Future of Business and Finance

Sean Stein Smith

Blockchain, Artificial Intelligence and Financial Services

Implications and Applications for Finance and Accounting Professionals

Springer

Future of Business and Finance

The Future of Business and Finance book series features professional works aimed at defining, describing and charting the future trends in these fields. The focus is mainly on strategic directions, technological advances, and challenges and solutions which will affect the way we do business tomorrow. We also encourage books which focus on the future of sustainability and governance. Mainly written by practitioners, consultants and academic thinkers, the books are intended to spark and inform further discussions and developments.

More information about this series at http://www.springer.com/series/16360

Sean Stein Smith

Blockchain, Artificial Intelligence and Financial Services

Implications and Applications for Finance and Accounting Professionals

Springer

Sean Stein Smith
Lehman College, CUNY
Bronx, NY, USA

ISSN 2662-2467 ISSN 2662-2475 (electronic)
Future of Business and Finance
ISBN 978-3-030-29760-2 ISBN 978-3-030-29761-9 (eBook)
https://doi.org/10.1007/978-3-030-29761-9

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

This book is dedicated to my family, who continuously support and encourage me in all of my professional and academic endeavors.

Contents

About the Author

Sean Stein Smith is an assistant professor of Accounting in the Economics and Business Department at Lehman College. His research includes blockchain applications, cryptoassets – including but not limited to decentralized cryptocurrencies, stablecoins, and other blockchain related applications. Additional areas of focus include robotic process automation and its impact on accounting, as well as how integrated financial reporting can change disclosure and reporting at various organizations. He has presented his work at dozens of national and international conferences, both practitioner and scholarly in nature, including the Annual Conference of the American Accounting Association on multiple occasions. Sean also serves on the Advisory Board of the Wall Street Blockchain Alliance, where he also leads the Accounting Working Group, focusing on the creation and dissemination of thought leadership connected to the blockchain and financial services space. He is also the chairperson on the New Jersey Society of CPAs Emerging Technology Interest Group, spearheading efforts and initiatives to more effectively integrate emerging technology tools into practice. Bringing this expertise to Lehman, and in addition to serving as a faculty liaison to the Freshman Year Initiative, Sean is in the process of developing a blockchain certificate project in conjunction with the School of Continuing Education and Professional Studies. Sean will be serving as the E.C. Harwood Visiting Research Fellow at the American Institute for Economic Research during 2019, and has had books published, or that are in the publication process, at Taylor and Francis, Springer, and Palgrave-MacMillan.

Part I

Definitions, Overview & Information for Practitioners

Foreword & Introductory Information

1

There has been a large amount written and spoken about artificial intelligence, blockchain technology, and the implications that these technology tools will have on the accounting profession in both the near and long term. One just has to look at the frothy and volatile nature of the cryptocurrency, on top of the introduction of hundreds of new coins, for potential evidence of market conditions overheating. Such a large amount of analysis and speculation may appear to some as the symptoms and stages of a bubble or over excitement in the marketplace, but upon further review this does not appear to be the case. While technology has played an important role in the accounting and finance profession since the beginning of the computer age, there are several fundamental characteristics that differentiate these technologies from earlier iterations. What this book attempts to do, however, is to not only breakdown these sometimes amorphous technology concepts, but also analyze the implications of these technology tools and platforms, and to finally project possible implications of these tools on the financial services profession.

Finance and accounting may seem like they are only subsets of the economy, and depending on where you are reading this book from, might not even seem like worthy of an entire book in the context of blockchain technology. The majority of blockchain and artificial intelligence analyses have, instead, focused on the broad based implications of how these technologies will revolutionize not only business, but also society. Accounting and finance, despite the fact that they are only pieces of the broader economic and society, have an outsized impact on the economy and marketplace. The transmission of credit, safeguarding of information, and accurate reporting of financial information and data form the basis for how business decisions are made, both in local and global situations. Communicating this information, and doing so in an encrypted manner appears to be more important than ever in a world buffeted by data breaches and hacking; both technologies appear to have potential to facilitate this process.

Lastly, one of the core purposes of putting this text together was to not only discuss these wide ranging implications and technologies, but to provide readers suggestions and guidelines moving forward. Put simply, blockchain and artificial

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_1

intelligence have the potential, and to a certain extent already are, transforming how the financial services industry engages with the business and stakeholder community. Taking a broader view of the accounting and finance industry, however, and the implications for improved communication, data management, and data encryption become clearer. Suggestions, recommendations, and insights connecting these technological forces with the current status of the accounting and finance fields form some of the key takeaways of this book. Regardless of what niche of finance or accounting readers you find yourself employed within, there are going to be applications and suggestions you will find helpful contained herein.

Technology is coming for the profession, will have a tremendous impact, and it lies with us to be ready. Consider this book a great way to not only keep yourself informed, but to help you get started addressing these important topics.

A Splash of Cold Water

This book focuses on blockchain, artificial intelligence, and the applications that these technologies will have for the financial services profession and the individuals employed therein. With billions invested, and thousands of very smart and motivated people working on these solutions there will invariably be products and services that succeed in the marketplace, but there will also – without a doubt – have many false starts. As of the writing and editing of the book during 2018 and 2019 there was already some speculation that perhaps the hype and excitement around cryptocurrencies and blockchain may have very well outpaced the functionality of the technology at this time. For example, an August and September 2018 issue of the Economist focused on the let downs and perhaps over excitement that has embraced the cryptocurrency and broader blockchain space. At the core of the idea, cryptocurrencies, including the headline generating Bitcoin, were started as an attempt to address what were perceived to be fundamental and core failings of the existing financial system. Namely, the centralized nature of transaction processing and data verification creates a scenario in which hackers and other nefarious market actors do not even have to search for where valuable data is stored. Rather, the very centralized nature of data storage and processing creates a scenario in which organizations are consistently put on the defensive, with a track record of consistent hacks and data breaches.

