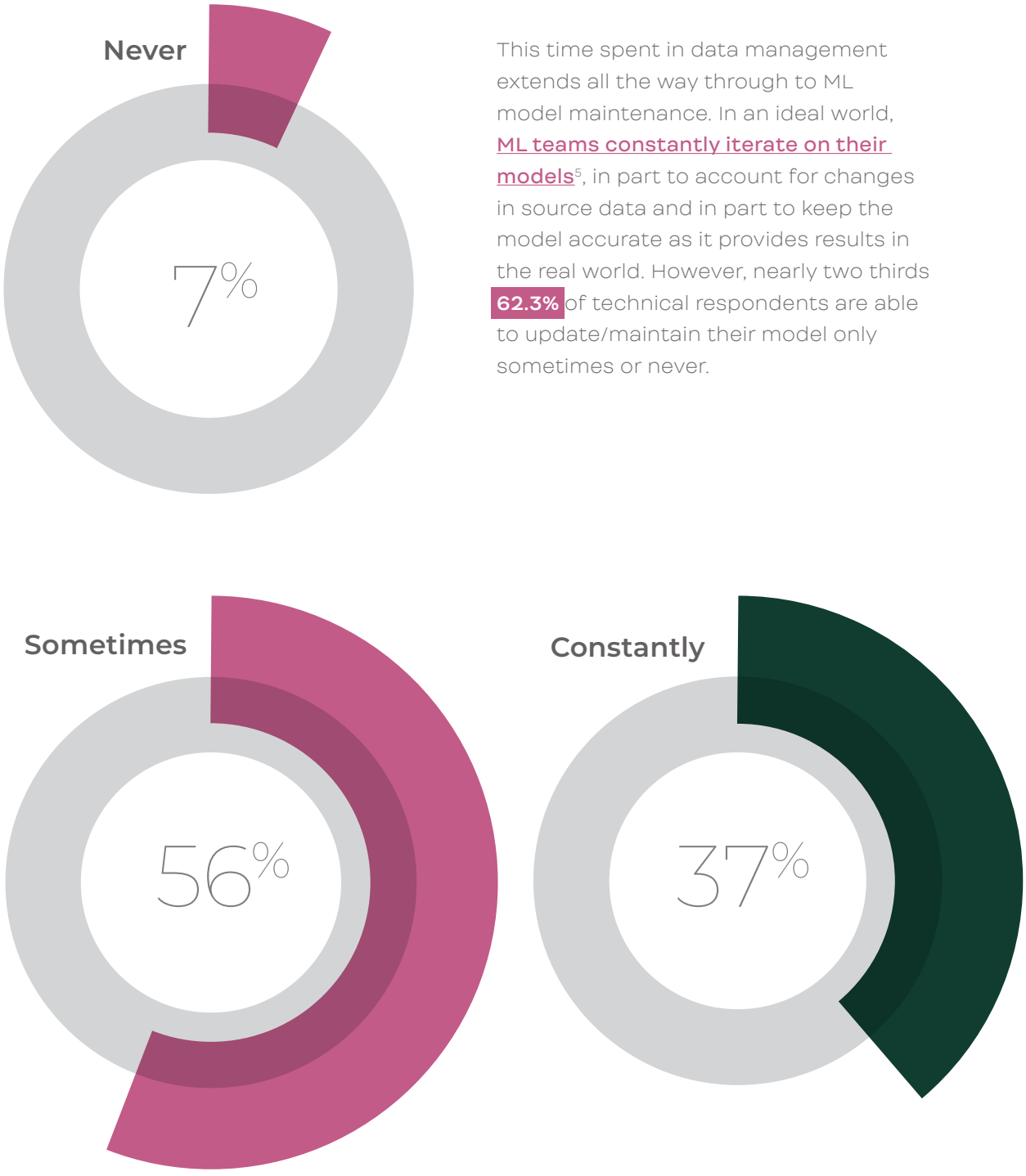
Nearly three-quarters of technical respondents 73.5% spend 25% or more of their time managing, cleaning, and/or labeling data

What percentage of your time do you spend managing, cleaning and/or labeling data?



(Figure 4: How technical practitioners spend their time managing and cleaning their data)

How often are you maintaining/updating your machine learning model?



This time spent in data management extends all the way through to ML model maintenance. In an ideal world, ML teams constantly iterate on their models[5], in part to account for changes in source data and in part to keep the model accurate as it provides results in the real world. However, nearly two thirds **62.3%** of technical respondents are able to update/maintain their model only sometimes or never.

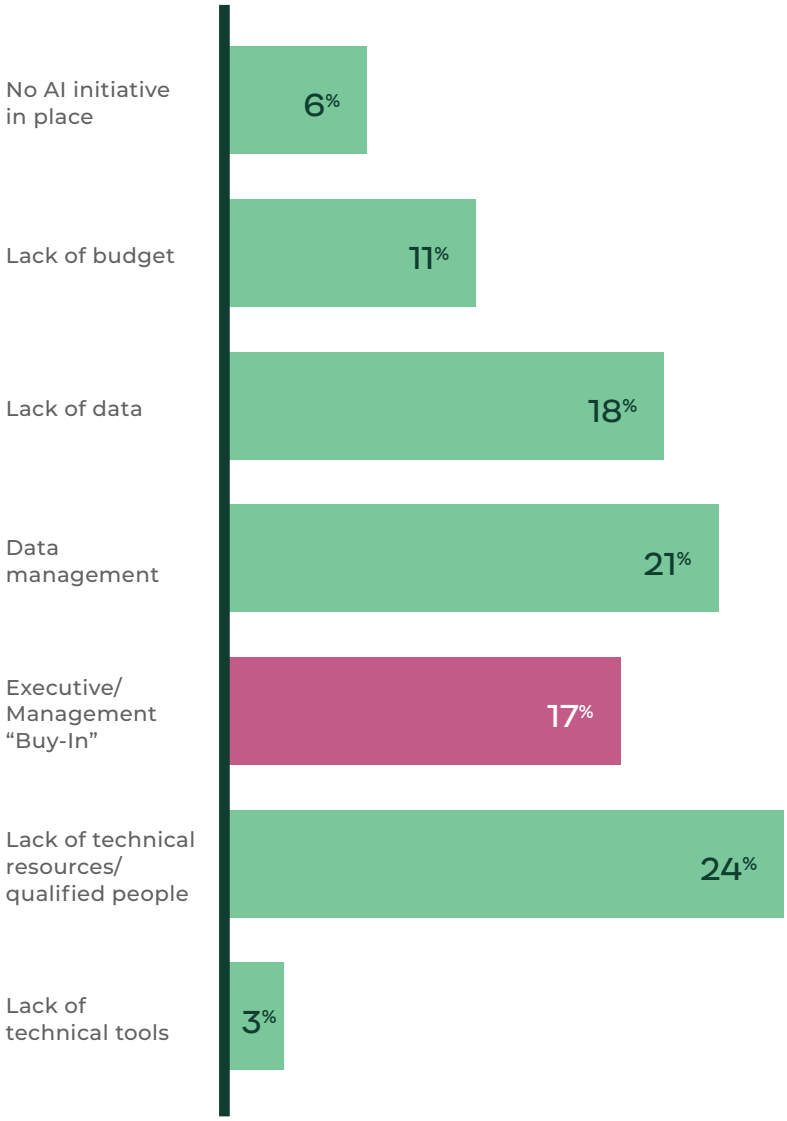
(Figure 5: How often technical practitioners are managing their machine learning models)

Data management is not the only thing making it difficult for technical practitioners to create their algorithms.

17% report that executive "lack of buy-in" is a bottleneck for proceeding with AI projects.

Other bottlenecks include the facts that some (6.2%) work for an organization with no AI initiative in place, and others (10.8%) do not have enough budget to move forward with their plans. Other data scientists and ML practitioners (23.7%) feel their organization suffers from a lack of technical resources or qualified people to help them make AI a reality.

