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ThinkTWENTY20

The Magazine for Financial Professionals

How AI Will make Accounting and Auditing more Interesting

ChatGPT (and GPT-4) in Accounting Education?

Artificial Intelligence Technologies with Implications for Assurance Services

Security Implications of ChatGPT: Preview of a Cloud Security Alliance Whitepaper

Cutting through the Hyper Sensitivity of OpenAI's ChatGPT-4 AI Generation

Number 16, Spring 2023

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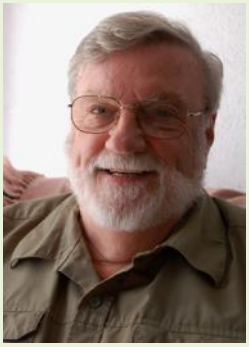
Editorial



Gerald Trites, FCPA, FCA, CISA
Editor-in-Chief

Artificial Intelligence has been booming especially since the introduction to the public of CHATGPT last year. Indeed the effect has been so impressive that we are devoting most of this issue to ChatGPT and its relatives and the many aspects of the accounting and financial professions that it is impacting.

Gundi Jeffrey interviews partners of KPMG and MNP who point out that the profession is in the early stages of adopting ChatGPT and do not use it on client data because of security concerns. They have their own AI tools to use and say that AI is having a tremendous impact on their work. However, they see a real future for ChatGPT style tools in the future as we gain a greater understanding of their uses and limitations.

In the world of academia, Irene Wiecek writes about the certainty of ChatGPT become a permanent fixture in the teaching world and of how both professors and students need to embrace the technology and learn how best to incorporate it in their learning and research activities. And Efrim Boritz describes some of the results of research conducted to identify assurance-related technologies and tools such as those related to AI. He points to the extensive nature of the effects of AI on assurance and the many ways the technologies can be used. The article provides a wealth of information on this area of research.

As further evidence of the work the profession is doing to come to grips with the security implications of ChatGPT, Eric Cohen provides a thorough overview of a recently issued paper by the Cloud Security Alliance (CSA) on the security implications of ChatGPT. Finally, the last word comes from ChatGPT itself, in the form of an article on the Future of the Profession. A series of questions from the editors resulted in an article that we thought worthy of publication. We'll see much more on ChatGPT and AI in general over the next few years. It promises to be an exciting experience!

How AI Will Make Accounting and Auditing More Interesting: In Their Own Words

By Gundi Jeffrey

Gundi Jeffrey is an award-winning business journalist specializing in writing about the accounting profession for various publications in Canada and England. In 1985, she co-founded The Bottom Line, Canada's only independent publication for the accounting and financial professions, serving as its executive editor.

According to a post by Brandon Malekie on the webpage of #Flocast, "bringing artificial intelligence, or AI, into accounting and audit will make that work more fun and provide the deeper insights that businesses crave. For the first time in the history of accounting, accountants will get a break from the boring tasks that bots and AI can do faster and more accurately, and they'll get to do more of the work that actually requires a CPA. That's happening today in accounting firms and in accounting teams in industry that are implementing AI technology."

But today's AI has advanced beyond simple rote memorization of tasks to learn on its own. Machine learning, or ML, uses AI algorithms applied to large datasets to identify patterns and make predictions or decisions with limited human guidance. This type of AI gets better as it processes more data, and may apply natural language processing to interpret spoken or written language. The datasets here may be structured, such as a set of accounting transactions, or they may consist of unstructured data, which can include satellite images, email messages, and audio or video files — basically anything under the sun that can be digitized.

Because bots never get bored and perform their tasks flawlessly and quickly, AI is especially useful for the repetitive, error-prone manual processes that have defined the work of accountants and auditors for centuries. Now, thanks to new technologies being implemented by forward-thinking accountancy firms and accounting professionals in industry, accountants will have the time and energy to provide the higher-value consultative work that actually helps organizations achieve their goals.

There has, however, been considerable recent blowback to AI development, especially to ChatGPT, which offers many benefits but has also been criticized for being developed too quickly and tends to be error prone.

As a follow-up article to one we published in Spring 2019, the use of AI at two of Canada's major accounting firms MNP and Deloitte – which detailed where and how they were applying AI – we went back to two firms to see how their use of AI has evolved. This time, we spoke to

MNP Partner Darryl Humphrey, PhD, PMP, Assurance Innovation, and Bryant Ramdoo, Partner and National Audit and Assurance Innovation Leader, KPMG Canada.

ThinkTWENTY20: *Times have changed in recent years. AI has now evolved into different branches, with ChatGPT and its rivals being only one of the new technologies that has found rapid uptake. What major changes have you seen in AI technology?*

Bryant Ramdoo: There has been an acceleration in the number of organizations developing and investing in AI technologies, which was exacerbated by the global pandemic, supply chain issues, and the skills shortage in many fields. In fact, a recent KPMG Canada survey found that 37 per cent of Canadian companies and 72 per cent of those in the US are already using Chat GPT in their operations. The sophistication of AI has advanced rapidly in generative AI, including natural language processing (NLP) and computer vision, which uses text, audio, video and image files to create new content. While there have been many advancements, we know it's critical to have responsible and explainable AI with safeguards that ensure data integrity and best outcomes to support the highest audit quality.

KPMG in Canada has been at the forefront of implementing AI technology for some time. We've been working in collaboration with a world leading, Canadian-based technology firm MindBridge for many years to harness the power of AI. Building on this early and multi-year collaboration in Canada, KPMG recently announced a new global strategic alliance with MindBridge that will further embed trusted, advanced AI capabilities into KPMG's smart audit platform, KPMG Clara, responsibly and consistently to our digital audits around the world.

Darryl Humphrey: The major changes in AI technology have happened in the past 4-5 months. The public availability of generative AI tools such as ChatGPT and DALL-E (algorithms that create new digital content, such as images, video, audio, text, or code, based on existing content) has been a watershed moment. The speed at which these tools are being adopted is unprecedented and additional applications are being announced daily. The AI innovations are coming from the big players (Microsoft, Google, Meta, Amazon, etc.), from niche players (e.g., Databricks), and numerous startups.

Within the O365 ecosystem, Microsoft's Co-pilot promises to greatly reduce the friction in two key capabilities that every business needs: a) data access and synthesis and b) intelligent workflow. ChatGPT's Application Programming Interface (API) extends this benefit beyond the Microsoft application portfolio. They are definitely changing how we interact with information and produce knowledge-based work products.

Bloomberg has shown how companies can implement bespoke versions of these tools in their own environments and apply them against their proprietary data sets (Introducing BloombergGPT). Open-source options are also available from several sources (e.g., Hugging Face, Meta, CollosalAI) lowering the barriers to adoption for all. These transformative capabilities can be leveraged by businesses of any size.

ThinkTWENTY20: *How is the increasing use of AI technology affecting the way you run your business?*

Ramdoo: Audit quality is our highest priority and leveraging technology such as AI in the audit is critical to our ability to identify areas of greatest risk, especially over larger and more complex sets of data. By responsibly harnessing the power of AI, we're able to transform the audit to better serve and protect the growing needs of Canadian businesses, investors, and audit professionals. It means being able to see all the needles in a field of haystacks, and we're excited to further advance these efforts globally.

We aren't just pulling a tool off the shelf. KPMG Clara, our smart and intuitive technology platform was developed to be a foundational technology platform for KPMG to deliver audit quality. KPMG Clara evolves to embed new technologies, including artificial intelligence, blockchain, and other cognitive capabilities. Responsible AI requires a careful and measured approach, and we invested the time and resources to get it right at every step of the way creating bespoke, customized tools with some of the leading partners in the industry. That's a key differentiator for us. We are big believers in making AI available for everyone, processing data faster and with greater insights, and thereby revolutionizing the audit experience for our clients and our people.

Humphrey: We definitely believe that adopting AI in a systematic way provides a competitive advantage. To date, AI technology has primarily allowed us to do the same scope of work faster and at a higher level of quality. In some use cases such as journal entry testing, we are completing a larger scope by analyzing all transactions in the ledger. The increased capacity for analysis and knowledge synthesis has created the opportunity to evolve our audit methodology, to directly incorporate AI-enabled audit procedures. Our practitioners are better able to provide what we have termed Insight Driven Assure: *Informed decision making that exists at the intersection of professional judgement and data*.

We are expanding the AI value proposition with the initial steps for integrating the use of AI in the performance of review engagements as well. As these engagements focus on analytics and discussion, we are expecting to realize considerable efficiency and quality gains in review engagements.

ThinkTWENTY20: *What new AI tools have you added to your arsenal of late?*

Ramdoo: We are constantly looking in the market for the right tools and the best collaborations. Our new global alliance with MindBridge advances years of work we started right here in Canada to the global stage. By embedding MindBridge's advanced statistical, machine learning, and analytics technology into KPMG Clara, digital audit can analyze all of our client's financial transactions on a more granular level. Rather than relying on a sample of data, transparent or "explainable" AI-based analysis will enable auditors to evaluate the entire

population of financial transactions and identify higher-risk anomalies for further analysis and investigation.

Through the use of tools such as Alteryx, our teams can build customized client-focused bots, to quickly extract data from multiple sources and automatically cleanse, transform, and analyze it reducing human time and effort. It can also automate repetitive tasks and complex calculations helping auditors to identify trends in large datasets more efficiently and enhance overall audit quality.

We also utilize Microsoft Azure's cognitive capabilities for image and text recognition to automate many tasks our auditors historically performed manually, from vouching invoices to ensuring financial statements are mathematically accurate.

These kinds of tools have been a game changer. They offer low-code/no-code solutions to harness the power of AI directly in the hands of all our people. This helps improve our ability to focus our investigations and identify areas of greatest risk. We're not automating the audit—we're augmenting it and investing in tools that provide our people with added lens for better insights, better conversations, and better audit quality.

Humphrey: Adopting AI tools is a journey best taken in measured steps. We are definitely on our way, taking the time to incorporate what we learned in our initial deployments to our recent efforts. We have expanded our use of MindBridge to cover our entire audit practice. DataSnipper has been adopted across the firm. We are continuing to prototype ways of incorporating Natural Language Processing (NLP) tools into our workflows. Efforts are underway to understand how to gain the benefits of adding generative AI and to manage any possible risk to our clients and our firm.

ThinkTWENTY20: *In what areas are you finding AI the most beneficial and how are they helping your firm?*

Ramdoo: By employing AI responsibly into our audits, auditors are able to identify potential risks and errors in financial statements at a greater scale. AI can identify patterns and anomalies in data that may be difficult for humans to detect, providing auditors with more in-depth insights into the financial health of an organization.

For our audit professionals, that means spending time where it matters – most focused on areas of relevant risk, which can drive new insights into our clients' business and better conversations that challenge management.

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Humphrey: Audit analytics was the first AI use case we pursued, journal entry testing to be specific. We are continually working with assurance engagement teams to identify audit tests that can be better executed by incorporating AI for one or more components of the work. We are in our first year of expanding the types of analytics we produce with the AI tools to better

align with the needs of review engagements. Using generative AI to draft the initial work product is a use case we are exploring.

Our ease bookkeeping service line employs a suite of SaaS packages that incorporate AI-assisted workflows to provide a completely digital experience for our ease clients.

Our consulting teams are very active helping clients improve their businesses with AI-assisted workflow improvements and insight generation from analyses that would have been difficult to execute a few years ago.

ThinkTWENTY20: *Is it used for auditing, accounting, data analytics, consulting and internal management?*

Ramdoo: AI is transforming and revolutionizing the way we do business in all functions. Using AI in datasets lets us identify anomalies and areas of greatest risk with speed and precision. The variety, volume, and velocity of the data generated and stored today is creating a greater need for data integrity, bringing opportunities for data and technology assurance.

AI can help our professionals with assurance and compliance with acceptable standards and regulations. We have a vision of continuous audit, in which our AI tools are constantly running through the audit. And there are a lot of small use cases for daily functions, such as auto-filling an Excel formula or email, that can speed up our professionals' day. Those seconds add up, allowing us to concentrate on value-added services and raise the bar on expectations of the market.

ThinkTWENTY20: *Have you been using the increasingly popular ChatGPT? If so, how do you use it and how does it benefit your firm? What issues does it raise and how are you dealing with them?*

Ramdoo: We are continuously exploring many other use cases for applying AI within our audit practice, including in communications to clients. But we have to be careful of the information that any tool is providing, the outputs and potential security issues. As an AI model, natural language processing tools require access to large amounts of data to function effectively, and this data may contain sensitive information. There is also the risk of the model being trained on biased data, leading to biased results. Additionally, there is the risk of the model being hacked or compromised, leading to unauthorized access to sensitive information.

We are watching it closely, and carefully managing associated risks. While we're interested in co-pilot tools that autofill and augment, and speed up how our professionals work, it's imperative that we be guardians of client data by ensuring proper data security and policies are in place, and that any efforts serve to enhance public trust.

Humphrey: Team members have been using ChatGPT to quickly generate draft versions of internal communications, Excel formulas and code snippets. The emphasis is on using the tool for research or the compilation of draft content. ChatGPT is not yet used to generate audit findings or to provide assurance on an engagement. It has seen use for internal tasks and professional judgment is always required to completely tailor the work product to the need. We are very careful to not use tools like ChatGPT with client information of any sort.