Framed in this context, the cryptocurrency movement has failed in its initial ambition – to displace traditional fiat currencies such as the USD and Euro, due to price volatility, lack of efficiency with regards to transactions processing, and a lack of merchants willing to accept cryptocurrencies as a medium of payment. That said, and even acknowledging the lack of applicability for currency purposes in the cryptocurrency marketplace, there is an appetite for investment in this space on the side of clients. Especially during the runup in price during the end of 2017, investor interest seemed to rise alongside the prices of Bitcoin and other various cryptocurrencies; financial professionals have a fiduciary duty to explain what exactly this means for investing and investment options. Put simply, accounting and financial

services professionals must be able to offer objective and realistic advice in terms of both investing in these options as well as realizing just how much work is left to build out the technology in these spaces. Even as the cryptocurrency buzz and excitement has faded from the headlines alongside the drop in price of Bitcoin and other cryptocurrencies, blockchain has superseded many of the conversation in terms of excitement and investment.

Blockchain, however, does not represent a magic solution or investment either, and that is the fact that does appear to be slowly entering the market conversation. Following the interest, investment, and dozens of conferences focused on blockchain applications across industry lines, the technology does appear to be entering the trough of disillusionment that often accompanies emerging technology forces. Numerous projects have been launched and funded, with IBM taking a leading role in assisting other organizations, but based on recent market evidence, the vast majority of these projects remain in pilot or beta phases. That said, there does remain a large amount of interest in this area which will invariably drive increased interest in the blockchain space at large. Understanding these emerging technologies, acknowledging the reality that many of these technologies are still in pilot or beta phases, and connecting these technologies to the financial services landscape are responsibilities every practitioner must understand and be aware of.

From Hype to Proof

Blockchain my have burst into the mainstream consciousness as a result of the dramatic increase in the price per bitcoin of 2017, but 2018 could be categorized as the trough of blockchain enthusiasm. Many of the programs that had been launched during the heyday of bitcoin euphoria during 2017 or during the initial part of 2018 either remained in the pilot phase of production or had been cancelled altogether. Be it a result of the costs associated with implementing and maintaining blockchain systems, the complexity of integrating blockchain platforms with current ERP technology, or the fact that many blockchain based options are not as appropriate or efficient, many of the initiatives were cancelled or shelved during the year. This decline in interest and project progress was compounded by the dramatic collapse of cryptocurrency prices during the year, further fueling doubts of the validity or appropriateness of blockchain for enterprise based solutions. These are the facts on the ground, and as of this writing the price via cryptocurrencies seems to have stabilized, albeit at lower levels than those achieved during 2018 and 2019. Even though blockchain projects and program continue to be launched, the focus of different blockchain projects and initiatives have diverted some exclusively cryptocurrency projects to those more enterprise based. Possibly not as scintillating as projects that are based around or connected exclusively to different types of cryptocurrencies these projects are increasingly connected to enterprise and industrial applications.

Taking a step back and observing the blockchain space from a higher level and broader perspective this transition and development tends to make sense from a financial and nonfinancial perspective. First introduced with collaborations and

partnerships between international shipping organizations with spearheaded by IBM and Maersk, this coordination and associated efficiency gains created a possible paradox for the blockchain ecosystem. On one hand, the spectacular rise in the price of bitcoin and other cryptocurrencies did attract substantial investments and interest from individual and institutional players, including large amounts of coverage in mainstream media. Of course, and as usually occurs in the marketplace, and especially one such as nascent and emerging as blockchain itself, the dramatic rise in price of cryptocurrencies was only exceeded by the collapse of different cryptocurrency prices in 2018. Mirroring the price action of different cryptoassets, the drop in price did lead to the cancellation, shelving, and postponement of numerous projects. Price targets and forecasts that had been made during the enthusiastic increase in prices were quickly revealed to have been made with incomplete information, or at the very least in the heat of the proverbial moment. Even as institutional fund flows continued to enter the space, including the establishment and refinement of, there was a sentiment that dominated the airwaves that perhaps blockchain was not all it was initially cracked up to be.

Such a perspective is incomplete, and not to mention inaccurate, especially when objectively analyzed and viewed in the face of just what is going on the blockchain ecosystem. Be it represented by advances in smart contracts, the rise of decentralized exchanges and other business models running on blockchain based solutions or applications, or the establishment of different payment options allowing cryptocurrency to be used. Additionally, the continued development and building out of non-bitcoin blockchains such as the Ethereum has allows the investment and development of a number of different options to enter the broader marketplace. For example, blockchain can be used as an infrastructure system and platform to either replace or substantially augment current enterprise systems, but that is only the proverbial tip of the iceberg. Healthcare, transportation and logistics, education, food safety and treatment, retail, intellectual property and intellectual assets all represent prime candidates for improvement via utilizing blockchain based solutions.

Cryptocurrency may have launched the initial interest and enthusiasm for blockchain technology itself, but the price declines that have impacted the marketplace during 2018 should not dissuade either individuals or institutions from investing in more robust solutions. This book mentions and discusses cryptocurrencies, obviously, as they are (and will continue to have) an impact on the financial services space. That said, an appropriate way to think about the complicated relationship between cryptocurrencies, blockchain, and other enterprise applications is to imagine cryptocurrencies as one tool in the proverbial toolkit used by practitioners. Instead of focusing on the price action linked to different cryptocurrencies, the focus has continued to shift toward the enterprise applications for the technology itself. Interest and investment into differentiated blockchain technology solutions are already entering the marketplace, so it appears to merely be a matter of time before broad based enterprise adoption is fully underway.

Figure 1.1 breaks down and summarizes some of the core concepts related to blockchain, without focusing too much on the technical side of things, and instead highlighting the practical components that professionals need to be aware of going forward.