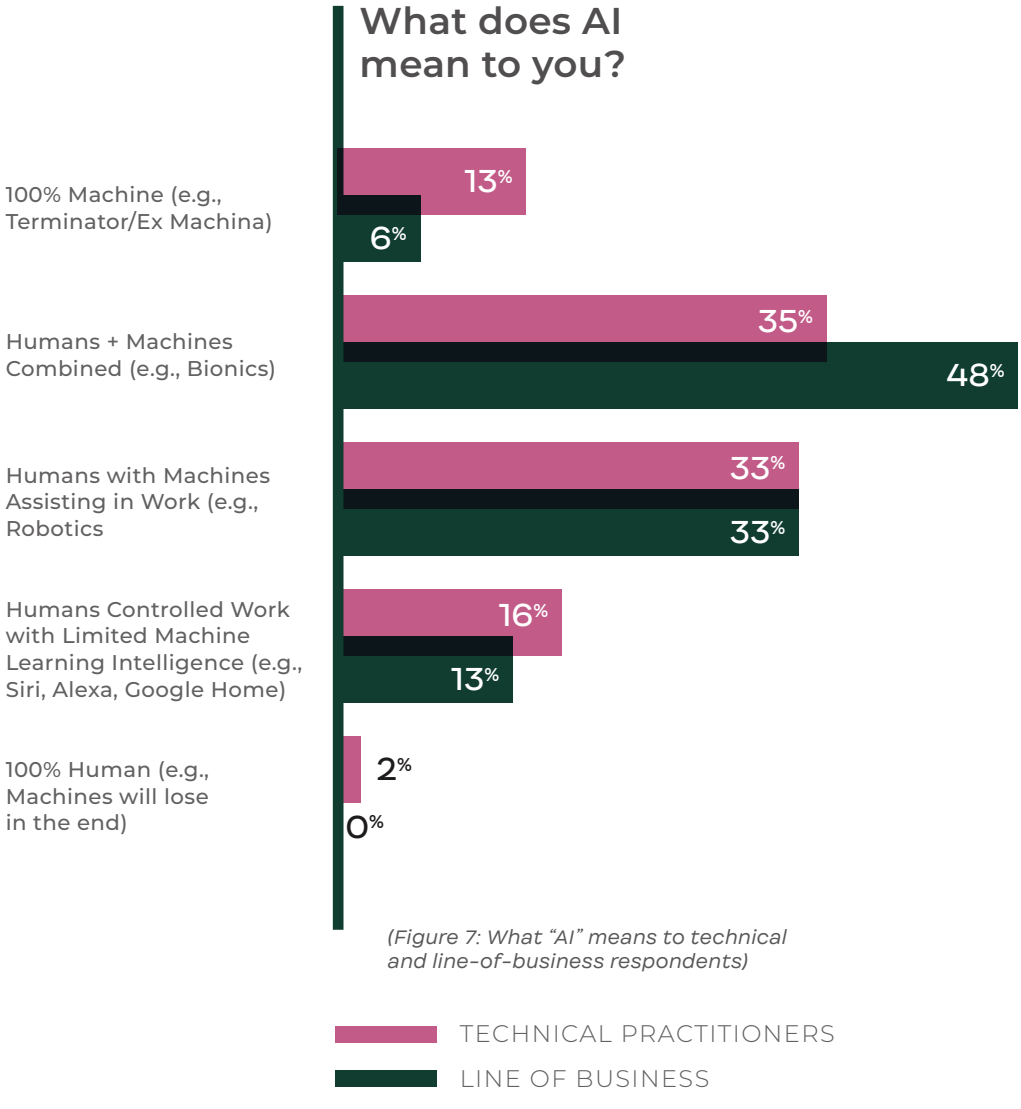
What do you consider the biggest bottleneck to any of your AI initiatives or project?



(Figure 6: The biggest bottlenecks preventing AI initiatives moving forward)

The Future is... Human? Machine? Cyborg?

Finally, technical practitioners may have a slightly different view of what AI in the real world looks like. Nearly half (48%) of line-of-business owner respondents believe the future of AI will resemble "bionics," a sort of symbiotic "humans + machines" combination. Just 35.6% of technical people believe the same, with slightly more technical people feeling AI will exist as "humans with machines existing in work." More than double the amount of technical practitioners than line-of-business owners (13.6% vs. 6.3%) see AI producing a 100% machine future.



(Figure 7: What "AI" means to technical and line-of-business respondents)

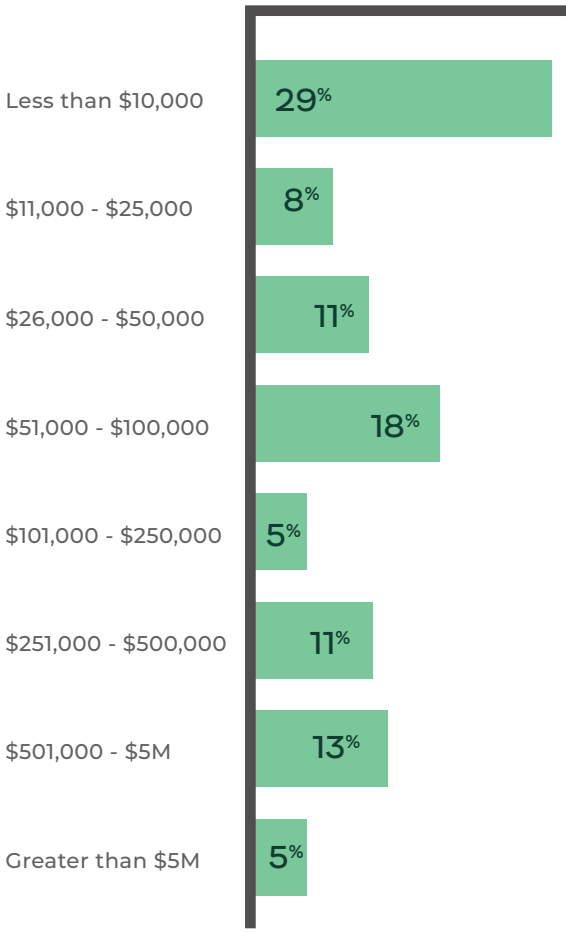
The solution?

It’s clear that people in line-of-business roles and technical practitioners must do more to collaborate. By getting in the same room, the two groups can work to find common ground when it comes to their AI initiatives.

LOB Budgets Suggest Growing Importance of AI Initiatives

Nearly one-third (29%) of line-of-business respondents report that their AI budget is $250,000 or more. This investment makes it imperative that line-of-business owners and technical practitioners form a united front when it comes to AI decision making.

A majority (52%) of line-of-business owners are spending at least $51,000 on AI initiatives. 5% of respondents have budgets that allocate $5 million or more toward AI initiatives. These figures showcase the rising importance of AI and ML to the value proposition within most organizations.

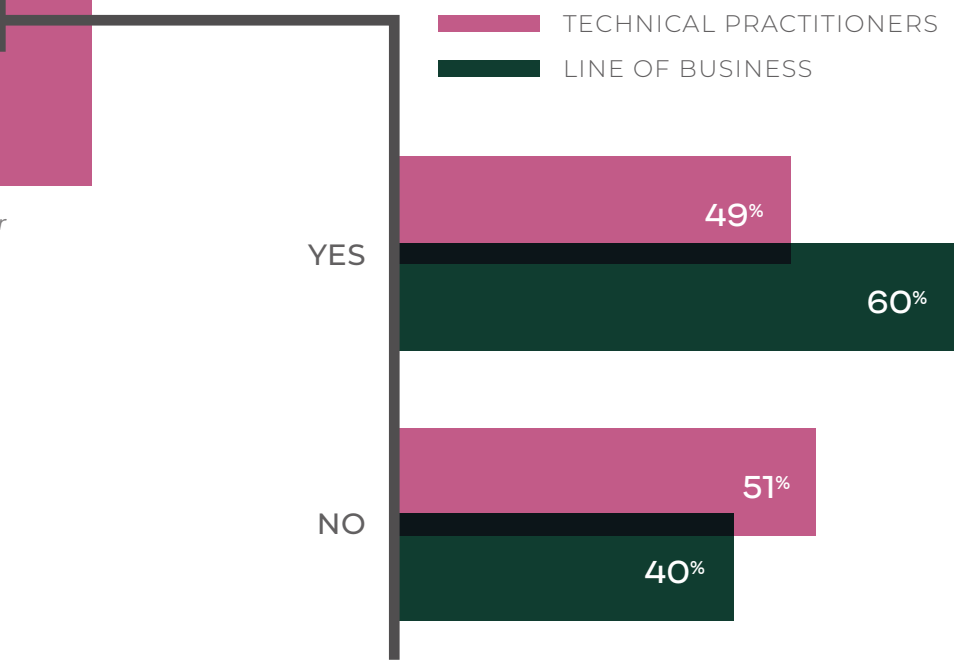


Do you have an allocated budget for any AI initiatives and if so, how much?

(Figure 8: Budget allocated for AI initiatives, per line-of-business owners)

The belief in AI adoption, and the processes that support it, is another place where technical and line-of-business AI owners differ in their response. While 49% of technical practitioners feel their company is behind when it comes to adopting AI, 59.5% of line-of-business owners feel their companies are behind. Perhaps collaborating more and finding common ground can help these two groups better understand where companies are in their path to AI success.

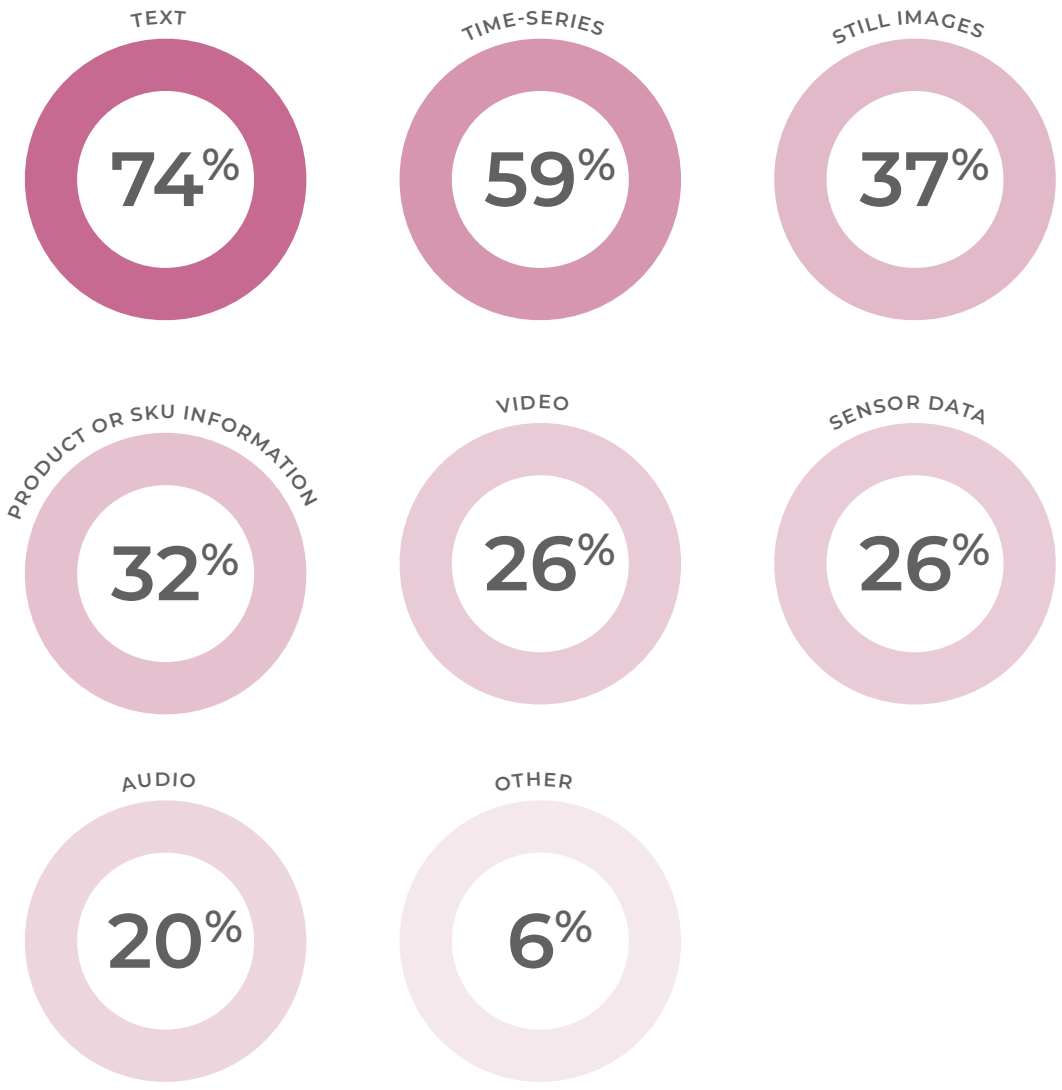
Do you feel that your company is behind when it comes to adopting AI?