The need to protect client data and our own intellectual property means our Assurance Innovation team has been tracking the maturation of large language model (LLMs) and knowledge graph tools for some time with an eye to creating a suite of domain-specific GPT tools (e.g., tax, audits, reviews). With services like Azure OpenAI becoming generally available, we will be able to build powerful generative models for ourselves and for our clients. Databrick's recent release of Dolly provides another option for developing firm-specific applications that run in our own environment using our data to build the knowledge graph.

With services like Azure OpenAI becoming generally available, we will be able to build powerful generative models for ourselves and for our clients.

ThinkTWENTY20: *Has data analytics evolved with the new technologies now at hand?*

Ramdoo: The usage of data analytics has evolved significantly over the years within audit. Previously, we were limited by compute power and often the need for a deeper understanding of coding to develop discreet analytics. Now, with the use of next-generation tools such as Alteryx, Azure Power Platform and others, you can develop machine learning algorithms, big data analytics, and customized bots to automate tasks all in a user-friendly interface — no coding required. We are now starting to see enhanced adoption in real time with increased ease of use. It's a low-code, no-code revolution.

Humphrey: Data analytics hasn't fundamentally changed with the new technologies. The statistical and algorithms underpinning the analytics are not that different today than a few years ago. What has changed is that it is much easier to access analytical tools. We are seeing the first wave of the democratization of analytics functionality. The low-code/no-code tools are more capable today, allowing a greater portion of our team members the opportunity to focus on applying their business and client knowledge to the analytics and not get bogged down in coding.

ThinkTWENTY20: *Any drawbacks? Challenges?*

Ramdoo: Audit quality is paramount and applying technology such as AI responsibly is critical to allow our audits to put continuous focus on areas of greatest risk and what matters to our clients, and the markets and public we serve. A key risk relevant to audit is "explainability." AI technology for audit cannot be a black box. Our auditors need to understand, explain, and document why the technology may be highlighting certain items and trends. That's why we believe it's important to have people working alongside AI to prompt deeper thinking and challenge where necessary. At the same time, that helps train the AI continuously through human input.

Change management is also key as AI adoption ramps up. Technology augments, but it doesn't replace the work of professionals. All new technologies challenge the status quo and require people to challenge previous assumptions. Technology is no longer the domain of specialized IT auditors, all auditors today need to be data and technology savvy, and the human element to train and develop those skills is key focus area.

Humphrey: As always, the quality and appropriateness of the available data is the limiting factor in getting value from analytics. There is a risk that team members will now be able to execute analytics that they don't fully understand how to interpret. Similarly, the outputs of GPT tools are usually quite readable and sometimes hallucinogenic. Applying professional judgement and having a quality control process will always be required. This is in line with our assertion that a human-in-the-loop approach to AI adoption is the best way to get the advantages and managing risk.

It is important to stress the need to take a measured approach to incorporating the use of tools like ChatGPT and advanced analytics. Especially when you have a large work force to train in its appropriate use. The early adopters will usually demonstrate the benefits of a new technology and that user segment should be encouraged. They should also be educated on the risks and actively participate in providing usage feedback to the business stakeholders.

Allowing time for comprehensive change management is critical to long-term success. We have expanded our innovation team to include change management specialist. This facilitates tailoring the messaging and training to each of the user segments (early adopters, early majority, etc.) that make up our assurance practice.

ThinkTWENTY20: *How are your client services evolving as a result? How are clients responding in this new environment? Are they up to speed?*

Ramdoo: In our CEO Outlook Survey, we found a large majority of CEOs around the world are prioritizing digital transformation, with 72% saying they have an aggressive digital investment strategy. It's exciting that we have the tools to help them in this journey and are rolling them out.

Some clients are more advanced than others in thinking about implementing this type of technology. While it can be a game changer across industries, adopting the technology brings challenges, such as culture change, lack of skilled resources, outdated IT architecture, concerns about security, reliability of the outputs, the rise of blockchain and the increasing emphasis on ESG.

The good news is that we are bringing the highest level of technology across the board, for large and small companies. And we're constantly feature engineering our tools for particular industries that have specific datasets or risks.

Humphrey: As a profession, we are still in the early stages of AI adoption. The impact on client services is just beginning to be felt. We are definitely seeing that our engagement teams are often more efficient. How to translate the new-found availability into additional value for our clients and ourselves is a work in progress.

This is a journey for our clients as well. More and more clients are expecting assurance engagement teams to be using AI, often explicitly requesting it in Request for Proposals (RFPs). For many clients, the AI awareness is there and they expect their professional services

providers to be knowledgeable and using these tools where appropriate. Other clients are not as far along the awareness spectrum. It is important to keep in mind that for some clients to be able to provide information digitally in support of an audit or review would require a substantive transformation of their operations. There is still a lot of paper-based and manual processes, for clients and auditors alike.

As a profession, we are still in the early stages of AI adoption. The impact on client services is just beginning to be felt.

ThinkTWENTY20: *What are the competitive pressures to adopt AI?*

Ramdoo: In our industry, a large driver is the need for more professionals in assurance and accounting. Part of the solution is adopting AI so that we can remove routine tasks and facilitate the speed in which we can obtain relevant and reliable information, which may also help point them to areas of risk or concern in the file so they can focus their efforts on areas in the audit that truly matter. Increasingly, clients and investors are looking for the level of assurance that can only be provided by employing new technologies.

As technology advances, so do we. Through KPMG Clara, our audit professionals have access to the latest capabilities, are executing audits consistently across the globe, and have a fully digital experience through a data-enabled workflow. That not only helps to enhance the quality of audits across the globe, but it also helps us attract top talent as well.

Humphrey: There is little doubt that the age of AI has arrived and those who first learn to leverage it in their services will have a huge competitive edge. There is truth in the saying that AI is not going to take away an accountant or auditor's job, it will be taken by an accountant or auditor that is leveraging AI. We have seen transformative technologies before. We have never seen one with the adoption rate of generative AI.

ThinkTWENTY20**:** *Does this mean you have to hire more technology-oriented staff or does your accounting staff have sufficient technological knowledge to handle the changes?*

Ramdoo: We took action early on to lead the industry and invest in the skills our auditors would need to meet the needs of a future of auditing. In 2018, we built KPMG Digital Academy in collaboration with Simon Fraser University to upskill our audit professionals in data and analytics, machine learning and AI. Upon successful completion of the 9-month program, auditors can earn a Graduate Certificate in Digital Analytics, with the potential to go on to obtain a Master of Science in Accounting with Cognitive Analytics. And we have embedded data and analytics training into our core learning curriculum for everyone.

We also believe in hiring in specialties that go beyond traditional accounting firms. So, we are not only continuously developing our auditors' knowledge and experience, but also augmenting our teams with professionals who have specialties in software, cloud capabilities, data science and AI, and who can bring industry best practices to our smart audit platform. We can't predict all the new needs of the future, but we are certainly ready to meet them when they arrive.

Humphrey: It is a bit of both. As the AI tools get easier to use, the level of technological knowledge required goes down. In a large assurance practice, there are always a number of

team members that are tech-savvy, the early adopters you need to get momentum. Bringing on the majority of the team members will require increased training in data literacy and the specific tools a firm chooses to adopt.

The required skill set is definitely changing. Prompt engineering was an academic term until very recently. Now it is the hottest skill in the job market. The traditional education system can't adapt fast enough. Firms will have to rely on boutique education providers that are agile enough to quickly develop content and deliver it in a way that fits in with the rhythm of the professional services firm. For firms with sufficient resources, the innovation teams will have to support engagement teams as they learn how to adapt processes to take advantage of the AI tools.

ThinkTWENTY20: *Does it really free up professional personnel for more advanced functions?*

Ramdoo: Yes. From our experience, AI enables our team to focus on audit work in higher risk areas of a file. Traditionally as auditors, we try to find that needle in the haystack. Now we've developed tech where we're identifying *all* the needles in fields of haystacks. We can pinpoint the areas of greater risk and where significant professional assessment and solutions are needed. Trust and building solutions together are key. AI tools and our collaboration with other leading organizations help us to deliver on these mandates.

We can pinpoint the areas of greater risk and where significant professional assessment and solutions are needed. Trust and building solutions together are key.

Humphrey: AI tools definitely free up time. At first, the availability gains will be spent reviewing the quality and applicability of the resulting work product. As team members gain a deeper understanding of the appropriate use cases for each AI tool, less review time will be required. This will likely happen at a different rate for each practitioner. As assurance services is a team sport, it will take some time for these efficiency gains to aggregate and their transformational impact to be realized. As the nature of a practitioner's work will change, some of that freed up time will have to be spent gaining the skills and experiences required to perform the more advanced functions.

ThinkTWENTY20: *From your current point of view, where is this going in the future, given the rapid advancement of AI into areas unimaginable just a few years ago?*

Ramdoo: We know the acceleration of adoption will be enormous and bring new opportunities. Using AI to test historically highly judgmental areas such as future cash flow estimates can be achieved through AI based prediction, models using inputs from disparate sources, reducing audit efforts and drastically increasing quality. Applying AI tools to flag transaction or events in a data-lake, in real-time, will fundamentally change how and when auditors perform their procedures to a continuous audit methodology, which could completely revolutionize the audit of the future.

We have a view that technology, including AI, has the potential to empower auditors to deliver even more value in the audit. It also creates an opportunity for the role of auditors to change as

AI tools continue to augment their work and free up time to provide new services in expanding fields. But we must remain vigilant and help ensure that AI tools are providing relevant and reliable information and that the outputs are explainable, meeting the expectations of regulators, clients, investors, and the public.

Seventeen years ago, I started as a staff with KPMG manually adding trial balances with a calculator and documenting my work on sheets of paper. When I look at what technologies our people have available today, there's certainly never been a more exciting and purposeful time to be an auditor.

Humphrey: There is no question that AI will be pervasive in assurance services by the end of the decade. The opportunities to reduce the practitioner's involvement in non-value-added tasks are just too abundant. The commercial availability of robust AI development environments means that firms will have an option of developing in-house tools that leverage their proprietary data in bespoke workflows. Firms that choose to rely on commercial products/services will have a much greater range of solutions to choose from. These solutions are likely to still be relatively narrow in focus. However, the increase in API-centric architectures will make it easier to have the point solutions work together.

ChatGPT (and GPT-4) in Accounting Education?

By Irene Wiecek, FCPA, FCA

Irene Wiecek is a Professor, Teaching Stream, Accounting Area, Director of the Master of Management & Professional Accounting (MMPA) Program and Director of the BIGDataAIHUB at the Institute for Management & Innovation at the University of Toronto Mississauga, with a cross-appointment to the Rotman School of Management.

In my humble opinion, as an accounting academic, AI-powered, large language models such as ChatGPT (and GPT-4) are here to stay – and they will keep getting more powerful.[1] That, to me, does not represent uncertainty. It represents certainty. As educators and researchers, we have a unique opportunity to think about how these technologies can be used to make a better, while still human-centred, life. And our students will and should lead the way. How do we navigate these waters? Given the proliferation of technologies such as ChatGPT (and GPT-4), how do we best prepare our graduates to enter the changing work force and add value to society?

There are many conversations going on at present about what we should do about the rise of such technologies in the classroom (with some individuals expressing positive and supportive views of the technologies and some voicing serious concerns). But the real question is not whether we should ban these from our classrooms and broader learning environments. Rather, the real question is how we help our students use ChatGPT and other similar technologies to augment human intelligence, in a responsible and ethical way, with the emphasis on the latter.

Will technologies such as ChatGPT take away jobs? Of course. But this is not a bad thing. The technologies were designed to simplify tasks and streamline workflows. It should not be a surprise then, that jobs will certainly be changing. New technologies always cause shifts in the workforce and change how many people learn and do their jobs. The flip side of this coin is that they also create new opportunities. We need to be sorting out just what these are. What human skills and competencies will be prized as we move deeper into the technology dominated space that our world is fast becoming?

In an academic environment, how we create optimal learning environments and do research is already changing, with many of us embracing more and more technologies to become more productive and glean deeper insights. Are we embracing these technologies to automate many

[1] ChatGPT is powered by GPT-3.5 models and was released in November 2022 by OpenAI. The GPT-4 model was released subsequently, in March 2023, and is currently available for a fee, through “ChatGPT Plus”. GPT-4 also powers Bing (Microsoft’s search engine).

of our own tasks and streamline our own workflows? Or are we doing so to make a better learning environment for our students? Or is it both? I believe we need to be doing both.
To truly and authentically engage in a conversation about using this technology in our classrooms, it is helpful to have a basic and common understanding of the technology itself. We will first look at what ChatGPT (GPT-3.5) is, and what it is not.

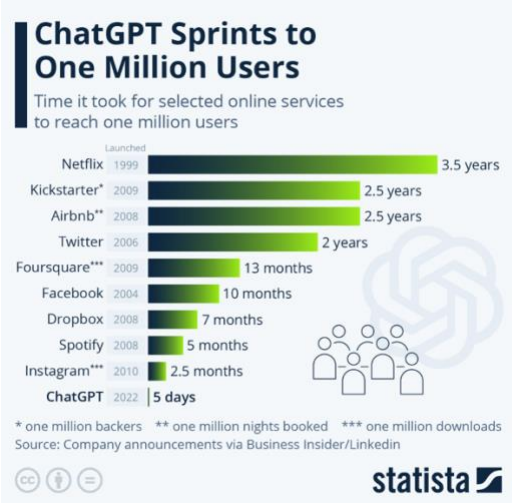
We will then have a look at (what I believe is) the inevitability of allowing it in our classrooms and, finally, how we might use Chat GPT (and GPT-4) to provide learning opportunities for our students.

