the rise of artificial intelligence:
a critical inflection point for the accounting profession

EXECUTIVE SUMMARY

The age of artificial intelligence (AI) is upon us. What does this mean for the accounting profession? If the headlines are to be believed, artificial intelligence will transform it, among a long list of other fields[1].

In fact, Gartner predicts that AI technology will be prevalent in all new products by 2020 and Tractica forecasts the global AI market to be nearly $60 billion by 2025.

As is often the case, the truth is more nuanced. Yes, the AI wave, which contains the branches of machine learning (ML) and deep learning[2], is fully upon us. And yes, its impact, already substantial, is growing at a rapid pace.

That said, AI is fundamentally like other technologies: it's a tool. When deployed smartly, it elevates human work by making a variety of tasks more efficient, accurate, and less time consuming. As such, we believe AI will change the relationship accountants have with their clients by creating opportunities to add value.

"The past decade has been about the move to cloud accounting and online finance," said Erik Asgeirsson, President and CEO of CPA.com. "The profession's move to the cloud has set the stage for the rise of artificial intelligence in accounting and auditing. AI will give CPAs new opportunities to specialize and to deliver insights, value and trust to clients."

IN THIS REPORT, WE WILL...

Outline what artificial intelligence is and provide definitions of the technology's most impactful branches: machine learning and deep learning.

Place artificial intelligence in historical context. Pioneered in the 1960s, AI weathered a number of hype cycles, with expectations crashing under the weight of inflated expectations. We'll explain why AI is finally at an inflection point – at least in terms of how it is changing the way firms do business.

Highlight examples of how accounting firms are already using AI products and services. From real-time monitoring, to augmentation, to risk assessment, the technology is already helping accountants work more strategically and efficiently.

Provide guidance on how firms can incorporate AI and ML into their operations. We outline the pros and cons of building in-house solutions, versus turning to vendors, and share strategies on how firms can evaluate and implement available AI-powered products and services.

ARTIFICIAL INTELLIGENCE:
A BRIEF EXPLAINER

"Classically, the definition of AI is machines that exhibit intelligent behaviors or machines that can accomplish things that previously only humans could, so flying planes, driving cars, being able to talk to humans, and so on," said Viv and Siri Co-founder Dag Kittlaus[3], a keynote speaker at Digital CPA 2018, an annual conference for practitioners that focuses on how technology is transforming accounting.

AI IS NOT NEW

"People were doing this back in the '60s," said Andrew Glassner, a leading expert on artificial intelligence and the author of a two-volume set on deep learning[4]. Over the last decade, however, there have been huge advances[5] in the field, spurred by leaps in computing power, software capability, and access to large amounts of data.

MACHINE LEARNING

Machine learning (ML) is a mature version of artificial intelligence. Unlike an old-fashioned rules engine, which can interpret rules with a high degree of accuracy but does not improve its performance over time, machine learning is able to do what its name implies: learn as it goes. When a machine learning engine is designed properly, it improves at analyzing patterns as it gains experience or processes more data. The more data it inputs, the more accurate the machine's outputs.

ML is behind much of AI's advances, and a number of accounting software developers have started to incorporate the technology into their product offerings. Sage Intacct, for example, is building a ML-powered platform called Pacioli. As the company explains[6],

ar·ti·fi·cial in·tel·li·gence
/ ˌärdəˈfiSHəl inˈteləjəns/

noun

the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and language translation. *Abbreviation: AI, A.I.*

Pacioli is designed to take note of the actions an accountant performs in a day in order to learn from them. Eventually, it will be capable of not only pulling up necessary pieces of information for CPAs as needed, but will anticipate potential errors, catch abnormalities, and flag next steps in real-time. While still in development, Pacioli is an example of how machine learning will be used to augment human workflow in accounting.

DEEP LEARNING

A branch of machine learning, deep learning (DL) allows AI systems to perform complex tasks, such as image recognition, voice search, or automatic language translation, by creating a network of machine learning engines; each layer processes incoming data, and then passes the output on to the next layer. "Visualizing these stacked layers from above helps capture the 'deep' in the name" Glassner said.

A NOTE ABOUT ACCURACY

To work, many machine learning engines first require training. Let's say a ML system is designed for expense management, like Expensify. The system allows a user to take a picture of a receipt, after which it is coded automatically, thanks to image recognition and object classification algorithms. To pull this off, the system must first have access to a large number of pre-coded receipts, so it can identify the patterns and characteristics necessary to complete the task moving forward.