(Figure 9: How respondents feel about their company's AI adoption - is it behind)

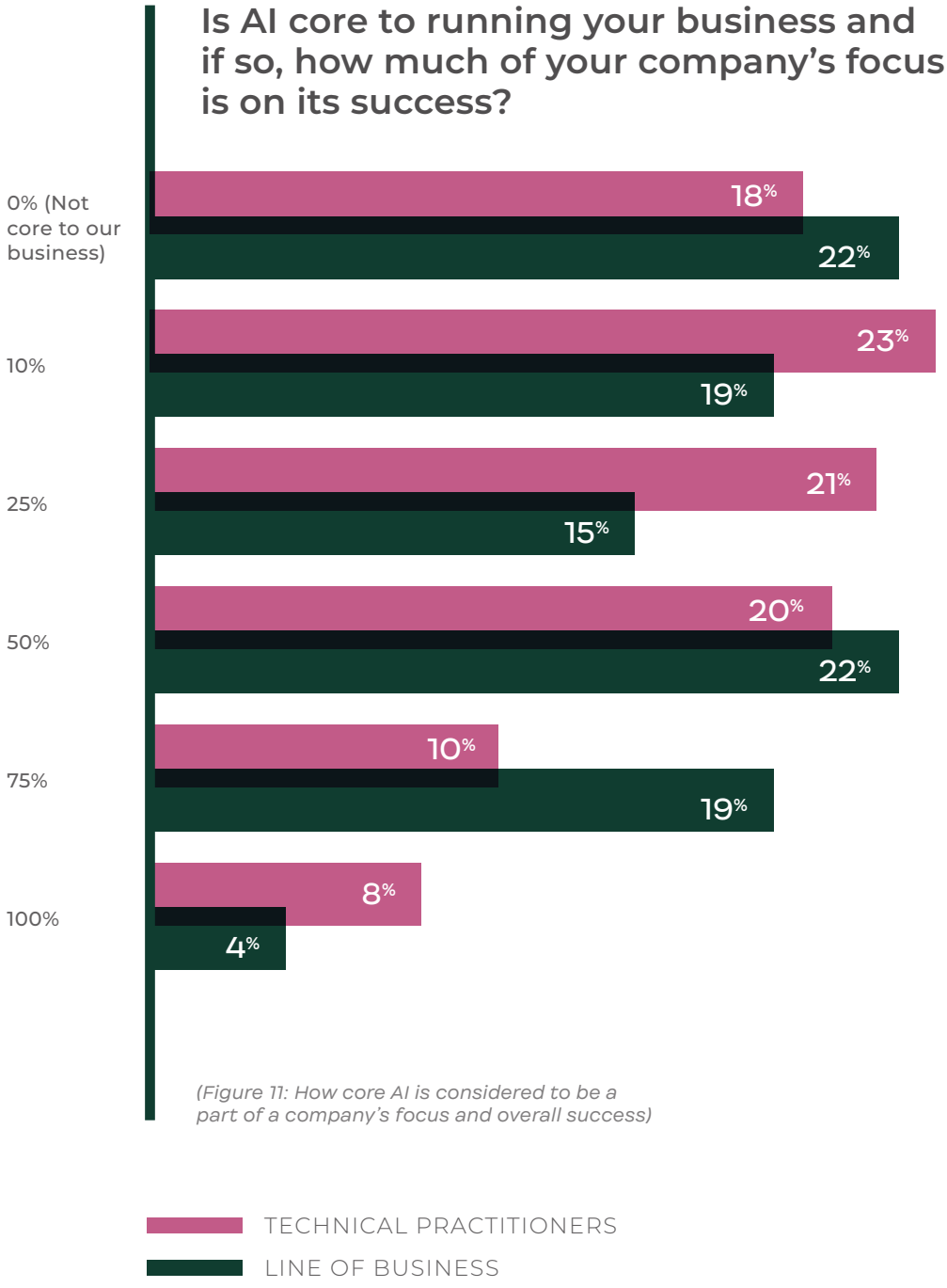
When asked what type of data their organizations use most often for AI initiatives, line-of-business and technical practitioner respondents replied with an array of answers. However, across both the line-of-business respondents and technical practitioners, the most common data types in use are: text, time-series, and still images. Product or SKU data also appears to be growing as a chosen data type. The rise of visual data types hints at more practical applications of AI in the real world, from ML-driven agriculture machinery to self-driving vehicles.

What kinds of data do you work with?



(Figure 10: Types of data respondents work with for use with AI)

According to respondents, 81% of technical practitioners and nearly 79% of line-of-business owners say AI is core to their business: These budgets aren't going toward projects and one-off initiatives; they are powering the heart of businesses themselves. More than one-third (38%) of technical practitioners say that more than 50% of their company's focus is on AI. 44% of line-of-business owners say their companies direct at least half of their focus toward AI initiatives. AI is a core to many businesses, and takes up the majority of the focus of many organizations.

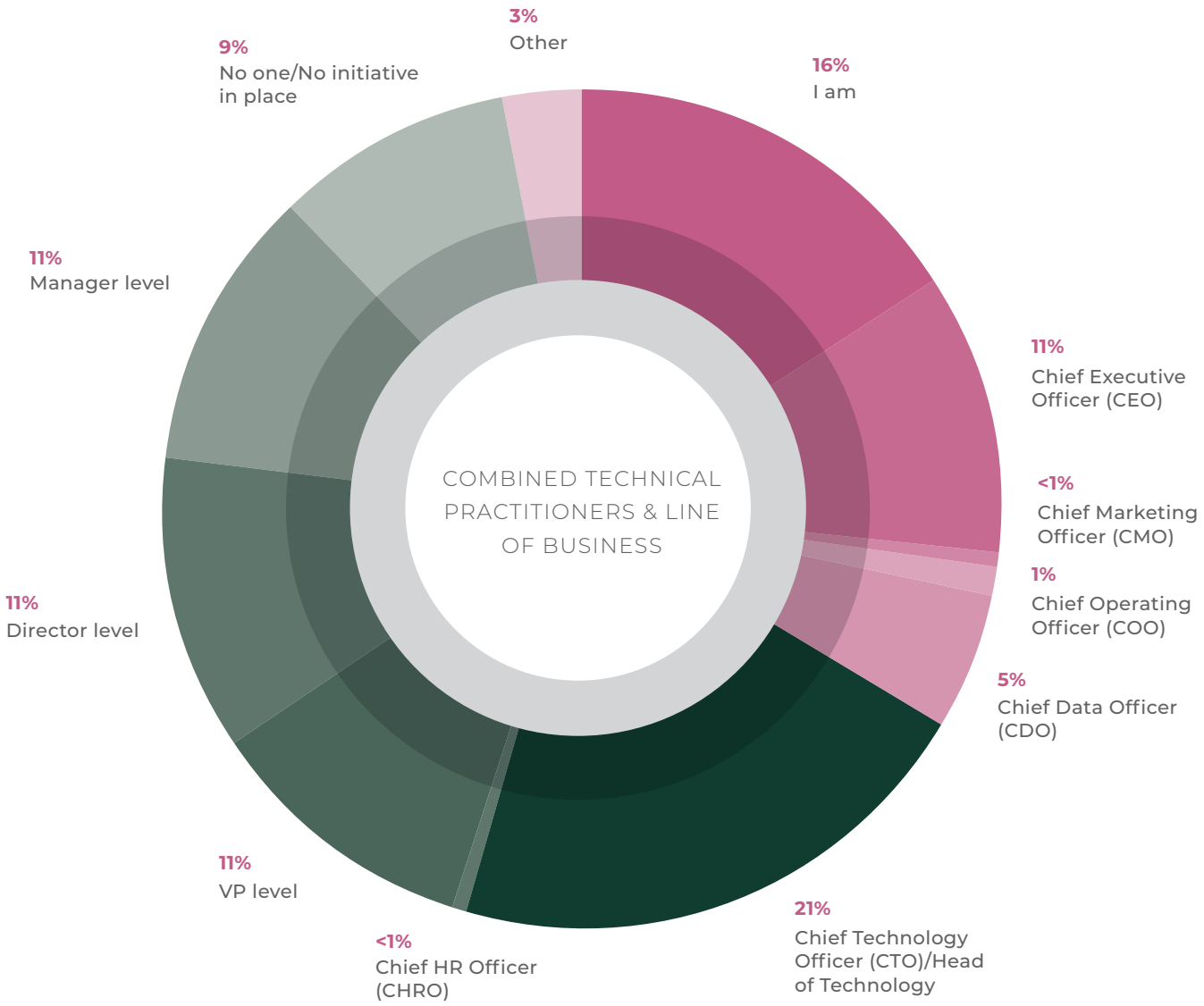


(Figure 11: How core AI is considered to be a part of a company's focus and overall success)

This AI focus is driven by leaders at the top level of many organizations. For line-of-business owners, 22.8% report that the CTO is responsible, 12.7% report the CTO is responsible, and 19% report they — manager level and above — are responsible.