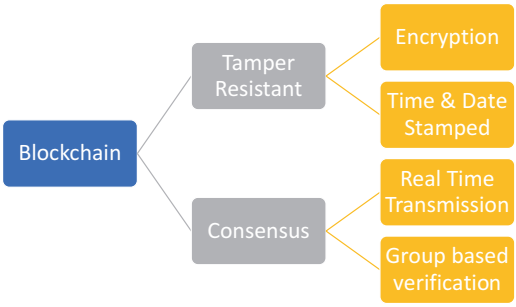

Fig. 1.1 Blockchain basics

Being Future Ready

Now, right after that splash of cold water that hopefully dampened any unreasonable enthusiasm or buzz that may have been generated due to the numerous headlines lets take a look at some underlying themes that are holding true. That said, there is another fact that must be acknowledged before we dive headfirst into this rapidly moving and changing technology landscape. In order for financial services professionals to evolve and develop into the strategic advisor and business partner so often cited as the end goal for the profession the current level of technological integration is simply not enough. As the broader business landscape continues to evolve and shift at an accelerating pace, it is increasingly obvious a bifurcation is occurring. Within the financial services landscape, which includes everyone from CPAs to investment bankers, there are practitioners and firms who appear to be proactively moving toward where the landscape is shifting, and there appear to be practitioners who are not doing so. Although the transition may be challenging and difficult for some organizations and individuals, becoming future ready, or future proof is not something that can be perceived or evaluated as an optional task, or something that can delegated to a chief technology officer.

Rather, the shift toward being future ready or future proof is one that may have been initiated by technology, but is much broader in scope. From Amazon to Tesla, customers and consumers are increasingly comfortable with technology, customized data, and real time analytics based on this information. Financial data, by contrast, especially the types of information that is reported to investors and the marketplace, has not changed with the rest of the business landscape. This would be a problem in any event, but is compounded by the following reality that has been enabled by the rapid technological integration of business at large. In many situations, especially as software and platforms become easier to use and more readily accessible in terms of cost, the necessity of employing a traditionally certified financial professional may be dropping. Of course, there are specific legal, reporting, and compliance based work that only a certified professional can perform (such as a CPA signing off on an audit), but analytics and forecasting can, and increasingly is, done by non-CPA, non-CFP, and non-CFA holding practitioners and firms.

Blockchain and artificial intelligence represent powerful technologies that have the potential to launch a paradigm shift in the financial services professional landscape, but they are merely symptoms of a much more radical and comprehensive change. Financial services professionals are, almost without exception, going to have become more adept, forward thinking, and able to use technology in the course of doing business and serving clients. Pushed to the forefront by the rollout of blockchain and artificial intelligence, the financial services landscape, including both the individuals and practitioners therein must evolve and keep pace with the rest of the changes in the broader business landscape.

The Technology Landscape

While it may seem like technology has emerged rather recently as a disruptive and powerful technology force the reality is that technology has, over the history of the accounting profession, played an integral role. Put simply, the modern accounting function and marketplace as it currently exists would not exist as it currently is constituted without the integration and implementation of various technology tools. That said, the integration and implementation of tools and platforms such as blockchain options and artificial intelligence represent a fundamental change in how accounting practitioners interact with the broader business landscape. While technology has been a part of the business environment since the development of computer options, the actual implementation of these tools has primarily been focused on automating and increasing efficiency of current processes. Process improvement, achieving increased efficiencies through technological augmentation of existing methods, and driving increased profitability as result are recognized as standard business practices across industry lines. That said, even as technology becomes increasingly integrated into how businesses operate and are evaluated by the marketplace, accounting firms and professionals appear to be playing the proverbial catch up game with regards to technology.

Artificial intelligence, for example, is evident throughout the marketplace and consumer applications such as Alexa, Siri, and Cortana, and other numerous tools that individuals use everyday but are not necessarily aware that AI is a component of. The speed and process improvements associated with technology tools are also evident across different industry lines and geographic regions. Market leading organizations, including but not limited to Amazon, Google, Tesla, Tencent, Alibaba, and Netflix have implemented AI tools and platforms to assist with increasing both customer satisfaction and operational performance. Gathering information, making effective utilization of different sources of information, and being able to leverage this data to make better business decisions form the basis for possibly a sustainable competitive advantage. Information has been cited, in both practitioner and academic publications, as a potential source of competitive advantage moving forward in terms of both profitability and operational effectiveness. Simply making use of information, however, appears to be insufficient to successfully complete and thrive in an increasingly global and digital business landscape.

Blockchain, regardless of the accounting specific implications of this technology platform, is already being adopted and implemented across different industry lines, including some of the largest multinational organizations across the globe. Examples of organizations that have already implemented blockchain technology include, but are not limited to FedEx, British Airways, UPS, and other organizations with supply chains that span different geographic and industrial lines. While this text will be diving into the specific characteristics of blockchain technology, including differentiating factors distinguishing this technology, the overarching theme of decentralized and encrypted information is essential to understand the impact blockchain may very well have on the business landscape at large. The underlying theme, however, is not related to anyone technology, however, but the growing importance of data as a strategic asset and piece of information.

Data as an Asset

Since the digitization of technology across industry lines, the information produced, analyzed, and communicated by different organizations has been extremely valuable both to management professionals and the external users of said information. That said, the importance of effective data collection, reporting, and analysis appears to only have increased in value as increasing percentages of organizational value are tied up in intangible assets. Going by many names and iterations, including but not limited to intellectual property, intangible assets, and other data driven assets, it appears clear that the information produced by organizations can and should be leveraged to achieve business objectives. Drilling down, and reflecting on just how leading organizations operate and sustain leadership positions in the marketplace, the intersection between data and emerging technologies becomes clearer. Information, both quantitative and qualitative in nature at the inception of data generation, is coordinated, analyzed, and reported as a matter of business practice in any case. Extending this relationship, and focusing on the importance of using information to make decisions, both blockchain and artificial intelligence can assist management in more efficiently making use of organizational information.

That said, it is not enough to simply harness to technology to make better use of existing information and data; management teams must also be able to protect, filer, and report these varieties of data flows to the marketplace. In a business environment and landscape that increasingly depends on information, both quantitative and qualitative in nature, it is also important that management professionals safeguard and protect these different sources of data. At this point, and prior to diving directly into both an in-depth analysis of technology options and a review of applications for the financial services industry as a whole, a brief overview and introduction of the different technology tools in marketplace appear to be appropriate. While it is true that each technology or trend introduced and listed here will be examined in much more depth throughout this text, a preliminary introduction makes sense for several reasons.