There are a variety of reasons why ML engines fail to improve over time – the data could be labelled incorrectly, or there's not enough data to learn from. But when everything aligns, the system will progressively improve as more data is processed, i.e. it will "learn" as it goes. To use our example, once enough coded receipts have been fed into the algorithm, the system is proficient at sorting new ones into the correct categories; what's more, it will grow more accurate as it continues to process additional receipts.

AI ON THE HYPE CYCLE

The field of artificial intelligence has been around for more than half a century. Over the years, excitement around the technology has ebbed and flowed.

"There was this real enthusiasm about it decades ago and it ended up being over-hyped. There really wasn't a lot of true progress," Kittlaus said. "A lot of people had lost faith and thought that was really just a hype cycle."

This continued into the 21st century, when expectations around AI – fueled by feverish media coverage – notably outpaced real-world applications. The disconnect led to disillusionment: *Was AI actually going to transform the world?*

This progression is by no means unique to AI. Instead, it happens so frequently, that the research firm Gartner has developed a trajectory that charts the rise, fall, and then slow ascent of emerging technologies. The Hype Cycle[7] typically begins with a trigger point, after which the technology shoots upwards to reach the peak of inflated expectations, before crashing downwards on the weight of such heady projections. Finally, provided the technology is durable, it slowly climbs the plateau of productivity to reach mainstream adoption.

AI's various subcategories fall at different points[8] on the latest iteration of the Gartner Hype Cycle. Machine learning and deep learning are at the peak of inflated expectations, for example, while general artificial intelligence has yet to reach the hype apex. It's imp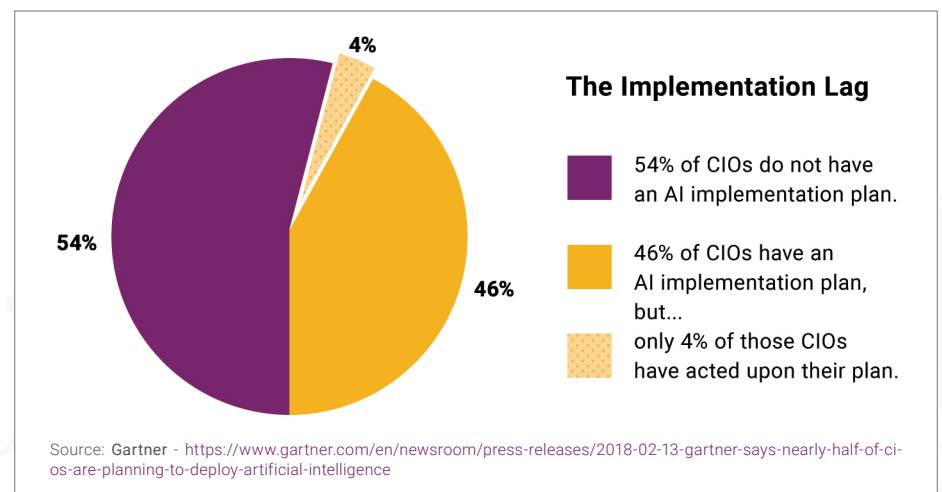ortant to note that the pace at which each tech-nology progresses through the cycle varies widely: "Some of them, such as deep neural nets and virtual assistants, will reach mainstream adoption in the next two to five years," Mike J. Walker, Research Vice President at Gartner, said in a recent trend report[9]. "Other emerging technologies of that category, such as smart robots or AI PaaS (Platform as a Service), are also moving rapidly through the Hype Cycle, approaching the peak and will soon have crossed it."

Despite AI's improved capabilities, barriers to adoption remain stubbornly in place, which helps explain why the technology as a category, by Gartner's estimation, is still headed for the trough of disillusionment. Earlier this year, the research firm noted[10] that it remains cautious about AI's immediate impact: despite an expressed desire to deploy the technology, many companies are multiple steps away from implementation. According to the firm, while 46% of CIOs have developed plans to utilize AI, only 4% have actually done so.

In a separate global survey[11] of over 700 senior finance leaders by Oracle and the Association of International Certified Professional Accountants – the global organization that encompasses CPA.com and its parent, the American Institute of CPAs – some 89 percent of organizations said they have not deployed AI at scale in the finance function, despite a correlation between the deployment of the technology and revenue growth.