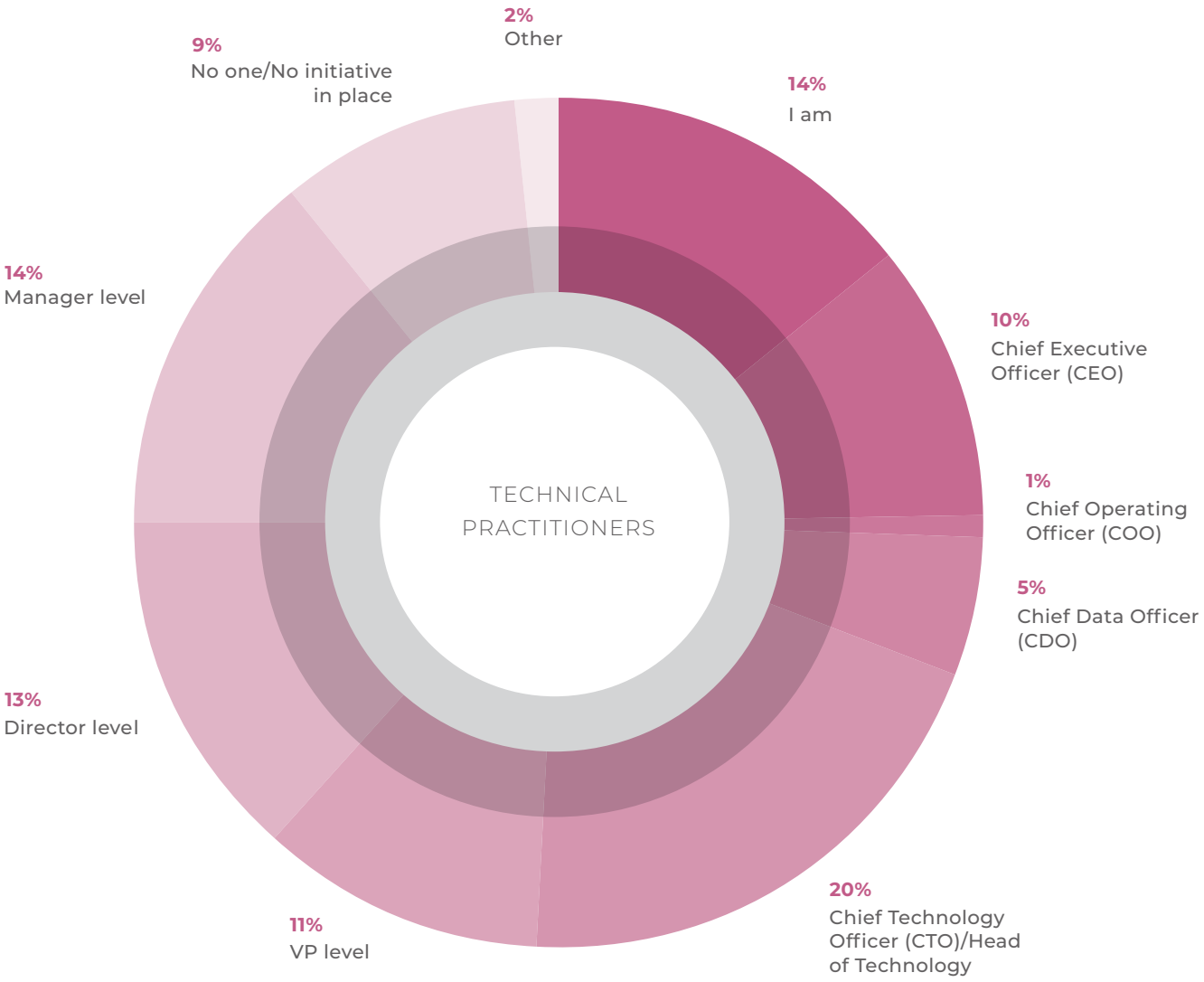
For technical practitioners, 20% feel the CTO is responsible, 10.3% feel the CEO is responsible, and 14.4% feel they — mostly data scientists and machine learning engineers — are responsible. That around one in seven technical practitioners feel they must fight to make AI work in their organization while also cleaning data and managing algorithms suggests a need for a different organization hierarchy. For organizations with the resources, these findings may point to demand for a CIO or chief data officer-type of role to accept responsibility for AI initiatives.

Who is ultimately responsible for all AI initiatives within your organization?



(Figure 12: AI responsibility within the organization)

Who is ultimately responsible for all AI initiatives within your organization?

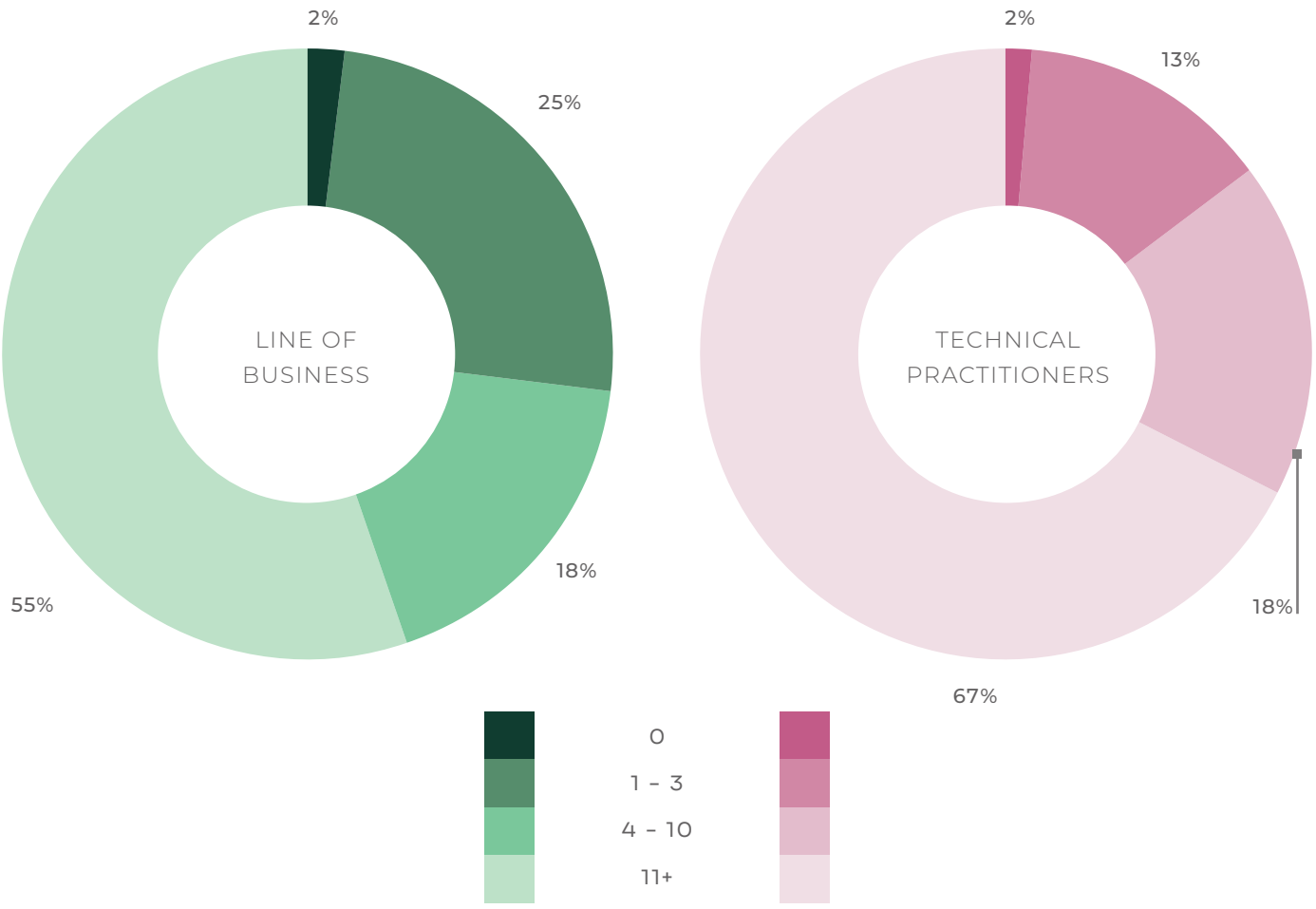


(Figure 13: AI responsibility within the organization according to technical practitioners)

62% of line-of-business owners reported that those responsible for AI initiatives hold titles of VP and above; 47% of technical practitioners reported the same. While there are some discrepancies between the two sets of respondents, it's clear that AI is often a top-down mandate in most cases.