What ChatGPT (GPT-3.5) Is

***It is a chatbot*.** More specifically, ChatGPT is a large language model chatbot. It is meant to simulate human-like conversations and text. GPT stands for "generative, pre-trained transformer." "Generative," because it generates human-like interactions; "pre-trained" because its outputs are based on its prior training (trained using machine learning on very large amounts of internet data and data licensed from third-party providers, only up to September 2021); and finally, "transformer" because it uses its underlying architecture to transform parts of words (referred to as "tokens") into what we would call "natural" language" (i.e., language that would naturally be spoken by humans in response to a user query or prompt).

After initial training, the model (or algorithm) is fine-tuned by using human feedback, in a process called reinforcement learning from human feedback RLHF. The model is constantly being updated and upgraded to make the output more human-like.

Its uptake has been shockingly rapid. After its release in November 2022, it gained one million users within 5 days. The chart below[2] shows a comparison with other technologies. Enough said.



[2] https://www.statista.com/chart/29174/time-to-one-million-users/.

What ChatGPT Is Not

By itself, ChatGPT (GPT-3.5) is not a search engine. It is not connected to the internet unless plugins are used to augment its capabilities (more on that later). Search engines are programmed to crawl the internet looking for things, based on a search query that is input by a user. Historically, search engines have returned a ranked list of links to sites that pertain to the query. The user must then sift through the list, perhaps visiting the linked websites, to continue to try to find an answer to the search query. It can be a time-consuming process with many dead ends and information provided that is not actually relevant to the user query.

By comparison, ChatGPT relies only on its training to respond to the user query with human-like conversations. During training, it was fed hundreds of gigabytes of data, largely from the internet and including books, the Wikipedia body of knowledge and research articles. This is somewhat similar to the way many of us learn, i.e., by reading a book for instance. When prompted, ChatGPT will rely on only what it has digested during its training, much like students might respond to questions after reading a textbook, basing their responses on what they have read in the book.

On its own, it cannot access up-to-date information. Search engines can access all data that is publicly available on the internet and can do so in real time. If you wanted to know a current stock price or the temperature outside at the current moment, a search engine can quickly find that for you. Since Chat GPT has been trained only on certain information and only up to September 2021, it does not "know" about events that happened after that date. These events were never included in its training material so it cannot have a conversation about them. This would be like asking your students to complete an in-class test on material not yet covered in a course. ChatGPT would not be able to tell you the temperature at the current moment although it would be able to tell you what the historic average temperature might be.

It is not always right, nor are its answers always acceptable. ChatGPT suffers from what are known as "hallucinations," i.e., it returns false information and is wrong in quite a few cases. Just why is this? It has to do with the way that the chatbot compiles its output (responds to a user query). Recall from above that, when prompted with a query, the chatbot is not "going out to search the internet." Instead, it is relying on its training data to compile an answer.[3]

Suppose the user asks why AI should be embedded in accounting education. ChatGPT may begin to answer by starting with the same words as the user prompt (query). Logically, the answer might start with "AI should be embedded in accounting education because it will enhance…." Now, it must decide what goes next. In general, it goes back into its training material and, given the context of the query, it looks at the probability that any given word (or part of a word) might follow the words in the sentence it has already started.

[3] This is based on a very interesting article which really helped me think about the issue of "hallucinations." A more technical discussion is contained in the article in the following link: https://writings.stephenwolfram.com/2023/02/what-is-chatgpt-doing-and-why-does-it-work/.

While the process is a bit more complex than this, in essence, it will then identify and rank possible words (or parts of words) that are likely to follow the words it already has in its sentence (considering the probabilities of each word occurring in its training material). Given its training data, if the next most likely word is "cognitive," it would add that word and start looking for the next word that would follow "cognitive." That next word might be "development" for instance. It would then continue, looking for each successive word, thus creating a sentence or two.

The algorithm is built so that it does not always use the most likely next word. This is so that the output is not always predictable. Instead, it might use a word that is likely, but not the most likely. This introduces some randomness in the responses. After all, if asked the same question, your students would not always answer in exactly the same manner. This results in interactions with the chatbot that are more interesting and human-like.

Therefore, although the algorithm has been trained (on lots of data but only up until September 2021) to mimic human language and consider context, it will not always give the same answer and the answer might not always make sense when taken in totality. Recall that, as it compiles the answer, it is adding one word (or part of a word) at a time, based on its probability of occurrence from the training data. It is not "thinking" nor "sense-making" as we humans would do. Because its training data was defined (by someone), bias in the data also exists. Ambiguity in the user prompt (query) might also create problems. Thus, the answers must be taken with a grain of salt.[4]

Students generally embrace emerging technologies – and much faster than many faculty members – especially when it helps them get their homework done or streamlines their studies.

ChatGPT is not GPT-4. So far, we have been talking about ChatGPT (which is based on GPT-3.5 models). In March of 2023, OpenAI released GPT-4 in beta mode. While GPT-4 is based on GPT-3.5, it is more powerful than its predecessors. With GPT-4, many of the limitations identified above with ChatGPT have been sorted out, mitigated or may even disappear.[5]

It can also operate with plugins (software add-ons that enhance productivity). These plugins can connect the chatbot in real time to other applications and the internet. Depending on the plugin, this could, for instance, allow GPT-4 to retrieve real time information and/or do things like book flights and order food. GPT-4 acts as a chatbot interface with these other applications

[4] The OpenAI website lists a more fulsome discussion of the limitations of ChatGPT, Introducing ChatGPT (openai.com).

[5] https://arxiv.org/abs/2303.08774 .

and services. This is a very useful augmentation of its capabilities and, by allowing the chatbot to connect to the internet and take actionable steps, its usefulness increases significantly.

OpenAI has also made the chatbot technology available to developers as an application programming interface (API), which allows developers to build applications and services using both the GPT-3.5 and GPT-4 models. For instance, OpenAI is collaborating with Khan Academy in a pilot project to use GPT-4 to power Khanmigo, to provide personalized tutoring or support to students.[6] Thus, the technology will continue to become even more pervasive.

GPT-4 also differs from ChatGPT (which is text-based only), as it is multimodal, accepting both text and image inputs.[7] GPT-4 is currently available through "ChatGPT Plus" for a fee. As such, it may not be widely used (yet) by students. GPT-4 also powers Microsoft's search engine Bing (which is available to all), allowing for a more conversation-like interface between the search engine and the user.

With the release of GPT-4, the lines between large language models (including ChatGPT and GPT-4) and search engines are starting to blur and the chatbot technology is now being integrated with other technologies (visibly or invisibly).

Is The Use of Such Technologies in Our Classrooms And Learning Environments Inevitable?
Now that we have a bit of a better understanding of the technology itself (including how it is rapidly changing and morphing and how pervasive it is becoming), we can start to think about its use in the classroom. Below are some thoughts.

Keeping up with our students in terms of adopting new technologies. If there is one thing that I have learned, in my many years at the university, it's that my students generally embrace emerging technologies (and much faster than many faculty members), especially when it helps them get their homework done or streamlines their studies. Use of ChatGPT is no exception.[8] What choice do we have, as educators, other than to similarly embrace the technologies? If not only to maintain academic integrity, should we not be using ChatGPT and GPT-4 to help us to create a better student learning experience? We could certainly use it to streamline our own workflows so that we free up our time for more individualized student interactions. I have started down this path and it can be a real time-saver for faculty members.

The changing workplace. The workplace is increasingly becoming more and more automated, with rote and predictable tasks being supplanted by technologies such as these. In fact, many accounting-related tasks currently being performed by humans are at high risk of being replaced with large language models such as ChatGPT. In a recent study looking at the impact of large language models on the labour market, the authors noted that most occupations will be

[6] https://openai.com/customer-stories/khan-academy.
[7] As an example, a picture of ingredients such as milk, eggs and flour was input to GPT-4 asking what could be made with the ingredients pictured. GPT-4 responded, noting that things such as pancakes, waffles and crepes could be made.
[8] https://stanforddaily.com/2023/01/22/scores-of-stanford-students-used-chatgpt-on-final-exams-survey-suggests/.

affected to some degree, and some professions are significantly exposed, including those such as the accounting profession (and tasks such as auditing and tax preparation).[9]

If we are hoping to prepare our graduates for entry into the workforce, we need to be cognizant of the fact that tasks in certain professions (including accounting) will change significantly. New technologies can and should be harnessed, where possible, to augment human intelligence, optimize performance and streamline processes. Machines can certainly do many (but not all) things faster and more consistently than humans and, therefore, curricula need to focus on the value that humans bring to any given role, understanding that this will continue to change as technologies such as ChatGPT become more powerful and pervasive. Our students will have to understand how to use and interact with these technologies.

We have a great opportunity to help our students understand what it means to use technologies such as ChatGPT (and GPT-4) in an ethical and responsible way.

Encouraging our students to be technologically savvy. The new CPA Competency Map (CM2.0)[10] in Canada notes that being "tech savvy" is a required skill and competency for newly qualified CPAs. If your students are CPA bound, they therefore have no choice but to walk this path but, as noted earlier, more and more jobs are requiring this skill anyway, as things continue to become more automated. What does being tech savvy mean though? That is a good question. Does it mean knowing how to use data analytics platforms such as Tableau or (advanced) Excel? That is certainly part of it. It seems like we have been on a journey the last few years to revamp curriculum to incorporate data analytics. Most schools and employers increasingly prize data analytics skills and happily incorporate them into curriculum and training. I would be surprised to see university and college level programs that do not use data analytics platforms and Excel.

How is ChatGPT different though? It is yet another tool that we can use to make better decisions and better utilize our time. Why would we argue that data analytics skills supported by technologies (such as Tableau or Excel) are good (and part of being tech savvy), but language skills supported by technologies (such as ChatGPT) are not good (not part of being tech savvy)?

Many language skills related tools are already embedded in platforms such as Word (think spellcheck).[11] Microsoft has recently announced that it will bring AI into Outlook, Word, Excel and PowerPoint.[12] According to Microsoft, the new features will be built on the same technology that underpins ChatGPT. This means that ChatGPT technologies will soon move from being "cutting edge" to being fully-integrated mainstream, everyday tools. If we allow the use of Word and Excel in our classrooms, we will, by default, be allowing the use of ChatGPT technologies once this is put in place. Some might not even understand that these well-used

[9] GPTs are GPTs: An early look at the labor market impact potential of large language models (openai.com).
[10] https://cpaleadstheway.ca/ .
[11] I note, while writing this, that Word also now checks for clarity, conciseness, inclusiveness and sensitive geopolitical references. I wonder if, pretty soon, it will check for factual correctness and suggest additions!
[12] https://www.cnn.com/2023/03/16/tech/openai-gpt-microsoft-365/index.html.

mainstream applications are supported by the ChatGPT technology as it might be behind the scenes (much like Microsoft's Bing search engine is currently being powered by GPT-4).

The challenge for academics is to decide just how deep an understanding we need when it comes to technologies such as this (whether they are embedded in other applications or not). Certainly, some basic understanding of the risks and opportunities of a specific technology such as ChatGPT is required. If academics and students do not understand the technology sufficiently, then they might not understand the risks associated with using it.

Some of the risks associated with ChatGPT include the following:

- Potential privacy breeches, not only with user data (including payment information) but also user chats.[13]
- The risk of "hallucinations" resulting in incorrect and/or fictitious responses as discussed earlier.
- Outdated information (given that the training data only goes up to September 2021). Students should understand which version of the underlying model they are using since newer versions are more reliable and have greater flexibility.
- Unintended bias in the training information, resulting in biased responses.[14]

Managing the Associated Risks When Using ChatGPT

Would your students know when and why to put the guardrails up and how they might manage the associated risks when using ChatGPT?

Rethinking academic integrity in a technology-driven world. During covid-19, many post-secondary institutions observed increases in the incidence of academic misconduct, often involving technologies. Existing control systems to monitor use of unauthorized aids and plagiarism (two prominent forms of academic misconduct) appear increasingly to be inadequate in the face of many newer technologies. Academics understand the need to continually update our control systems to combat academic misconduct, but how do we get ahead of emerging and more powerful technologies that are increasingly available to our students? It feels like a battle that we are destined not to win. Being vigilant and following through on cases of academic misconduct are extremely important (and we will continue to do so) but are there other tools that we can also use?

We could certainly update the definition of academic misconduct as needed. Some schools are claiming that use of chatbots such as ChatGPT should be cited as an academic offense (specifically linking its use with plagiarism). Others are going further, publicly banning its use[15].

[13] Indeed, on March 24, 2023, OpenAI noted that they had taken the chatbot offline to fix a bug in the open-source library which allowed both of these to occur https://openai.com/blog/march-20-chatgpt-outage.