THE BOTTOM LINE

While AI's presence has grown more powerful and high-profile in the last few years[12], adoption remains incremental. "I think AI has taken a different path than most other emerging technologies," said Aaron Harris, Senior Vice President, Head of Engineering and Technology at Sage Intacct. Despite its storied history, on a consumer-level, the technology has only recently entered the mainstream in a visible way. Meanwhile, "much of the

The Implementation Lag

■ 54% of CIOs do not have an AI implementation plan.

■ 46% of CIOs have an AI implementation plan, but...

▨ only 4% of those CIOs have acted upon their plan.

Source: **Gartner** - https://www.gartner.com/en/newsroom/press-releases/2018-02-13-gartner-says-nearly-half-of-ci-os-are-planning-to-deploy-artificial-intelligence

reaction from the accounting profession has been pretty superficial," Harris says. In his view, there's been too large a focus on flashy applications such as chatbots at the expense of products capable of meaningfully altering workflow.

That's beginning to change. In the last few years alone, vendors, including Sage Intacct and Intuit, have rolled out suites of AI-powered products. "All of our online products have AI and ML features," said Mamie Jones, Senior Vice President of Product Development at Intuit.

As we'll see later in this report, their impact – on efficiency, value-add, and reliability – is already being felt across the profession, with McKinsey & Company reporting 43% of the finance and insurance industries' tasks are open for potential automation.

THE BIG PICTURE

Before we get into the nitty-gritty of how artificial intelligence is changing how firms operate *today*, let's zoom out to consider how the technology is reshaping the broader professional landscape.

For firms, at a high level, "AI will take the drudgery away and their work will move up the value ladder. Their role will evolve," Jones said. "The manual data entry work will be automated and that will enable them to spend more time on advising and coaching clients and ensuring that they make better financial decisions." According to Samantha Bowling,

a Partner at Garbelman Winslow, it's important to view AI as an opportunity, not an adversary. Winner of the CPA.com Innovative Practitioner Award for 2018, Bowling has spent over a decade getting her firm up to speed on the latest technological advances.

For example, she recently implemented Mindbridge AI's auditing platform[13], which has transformed the way she conducts audits. Instead of sampling data, she runs the entire general ledger and supporting ledgers through the platform, which automatically flags risky transactions for her to review. "If I get hundreds of high-risk transactions, I know I'm going to charge more," she said. This strategy should help resolve the trepidation many practitioners feel at moving from hourly billing to value-based pricing. Altogether, the platform has saved her time and made the way she approaches tasks more efficient.

Such positioning is key: AI is not a foe coming to replace human jobs, it's a tool that will make work more accurate and efficient. Herman Man is the Vice President of Product and Partnerships at Xero, an online accounting vendor that offers AI-powered products, including software for invoicing and bank reconciliation. "Everything we talk about is human at heart," he said. "We don't look at machine learning as a tool to replace accountants and bookkeepers – quite the opposite. We look at it as a tool to empower and give them back time, so they can spend that time on their clients." Xero has made a significant in-

vestment[14] in developing machine learning products, such as those for invoicing and emails-to-bills.

As CEO and Founder of the expense management service Expensify, David Barrett is an AI evangelist. That said, he believes too many firms get caught up in the flashiness of the technology, becoming distracted by how it works, not what it can do. A more productive strategy is to invest time into understanding how AI can automate processes, improve quality, and solve problems. Save for a select group of employees within the firm, "how it operates behind the scenes doesn't matter so much." His point: you don't always need to know how a tool operates to use it effectively.

It's also important to remember that for all its strengths, AI has serious limitations. Machines are good at assisting with repetitive, structured tasks and finding connections based on previous data sets. They are bad at creative problem-solving, forward-looking insights, and building personal connections – areas that accountants can build advisory services around.

Further, building trust by asking clients the right questions simply isn't something an algorithm can do. "A machine doesn't understand whether or not a parent is sick, or when a child is going off to college – but an accountant does," Man said. By delegating rote tasks to AI platforms, firms free up valuable time and energy they can spend on the areas of business only they can perform.

CURRENT AI
ACCOUNTING SOLUTIONS

Now that we've made a case for why artificial intelligence is an important tool, let's take a closer look at how the technology has been incorporated into offerings from vendors, as well as how firms are using these products in their daily operations.

DATA CAPABILITIES

It's helpful to divide data's capabilities into four tiers: descriptive (what happened), diagnostic (why it happened), predictive (what will happen in the future), and prescriptive (what to do based on said prediction). The level of sophistication increases as you move up the chain. Descriptive analytics and, to a large degree, diagnostic analytics can be done using Excel, Daniel Cohen-Dumani, a Partner and market leader at Withum+ elaborated during a recent Digital CPA panel.