First, an introduction of various ideas, concepts, and applications at an early stage in the text allows the creation and establishment of a working definition to be used not only within this specific text but also in general marketplace conversation. Working off a common set of terminology and concepts is important, but especially important when discussing and examining relatively advanced and amorphous technology trends that include ideas like blockchain, cryptocurrencies, artificial intelligence, and the increased digitization of the accounting function. Second, laying the groundwork for the more advanced and in-depth conversation and analysis that will be a component of this text will help in reducing the hype, buzz, and subsequent confusion present all too often within the discussion surrounding rapid technological advancement. Drilling down, and understanding both the components of technology tools and the ramifications of these tools in a logical manner allows for a more substantive conversation focused on real world applications versus speculation.

Third, and arguably the most important part of performing an introductory summary and overview of what will be discussed in this book is that, by doing so, readers and users of this text will have a roadmap and framework through which to absorb the content contained therein. While ideally, every reader of this text would focus equally on every chapter and piece of information within this book, if you are more interested in one section over another section of this text, establishing working definitions and guidelines up front provides an opportunity to focus on which areas are most specifically interesting. With that said, and not meaning to represent a comprehensive review of either the topics to covered nor a final definition, the following information can be provided.

Topics & Themes

Technology as a Tool the theme of this book is not to speculate nor offer wild predictions as to the future of the profession, nor to launch the discussion of the future of the profession in some other direction toward a future in which practitioners are disrupted out of primary roles and responsibilities. Like many other truths and facts, however, the reality on the ground is far more complicated than either one of those scenarios. Some practitioners and commentators speculate that the future is one of virtually unlimited opportunity and growth for the financial services profession, spurred on and driven by technology tools and adoptions. Anyone who has dealt with financial services practitioners or institutions in real life will be aware of just how many obstacles remain on the path toward full technology integration. Paperwork, in either physical or electronic form, is one of the most prominent pain points between clients, institutions, and brokers.

On the other end of the perspective is the opposite perspective and point of view that is put forth by some in the financial services space. Automation, disruption of current roles and responsibilities are forces already underway in the marketplace, and have both created new jobs and roles as well as already eliminating other ones during the process. Even as some roles and tasks are automated, however, it is important to weigh the learning curve and obstacles that can hamstring and prevent

the full on implementation and adoption of different emerging technologies. Budgets, the complexity of technology tools itself, and the difficulty of mapping and connecting new technology systems to current enterprise platforms all represent possible stumbling blocks that might slow the adoption and integration of technology overall. That said, and what this book attempts to cover and discuss, are both the technology tools themselves as well as the implications these tools will have on different aspects of the financial infrastructure.

Blockchain Perhaps one of the most discussed and analyzed technology trends, especially among accounting professionals, of the last several decades, the potential and ramifications of blockchain technology still appears to be in early stages. At the core of the idea, blockchain is **not** a financial services tool, platform or application. Rather, blockchain, no matter if it is operated as a public blockchain model or a private blockchain, is a decentralized database that allows users access to encrypted information in real time. Individual components of blockchain technology, such as public/private keys, encryption, and inclusion in a cloud based network may not represent innovative ideas on a standalone basis, but when combined are a potential game changer for the profession.

Artificial Intelligence In the past, the applications of AI that most individuals may have been the most familiar with took the form of whatever had been communicated or featured in movies and other sources of entertainment. This, along with large amounts of debate and discussion of the topic, has tended to create an ominous air around this topic for sure, but that does not have to be the case. At the core of the idea, and ignoring the often breathless commentary in the marketplace, AI represents a program or suite of programs that can augment, replicate, or eventually replace human oversight and interaction with business issues. At this time, and especially appropriate for accounting and finance professionals, is that AI has not yet progressed to the point where it can entirely replace human interaction. What it can do, however, is certainly worthy of additional analysis, specifically in the context of accounting and finance work.

Robotics Process Automation The phrase and concepts that underpin RPA are not necessarily new or innovative in nature. Rather, they have been around in the technology marketplace for several decades, as various different types of automation, efficiency oriented projects, and streamlining enabling tools have entered into the marketplace. What RPA does is a two fold change from prior activities and initiatives in this area. First, RPA enables the development and implementation of bots to enter the workforce, and more importantly, for bots and other automaton software to engage in financial and accounting activities. Second, and a core focus of the analysis conducted as a part of this book is the reality that, for all intents and purposes, RPA can and often is viewed as a realistic stepping stone toward full blown artificial intelligence. A good analogy is to present RPA as a bridge or midpoint between current systems and technology and full blown artificial intelligence platforms.

Cryptocurrencies Arguably the most high profile example of rapid technological change and adoption by market participants, cryptocurrencies attracted large amounts of coverage for several reasons. First, some believe that they represent an eventual alternative to traditional fiat currency and an option for those not wishing to remain a part of the current financial infrastructure. Second, as a decentralized application, especially in the case of Bitcoin which operates on a completely decentralized model, there is no single entity in charge of regulation, oversight, or enforcement. Put another way, there is no one or nothing in charge of resolving Bitcoin based disputes. Third, and lastly, the uncertainty surrounding both the implementation and taxation of Bitcoin and other cryptocurrencies continues to create anxiety and feelings of stress within the professional landscape.

Automation Automation and the improved productivity that often comes along with increased efficiency and technological integration can be viewed as both a positive and negative trend for the profession. Viewed from a negative perspective, the increase in automation can, and most likely will, lead to job losses, displacement of some professionals in the workforce, and lead to a redefining of how accounting professionals are educated in the future. Examined from a more positive point of view, however, automation and the increases in efficiency that will be generated will most likely unlock opportunities for the profession associated with both current and future revenue opportunities.

Continuous Reporting One of the most common complaints and issues associated with financial reporting and accounting processes in the current marketplace is that, despite improvements in technology throughout the process, the information reported to the marketplace can easily be between 3–6 months out of date. Compounding this time delay factor is the reality that, in virtually every situation, the current status of financial reporting is only of interest of applicable to a rather narrow set of end users. Regardless of whether the organization is publicly traded/owned, or privately managed, most traditional financial reporting is only applicable or of interest to creditors of equity shareholders. As stakeholders increasingly expect and require a broader array of information, including both financial and non-financial information, current accounting processes will have to be automated with technology and transitioned to a more continuous process.