A full 67.3% of technical practitioners have consumed at least 11 pieces of ML-related content — articles, blog posts, whitepapers, etc. — in the past six months. 55% of line-of-business owners also report having reviewed at least 11 pieces of content. Reading is not the only way individuals are investing time and energy learning about the latest in AI and ML.

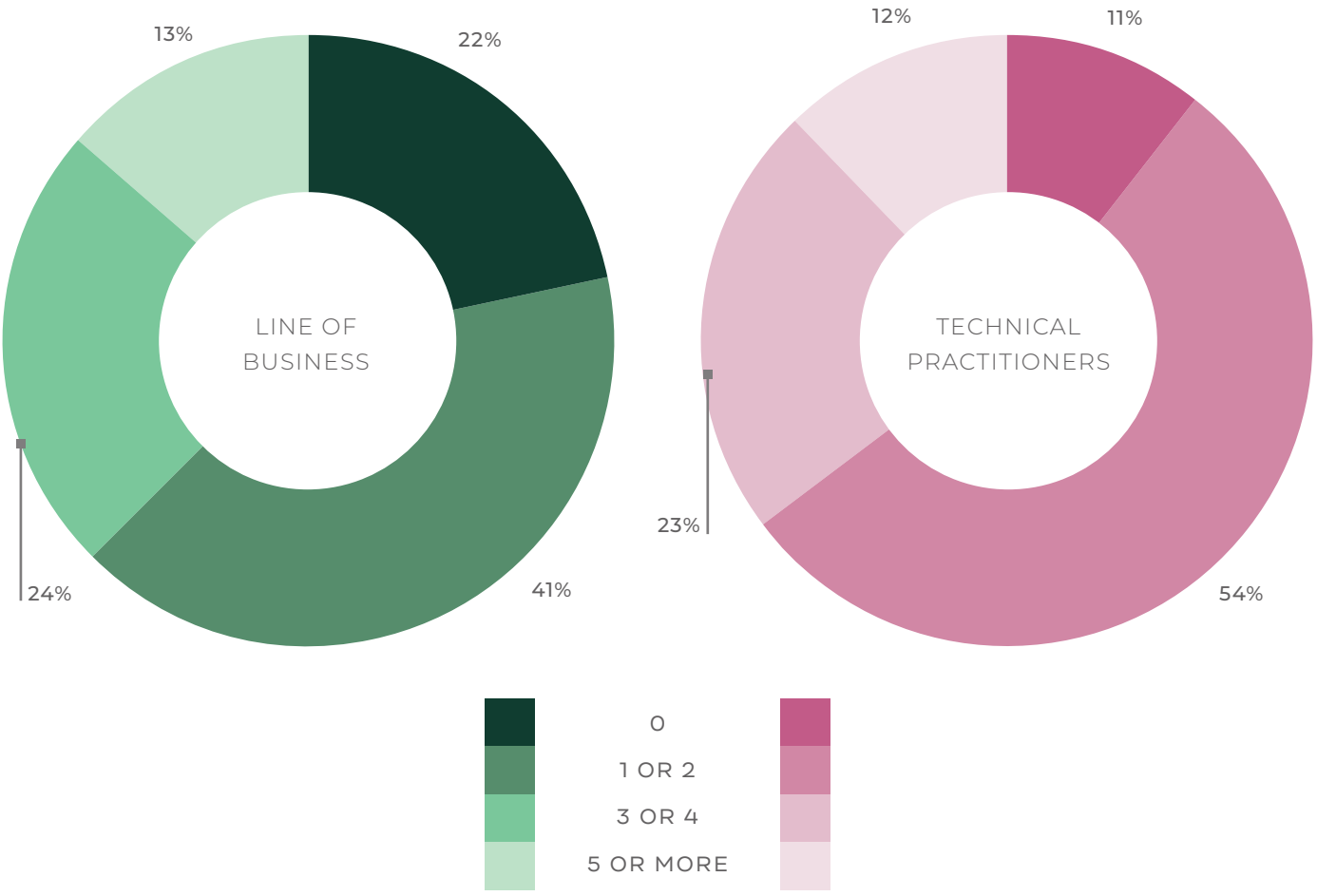
How much content have you consumed (press, articles, blog posts, etc.) on the topic of AI in the past 6 months?



(Figure 14: Amount of AI content consumed in the past 6 months)

Nearly 90% of technical practitioners will attend at least one industry event in the next year versus 78% of line-of-business owners who will be in attendance. 35% of technical respondents will even attend 3 or more events, while 37.5% of line-of-business owners will attend multiple events, showcasing how creating useful AI is an ongoing process for many.

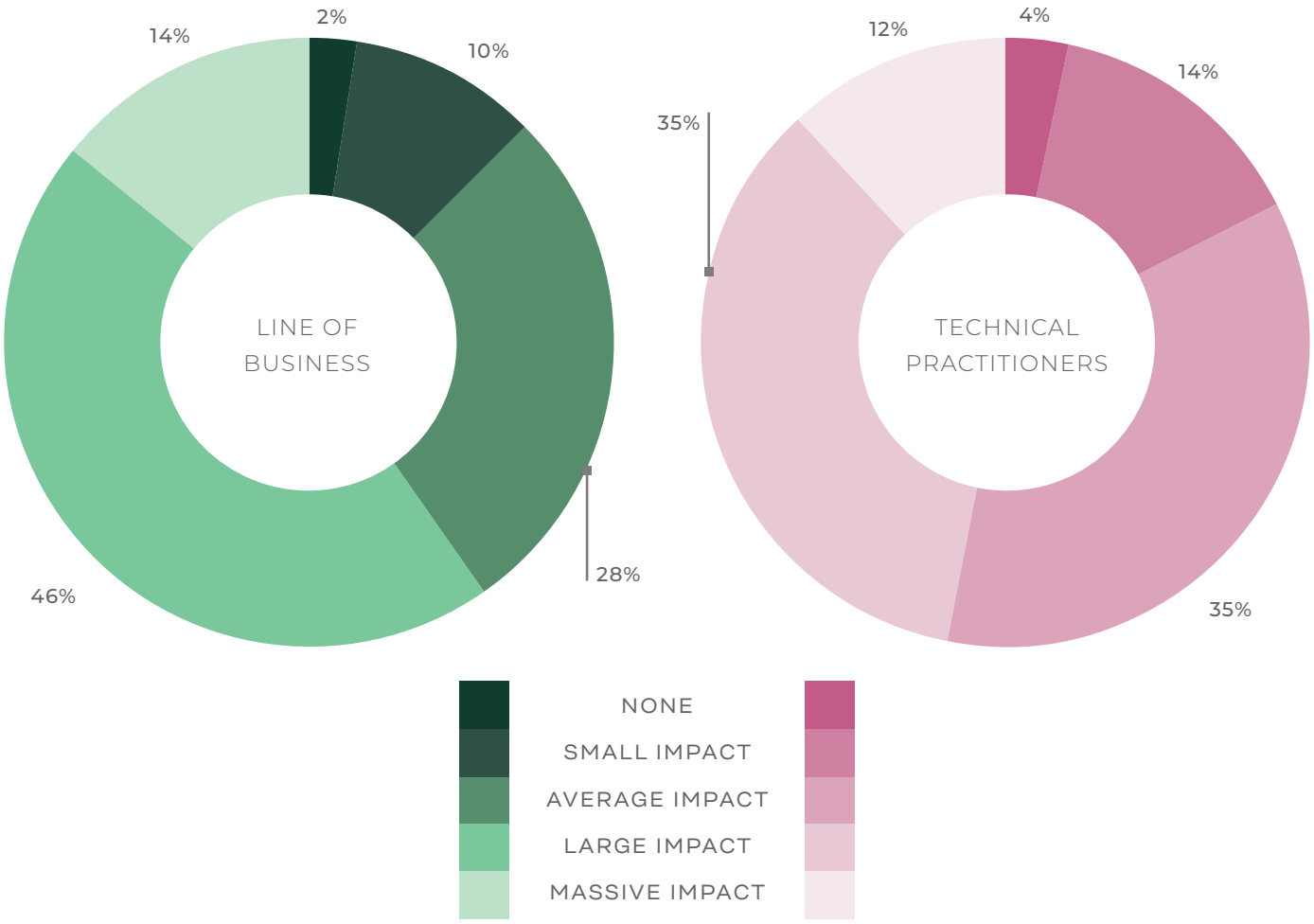
How many AI focused events will you attend in the next 12 months?



(Figure 15: Number of AI events which will be attended within the next 12 months)

One reason organizations are investing so much money and time into AI initiatives is because they truly believe those initiatives will have an impact on the world around them. 47% of technical practitioners believe their AI projects will have a large or massive impact on the world, though a majority (59.5%) of line-of-business owners feel similarly. This tells us that line-of-business individuals feel their projects are more impactful than their technical peers do.