[14] Sam Altman, CEO of OpenAI posted this on Twitter. In addition, potential social biases are noted as limitations on the OpenAI website.

[15] https://www.reuters.com/technology/top-french-university-bans-use-chatgpt-prevent-plagiarism-2023-01-27/.

Is banning the technology the answer? Where do we draw the line and which technologies are on the "wrong side" of that line?[16]

Other schools are using curriculum design as a tool to combat academic integrity issues, shifting for instance, the nature of the course deliverables, putting emphasis on handwritten essays and/or oral examinations where academic misconduct is less likely to occur.[17]
One thing that is becoming abundantly clear is that historic ways of administering, designing and delivering programs and courses are non-sustainable in a tech-enabled environment. Maintaining academic integrity using these older approaches and practices has reached a tipping point. We need to step back and look at our learning environments through a technology lens.

Careful design of curriculum is critical – more so now than ever. Which human skills and competencies would we like to encourage in a world where machines and new technologies are increasingly being employed? How can we best provide learning and assessment opportunities to allow and encourage our students to develop these, while embracing (perhaps) a fresh take on academic integrity? It is quite a challenge but certainly an interesting and worthy one.

Using ChatGPT to Provide Learning Opportunities That We Would Like to Encourage
As introduced earlier, one way to think about incorporating technologies such as ChatGPT into the classroom is to consider the skills and competencies we want to encourage in our students. These might be skills and competencies that we have always sought to embed (traditional competencies associated with accounting), or they might be new ones. Either way, we have to think about them in the context of technology, and we have to think about the human piece, i.e., how we interact with the technologies, applying unique human skills and competencies and how the technologies can augment human intelligence to achieve efficiencies and better insights.

As an example of a more traditional competence, we might consider the trust that accountants bring to decision-making, for instance around financial statements and sustainability disclosures. Accountants are trusted because they are ethical. They ensure that the data used for decision making is appropriate and that the underlying systems to produce information may be relied upon (i.e., to produce decision-relevant information).

Let's think about this in a technology-forward environment, where technologies such as ChatGPT and GPT-4 are used. How can people trust accountants if they are using technologies (or systems that are powered by technologies) they do not understand? How is this ethical?

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[16] I recall when many schools banned the use of computers and phones in the classrooms and in examinations. Many of us now encourage and support the use of computers and phones in the classroom. I would hazard a guess that we will similarly and eventually have to figure out how to effectively incorporate ChatGPT into our curricula.
[17] Asking students to write their answers using only pen and paper seems extreme to me. In my opinion, it represents a step backwards and an inelegant response to the perceived risks apparently posed by ChatGPT. The cognitive process required to formulate a response to an examination question using only a pen and paper is much different than that required when composing an answer with a computer. Using a pen and paper requires some pre-thought about the structure of the answer, whereas using an application such as Word allows for capturing ideas and subsequent re-arranging and editing to occur. The latter allows for more freedom of thought and creativity (both human centred skills that are ironically supported by using more technology). There is also the speed factor. Using pen and paper is certainly slower. This would make a difference in a time-constrained situation.

How is this responsible? If they do not have the expertise, they at least have to have sufficient understanding to be able to collaborate with someone who does understand the technology. This speaks to the earlier point regarding the need to identify a sufficient level of understanding of the technology – either to use it ethically and responsibility or to be able to collaborate with someone more knowledgeable. This would make an excellent and provocative class discussion.

Another example of a traditional concept that many accounting instructors seek to embed in accounting curriculum is skepticism. Accountants pride themselves on being skeptical – a uniquely human mindset, by the way. Accounting students can apply skepticism when evaluating risks and limitations associated with emerging technologies such as ChatGPT (and GPT-4).

We have a great opportunity to help our students understand what it means to use technologies such as ChatGPT (and GPT-4) in an ethical and responsible way. We (professors, students and professionals alike) are all trying to figure out just what this means. There is no right answer since new technologies keep proliferating and societal views of what is acceptable also continue to evolve. That's what makes this so interesting.

The more technologies proliferate the learning space (and our communities), the more we should focus on supporting the development of human skills and values (such as curiosity, creativity, agility, adaptability and the ability to collaborate)[18] in our classrooms, providing opportunities to nourish and cultivate them in the safe spaces that our classrooms should be. We have a long road ahead of us – but definitely an interesting one.

[18] https://cpaleadstheway.ca/. See CPA Ethical Mindset, page 13.

Artificial Intelligence Technologies with Implications for Assurance Services

By J. Efrim Boritz[1]

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AI technologies are being widely explored and adopted by entities to enhance their customer services, internal processes or production processes. CPAs may encounter these technologies in their workplaces or when providing advisory services or assurance services. This article describes some of the results of research we conducted to identify assurance-related technologies and tools such as those related to AI.[2] The research consisted of two main phases: 1) an information search aimed at identifying assurance-related information technologies and tools (T&Ts) and 2) a survey of practitioners to determine their familiarity with those tools and the impact of those T&Ts on service-related activities.

The information search consisted of three main elements. The first element was a search of accounting firm websites. This was followed by a search for information on other websites, identified through Google searches using a variety of assurance-related search terms. These searches were supplemented by a search of recent literature on Google Scholar, Social Science Research Network (SSRN) and the American Accounting Association's (AAA) digital library.

The search identified 37 organizational technologies for enhancing and analyzing business processes that could be subjects of assurance service or tools that could affect how assurance services are conducted. This article focuses on the AI-related T&Ts that could be subjects of such assurance services and tools. It summarizes some of the information reported in more detail in Boritz et al. (2023).[3]

The AI-related technologies identified by the searches include AI algorithms and machine learning (AI/ML), computer vision/image processing/facial recognition, natural language processing (NLP)/speech-text software, interactive conversation systems/chatbots,

[1] This article is based on research conducted by the team listed in the next footnote.
[2] Boritz, J.E., T. Bauer, K. Fiolleau, B. Pomeroy, A. Vitalis and P. Wang, *Cataloguing Assurance Related Technologies and Tools* (University of Waterloo, Working Paper) April 2023.
[3] *Ibid.*

virtual/augmented reality, automated self-assessment checklists, network platforms and social networks.[4]

The second part of the research involved a survey of CPAs to determine their familiarity with these T&T's and their assessment of the impact of these T&Ts on: a) identifying, collecting, and/or preparing data, b) analyzing data, c) assessing risks, d) obtaining an understanding of an organization's systems, processes and controls and evaluating their effectiveness (e.g., compliance with specifications and requirements) or e) obtaining and understanding of and evaluating transactions, amounts, activities, assertions, KPIs, etc. Respondents were also asked for their views about the general impact of technology on the accounting profession and which T&Ts they would be interested in learning more about.

In the balance of this article, I describe the AI-related T&Ts identified and some of the survey findings.

AI Technologies That Affect Organizational Performance and Risk

Network platforms such as Google, Uber and Airbnb, and social networks such as Facebook, Twitter, Reddit and others, gather enormous amounts of structured and unstructured data and have access to virtually unlimited computing power.[5] They not only require the use of AI technologies such a machine learning to manage the flows of information through their networks but also provide an ideal context for the development of powerful AI tools based on applications of machine learning techniques.

Because of the impact of network platforms on society across the globe,[6] there is interest in auditing the AI algorithms that the networks use.[7] For example, the Web Transparency & Accountability Project at Princeton University[8] creates online software robots that masquerade as various types of people with mental health issues in order to study the treatment received by these software robots, ranging from search results delivered by search engines to job placement responses. Similar initiatives are reportedly being undertaken at universities like Carnegie Mellon and MIT (O'Neill 2016).[9]

[4] Robotic process automation (RPA) is included among the 37 T&Ts identified, but is excluded in this article because it is not an AI, but rather, is an algorithm-guided mechanism designed to connect and automate various processes. Like many other of the technologies identified (e.g., drones, internet of things, etc.), RPA can be enhanced through the use of AI, but doesn't require it. In contrast, network platforms such as Google and social networks such as Facebook are included in this article because, at their present scale, they require the use of AI/ML to make them operational.

[5] I make a distinction between network platforms and social networks. Network platforms connect buyers and sellers of products, services or information (e.g., Google connects users who are basically sellers of access to them based on their search requests with advertisers who are buyers of access to categories of search requesters, Uber and Airbnb connect buyers of transportation or accommodation services with suppliers of such services). In contrast, social networks connect users interested in communicating, sharing information and interacting.

[6] Kissinger, H.A., E. Schmidt and D. Huttenlocher. 2021. *The Age of AI And Our Human Future*. 2021). New York: Little, Brown and Company.

[7] Governments Should Independently Audit AI Tools For Fairness: Analytics Expert (iapa.org.au).

[8] https://webtap.princeton.edu/.

[9] O'Neil, C. 2016.Weapons of MATH Destruction. New York: Crown.

AI algorithms based on machine learning may require the use of AI tools, such as those commonly used in software quality assurance (Ramchand et al., 2021).[10] In fact, it may be impossible to test such algorithms without using AI tools (see Algorithm Assurance | Deloitte Malta). For example, Certified Artificial will independently verify that products and services offered by an entity are using AI technologies and issue an embedded digital certificate to that effect (see Certified Artificial).

The World Economic Forum (WEF), AI Global and the Schwartz Reisman Institute for Technology and Society (SRI) at the University of Toronto have announced the launch of a working group to lead the development of a globally recognized certification program for the responsible and trusted use of algorithmic decisioning and AI systems (see U of T's Schwartz Reisman Institute and AI Global to develop global certification mark for trustworthy AI (utoronto.ca)). Although certification is not the same as assurance as defined by the accounting profession, it has many similar elements, the most important being the provision of confidence about the trustworthiness of a subject matter by an independent party. The ability to explain the workings of an AI algorithm is crucial to justifying its trustworthiness. Zhang, Cho and Vasarhelyi (2022) provide a case study of the application of explainability to AI algorithms (XAI).[11]

Network platforms and social networks gather enormous amounts of structured and unstructured data and have access to virtually unlimited computing power.

Computer vision/image processing/facial recognition is a subset of AI. Its purpose is to enable image processing devices to recognize objects, people and activities. It can be used for quality control in production, to recognize and record visual data and convert it into other data formats. For example, it can count objects and record the counts in a spreadsheet or database. Image processing can also be used for monitoring physical access security and continual surveillance of diverse types of locations by recognizing movement of equipment and people. Facial recognition can also be combined with chatbots to improve communications and to assess social interactions through the analysis of facial expressions. Facial recognition can be combined with eye tracking to understand human information processing behaviour, including what information is attended to during conversations or analytical processing. A major risk with image processing is, however, the creation of mis-information through the generation of erroneously or intentionally false images ("deepfakes").[12]

Natural language processing (NLP) is part of the AI domain that deals with communication between humans and computers. NLP includes text processing, voice processing and machine

[10] Ramchand S., Shaikh S., Alam I. (2022) Role of Artificial Intelligence in Software Quality Assurance. In: Arai K. (eds) Intelligent Systems and Applications. IntelliSys 2021. Lecture Notes in Networks and Systems, vol 295. Springer, Cham. https://doi.org/10.1007/978-3-030-82196-8_10.

[11] Zhang, A.C., S. Cho and M. Vasarhelyi, "Explainable Artificial Intelligence (XAI) in Auditing" (*International Journal of Accounting Information Systems*, August 1,2022). Available at SSRN: https://ssrn.com/abstract=3981918 or http://dx.doi.org/10.2139/ssrn.3981918.

[12] Researchers can now use AI and a photo to make fake videos of anyone | CNN Business.

learning and is applied in speech to text, text to speech, interactive conversation systems/chatbots, language translation, etc. NLP is suited to the analysis of unstructured textual information, which is said to make up 80% of data. NLP can be used to extract knowledge from unstructured texts, emails, records and files for evidential purposes, or to codify knowledge contained in historical records or to identify potential improvements in the understandability and informativeness of reports, filings and disclosures. NLP applications such as Kira Systems and Blue J Legal can be used for parsing contracts and other textual presentations of company information, saving time and improving accuracy of textual analyses (Agrawal et al. 2019).[13]

Interactive conversation systems (i.e., chatbots) have been in the spotlight with the introduction of ChatGPT in late 2022 by OpenAI, called a "landmark event" by the Canadian Broadcasting Service.[14] Chatbots have, however, been used by business entities in customer facing applications to provide services and support for some time. Effective chatbots increase operational efficiency, improve quality of service and enhance associated analytics.

Chatbots combined with facial recognition can also be used to control access to assets. For example, chatbots can be used to screen employees or other individuals seeking access to restricted physical facilities by combining biometric characteristics of the individual using facial recognition with information possessed by the individual by asking them questions that verify their identity. Chatbots combined with cognitive processing can be used to make judgments and arrive at conclusions based on their conversations with humans. For example, chatbots can be used to anonymously interview whistle blowers to encourage reporting of misdeeds while screening out frivolous or malicious reports. They can also be used for training purposes and there is ongoing research into the requirements and issues related to such uses. One of the worrying risks associated with chatbots is the creation of false information such as blogs, news reports and essays that are purported to be original works created by people.

Virtual reality (VR), augmented reality (AR) and mixed reality (MR) devices in the form of headsets, glasses, and even phones create visual environments that users can immerse themselves in to experience and interact with. Virtual reality refers to immersive visual environments. Augmented reality refers to physical environments that are augmented by virtual additions.