The next tier up, predictive analytics, enables firms to create better strategies and measurement systems based on this forecasting. "You can develop KPIs that will prevent a future failure," Cohen-Dumani said. Despite its sophistication, many predictive applications can also be done in Excel.

Prescriptive analytics is where the power of AI and ML come into play. Such a system isn't just capable of forecasting, but able to learn from the data to "give you insight and direction for the future," said Cohen-Dumani. When deployed correctly, this can be invaluable, enabling firms to provide instructive advice in real-time.

AUGMENTATION

As previously noted, one of AI's greatest advantages is its ability to help with repetitive tasks, such as bank reconciliations, cash forecasting, procurement, transaction coding, billing, and invoicing, thereby reducing human workloads. "The measure of AI is how much it takes away from human activity," Barrett said, notably the repetitive, "anger-inducing," rote jobs.

A variety of vendors offer AI products and services that can save firms time and improve accuracy on all of these fronts. Many SaaS (Software as a Service) accounting systems offer features including email-to-bills[15], which cuts down on the need for repetitive manual data entry by extracting information directly from PDFs and using it to create custom invoices; billing platforms[16], which automate the transaction coding process; and bank reconciliation[17], which matches transactions to their corresponding invoices, bills,

and other items. Intuit recently announced[18] a bevy of AI-driven solutions for their QuickBooks Online Accountant product, including their aggregation of data from 3.4 million users to make recommendations on cost-savings or even pricing opportunities.

For the profession as a whole, automating tasks is low-hanging fruit, said Jerry Ravi, a Partner and practice leader at EisnerAmper specializing in process, risk, and technology solutions. **Automation models work best in controlled environments with rules and set processes, of which accounting has many.** In addition to its standalone value – automation can save firms a significant amount of time and resources – task automation is a necessary foundation for more sophisticated deployments of artificial intelligence, such as machine learning.

The beauty of machine learning is that the more data the system ingests, the better it performs. Man, Vice President of Product and Partnerships at Xero, has witnessed such improvements firsthand. When Xero launched its bank reconciliation product a couple of years ago, it would suggest matches, instead of selecting them as the default option. But as the software handled more transactional data, its accuracy improved. Today, matches are made automatically. (In case of error, they can be manually overridden.) This interplay – AI's speed and accuracy coupled with human oversight and decision-making – is a powerful one.

Another good example of AI and ML in

action is AICPA's MyCPEMgr[19], an online tool that helps accountants manage their continuous education requirements. The first iteration of the product used AI to identify education requirements that still needed to be fulfilled. The latest version, which incorporates

ML, is able to recommend specific courses based on a user's location, usage pattern, and missing requirements.

REAL-TIME MONITORING

Much of the conversation around AI focuses on the tasks – and, by extension, the jobs – it will transform. But the technology also opens new doors for the profession.

One powerful advantage AI enables: continuous monitoring, both at an organizational and industry-wide level. This is a giant leap from the way data is currently analyzed at most firms. Continuous monitoring, in which a company's data is analyzed on its own as well as against a variety of other external metrics, can unearth valuable insights, patterns, and trends invisible to even the most highly-trained human eyes. Such platforms allow accountants to figure out not only where their clients' money is going, but how their

transaction histories compare to those of similar businesses. Having the ability to not only identify where the risk is, but why it exists and potentially what to do about it "is a way to substantiate your fee with the client," Garbelman Winslow's Bowling noted.

Using IBM Watson, EisnerAmper has built its own internal AI tools to find anomalies in real-time. "Watson sees anomalies in contracts that an individual would miss," Ravi said. It's also far more efficient and scalable, capable of reviewing tens of thousands of contracts in the fraction of the time it would take human workers to do the same.

Multiple vendors are developing continuous monitoring features. For example, let's say a company's contracted monthly recurring revenue is a top concern for a client: "With AI we can watch every bit of information flowing into the organization that might affect that figure, and spot any changes in the trend," Sage Intacct's Harris said, such as when a formerly healthy growth rate suddenly levels out. On its own, this is a useful data point. But such software could go a step further, identifying potential factors that might have contributed to the dip, both internally and by comparing its financial data to that of its competitors.

"Bill.com is leveraging the power of AI and machine learning to deliver insights to our accountant customers so that they can provide better advising services to their clients. The first step has been minimizing data entry from

invoices and bills. The next step will be delivering insights and recommendations based on cash flow and when to pay bills," said Vinay Pai, Senior Vice President at the company. Such a service would, for example, be able to alert a company if it is running low on cash flow – and then go one step further, by providing recommendations for how to mitigate the issue, such as highlighting expenses that can be moved from net 10 to net 30.