What This Means for Financial Services This entire text is dedicated to an in depth review and analysis of these technological forces, and just what these forces may mean for the financial services landscape moving forward, but it appears logical to frame the analysis upfront to focus the conversation and attention of the users of this text. Put simply, and regardless of what subset an individual practitioner finds themselves within, it is increasingly clear that current practices and processes will be insufficient moving forward. Automation, technological integration, and increasing competition from non-traditional areas are combining to create an environment in which financial services must adapt to keep pace and thrive moving forward. Financial services, including but not limited to accounting, financial analysis, and banking related activities will need to evolve and change in the face of technological disruption.

While these core areas form the foundation of this book, they are by no means the only subjects to be discussed nor do they represent the totality of forces driving change within the profession. That said, and important to acknowledge at the beginning of this conversation, is that technology tools and platforms are enabling disruption and change at a pace unlike other disruptive trends that have previously occurred within the profession. Change, of course, is an inevitable part of business and of sector specific development, but the pace of change appears to be accelerating at a rate difficult contend with using traditional tools and processes.

Chapter 1 Summary

Chapter 1 forms the introduction and overview of the terminology and topics that lie at the center of this text, including not only the terminology and technical concepts, but also how these topics will connect to the financial services profession. Specifically, this chapter breaks down the technical topics and concepts – ranging from robotic process automation, to artificial intelligence, to blockchain and cryptocurrencies. Reinforcing the appropriate definitions and terminologies associated with emerging technology is especially important for practitioners seeking to have intelligent conversations and debates around these topics moving forward. Bad information can cause even the most promising project to fail, and professionals must be able to objectively asses the viability and legitimacy of projects from both an operational and financial basis. On top of introducing the topics themselves, Chap. 1 also analyzes the topics and content in ways that are understandable and applicable for corporate practitioners. Instead of just focusing on technical, or jargon fueled definitions that focus on too much detail, this chapter lays the groundwork for the rest of the text by presenting these concepts in a manner that is understandable and useful for readers of this text. Technology will, and already is, changing the face of the financial services professional landscape, and are topics that every professional must understand and apply in order to service clients effectively.

Reflection Questions – Chapter 1

1. What is your current comfort level, at an organizational and individual level, with these emerging technology tools?
2. Do clients seem to be knowledgeable or interested in emerging technologies such as blockchain, artificial intelligence, robotic process automation, and cryptocurrencies.
3. Have you or your firm dealt with any regulatory or legal issues associated with these technology tools.

Supplemental Readings

CPA.com White Papers – https://www.cpa.com/whitepapers

The Changing Accounting Landscape

2

It should come as no small surprise, especially to those of you reading this book, that the business landscape at large is in the midst of a technological paradigm shift. That phrase may appear to be to be excessive or perhaps a little buzzworthy, but it is difficult to think of a word or phrase that would be equally appropriate. In addition to the underlying trends that are redefining society and business at large, namely demographic changes, the machinations of global trade, and the increased digitization of information, there are who new areas of business and science being developed as we speak. Even the new technology tools that are the focus of this text, however, it is important to note that the evolution, iterations, and developments of accounting and financial services is not necessarily new; the tools have continued to change rather than the goal of the tools themselves (Winsen and Ng 1976). With every new development, however, comes the proverbial push and pull of innovation and regulation; blockchain and artificial intelligence are not exempt from this market reality. These dynamics, specifically as the relate to the accounting profession, represent forces and changes that must acknowledged and addressed in a proactive manner. Accounting professionals seem to be aware of, from the number of articles and discussions focused around the emerging technology space itself, but action steps still seem to be a work in progress. Specifically, as of this writing, there is no authoritative or definitive guidance issued by any accounting institutions or bodies that have entered into the marketplace. To kick things off and to help frame the conversation, Fig. 2.1 presents a summary and highlight of trends that are changing the accounting profession from its current position to where many experts predict it will end up.

Regulation

Put simply, accounting and financial services are a highly regulated set of industries, with regulations and oversight vying other tightly regulated fields such as healthcare and regulated power transmission and distribution. Taking the political winds out of

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_2

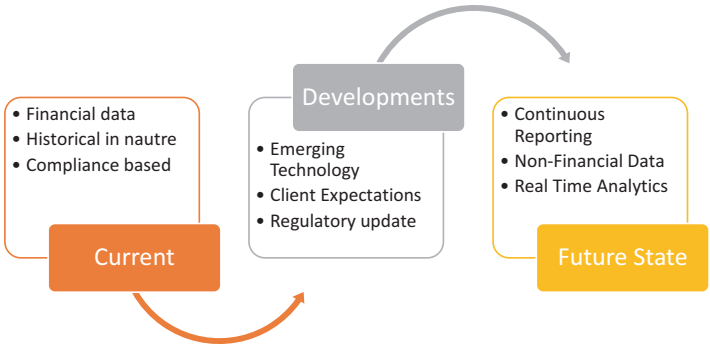

Fig. 2.1 The changing accounting landscape

the equation for the purposes of this conversation, it is reasonable to conclude that regulation has, continues to, and will be a powerful force in the fields of financial services. Traditionally the scope of regulation has been limited to the reporting and communication of financial information to a relatively narrow set of stakeholder groups – creditors and equity owners. Additionally, the guidance and frameworks promulgated by the FASB and IASB form the guidelines and standards by which much of financial information is compiled and distributed. In addition to all of these existing guidelines, however, the rise of the both blockchain and artificial intelligence leads to the following question. As financial services become increasingly integrated with technology tools, will technology style regulation begin to intrude on the profession?

This is not an academic or theoretical question with the passing into law the General Data Protection Regulation (GDPR) on May 25, 2018. Although this regulation originated in the European Union and was primarily originated at technology firms who had access customers social information, the connection between this regulation and financial services is relatively clear. This regulation originated within the E.U., but if an organization has any information on any E.U. citizen that organization falls under the guise of this fairly sweeping regulation. Without diving into too much detail as to the specifics of this regulation, if an organization has any information that could be used to identify an individual, extra precautions and safety standards must be taken. Taking a step back, and observing the language of the GDPR legislation from a market based perspective, the following conclusion begins to materialize. Payment and purchase information, investment information, trading history, accounting records, income tax payments and filings, and assorted other financial information can, and is, considered to be identifying data. In addition to the obvious compliance implications of this regulation there also appear to be opportunities aligned with the increased regulatory oversight of the profession linked changing regulation.