For example, Microsoft's HoloLens is an augmented reality headset that projects computer-generated images and tools onto a visor in front of the user's eyes. To the user, these images appear as holograms existing as part of the surrounding world. The holograms adapt to the environment while interacting and functioning with the user's eye and hand movements. Mixed reality is the integration of physical and virtual realities. For example, a camera at a remote site transmits images to the headset of the individual wearing it who then can interact with the remote environment in real time (see 1388-Texto do artigo-2520-1-10-20170315 (3).pdf). These

[13]Agrawal, A., J.S. Gans and A.Goldfarb. 2019. Artificial Intelligence: The Ambiguous Labor Market Impact of Automating Prediction. *Journal of Economic Perspectives* 33 (2): 31-50.

[14] ChatGPT a 'landmark event' for AI, but what does it mean for the future of human labour and disinformation? | CBC Radio.

interactions can be used to assess operations and controls at remote environments and for training purposes.

Automated checklists can automate repetitious completion of checklists to provide real time reports on the status of various risks and controls. When combined with AI-based tools and techniques, smart checklists can fill themselves out to expand the power and reduce the cost of monitoring and compliance checking of procedures and controls.

Our research identified companies offering smart checklists and self-assessment tools in several areas, including ones for use in connection with reporting on service organization controls (SOC) as well as reporting on ESG related processes and controls. For example, the Vanta platform offers tools for gathering data for a readiness assessment for SOC 2 engagements.[15] Sustainability Advantage offers a "Comprehensive, generic, sustainability self-assessment tool [that] can be used by any-size organization, in any sector, in any country."[16]

When applied to data networks, these tools can lead to more efficient and effective control testing.

AI Technologies that Affect How Assurance Services Are Conducted

The T&Ts discussed in the previous section not only affect organizational processes, but may also affect how assurance services are conducted. AI algorithms based on machine learning and neural networks can be used to monitor, analyze and evaluate systems/and processes. AI Algorithms can also be used to understand and evaluate the AI algorithms used by organizations to generate data. Through the addition of intelligence to continuous control monitoring (CCM), continuous auditing and process mining, AI algorithms can enhance continuous learning about system behaviour from the data processed by the system. When applied to data networks, such tools can lead to more efficient and effective control testing. AI algorithms based on machine learning can be used to understand and evaluate transactions and balances by relating them to other data recorded in internal data bases and external networks.

Audit firms are reportedly using image processing to scan documents such as invoices to extract key data from them as part of their audit procedures.[17]

As mentioned previously, NLP can be used for parsing various textual presentations of company information such as contracts, policies, disclosures, reports and regulatory filings. By combining with RPA, NLP can perform repetitive tasks to analyze documents to draw conclusions about risks, controls, evidence, etc., to identify inaccurate or misleading information. Auditors are reportedly using NLP for textual analysis of contracts, leases, mortgages and other documents to identify exceptions for human review.[18]

[15] Automate security and compliance, starting with SOC 2 (vanta.com).
[16] Assessment Tools | Sustainability Advantage.
[17] Almufadda, G. and N. A. Almezeini. 2022. Artificial Intelligence Applications in the Auditing Profession: A Literature Review. Journal of Emerging Technologies in Accounting 19 (2): 29-42.
[18] *Ibid*.

Interactive conversation systems/chatbots can be used to gather data for control and audit purposes. For example, they can be used to "interview" operational staff periodically to obtain answers to internal control questionnaires. They can also be used to gather recurring data for spreadsheets and databases.[19]

Chatbots can be combined with facial recognition to enhance the communication between audit team members and the chatbot as a way of co-ordinating, centralizing and recording audit related communications. Chatbots combined with cognitive processing can be used to make judgments and arrive at conclusions based on their data bases and conversations with humans. For example, chatbots can be used to guide an auditor's assessment of management's estimates and to interview assurance service personnel as part of the review process. As noted in the discussion of organizational technologies, chatbots can also be used for training purposes and there is ongoing research into the requirements and issues related to such uses.

VR can be used for remote auditing; for example, it can be used for inventory observation (Smart Glasses Wearable Headsets Enhance Audit Quality - KPMG United States (home.kpmg) and plant inspections when biohazards are an issue (https://www.thepigsite.com/articles/eyesucceed-wearable-technology-and-augmented-reality). Thus, virtual/augmented reality can be used to review and evaluate processes, related risks and controls.

As discussed previously, automated (smart) checklists can automate repetitious completion of checklists to provide procedural guidance to assurance providers and help in the evaluation of processes and controls. Such self-assessment tools can enable the completion of risk and control assessments by client personnel, reducing the time and cost of performing such assessments by internal and external assurance providers who can verify and test those checklist applications as part of their risk assessment process when providing assurance on an entity's internal control.

Discussion and Conclusion

It is generally recognized that the economic and social impact of technology (especially AI) is significant, changing the way business is or will be done.[20] Our survey suggests, however, that CPAs are not familiar with most of the AI technologies discussed above.[21] Survey respondents attributed the greatest overall impact to virtual/augmented reality and the second greatest impact to AI/ML. The lowest overall impact was attributed to computer vision/image processing/face recognition, while the second lowest impact was attributed to interactive conversation/chatbots. Ironically, interactive conversation, in its GPT incarnation, was recently

[19] The most advanced use of generative chatbots such as ChatGPT involves using chatbots to generate information from its training database, and in the future, the internet.

[20] Holmes, A.F. and A. Douglass. 2022. Artificial Intelligence: Reshaping the Accounting Profession and the Disruption to Accounting Education. *Journal of Emerging Technologies in Accounting* 19 (1): 53-68

[21] *Op.cit*, *Assurance Related Technologies and Tools*.

identified as a technology that is likely to significantly affect the jobs of accountants and auditors, among others.[22]

Our discussions with practitioners suggest that most of the T&Ts used in business processes are often not within the scope of financial statement preparation or audits. Thus, preparers and auditors of the financial statements appear to be shielded from the sophisticated systems of the very companies/clients they serve, as the financial processes of these organizations are legacy systems involving little innovation. On the one hand, this enables financial statement preparation and verification to be relatively unaffected by the technology-based upheavals in organizations' business models themselves. On the other hand, this shield may prevent assurance professionals from seeing the potential for value adding advisory and assurance service opportunities arising from the organizational technologies underlying current and emerging business models and new automated tools and techniques.

Users may be familiar with technology but not the language that goes with it, which could cause difficulty in explaining problems discovered

If accounting firms wish to expand into new assurance areas, then additional knowledge and skills will need to be developed or obtained through other means to allow them to leverage their assurance knowledge in these new areas. Assurance on system and organization controls may require detailed knowledge of IT-related processing features, tools and controls. Some services may also require or benefit from knowledge of and ability to use advanced automated tools in the provision of assurance services. Although some of the technologies discussed above may not be applicable to small CPA firms or sole practitioners, a recent workshop on the impact of AI on the accounting profession included a presentation by a partner in a small firm (less than 20 employees) on the AI-enhanced tools she used to leverage her CPA competencies and enhance her efficiency and effectiveness in a variety of service areas.[23]

In their comments, survey respondents identified challenges with T&T adoption, digital transformation and change management. Some expressed concerns about the slow progression of digital transformation in corporate accounting and finance departments in Canada, resistance from accounting leadership or the adoption of semi-digital processes. Others noted that it is difficult to keep up with the pace of change and risks associated with adoption of new technologies (e.g., increased complexity, over reliance, data corruption, cyber risk). Also, digitalization can make tasks that were done effectively and efficiently in the past less effective and less efficient and reduce understanding of the cycle of business activity. It appears that there is a need for best practices and guidance related to automation and other technologies and the potential impacts of various technologies including both their potential utility and risk.

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[22] Eloundou, T., S. Manning, P. Mishkin and D. Rock. 2023. GPTs are GPTs: An Early Look at the Labor Market Impact Potential of Large Language Models. *(*Working Paper, University of Pennsylvania, Open AI, Open Research) available at 2303.10130.pdf (arxiv.org).

[23] Boritz, J.E., and T.C. Stratopoulos. 2022. JIS Workshop on AI and the Accounting Profession: Views from Industry and Academia (December 6, 2022). Available at SSRN: https://ssrn.com/abstract=4295282 or http://dx.doi.org/10.2139/ssrn.4295282.

In connection with education and training, practitioners expressed a need for a common language and terminology that is easily understood by those outside the computer science field. Users may be familiar with technology but not the language that goes with it, which could cause difficulty in explaining problems discovered. Some practitioners are concerned that students who rely solely on software may not have a grounding in manual processes, while others emphasize the importance of updating training programs to ensure CPAs have a robust understanding and working knowledge of new technology. Some point to the need for more specialized skills as technologies become more prevalent and some question whether CPAs trained as accountants are expected to become IT experts.

Beyond Traditional Technology Competencies

In summary, organizations' adoption of new technologies can create performance concerns, data privacy and security concerns, as well as demands for compliance with various regulatory requirements. These concerns create a market for assurance engagements to facilitate adoption of new technologies, as well as ensure compliance with regulations. Assurance services, such as the SOC branded services aimed at testing and evaluating controls at service organizations, create models for assurance provision (i.e., creating a description of a system, process or data set; auditing the description to ensure its completeness and accuracy; auditing the described system process or data set to determine its consistency with the description and achievement of suitable evaluation criteria; and providing information on the results of tests).

Many of the technologies and tools surveyed have already been adopted by some private and public sector organizations, and some have advanced to a second or third generation capable of enhancing organizations' products and services and automating their processes. The actual current experience in the accounting profession with many of these technologies and tools is, however, still limited.[24]

The competencies required by many of the technologies and tools discussed in this article may be beyond the professional accountant's traditional technology competencies related to financial measurement, disclosure and related controls. Specialists may be required to work with the technologies and tools discussed in this paper as suggested by Boland et al. (2022).[25] Although accounting firms are involved in disseminating information about many of these technologies and tools, and offering advisory services aimed at deploying them in organizations across the globe, they are still experimenting with them when it comes to incorporating them within their assurance processes. Part of the rationale for the slow uptake of some of the tools may be due to concerns about the uncertain economic benefits of investing in them, risks of misapplying them, costs of training personnel in their use and maintenance, and scarcity of human resources with the required competencies.

[24] Boland, C.M., N.B. Galunic and M.G. Sherwood. 2022. Technology-Based Audit Tools: Exploring the Current State and Future Direction (Working Paper, University of Wisconsin, PCAOB, University of Massachusetts) Available at SSRN: https://ssrn.com/abstract=4258373 or http://dx.doi.org/10.2139/ssrn.4258373.

[25] Ibid.

Security Implications of ChatGPT: Preview of a Cloud Security Alliance Whitepaper

By Eric. E Cohen, CPA

Eric E. Cohen, CPA, is a technologist with a passion for collaboration toward the goal that "a piece of business information, once entered into any system, anywhere, never needs to be retyped as it moved through the business reporting supply chain." He's also a prolific author, engaged in virtually every effort to standardize accounting and audit data, a national expert to a wide variety of standards efforts, and co-founder of XBRL.

This article provides an overview of the forthcoming paper by the Cloud Security Alliance (CSA)[1] on the security implications of ChatGPT.[2] ChatGPT is an artificial intelligence (AI)-based chatbot that has gained widespread popularity and adoption, leading to the release of other similar products by competitors. While ChatGPT has many impressive capabilities, there are also concerns about its limitations, weaknesses, and potential security risks, and especially privacy risks. The CSA paper aims to explore these issues and their impact on the cybersecurity industry.

The topic of ChatGPT and its security implications is of great importance and relevance to the readers of *ThinkTwenty20*. As an emerging technology that in a very short period of time has already had a significant impact on the consumer market, ChatGPT is poised to disrupt many industries, including cybersecurity and accounting/auditing. The forthcoming CSA paper is a crucial resource for understanding the risks and opportunities associated with ChatGPT, and readers are encouraged to read and comment on the draft as it is made available.

As an emerging technology that in a very short period of time has already had a significant impact on the consumer market, ChatGPT is poised to disrupt many industries, including cybersecurity and accounting/auditing.

ChatGPT has already made waves in the media and popular culture, with its rapid adoption by users and the release of competing products. However, this popularity has also led to concerns about privacy, bias, and accuracy. For example, the recent ban of ChatGPT in Italy highlights the challenges of protecting user privacy in the age of AI. Similarly, the ongoing debates around the accuracy and reliability of ChatGPT's responses show the need for greater education and awareness about its limitations and weaknesses.

The CSA paper promises to provide a high-level overview of the implications of ChatGPT for the cybersecurity industry. While the paper is still in internal review and its contents subject to change, some key themes are likely to emerge. These include the need for greater transparency and accountability in the development and deployment of AI-based chatbots, the importance of educating users about the limitations and weaknesses of ChatGPT, and the potential impact of ChatGPT on businesses and industries. Readers can stay tuned for more updates on the CSA website and *ThinkTwenty20* blog and LinkedIn posts.

This article will cover three areas. It will begin with some background on ChatGPT and the new competitive AI environment that has disrupted the world since November 2022; it will then discuss the CSA paper. Finally, a call to the financial professional.