EVOLVING THE AUDIT

In the fall of 2018, the AICPA and a significant number of the nation's largest accounting firms announced they are moving forward with a multiyear initiative to create a new, innovative process for auditing driven by AI and other technology. The goal of the collaborative effort – with contributions of time, talent and funding by leading CPA firms, the AICPA, CPA.com[20], and the AICPA's technology partner, CaseWare International – is to develop a transformational auditing methodology supported by a state-of-the-art technology platform.

The output of this Dynamic Audit Solution initiative will be available to the more than 14,000 firms that have auditing practices in the United States.

"I've been very focused on our ability to take the technological changes that are occurring in auditing and make it available to firms of all sizes so that they can continue to be in that audit space," Barry C. Melancon, CPA, CGMA, President and CEO of the AICPA, said

at Digital CPA. While the Big Four are investing hundreds of millions in new technologies, other individual firms lack the financial capacity to do the same. The AICPA-led effort helps put these firms on similar footing.

"We can take a more cautious approach to change, automate here or there using existing methodology, or we can boldly reimagine what auditing in the future will look like," Melancon said at the fall meeting of the AICPA's governing Council. "To me, and to the firms that have committed to this initiative, the choice is clear."

AI, along with other technologies, enables the continuous audit, in which all transactions are tested in real-time. Say a commission expense is inadvertently coded to go to the HR department. Rather than discovering the error after the fact, as part of a periodic audit – which would then require write ups and reports - a continuous system would identify and manage the mistake shortly after it occurs.

It could also categorize transactions by risk level in real-time. By bringing AI into the audit, "we are able to look at internal controls in a more efficient manner and identify where potential users

or staff have been deviating from their control," said Karen deSouza, Head of Product at CaseWare. With a manual audit, "it would have taken us months to work through all of our client's transactions to figure out that Joe Smith was doing things he shouldn't have been." With an AI system capable of continuous tracking, it's possible to flag such irregularities as they occur.

"We're not saying we want to automate the audit to the point users aren't there anymore," deSouza said. Instead, the aim is to provide firms with AI "toolkits to provide significantly more value to clients."

THE BOTTOM LINE

Artificial intelligence is poised to reshape the audit. As with most monumental shifts, this creates opportunities – and challenges. "It will change the requirements for auditors to be successful," Harris said. A foundational knowledge of accounting will remain important, but it will be joined by a range of new skills, including an understanding of data science. In the future, auditors will spend "less of their time looking at source transactions and interviewing customers and vendors," he said. Instead, they will need to "be able to assess the auditing technologies that their clients are using." In accounting, as with so many professions, the ability to understand and evaluate how technology is applied will become a central tenet of the job.

HOW FIRMS SHOULD PREPARE

Misunderstandings about what the technology represents, and how it will be deployed, are widespread. Too often, AI is presented as robots coming to automate away human jobs. While there are shades of truth to this interpretation – anything highly repetitive is a candidate for automation; the idea ignores the fact that many rote jobs have already moved overseas, where labor is cheaper.

More importantly, it overlooks the many opportunities seeded within the AI-shift as the systems are becoming more affordable and accessible.

For those who are at firms intimidated by or resistant to the idea of AI-driven change, start by identifying the pain points you'd like to address. Nine times out of ten, there is an AI-based solution that will make the task less onerous. This exercise not only proves the value of such tools but makes AI as a concept more tangible and less intimidating. "Start small and build from there," Ravi said.

After a firm has recognized the value of AI-powered advancements, it's time to develop a rollout strategy. At organizations steeped in older processes and protocols, such changes won't happen organically: AI demands new skills and approaches for tackling problems. And so, the next step becomes hiring at least one employee with deep-seated knowledge of the field. For AI, this likely means recruiting someone with data analytics expertise. In fact, the recent IFAC Global SMP Survey reported that 23% of all new hires in accounting firms over the next 12 months will be non-accounting roles.

BUILDING AI SOLUTIONS INTERNALLY VERSUS USING SOLUTION PROVIDER PRODUCTS

Building a system from scratch is a serious investment, said Expensify's Barrett. Very large firms, or those with specialty services, may have both the resources and incentive to do so. But for the majority of CPA firms, it's easier and more

efficient (both from a cost and time perspective) to implement a software stack using solution providers.