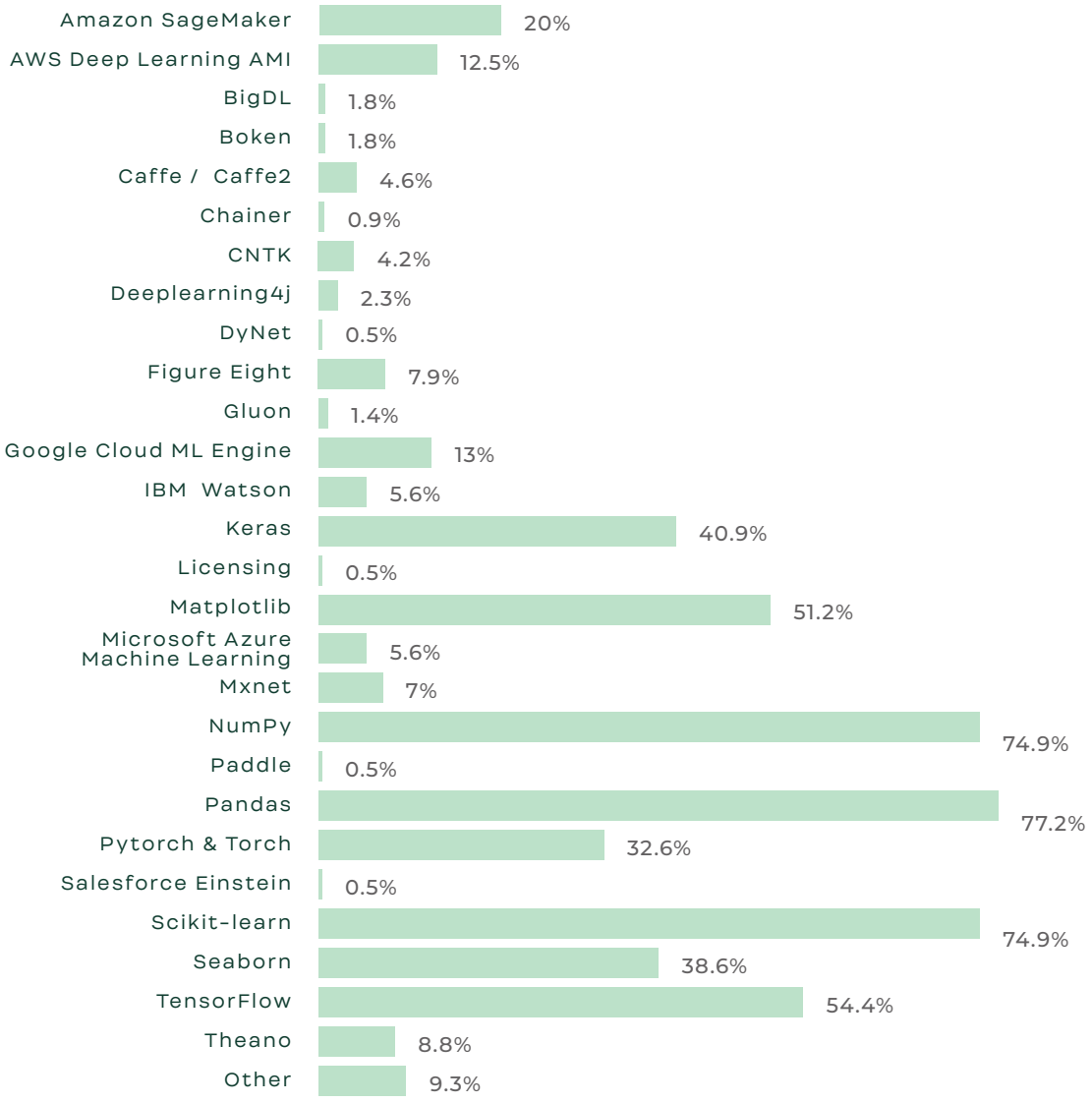
If your business has fully adopted AI, what impact do you feel your business will have on the world?



(Figure 16: The impact of a businesses AI initiatives in the real world)

After annotating data, ML teams typically select between making their models in house (typically the case when the company wants to build and protect strong intellectual property), paying a provider for an existing model (when off-the-shelf models suffice), or outsourcing a model (when the problem is well defined and only engineering effort is needed). Each of these options comes with its own pros and cons, depending on the project and resources available to a company.

Beyond cloud-based tools for ML — where the cloud provider manages infrastructure and frameworks for the end-to-end pipeline — teams will need ML frameworks and infrastructure for both training and serving models. Some popular frameworks and tools technical practitioners prefer in different stages of the ML pipeline are: Numpy and Pandas for loading data; Matplotlib for visualization; Scikit-learn and TensorFlow (including Keras) for ML models. The benefit of many of these frameworks is that they are open source and don't add to the overhead costs of an AI project. Still, the ability to use certain tools is something that is part and parcel of hiring skilled data scientists and ML engineers, and the cost for open source technology is assumed in the hiring of individuals.

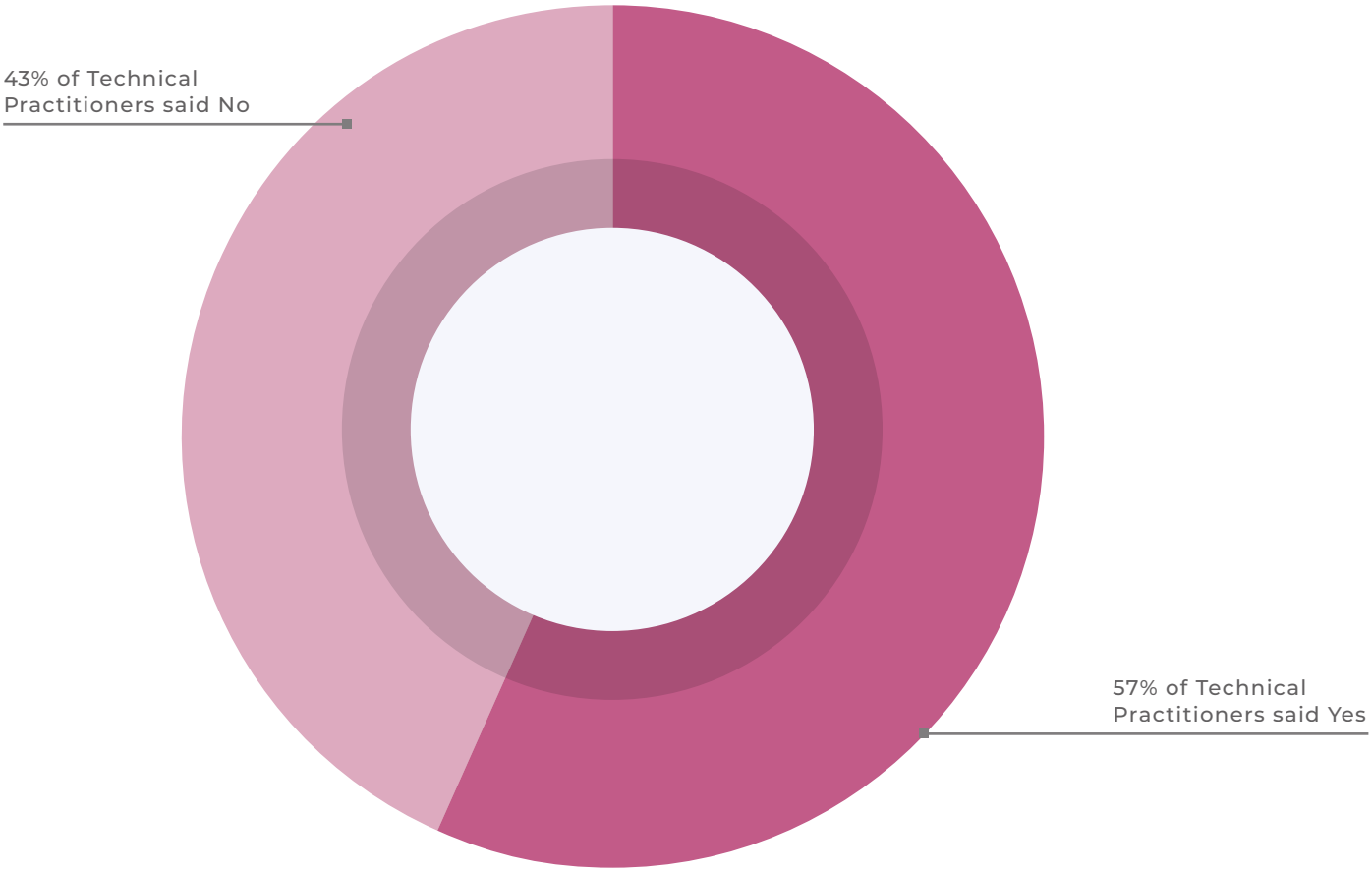


(Figure 17: Machine learning frameworks used by AI technical practitioners)

Generally speaking, technical practitioners believe they have the right amount of data to support their initiatives, with 57% reporting so. However, the remaining 43% require additional data.

To launch successful AI initiatives, companies must determine how to better support those who do not feel adequately equipped to tackle the task ahead of them. Part of this process will require finding common ground between technical and line-of-business individuals.

Do you believe you have the right amount/ enough data to support an AI initiative/project?