In addition to the looming implementation, and waiting for the proverbial hammer to drop on the first offending organization, financial professionals need to be aware of other regulatory changes that are coming for the profession. In addition to

international regulations and standards, standards in the United States – considered to be the most liquid and robust marketplace by many individuals – are also potentially going to impact the profession at large. In an almost contradictory manner, especially when viewed in the context of emerging technology and efficiency, technology may actually increase the importance of regulation. Details affiliated with these changes will be outlined in more detail throughout this book, but it is fair to say that technology and regulation need not be only seen as a hinderance or regulation, but rather an opportunity as well.

State by State Regulations

Further muddying the waters connected to blockchain and cryptocurrencies is the fact that, despite the confusion and debate connected to blockchain and other blockchain based applications at the federal level there is progress and developments occurring at the state level. In such a fast moving space like the ones connected to cryptocurrencies and blockchain at large, it is important for every practitioner to remain abreast of changing topics and changes occurring at every level. This sounds nice, clearly, but also has implications from a practical level as well, especially for how different types of information are treated and classified. No single analysis is going to encompass all of the regulatory changes in such a fast moving and evolving space, but there are some examples that are occurring that should be of interest to anyone in the financial services space.

Toward the end of 2018, Ohio attracted numerous headlines and attention for a variety of reasons, least of all the $100 million invested in Columbus by approximately half a dozen blockchain and cryptocurrency firms. These firms have attracted significant attention and the focus of other investment funds across the country, but are only one of the drivers of innovation in the state. In addition to this financial investment, Ohio – at the end of the year – became the first state to allow residents to pay local and state taxes via Bitcoin; this represents a significant change in how cryptocurrencies are utilized. Prior to this announcement and legal change, the only guidance – as will be discussed throughout this text – was the memo issued by the IRS in 2014 classifying cryptocurrencies are property for accounting, tax, and reporting purposes. Such a change, allowing residents and consumers to pay bills and debts is a clear shift in the development and evolution of cryptocurrencies from investments to full fledged currency equivalents.

New Hampshire, in the early days of 2019, also announced that residents and individuals would be able to pay tax bills and other issues with bitcoin and other cryptocurrencies. While a final decision has yet to be made, this also represents progress toward bitcoin and other cryptocurrencies shifting away from investment and opportunities to being able to used for the payment of debts and other bills. Even as the prices of individual cryptoassets have declined in 2018 and stabilized at these lower levels in 2019 these developments continue to point to greater increased institutional interest and development across different state and functional lines. These changes and developments, however, do pale in comparison to the potentially

ground breaking work that is underway in the legislature in the state of Wyoming. Although cryptocurrencies may be accepting broader acceptance in terms of how they are used and treated for different purposes, there does remain confusion and murkiness connected to how blockchain is treated overall.

Wyoming, beginning in 2018 and continuing in 2019, has taken a rather progressive and forward looking approach to the regulation and fields connected to cryptocurrency and blockchain overall. Mirroring a previously successful attempt to lead financial technologies like those utilized by Dakotas and Utah with the credit card processing industries in the 1970s and 1980s this may not as unusual as it may appear. Wyoming may not be the first place that comes to mind when the idea of a financial technology hub or center of excellence, but it is important to keep track of developments regardless of where they geographically occur. Spearheaded by a Wall Street veteran with decades of experience, and with bipartisan support across the legislative political lines it seems that these concepts have received an enthusiastic reception. While legislation and the ripple impact of these legislative actions may still have effects that are difficult to understand at this point in time the ramifications for financial services professionals can be forecasted with some degree of certainty. Drilling down into some of the changes and actions undertaken, there are a few items and pieces of information that should be taken into account.

First, and perhaps most importantly for the treatment of cryptocurrencies and other cryptoassets, a bill, SF0125, has put forth several different classifications for these assets. This may seem like a minor development or change, but is significant in ways that are – as of yet – ultimately unable to be forecasted. Drilling down, this legislation breaks out different cryptoassets into three separate categories, and also grants cryptocurrencies the same legal status as currencies such as the dollars used to pay and settle other obligations within the state. Again, this legislation is sponsored and supported at a state level, but represents the most significant development and progress on these issues to date. In addition to granting bitcoin and other cryptocurrencies the same legal status as cash within the state, this legislation also seeks to grant banks the ability to manage cryptoassets and cryptocurrencies as assets under administration.

Second, and building on that last sentence, the ability of banks to manage cryptocurrencies marks a departure and differentiation from the previously dominant legislation in the space – the New York BitLicnse. Currently the only financial institutions that are able to offer trust and custody services around different classes of cryptocurrencies, which complicates matters from a financial services and legislative perspective. Trust companies, or organizations that are offering services via a trust vehicle must register with the individual 50 states in order to do business across state lines. From a compliance and cost perspective this also means that the complexity and cost associated with offering these services is such that only the largest and most well established players – to date – have been able to do so. In addition, the S.E.C. has comes publicly and stated that the trust business model is not the preferred model of offering cryptocurrency services. Banks offer two distinct benefits versus trust organizations that are important for a financial services perspective. The ability to (1) operate across state lines with an operating model that does

(2) not require individual regulation or licensure in each state is simpler from a cost and operational perspective than doing so via a trust or trust based model of business.

Legalese might not always be an area where financial services professionals feel interested or able to establish a robust dialogue or engagement with other professionals, but is something that must be factored into any advisory service offerings moving forward. Whether it is something that has been established in different states, or changing regulatory models and frameworks being put forth at a national level, the implications of these changes are going to have a profound impact on the operations of businesses both within financial services and in other industries. Offering advisory services and robust client advice to both internal partners and external clients means that professionals need to understand both the financial effects of cryptocurrencies and other cryptoassets as well as what they mean for the interactions currently underway between different business entities. In addition to these regulations and responsibilities, practitioners also need to be aware, and kept abreast of what these mean for how blockchain is evolving alongside other business process improvements.