Background on ChatGPT

As noted, the Cloud Security Alliance (CSA)[3] will soon be publishing a draft paper for public comment on the topic of *Security Implications of ChatGPT*. The *ThinkTwenty20* community is strongly encouraged to read and comment on the draft when it is released, as well as to take a more active role in support of collaboration as CSA and other organizations continue to actively monitor and assess the benefits and risks of this emerging phenomenon. What is ChatGPT and what is this phenomenon?

On November 30, 2022, a new force was unleashed on the world, AI interaction with ChatGPT. AI, of course, is not new.

- AI has been a field of computer science for seventy years.[4]
- Apple showcased the vision they called Knowledge Navigator[5] in 1987. The vision was of a conversational personal assistant/chatbot, able to figure out the question rather than response to what was said, source and visualize resources, interact with the user and their contacts and much more.
- While the Apple Newton was not an incredible financial success, interactive AI with Apple's Siri, Google's Assistant and other voice-controlled personal assistants brought people closer to interacting with technology through voice exchange.
- The large firms have experimented with AI for contract review and journal entry work, amongst other projects, for many years.
- Companies like Mindbridge Analytics Inc.[6] have provided AI solutions for smaller audit firms; Mindbridge was founded in 2015.

As impressive as any of these milestones were, it was the release of OpenAI's ChatGPT that brought artificial intelligence to the masses and acted as the catalyst to the possibilities and challenges. ChatGPT did so in large part through the utter simplicity – by "putting the cookies on the bottom shelf where the kiddies can get at them," as one old radio preacher used to put it. ChatGPT made it so easy that anyone could do it, as long as they could get an account and the system wasn't overloaded with other requests. It did so by acting as an easily accessible "chat bot," a metaphor somewhat like instant messaging with a very smart, very fast, very

considerate, but often fallible computer acting as friend and guide – the user types and the AI types back in an ongoing dialogue. Although anyone can use it, getting the best results from it does require some experience and skill.

Many users have been treating ChatGPT like a search engine, which ChatGPT is not; it is a "large language model" that leverages a large amount of training material to interact with a user "in a conversational way. 'GPT' stands for *generative pre-trained transformer*. The platform can take input from the user and information on which it is pre-trained and transform it to generate responses. Or, as ChatGPT notes when asked, "what do the individual words generative pre-trained transformer mean?"

Sure, I'd be happy to break down the meaning of each word in "Generative Pre-trained Transformer."

Generative: This refers to the ability to generate new content, such as text, images, or audio. In the context of natural language processing (NLP), a generative model is one that can produce coherent and fluent sentences or paragraphs that resemble human writing.

Pre-trained: This refers to a type of machine learning technique where a model is trained on a large dataset before being fine-tuned on a specific task. Pre-training allows the model to learn general features and patterns in the data that can be useful for a variety of downstream tasks.

Transformer: This is a type of neural network architecture used in NLP that was introduced in the paper "Attention is All You Need" by Vaswani et al. (2017). Transformers use self-attention mechanisms to allow the model to focus on different parts of the input sequence, making them particularly effective for tasks such as language translation and text generation.

So, when we put it all together, "Generative Pre-trained Transformer" refers to a specific type of machine learning model for NLP that is capable of generating new content, has been pre-trained on a large dataset, and uses a transformer architecture.

"The dialogue format makes it possible for ChatGPT to answer follow-up questions, admit its mistakes, challenge incorrect premises and reject inappropriate requests."[7] As it is not a search engine, but a conversationalist based on its training, ChatGPT would confidentially provide answers to just about any question that does not fall beyond the borders of what OpenAI's guardrails for decency might consider appropriate. This means ChatGPT will confidently provide facts, references and other details that might be completely made up, although consistent with information in its training.

Nonetheless, more than just engage in conversational dialogue, ChatGPT has gone beyond most of our expectations, demonstrating its prowess in creating poetry and prose, organizing information, writing and debugging programming code, engaging in philosophical discussions, explaining and tutoring, and untold other capabilities. The author has personally engaged in theological discussion, British television trivia challenges, home repair advice, refreshing knowledge of a foreign language and translation of documents, creation of python programming code and XBRL instance documents, review of written materials, and a wide variety of other topics. ChatGPT has proven to be an amazing resource – but also has consistently made-up scholarly references, provided lyrics to songs it didn't know, fabricated biographies and otherwise given information that, if not treated with professional skepticism, could cause problems to the people who rely on the output.

The dialogue format makes it possible for ChatGPT to answer follow-up questions, admit its mistakes, challenge incorrect premises and reject inappropriate requests.

Nonetheless the rate of adoption by users of OpenAI's versions has been unprecedented, with the fastest-growing user base[8] of any consumer application in history. It has been featured heavily in the press, demonized and lauded in social media, and found its way into the plots of television shows. In March 2023, it was not only was the focus of an episode of the "irreverent" cartoon television series *South Park*, it was also given co-author credit[9] for an episode. So rabid has been the interest to gain access to ChatGPT, that hackers and scammers have flooded the market with ChatGPT extensions and apps that contain malware.[10]

This wild acceptance of OpenAI's ChatGPT has led to the acceleration of the release of other like products, both based on ChatGPT and licensed (such as Microsoft's use in Bing and Edge) and competitive, often with short-term detriment to the competitors[11] caught off-guard by the adoption of OpenAI's release and acceptance of ChatGPT. Microsoft licensed OpenAI's ChatGPT technology, as well as OpenAI's AI image creation tool DALL-E-2. Google released *Bard,*[12] Baidu released *Ernie*, Anthropic released Claude,[13] and numerous other alternatives have arisen.

With the quick rise and hype around the new tool, education around the limitations and weaknesses has been important to promote. All of the AI chatbot offerings[14] attempt to inform users that they are not magical front-ends to search engines, dealing only in the unvarnished and absolute truth. They "may occasionally" [ed: often] "generate incorrect information."[15] They "may occasionally produce harmful instructions or biased content." They may have limited knowledge, only as up to date as the materials they are trained on; the basic OpenAI ChatGPT has "limited knowledge of world and events after 2021."

Nonetheless, the news and social media are filled with users complaining about the perceived errors and problems. In addition, motivated users are trying to see if they can push ChatGPT beyond guardrails put in place to limit the impact of the known limitations. In addition, the

training materials included personally identifiable information (PII) and copyrighted materials, which may be exposed during use. There is evidence, however, that despite attempts to protect users' privacy (concerns about issues such as privacy have led to ChatGPT being banned, at least temporarily, in Italy[16]). The people of Italy are finding ways to circumvent the protections in place for them, using virtual private network technology (VPN). Analysts note that driving users to VPN technology may increase the risk of privacy breaches as VPN solutions introduce their own incremental privacy risks.[17]

From an Enterprise point of view, management has been working overtime to develop policies related to the use of OpenAI and its alternatives. Employees are thrilled at the new efficiencies where OpenAI can create and review their code, help them in developing logical arguments and crafting presentations, organize activities, and accelerate and improve the quality of their processes. Despite guidance from OpenAI that anything typed may be reviewed by the AI trainers[18] or even become part of the training for future versions,[19] trade secrets have been exposed.[20]

Understanding that ChatGPT is only a subset of AI is important, as the accessibility of ChatGPT means we are trying to use it for tasks for which other areas of AI may be more suitable.

CSA Paper: Security Implications of ChatGPT

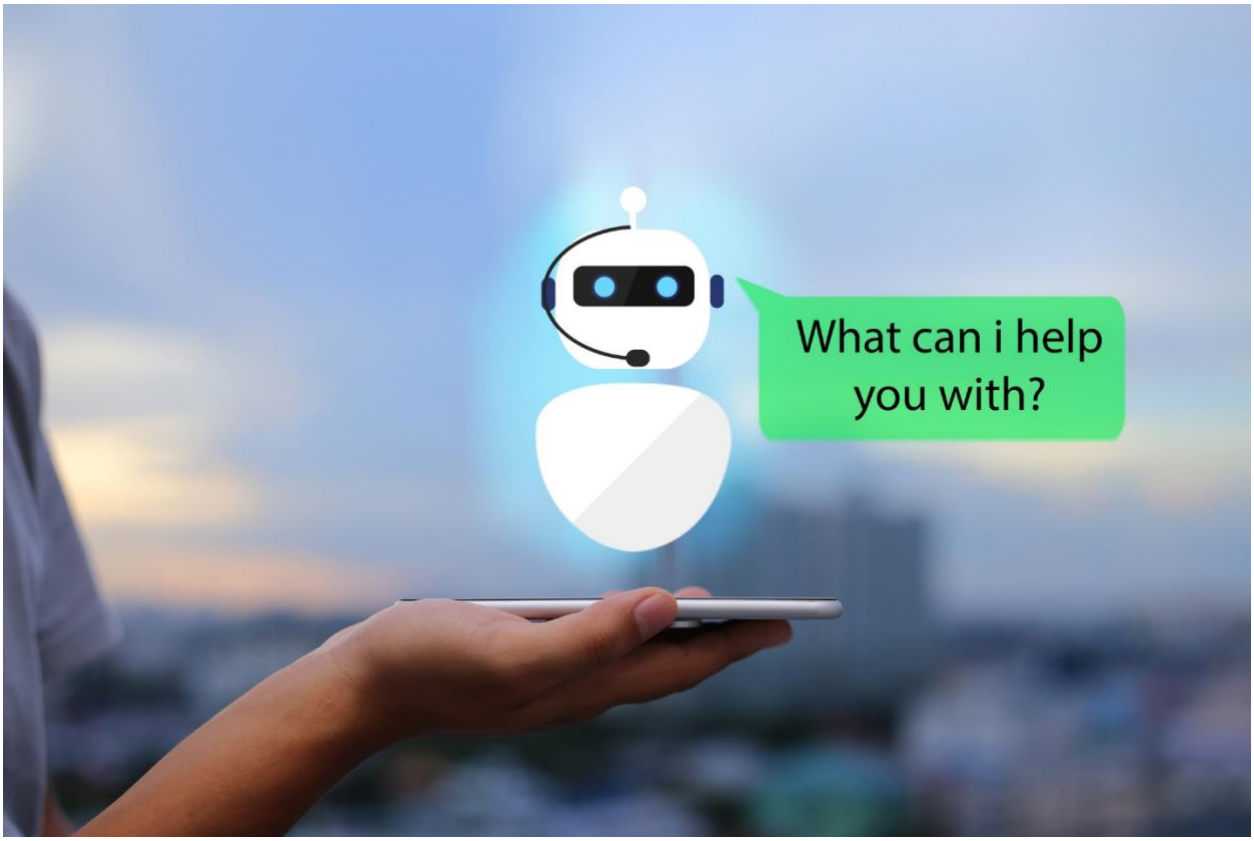
As a response to the phenomenon described above, the CSA provided an "open call to interested people to engage with them in the development of a paper that provides a high-level overview of the implications of ChatGPT in the cybersecurity industry." This paper is in final editing before a release for public comment. Quotes from the paper, as above, are based on an early internal release, and may not reflect the final draft. However, as the goal of this article is to provide background on the forthcoming CSA paper to help ThinkTweny20's readers to better assess it, preview quotes will be offered to help in that process. I will limit any larger excerpts to my personal contributions to the paper, although they are also subject to change or removal. Throughout this article, when I refer to "the author," I refer to myself; I am only one contributor of many to the CSA paper, fortunate to have collaborated with a stellar group of experts in security and AI.

A simplified outline (using my own words) of the paper:

- Introduction to ChatGPT
- How malicious actors can and are using ChatGPT
- How defenders can leverage ChatGPT
- How use of ChatGPT can be attacked
- How to help businesses cope with and use ChatGPT securely
- Things to know about generative AI – it has limitations and quirks of its own

- Conclusion
- References
- Appendices
- Additional resources

Let’s look at some of these sections.



Introduction to ChatGPT

The paper provides an overview of artificial intelligence and ChatGPT. Along with basics about what it is and how it works, the paper demonstrates that the place of ChatGPT in the larger world of AI, including GPT’s place as one of many generative foundational models.

Understanding that ChatGPT is only a subset of AI is important, as the accessibility of ChatGPT means we are trying to use it for tasks for which other areas of AI may be more suitable. As the old adage goes for financial professionals, we love spreadsheets, and so “Excel is the accountant’s hammer, and every task looks like a nail.” Even in the field of “generative AI,” the GPT model may not be the best model for the job.

This section ends with a brief discussion of other tools and solutions that shook up the security world. It is helpful to know that dissemination of both neutral and less benign tools has raised concern. While past performance is no promise of future results, the paper discusses a notable example of a hacking tool that evolved from concerns over becoming a pervasive enabler of exploits to a commercial provider of security solutions.

How Malicious Actors Can and Are Using ChatGPT

The second section focuses on "the potential risks associated with malicious actors using AI technologies to enhance their toolsets." ChatGPT has proven to be a powerful tool to write and review code. The good guys can use it to look for and remediate weaknesses in software patches, smart contracts and other code-based items of interest. That also means the bad guys can do the same. Threat actors can very efficiently analyze code and develop exploits. While the basic tools that unskilled malicious actors can use for breaching computers and networks have been broadly available for many years (leading to the term "script kiddies,"[21] ChatGPT has lowered the bar for customized malware.[22]

While many of the sections are aimed at an audience more IT technically oriented than the typical financial professional, each is an interesting read, with the most familiar to the reader being the potential of ChatGPT to facilitate phishing; in particular, "effortlessly craft[ing] legitimate-looking emils for various purposes." Our readers are probably aware that most scam emails will be filled with spelling mistakes and other inconsistencies; ChatGPT can customize, correct and create far more realistic communications.