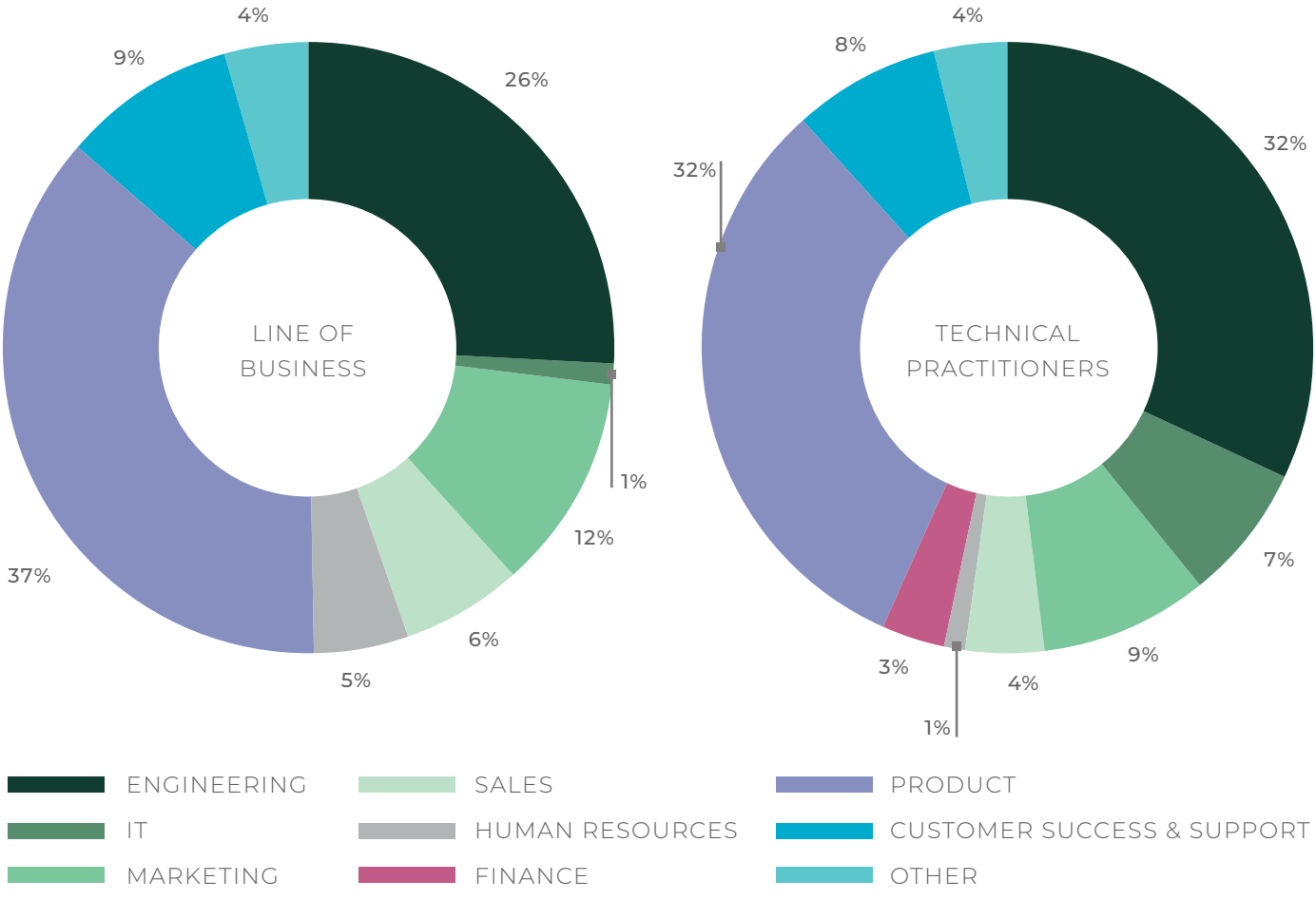
(Figure 18: Technical practitioners' belief in having the right amount of data to support their AI initiatives)

Bridging the AI Gap

We have seen that there are some differences between technical practitioners and line-of-business owners about how they view their organization's AI progress. Bridging the gap between the two practitioners will be an instrumental component in building a strong AI infrastructure.

One difference teams may encounter is where they expect AI to be deployed first within an organization. A vast majority (62.5%) of line-of-business owners expect that AI will first be in engineering or product deployment. Technical practitioners mostly feel similarly, except that 7% feel that AI initiative efforts will first go toward helping the IT team perform tasks. The disconnect could be due to a perception among engineers and data scientists that AI is a tool to assist with the automation of tedious tasks. Line-of-business owners may be more likely to leverage AI to improve decision making and support other business processes.

In which part of your business do you expect AI to be deployed first?



(Figure 19: Where AI is being deployed first within an organization)

Earning executive buy-in is the key to getting an AI initiative off the ground. Line-of-business owners felt someone like a CTO or the respondents themselves — most of whom are manager-level and above — are responsible for AI initiatives within their organizations. Technical practitioners were also most likely to report that a CTO is responsible for AI initiatives. However, technical individuals also reported that the respondents themselves — who are mostly data scientists — are the second-most likely group to be responsible for AI initiatives.

It seems that both groups can align on the idea of an executive-level individual carrying the responsibility for initiatives. However, the groups diverge after that decision, each feeling they are responsible for the project at hand. This divergence is where both line-of-business owners and technical practitioners must find common ground. Getting these teams and the authorizing executive in a room together to carve out a common understanding of responsibility will be hugely helpful in building a successful and sustainable AI initiative.

Finally, the two groups of respondents differ a bit in their expectations of data types their initiatives will use. 68.4% of line-of-business respondents say their AI projects use text data, 75.8% of technical practitioners say the same. While this number seems different at face value, the two proportions aren't too dissimilar and, in fact, suggest alignment on text as the most commonly used data type.

The differences in data type usage start to appear as respondents work their way down the list of data-type choices. 45.6% of line-of-business individuals highlight still images as a major data type, while just 34% of technical practitioners say images are a major data source. The widest gap exists with time-series data, the next most used form of data. While just 40.5% of line-of-business respondents say they use time-series data, 60% of technical practitioners report using time-series data.

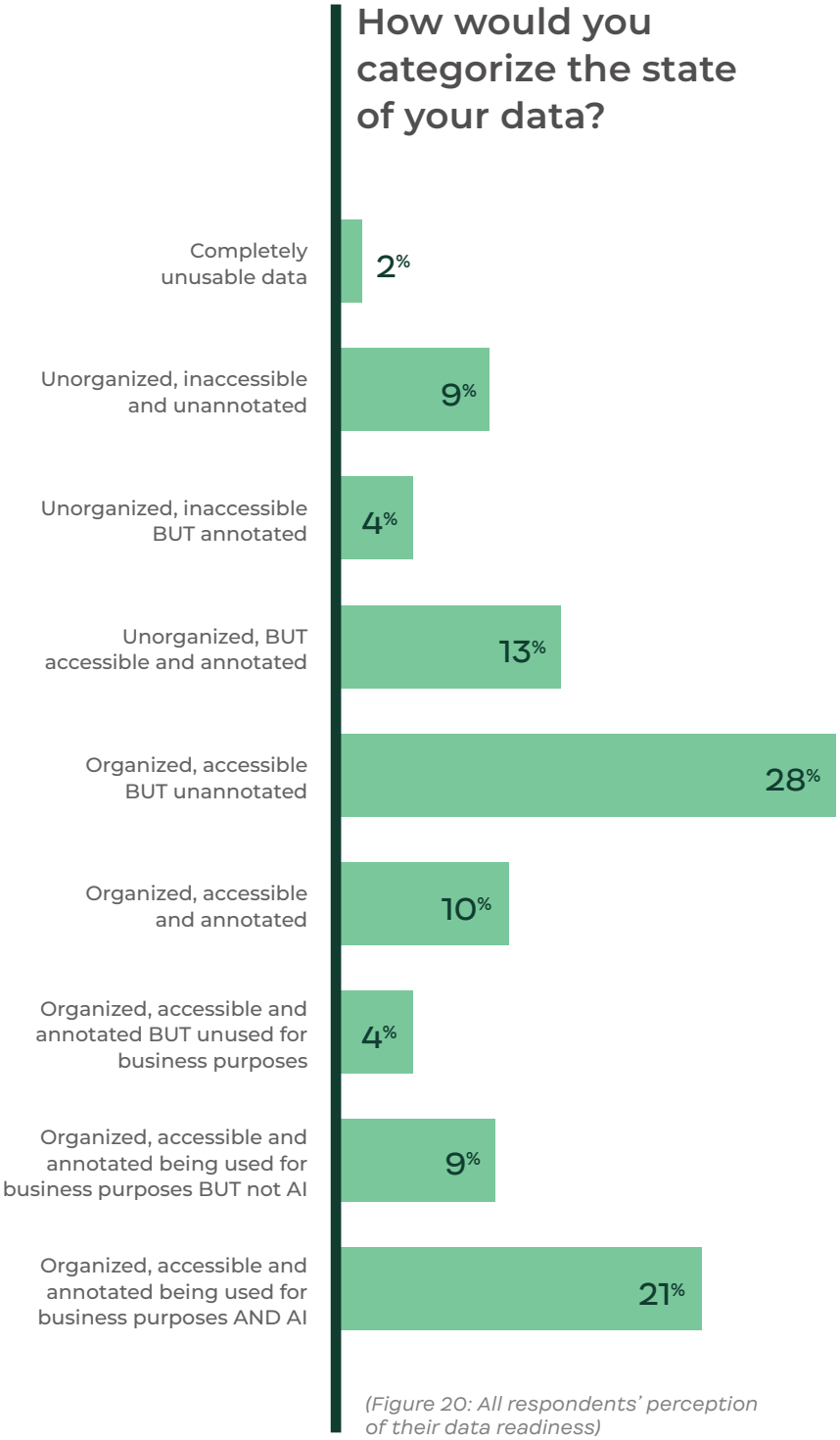
These differences suggest data scientists may lack the resources needed to annotate still images and time-series data. It will be difficult to align on the resources necessary for AI initiatives if the two groups cannot first come together to determine the types of data they will use.

Crawl, Walk, Run with AI

Before your AI initiative can run, it must first crawl and then walk. Creating a successful AI initiative requires examining where your organization is in terms of adopting AI. More line-of-business owners (59.5%) than technical practitioners (49%) feel their organization is behind when it comes to adopting AI. Bridging that gap and understanding why the groups feel differently can be a starting point in addressing AI readiness. This also shows that nearly half of all respondents, regardless of role, feel like they are behind. One reason respondents may feel they are behind may be due to the state of their data.

All AI initiatives must have organized, usable data. Luckily, most (72.7%) technical practitioners report that their data is organized and accessible. However, just 22% of those respondents report that their data is "Organized, accessible and annotated, being used for business purposes and AI."