Changing Accounting Standards

Accounting is often viewed as a traditionally oriented profession that is, at least partially, protected from the winds of disruption and change that tend to dominate headlines and stories, but the reality is far more nuanced. Regardless of which subset of the profession individual practitioners are employed within, there are substantial changes coming in terms of accounting regulation that are having a dramatic impact on both the profession and the clients that they serve. Specifically the changes to leasing standards, revenue recognition standards, and the classifications of how non-profit entities report assets and other classes of information are already having effects on how information and data are reported are already having an effect on how accounting professionals are perceived and interact with colleagues and external partners.

While the justifications for these changes and updates to regulatory standards, postulated by the FASB and being implemented through the 2018–2020 timeframe, differ, the underlying trend is the same; stakeholder groups and users of organizational information are increasingly expecting more up-to-date and relevant data. These changes, and the impact that will be felt by various organizations in different industries, do not appear to be insignificant nor appear to be a passing trend within the broader business landscape. Accounting and financial professionals are, increasingly, expected to be able to render both quantitative information and the implications of this information for business decision makers. Especially in the context of personalized and customized reporting and customer service from other organizations, accounting firms and the practitioners employed therein must be able to provide equal levels of service and information to customers and clients. The primary focus of these reporting changes was, in theory, to assist with the understanding and

interpretation of information that can otherwise be difficult to interpret and analyze for individuals who are not financial experts. That said, and understanding this as the underlying goal of these modified reporting requirements, accounting professionals can, and should, leverage technology to meet the expectations of stakeholder groups.

As of this writing there is not any definitive guidance in the areas of accounting guidelines or frameworks in the areas of cryptocurrencies, blockchain, or artificial intelligence. Industry groups, namely the AICPA and IMA, have begun to issue non-authoritative guidance and certificate programs in the areas of blockchain, how to account for blockchain transactions, and the broader cryptocurrency space, but as far as authoritative accounting guidance and regulation there does not appear to any on the horizon for 2018 or 2019. As stated above, there is certainly enough changing regulation and guidance entering the accounting and financial services space to certainly keep practitioners busy. Revenue recognition, the reporting of nonprofit financial information, and the changing of how leases are reported (moving from off balance sheet to on balance sheet) are significant issues to grapple with even without technology forces driving disruption. Emerging technologies and forces, including both blockchain and artificial intelligence, are going to have a substantial impact on the financial services landscape; regulation and guidance will have to keep pace. Now, it is important to recognize the reality that the guidance may not originate from the United States either – several international markets have already issued guidance and begun to utilize blockchain for business purposes. In any case, professionals will need to keep pace with the changing regulatory landscape, and be able to issue meaningful advice to clients regardless of location.

As of this writing there is no other definitive writings or guidance that has been issued or established, there are industry actors that are taking proactive steps to become increasingly integrated to the traditional financial system. A brief example, which will be revisited later throughout this text, is the continued integration and development of blockchain based applications for payment processors and payment service. SWIFT, which is in essence the underpinning of the global financial and payments system, is how funds and amounts are transferred between virtually every bank, credit card company, or financial services institution. An figure of just how important this system is the impact on countries that have been banned or barred from this system – such as North Korea and Iran at different times – have suffered dramatic economic contractions. Unable to conduct business with the majority of the world, countries or institutions cut off from SWIFT are, in effect, removed from the financial system entirely.

In early 2019, R3, a leading blockchain development organization, launched a partnership with the SWIFT network to handle and develop blockchain based options and alternatives for global payment processing. Especially as it connects to the enterprise applications and payments that can be facilitated via blockchain based platforms perhaps the most appropriate place to begin this analysis is with international payment and remittances. These transfers, even under the current model utilizing the most sophisticated payment structures and channels, can take days to settle and even longer to reconcile between the different institutions involved.

A credit card payment, for example, or a simple remittance of funds from a family member to other family members can take an extremely long time to settle and become finalized. Blockchain, especially the platform utilizing R3's technology – developed and tested for enterprise applications – means that these current pain points and obstacles can be addressed in a comprehensive manner from start to finish. Although the application and development of these technology platforms are still a work in progress at this time it does point to how integrated blockchain can, and might become full meshed within the global financial system.

Technology

Speaking of technology, and linking back to the central theme of this book, it is undeniable that technology and technological innovation is having a profound impact on the accounting profession. Blockchain and artificial intelligence, including the application of cryptocurrencies in the media landscape, have certainly received large amounts of attention and media coverage, but this is merely the most high profile application of blockchain technology in the broader business landscape. Blockchain, at the core of the idea, is a decentralized ledger system that allows encrypted information to be communicated in nearly real time to everyone who is part of the network. These dual forces, the encryption and real time dissemination of the information itself represents a paradigm shift for how information is created, transmitted, and communicated both within organizations and to external stakeholders. While it is true that technology integration is not necessarily a new force or trend within the accounting profession, the embedded nature of new and emerging tools has the potential to change the profession from the top to bottom.

Something that both financial and accounting professionals need to take into account is that, while the technical terminology, acronyms, and jargon may have evolved and changed that the underlying drive and push toward greater technology integration has remained consistent. Automation, digitization, and the increased utilization of technology to handle the decision making process are forces that have been in existence for several decades. From the beginning of the internet and computer revolution, technology has been leveraged and utilized by the financial services profession to achieve two goals (Caruso 2016). First, an overarching goal is to drive down the cost that financial services provided to end users, which mirrors the drive toward lower costs that consumers have come to expect from other areas of the market. Second, and building on the drive toward lower costs and increased service, the ability of financial professionals to take advantage of technology advances to expand and offer additional services forms a core of how many institutions have thrived following the financial crises. Applying the insights and information already in possession of the organization to new areas and additional products is a substantive way to add value.

Financial services professionals across the different subsets of the industry landscape have dealt with a variety of disruptive forces that have originated both as result of regulatory pushback and oversight and changes within the industries itself.

Automation, which has been present in the financial services landscape for decades, would be an unstoppable force in the business landscape by itself, but it has been amplified by recent developments and iterations of technology tools. Blockchain, a decentralized and distributed ledger system, is positioned to – at least to a certain extent – completely reinvent and overhaul how records and other types of information are kept. From a market perspective, it is also evident that decentralizing the transfer of information and record keeping will redefine the role of brokerages and market makers, including the role of major financial institutions.