How Defenders Can Leverage ChatGPT

The next section speaks about the steps management can take to leverage ChatGPT to defend against attacks. The author has appreciated the opportunity to hear from other participants in the paper's creation of their new efficiencies and successes with ChatGPT. Two of the sections of this part cover the ability to turn technical terms into English (or the language of the reader) and to explain updated security patches and change logs. We have all experienced having to "drink through a fire hose," perhaps most common when we try some new software or service and are faced with an agreement we must check before we can move forward. Having a tool that can summarize, look for red flags and otherwise find exceptions and explain it in easier-to-understand terms can take a lot of pain out of adopting and updating systems.

The author does not consider himself a programmer, although I teach students programming basics and a programming mindset. ChatGPT can do in seconds what used to take me a week when creating code. It can read a Python program and rewrite it in another programming language. Using simple textual prompts, ChatGPT can write regular expressions (regex) or otherwise take the complexity out of tasks.

In a space as rapidly changing and volatile as this – where almost every day a new opportunity or exploit or competitor to ChatGPT is named (at the time of this writing, an open-source attempt to make GPT-4 fully autonomous called Auto-GPT[23] has temporarily grabbed the attention of the press) – AI as the solution to keep up with cybersecurity in general and AI in particular makes a lot of sense – using "fire to fight fire," as it were.

How Use of ChatGPT Can Be Attacked

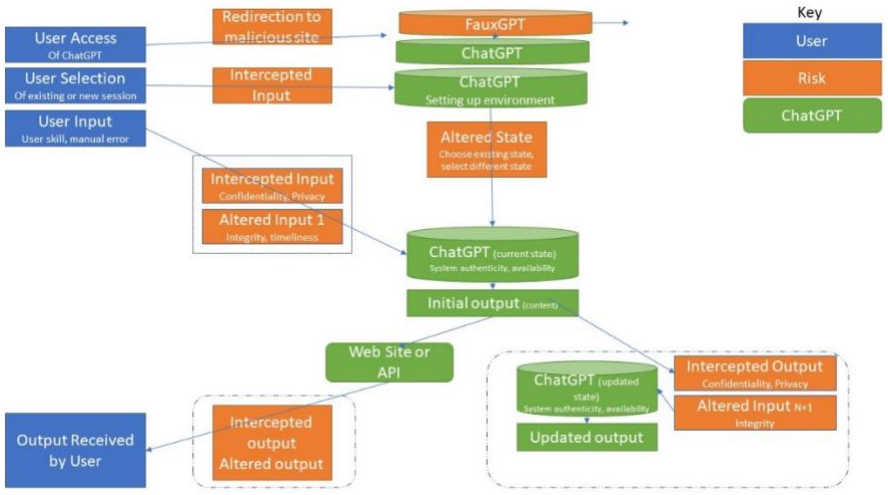
As users, organizations and nations begin to rely on the output of tools like ChatGPT, attackers have more incentive to intercept or alter that output. There are many ways to affect the end results, from impacting the core of the training content it relies upon, to finding ways around

the guardrails and protections, to intercepting and changing the sources, parameters, inputs and intermediate/final outputs between the user (whether a person typing directly into some manner of interface or using the application programming interface (API) to hook systems together.

In the diagram below, the author illustrates some of the touch points between the user and ChatGPT and the potential points for attack.

From my initial contribution, I note that "in the following illustration, many of the potential risk points to exploit the interaction between the user and ChatGPT are illustrated. This is highly simplified, but focuses on:

- Establishing a connection between the user and Cha.tGPT
- Starting a new conversation, or selecting an existing conversation to leverage the prior exchange.
- Entering user queries.
- Receiving and trusting that responses have maintained their integrity as the result of the query



During the intense and relatively brief time period we worked on drafting the paper, numerous changes to the ChatGPT environment have arisen. In late March, OpenAI announced initial support for "plugins" in ChatGPT. This enables ChatGPT to "interact with APIs defined by developers, enhancing ChatGPT's capabilities and allowing it to perform a wide range of actions."[24] However, it also opens even more access points for attack.

How To Help Businesses Cope with And Use ChatGPT Securely

The paper's next section includes initial guidance on security considerations while adopting ChatGPT. There is coverage, for example, of implementation leveraging Microsoft's Azure OpenAI Service for more control of the interactions and information.

Things to know about Generative AI – it has limitations and quirks of its own

The last section focuses less on attacks and more on the nature of generative AI technology itself. For example, the protections put into place by OpenAI, Microsoft or other solutions may sometimes limit the use. Many of us that have tried the Microsoft implementation of ChatGPT have asked what we may have thought was an innocuous question, but received feedback that "I prefer not" to continue the discussion from the chatbot. An AI expressing its "preference" for something is a state of anthropomorphism that may be troublesome, as helping users understand what AI is – and is not – is less stable when lines like that are blurred.

Conclusion, references, appendices, resources

Finally, the paper ends with a conclusion, references and resources, and appendices, including an interesting table illustrating areas of risks.

Call to Action

Will upcoming versions of ChatGPT take our jobs and lead to the extinction of mankind, as forecast by some, be the tool that will work hand in hand with tomorrow's professionals, or be a passing fancy? How can your organization or the ones you work with develop appropriate usage guidelines and policies? And how do we keep up with an area that is so rapidly changing?

This paper will be a great start and the CSA will appreciate your feedback. Plans for keeping this paper up to speed and beginning work on guidelines and policies are in place and can benefit from your help and support.

For more information, watch the CSA web site and the ThinkTwenty20 blog and LinkedIn posts. For a related panel presentation from CSA's March 28 *Cloud Threats and Vulnerabilities Summit 2023,* including the author as panelist, the video is available at the time of this writing from the CSA web site.[25]

Addendum:

This article was written during the writing of the paper and the final is now available at https://cloudsecurityalliance.org/artifacts/security-implications-of-chatgpt. My article does diverge a bit from the paper… but more to come. EEC

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[1] https://cloudsecurityalliance.org/.
[2] https://chat.openai.com/.
[3] https://cloudsecurityalliance.org/.
[4] https://www.livescience.com/49007-history-of-artificial-intelligence.html.
[5] https://www.youtube.com/watch?v=umJsITGzXd0.
[6] https://www.mindbridge.ai/news/mindbridge-founded-to-prevent-the-next-bernie-madoff-using-artificial-intelligence/.
[7] https://openai.com/blog/chatgpt.
[8] https://www.reuters.com/technology/chatgpt-sets-record-fastest-growing-user-base-analyst-note-2023-02-01/
[9] https://en.wikipedia.org/wiki/Deep_Learning_(South_Park), https://www.imdb.com/title/tt27035146/?ref_=ttep_ep4.
[10] https://www.digitaltrends.com/computing/chatgpt-extensions-apps-could-be-malware/.

[11] Google: https://www.reuters.com/technology/google-ai-chatbot-bard-offers-inaccurate-information-company-ad-2023-02-08/ Baidu: https://fortune.com/2023/03/16/baidu-ernie-bot-chatgpt-china-ai-share-price/.
[12] https://bard.google.com.
[13] https://www.anthropic.com/index/introducing-claude.
[14] See also Google's Bard and the help page at https://support.google.com/bard/answer/13275745?hl=en.
[15] https://chat.openai.com/chat.
[16] https://www.reuters.com/technology/italy-lift-curbs-chatgpt-if-openai-meets-demands-by-end-april-data-protection-2023-04-12/.
[17] https://techround.co.uk/news/after-italian-government-bans-chatgpt-vpn-searches-skyrocket/.
[18] https://help.openai.com/en/articles/6783457-what-is-chatgpt.
[19] https://help.openai.com/en/articles/7039943-data-usage-for-consumer-services-faq.
[20] https://adguard.com/en/blog/samsung-chatgpt-leak-privacy.html see also https://www.cnn.com/2023/04/06/tech/chatgpt-ai-privacy-concerns/index.html.
[21] https://en.wikipedia.org/wiki/Script_kiddie.
[22] https://www.recordedfuture.com/i-chatbot.
[23] https://github.com/Significant-Gravitas/Auto-GPT.
[24] https://platform.openai.com/docs/plugins/introduction.
[25] .

Cutting through the Hyper Sensitivity of OpenAI's ChatGPT-4 AI Generation

By Mark O'Connor, CPA, CMA

Mark has over 30 + years of experience in Financial Management, technology business development and change management. He has advised governments and business clients in building their business technology architecture, their processes, and their data. He qualified as a CPA, CMA with the office of the Auditor General of Canada.

Several technology veterans, for example Microsoft founder Bill Gates, have suggested that ChatGPT is the next big defining moment in technology. Could this be as big as the Internet itself? Could this be as big as the ubiquitous use of spreadsheets for financial analysis, forecasting and analytics? Could this make written documentation available world-wide in up to 95 languages?

The hype of this new tool has several business leaders who also signalling dangers of moving too fast and even risking or dooming the human race. These billionaire leaders include those with direct or indirect investment into the research to the development of the releases of OpenAI's Chat GPT. Both types of these leaders are proponents of their polar stances and may have business interests and influences in each of their public stands and product announcements.

The hype has become dramatic, and the rhetoric sounds suspiciously like an influencer's conspiracy theory as it evolves in the media and in the history of the technology and the control of this product. If we attempt to cut through the hype, we see that these leaders all agree that those chat-bots functions will be it is or will be a great way to:

1. Make brief, concise, and clear summaries of large documents in several languages.
2. Save in the creation of technical documentation.
3. A way to quickly assemble disparate documents, policies, processes.
4. Automate and consistently provide customer assistance with company products and services, while adapting dynamically to feedback.
5. Use in education and business management forums either now or when it has been proven to be safe, unbiased, up-to-date history wise and ethically trained and produced. Or to train, control, normalize or socialize to a way of thinking or form a preferred ideology?

OpenAI's ChatGPT-4, a chatbot system uses AI based machine learning approach build collections of text documents to train a bot to generate text into a conversation or banter. AI

training uses a Large Language Model (LLM) which holds and indexes a very large quantity of appropriately phrased sample of unstructured text data (e.g., a narrative technology or process description or story). This AI LLM expertise data is used to generate responses to queries made to the Chat-bot.

The intention is that the documents produced are deemed, by proponents, to be public domain and should not in, under these assumptions, be in violation of copyright. Therefore, this is not plagiarized.

Microsoft Release Announcement February 28th 2023; Bing and ChatGPT and Windows 11

SOON HUNDREDS OF MILLIONS OF WINDOWS 11 USERS CAN GET ACCESS TO THIS INCREDIBLE NEW TECHNOLOGY TO SEARCH, CHAT, ANSWER QUESTIONS AND GENERATE CONTENT FROM RIGHT ON THEIR WINDOWS TASKBAR.

Some educators, weighing into their plagiarizing concerns, are using ChatGPT detectors to catch students, or reduce marks for using CHATGPT when it has been banned as a tool by the institution or teacher. The same argument was made, in the day, for calculator use during an examination.

The ultimate responsibility, as per proclamation from OpenAI Chat GPT-4, is that protecting copyright rests with the individual producing the text narrative and their organization publishing the AI generated document. Since the GPT versions are so new, it is unlikely Generated AI copywrites have been effectively tested in the courts. Our initial and early testing findings on just a few cases found that generated text and diagrams have minimal references of source documents available to verify the proclaimed responsibility for copywrite protection. Many of our internet-based research tools normally use references to allow for confirmation and exploration of ideas. A good example is Wikipedia.

Chat GPT is in a test mode therefore caution is important in some cases. We have several questions. This may be one of the largest public technology tests conducted. Until better and fully transparent testing is done, published and accepted, could user's trade secrets, private or classified data be supplied to populate the LLM? Could a browser or applications supplementing LLMs latch on to ChatGPT queries? Could there be LLM additions made which contain market information or private information that is not intended for disclosure? It could be important, during this early testing, to try to get assurances for protecting your data or avoid using ChatGPT intake processes with sensitive, private or confidential information. It is a good practice in testing this tool to review ChatGPT query response for inappropriate disclosure before distribution or publication of your generated text.

Documents used in the base LLV document set are generally sourced from the Web. The LLM patterns and content are used to communicate the ideas, as well as process facts and knowledge. ChatGPT-4 contains data that can be dated or out-of-date by a couple of years. Therefore, it is already dated and incomplete content. We are told in the details we have that GPT-4 does not contain current history about visionaries, obituaries from the daily news, or tweets. We don't know what GPT generally knows and what it does not know.

In our research and case testing of ChatGPT-4, we made some queries of the local building code requirement for a beam span material and sizes. The query responded with a reference to a table in the Building Code of Ontario (which was noted but not provided). No further simple ChatGPT queries for the table would produce the values in that published table. That key table is probably not posted in the internet as it is somewhat guarded from being used by qualified professionals. The Building Code book must be purchased or borrowed from the public library, in this case, because the regulations intend that a qualified person, probably with building engineering credentials or training, read and to safely interpret the data – the old saying being that a little knowledge can be a dangerous thing.