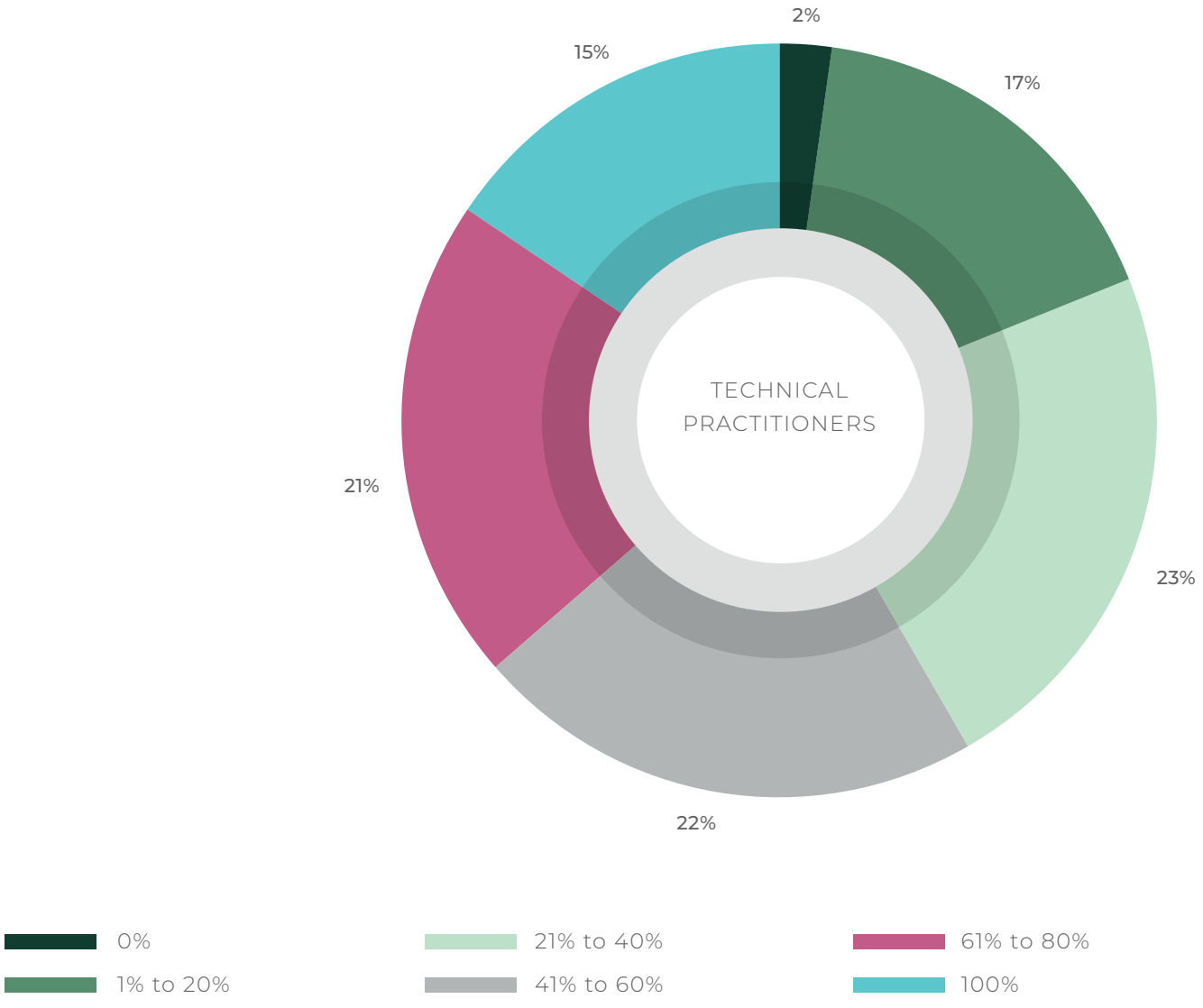
26.8% of technical practitioners with organized, accessible data report that their data is not annotated. However, an overwhelming 94.9% of technical respondents say "high-quality annotated training data is important to the success of AI." It is clear that, although most practitioners have accessible data, plenty still need to annotate that data before it becomes usable.



(Figure 20: All respondents' perception of their data readiness)

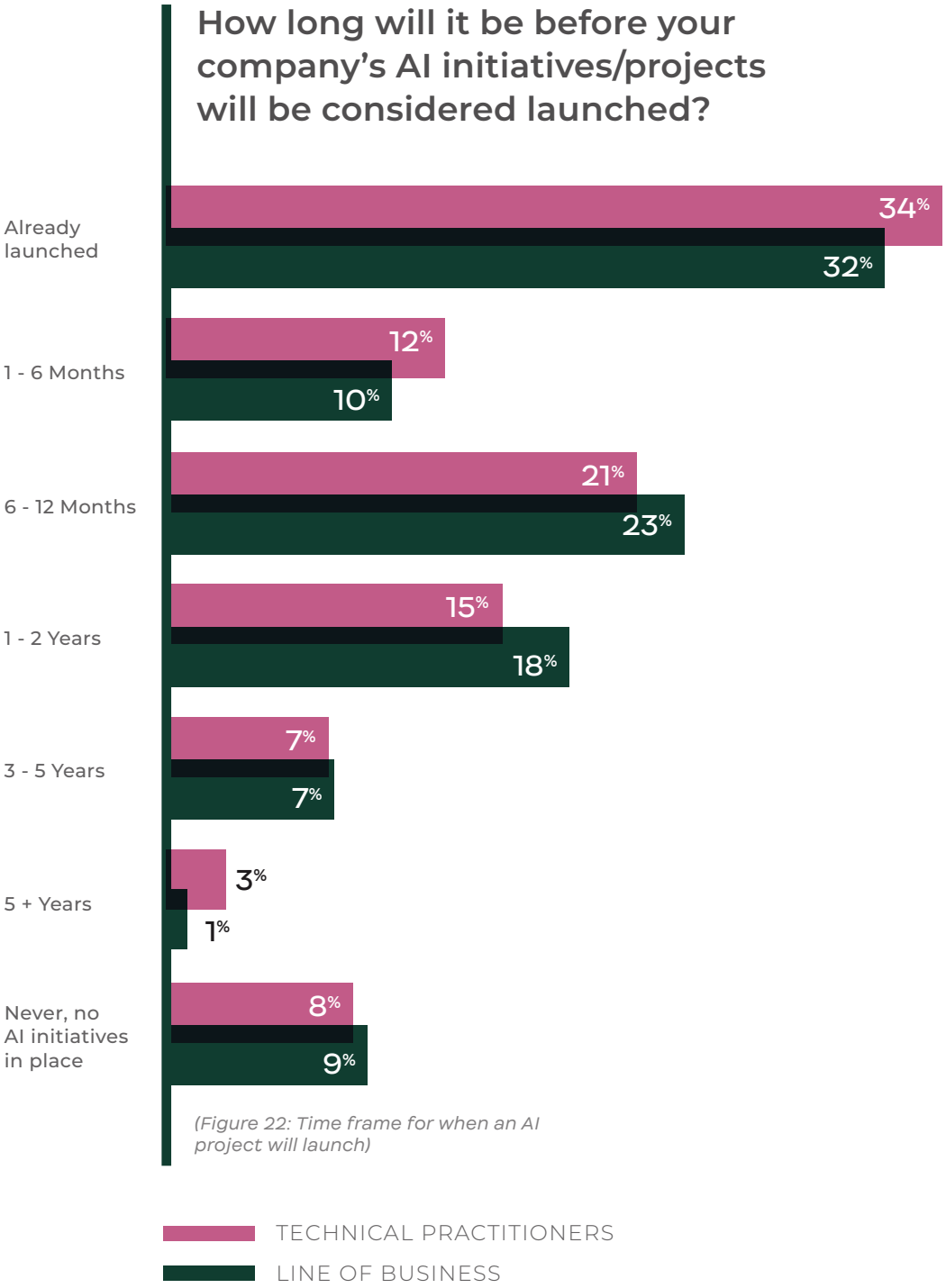
36% of data scientists say that 61% or more of their work informs or powers AI initiatives or projects. While not all data scientists are tasked with AI, it seems that the majority of respondents do not spend most of their time working on AI projects. Determining if this is the correct time allotment or if data scientists should be spending more time on AI projects will be helpful in understanding why or why not an organization feels AI ready.

How much of your work informs or powers AI initiatives and projects within your organization?



(Figure 21: The work of the AI technical practitioner informs AI initiatives and projects)

Nearly one-third of either group (31.7% for line-of-business owners and 34% of data scientists) reports that their company's AI initiatives are already launched. The timelines for both groups is a fairly even split. Nearly one-third believes their AI initiatives are one month to one year away from being launched, and about a final third of respondents in either group feels their launches are one year or more away. The good news is both groups seem to have formed a consensus about their timelines. Now it's up to both groups to determine how to best address those timelines given their current resources.



(Figure 22: Time frame for when an AI project will launch)

Conclusion

AI is already making its mark on real-world applications. Though the perfect autonomous vehicle algorithms, for example, have not yet emerged, every new attempt at creating AI for public use helps us move one step closer. While we wait for the more fantastic deployments to arrive, we can already begin to enjoy some of the ways in which AI is helping businesses compete and earn competitive edges.

Respondents see AI being used in the real world to accomplish a number of tasks. Some believe it will help automate processes, workflows, and simple tasks. Others feel it will enhance their organization's end products. Some believe AI will help accelerate scientific discovery. For many, AI's best use case is to supplement and complement human intelligence.

Whatever your use for AI, we hope this report has helped you gain a better understanding of the current landscape and appetite for AI initiatives among business leaders and technical practitioners. Please feel free to reach out should you have any questions about what you've read here or about embarking upon your own AI journey.

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figure eight

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