Building your own system is not typically the first option you should turn to, agreed Ravi. For firms just dipping their toes into the AI tools, there are a number of vendors who can help collect and organize their data in order to streamline tasks and improve efficiency. It's often a good idea to identify a few pain points you'd like to solve.

For firms at the beginning of this process, data collection and standardization are the most important – and often confusing – steps. When working with new clients, EisnerAmper offers a digital workshop, in which the firm helps them prioritize tasks they would like to automate and walks them through how to find and organize their data to make such automation possible.

Reconciliation, cash applications, procure to pay, and most other tasks that are

formulaic and rules-based are all good targets for automation, Ravi said. "As long as you know where the data is, we can come up with an automation plan," he said. Often, he works with clients to locate data from a variety of sources, including software such as QuickBooks, desktop computers, and sometimes even paper. Save for one, these clients are not accounting firms – but the same general process applies.

DATA ORGANIZATION

Once again, the first step to implementing AI at your firm is making your data easily accessible and compatible. Once you have a handle on your data, it's possible that it might need to be cleaned up so that it can run through the system. "In some cases, we do data cleansing," Ravi said, a decision EisnerAmper reaches with the client.

When selecting AI products to run this data through, make sure you are partnering with vendors who are providing real solutions, instead of flashy buzzwords. With any new product, "there could be hype involved," Vikram Holla, Director of Product Development at CPA.com, said. To separate products worth investing in from everything else, do your due diligence. Holla recommends asking questions such as, "How much data does a training set require to function?" While the answer largely depends on the use case, a reputable vendor should be able – and willing – to break it down for you.

Given that we live in an age where tools are multiplying and evolving, selecting a technology suite for your firm can be a daunting task. Writing down a list of requirements you'd like your software stack to be capable of performing is a good first step. This will help you narrow down the list of potential vendors that can fulfill your firm's needs.

A critical step in due diligence is always a live demo, but before the call make sure you communicate to the rep what you want to get out of the meeting and why you are interested in their system. Fail to do this, and the sales rep won't be able to tailor the demo to your firm's needs. Doing so will maximize your time and help you weed out systems that are not in sync with your firm's methodology or thought process.

After the demo, set up your free trial. Ideally, you want to push it to its limits and get a sense of its capabilities. If you run into a roadblock, reach out to the vendor to see if there's a workaround. At the end of the trial, the goal is to have a clear sense of whether the product fits your firm's needs, or if there is a product with features more aligned with your goals and processes.

To determine whether a vendor is offering an AI product capable of delivering real results, Gartner advises to ask the following questions[21]:

1. How will your AI-enabled product benefit the organization more than a similar product that does not use AI technology?

2. What AI learning method is being used in this product?

3. What specific skills and level of experience are required to successfully use this product?

4. How much training data is needed to "prime" the product, and how often will it need to be retrained?

If you're confused by any of the vendor's responses, ask them to walk you through it in greater detail. Before paying for a product, it's important that you, or someone at your company, understand how it works, and that you are selecting

a vendor that is willing to help make sure this happens.

Finally, think about how each tool fits into the stack you are building. Make sure you are selecting products that are compatible, i.e. that "talk to each other," Expensify's Barrett said, "The most important decision that a firm can make is committing to tools that integrate."

Bottom line: for all the hype and real power, AI is just a tool that can be deployed to solve a problem and help firms do more with less.

GOING FORWARD

If hiring people with tech skills and selecting the right vendors are immediate priorities, a longer-term goal might be reframing the way partners are compensated. Today, compensation is tied to billable hours, while time spent developing technology-based tools goes largely unrewarded. Without tangible incentives, it's difficult to motivate people to invest the necessary energy to discover, learn how to use, and implement AI tools.

That's a problem: as the professional landscape continues to be transformed by AI, these tools are only growing more important. A recent report that surveyed more than 1,000 CPAs and finance and accounting professionals identified artificial intelligence as the technology trend that will have the greatest impact on the profession over the next three years. At Digital CPA, the AICPA's Melancon underscored the importance of transformation and adaptability by quoting the futurist Alvin Toffler: "The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn."

FURTHER READING

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Deep Learning, What You Need to Know[29]
AICPA and CPA Canada

MEMBER RESOURCES

AICPA AICPA®

AICPA Beyond Disruption[30]
Find trusted resources you need to go beyond disruption.

AICPA Human Intelligence and Beyond[31]
Access expert recommendations you need to prepare for the future of work.

AICPA MyCPEMgr[32]

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FOOTNOTES

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