Without strict control, standardization and assurance from the Chat-bot suppliers there are risks and concerns of the chance that bots causing damage.

Based on how new this is, few people have a grasp of what GPT can or cannot do. What is not transparent and not independently assured at this stage of the AI applications are details about:

- The actual content of the training models. The content inclusions and exclusions, any biases and any private information that could be present or extracted from user AI training material content and later used by the public LLM. We do have vague claims from the developers but not yet independent assertions. This April 2023 The Canadian Federal Privacy Watchdog announced that they are probing OpenAI ChatGPT technology for the possibility of potential personal privacy breaches of this type. The US Federal Trade Commission is also investigating of similar complaints.
- How do we know that the LLM material is politically, religious and culturally neutral and not aligned with any particular extremities? Can certain lobby groups, parties, industries, companies, hedge funds and public relations groups intentionally add their own “spin” through supplementing with their own LLM training?
- Testing performed and certification assurance provided help to ensure that confidential trade secrets or private information are not disclosed in the LLM.
- Are there assurances that there are no inappropriate and deceptive biases introduced into the Chat-bot responses?
- In the case of dynamically updated LLM training, as in browser-addon versions of the Open AI base the users own, email could be used in the chatbot training.
- It has been difficult for some public AI Chat services to keep up or scale up to ChatGPT-query demand. Google has added their own ChatGPT as an addon to the Chrome Browser while Microsoft has their AI chat in Bing. The Twitter-Tesla group has indicated that it is independently working on its own AI Chat bot.

At this stage, given these concerns, the tool should be used with these aspects, factoring in and with consideration for, disclosure business risks.

While there is general agreement that the ChatGPT AI Generation method is extremely powerful, easy to use and a game changer, some industry ethical and safety advocates, government agencies and individuals who that the there has not been enough testing. There

are calls for a moratorium of new versions of ChatGPT for the next six months or until weakness are identified published and, where possible, resolved.

Like with any new technology, there will be early adopters/evangelists, those who will never use the technology and those who need conclusive demonstration of a return on investment and the technology's safety.

Architect the Company's Machine Learning

Large or forward planning organizations may want to architect there own AI ChatGPT LLV version that automatically injects their organization's ideology and business caring culture into the process guides and communication generation.

Adopting a new way to work and Change Management

Like any new technology there will be early adopters / evangelists, those that will never use the technology, and those that need conclusive demonstration of a return on investment and technology's safety. If you try to use the product for a small non-critical safe use case and document the objectives and effects you can quickly establish a well informed position on this fundamental change to your business and skill experience.

Try it for Yourself

The following links can help you to phrase your queries to achieve the kind results that you aspire to. At the time of publication, free for trial:

- CHATGPT from OpenAI -https://chat.openai.com/chat.
- Addon to your Chrome browser: https://merlin.foyer.work/.

ChatGPT is an artificial intelligence chatbot developed by OpenAI and released in November 2022. It is built on OpenAI's GPT families of large generative language models and has been fine-tuned using both supervised and reinforcement learning techniques. It has been growing in popularity with amazine speed.

The Future of The Accounting Profession

By ChatGPT

The accounting profession is one of the oldest and most stable professions in the world. It has, however, has gone through a significant transformation over the years, with the increasing use of technology and automation. In this article, we will explore the future of the accounting profession and the potential changes that will affect the profession in the coming years.

The Impact of Technology

Technology has had a significant impact on the accounting profession in recent years. Automation has enabled accountants to spend less time on repetitive tasks such as data entry, bookkeeping and reconciliations. The use of cloud-based accounting software has also made it easier for accountants to collaborate with their clients and other professionals.

The trend towards automation is likely to continue in the coming years, with the increasing use of artificial intelligence (AI) and machine learning (ML) in the accounting profession. AI and ML can automate tasks that were previously done by humans, such as data analysis and decision making. This can save accountants a significant amount of time and improve the accuracy of their work.

The use of blockchain technology is also likely to become more prevalent in the accounting profession. Blockchain can be used to create secure, transparent and tamper-proof ledgers that can be accessed by multiple parties. This can simplify the process of accounting for complex transactions, such as those involving multiple parties or international borders.

Overall, technology is likely to play a significant role in the future of the profession. Accountants who are able to adapt to these changes and incorporate technology into their work are likely to be more successful in the coming years.

Changes in Client Expectations

Client expectations are also changing. Clients are looking for more than just compliance and regulatory services from their accountants. They want strategic advice and guidance on how to improve their businesses.

This means that accountants need to be able to provide more value-added services to their clients. This could include advising on tax planning, financial forecasting and business strategy. Accountants who are able to provide these services are likely to be in high demand in the coming years.

In addition, clients are also looking for more personalized services. They want their accountants to understand their business and provide customized solutions that meet their specific needs. This means that accountants need to be able to build strong relationships with their clients and have a deep understanding of their businesses.

The Changing Role of the Accountant

The role of the accountant is also changing. As technology takes over more repetitive tasks, accountants will need to focus more on providing strategic advice and guidance to their clients. This means that accountants will need to have a deep understanding of their clients' businesses and be able to provide customized solutions that meet their specific needs.

In addition, accountants will need to be more proactive in identifying opportunities for their clients. This could include identifying new revenue streams, cost-saving opportunities or potential risks to the business. Accountants who are able to provide these types of services are likely to be in high demand in the coming years.

Accountants will also need to have strong communication and interpersonal skills. As the role of the accountant becomes more advisory, accountants will need to be able to communicate complex financial information in a clear and concise manner. They will also need to be able to build strong relationships with their clients and other professionals.

The Changing Business Model

The business model of the accounting profession is also changing. Traditionally, accounting firms have billed clients based on the number of hours worked. This model is becoming less popular, however, as clients look for more predictable and transparent pricing models.

Alternative billing models are becoming more popular. This could include fixed-fee pricing, value-based pricing or subscription-based pricing. These models provide clients with more predictability and transparency.

In addition, the use of technology is also enabling accounting firms to offer new and innovative services. For example, some firms are now offering real-time accounting and financial reporting services. This allows clients to access their financial information in real-time, providing them with up-to-date information on their business performance.

Firms are also increasingly using data analytics to provide clients with insights into their business performance. This could include identifying trends, highlighting areas of opportunity or risk and providing recommendations for improvement.

Overall, the changing business model of the accounting profession is likely to be driven by client demand for more predictable and transparent pricing, as well as the increasing use of technology to offer new and innovative services.

The Impact of Regulation

Regulation is another factor that is likely to have an impact on the future of the accounting profession. As the business environment becomes increasingly complex, there is likely to be greater scrutiny of the profession. This could include increased regulatory oversight, stricter reporting requirements and more stringent auditing standards.

In addition, there is likely to be increased demand for ethical and socially responsible accounting practices. This could include greater focus on sustainability reporting, environmental reporting and social impact reporting. Accounting firms that are able to demonstrate their commitment to ethical and socially responsible practices are likely to be more attractive to clients and other stakeholders.

Regulation is a key factor that is likely to impact the future of the accounting profession, both internally and externally. Let's take a closer look at each of these.

External regulation

External regulation refers to the rules and standards that are set by government agencies and other external bodies. As the business environment becomes increasingly complex, there is likely to be greater scrutiny of the accounting profession. This could lead to increased regulatory oversight, stricter reporting requirements and more stringent auditing standards.

For example, after the financial crisis of 2008, there was increased scrutiny of the accounting profession and a push for greater transparency and accountability. This led to the implementation of new regulations such as the Dodd-Frank Act in the United States and the European Union's Audit Regulation and Directive.

These regulations have had a significant impact on the accounting profession, and have led to increased reporting requirements, enhanced auditor independence and greater public disclosure. As the business environment continues to evolve, it is likely that there will be further regulatory changes that affect the accounting profession.

Internal regulation

Internal regulation refers to the rules and standards that are set by accounting firms themselves. Accounting firms are increasingly recognizing the importance of ethical and socially responsible accounting practices, and are implementing internal regulations to ensure that their staff adhere to these practices.

For example, many accounting firms have established internal codes of conduct that outline the firm's values and principles. These codes of conduct typically cover areas such as confidentiality, objectivity and professional competence.

In addition, many accounting firms are also implementing sustainability policies that outline the firm's commitment to environmental and social responsibility. These policies typically cover areas such as reducing the firm's carbon footprint, promoting diversity and inclusion and supporting local communities.

Overall, internal regulation is important in ensuring that accounting firms are able to demonstrate their commitment to ethical and socially responsible practices. This can help to build trust with clients and other stakeholders, and can also help to attract and retain top talent.

The Future of Regulation

Looking ahead, it is likely that regulation will continue to play an important role in shaping the accounting profession. As the business environment becomes increasingly complex, there may

be a need for new regulations that address emerging issues such as cybersecurity and data privacy.

In addition, there may also be a need for greater international cooperation on accounting regulations. As businesses become more global, there is a growing need for consistent accounting standards across different countries and regions.

Overall, regulation is likely to be an important factor in shaping the future of the accounting profession. Accounting firms will need to stay up-to-date on the latest regulations and ensure that they are adhering to both external and internal standards.

The Role of Education

As the profession evolves, there will be a greater emphasis on education and professional development. Accountants will need to keep up with the latest developments in technology, regulation and business practices.

This means that accounting education programs will need to adapt to meet the changing needs of the profession. This could include incorporating more technology and data analytics into the curriculum, as well as greater emphasis on soft skills such as communication, problem-solving and critical thinking.

In addition, professional development programs will also be important for accountants. This could include ongoing training in areas such as data analytics, AI and ML and blockchain technology.

Education is going to play an increasingly important role in shaping the future of the accounting profession. As technology continues to change the nature of the work that accountants do, education will be key to ensuring that they have the skills and knowledge they need to be successful in their roles.

One of the key areas where education will be important is in the use of technology. As we have discussed earlier, technology is transforming the accounting profession in a number of ways. Accountants will need to be familiar with the latest technologies and understand how to use them effectively in their work.

This could include learning about cloud computing, data analytics, AI and ML and blockchain technology. Accounting programs will need to incorporate these topics into their curriculums to ensure that students are prepared to use these technologies when they enter the workforce.

Another important area where education will be important is in soft skills. As the role of the accountant evolves, there will be an increased emphasis on communication, problem-solving, and critical thinking. Accountants will need to be able to work collaboratively with colleagues and clients, as well as have strong analytical and problem-solving skills.

Accounting education programs will need to incorporate opportunities for students to develop these skills. This could include group projects, case studies and other experiential learning opportunities.

In addition, there may be a need for new types of education and training programs in the future. For example, as the importance of sustainability reporting and social impact reporting grows, there may be a need for specialized training in these areas.

Overall, education will be critical in ensuring that the accounting profession is able to adapt to the changing business environment. Accounting programs will need to be agile and responsive to changing industry needs, and professional development programs will need to be ongoing to ensure that accountants are able to keep up with the latest developments in the profession.

The Evolving Role of the Accountant

In conclusion, the future of the accounting profession is likely to be shaped by a number of factors, including the increasing use of technology, changing client expectations, the evolving role of the accountant, the changing business model of accounting firms, the impact of regulation and the importance of education and professional development.

Accountants who are able to adapt to these changes and incorporate technology into their work, provide value-added services to their clients, build strong relationships and demonstrate their commitment to ethical and socially responsible practices are likely to be more successful in the coming years.

As the business environment becomes increasingly complex, the role of the accountant is likely to become more important in providing strategic advice and guidance to clients. The accounting profession is likely to continue to evolve, and those who are able to adapt and stay ahead of the curve are likely to thrive in the years to come.


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Twenty-First Century Corporate Reporting:

Effective Use of Technology and the Internet

How and why do corporations use the internet for reporting to their stakeholders? How and why has corporate reporting extended beyond financial reporting to include environmental, social, and governance (ESG) reporting and even integrated reporting. The major drivers of modern reporting have changed, to include data driven decision making, big data, and advanced analytics, as well as the use of electronic representations of data with tools such as XBRL.

Here we explore the various vehicles for using the internet, including social media and blogs as well as corporate websites and the websites of regulators. And we delve into the impact of portable devices, like smartphones and tablets.

Corporate reporting on the internet is changing fast because of changes in technology and stakeholder expectations. Companies are having a hard time keeping up. This book offers a roadmap to follow–a roadmap to start on now. Most importantly, the book lays out a strong case for integrated reporting and shows how reporting on the internet is ideally suited to the creation of integrated reports.

This book is of interest to executives in charge of the reporting function for their companies, students of accounting and management, and to serious investors and others with a strong interest in corporate reporting and the direction in which it is headed.

Gerald Trites is a CPA with a history of writing and publishing and a unique background. He was a partner in KPMG for seventeen years, and a tenured professor of accounting and information systems for ten. He also served for twelve years as director of XBRL Canada. He has published twelve books and numerous articles and papers. He worked as a research associate for the Canadian Institute of Chartered Accountants and served as chair of the Auditing Standards Board. He currently serves as editor-in-chief of ThinkTWENTY20 magazine, a publication he started in 2019 with the objective of publishing well-researched articles of substance.