Accounting professionals, already using technology to help automate, improve, and streamline processes within the organization, appear to be uniquely well positioned to deal with the coming technological shift already underway in other professions. An important point to remember, however, is that while the terminology and specifics of certain technologies may have changed during the last several years, the underlying point and purpose of technology for accounting purposes has not changed. While it is true that technology will automate and streamline processes, which will eliminate certain lower level jobs, tasks, and processes, it is important to remember that with every process that is automated there will be additional opportunities. As lower level tasks become automated, delegated, and outsourced to other professionals, accounting professionals will have to keep pace, evolve, and evolve alongside the broader business forces impacting organizations at large. Technology, certainly, holds potential for the profession and accounting practitioners at large, but it is arguably more important for accounting professionals to have the ability to understand how these tools functions and can improve the profession rather than technical specifics.

Redefining the Profession by Technology

The accounting profession, put simply, has traditionally been a profession and subset of the workforce that has not radically embraced technology nor usually been at the forefront of innovation. Such a resistance to change, innovation, and disruptive forces is not terribly surprising when taken in the context of accounting and the services performed by accounting professionals. Whenever accounting has been up front with experimenting with innovation, such as the creative or innovative practices utilized at organizations such as Enron, WorldCom, and Lehman Brothers the end result has been the failure of accounting firms and practitioners. Auditing, tax reporting, attest processes, and advisory services are experiencing a potential paradigm shift in how information is reported, who receives this information, and what the end result of this information is for end users. Financial services, including both accounting and finance professionals, have not yet been keeping up with the rapid digitization and transition of services. Redefining the profession, put simply, will require not only the understanding of technology tools available in the marketplace, but also being able to effectively utilize these tools to improve the quality of data for stakeholder groups.

Technology, despite some talk and mood of job displacement and disruption, will also unlock potential opportunities for motivated and practitioner professionals willing to embrace and leverage technology. As lower level tasks, and even accounting firms developed around said lower level tasks, are diminished in importance for the next generation of professionals, the ability of financial services professionals to move up the value chain will, in large, define the next stage of competitive advantages put forth by individuals and organizations. Effectively leveraging technology forces will, without a doubt, transform the profession from virtually top to bottom, but one specific application of technology that is already emerging as a leading indicator is automation. Drilling down, there are several trends and traits that should be analyzed and discussed as it pertains to automation and how the process of automation will impact what financial services professionals will do and undertake in the near to medium term.

Automation will be examined in the context of blockchain and artificial intelligence, but the underlying facts can, and should be examined here to set the tone for more detailed analysis throughout this text. First, lower level tasks such as reconciliations, bookkeeping, income tax reporting, and even basic portfolio allocation will increasingly be able to be completed by non-accounting professionals, requiring CPAs and other financial professionals to focus instead of more advisory and customer-centric activities. Second, as certain tasks are augmented, automated, or even outsourced in virtually their entirety, financial services professionals must be able to understand and apply technology tools and applications as they apply to tasks done with internal and external colleagues. Third, and perhaps most importantly, one of the most direct and practical implications of this increased technological integration will be hard decisions that have to be made across different organizations. This transition, although borrowing a term that have generated negative connotations in the past, may also open opportunities for professionals to embrace higher level, and higher margin, services.

Banking and other financial professionals are already seeing the impact of disruptive technologies on different subsets of emerging technology itself. Peer to peer lending, crowd funding opportunities, and the decentralization of different funding sources are continuing to disrupt and upend how organizations and entrepreneurs obtain financing. While cryptocurrencies have represented the most high profile application of blockchain technology to date, the ability of organizations to obtain or enhance financing utilizing said cryptocurrencies is still an emerging field. That said, the decentralization of how financial information can be distributed and funded represents a near existential threat to the traditional operating model and structure of financial institutions.

Pros and Cons

The financial services profession is no stranger to bringing technology or technology based solutions to the table, but it does seem that this recent application and integration of technology into the business landscape is a true redefining of the

financial services paradigm. Traditionally the technology solutions and associated information were seen as complementary to the core offerings and advisory services performed by individuals members of the profession. Regardless of industry subset the trends and implications had been that the primary service and value delivered to the marketplace has been generated and delivered by individuals with technology used as a complementary tool. Blockchain, robotic process automation, and artificial intelligence has the potential to radically transform finance from top to bottom, so let's take a look at some of the challenges and opportunities that will accompany such as transformation. This book focuses primarily on the blockchain ecosystem (which includes both blockchain and cryptocurrencies) and artificial intelligence, but these tools are only part of a much larger shift and evolution.

Challenges

What is often left unaddressed, particularly by those individuals not affiliated with the professional landscape themselves, is that these technology tools will usher in – without delay – an era of prosperity and growth. Blockchain, for example, is commonly pointed to as something that will reduce costs, lower organizational friction, and open the global marketplace for entrepreneurs and business owners. Artificial intelligence, in whatever form it takes, is pointed to as something that can – in effect – manage ever larger aspects of both personal and professional lives. From chat bots, to medical diagnostics, to financial trading, assessing the strength of potential borrows, and evaluating the effectiveness of an audit, AI or AI based tools are pointed to as bringers of efficiency across the board. Often unaddressed, however, are the real and tangible challenges and costs that are going to accompany these changes. Organizational change, as anyone who has ever been a part of an organizational project or initiative can attest – is difficult.

As these technology tools enter the workforce, there are going to be three primary effects and impacts that need to be assessed. First, some jobs will be eliminated, and that is a fact that cannot be explained away no matter how eloquent or forceful the thoughts are. While it is true that some of the jobs that will be eliminated are primarily lower level jobs or tasks performed by newer entrants to the workforce the reality is that these jobs still count and provide valuable internal and external services for both the organization and clients. In addition to the jobs that are going to either be severely augmented or eliminated altogether as a result of this increased automation, training and education practices will also have to be modernized. Taking this to its logical conclusion it is reasonable to conclude that the entire educational construct; from higher education to professional education will have to be modernized. As if that was not enough for the professional landscape to contend with, there are also the implications these technologies can have on outsourcing in the marketplace.

Outsourcing

Outsourcing may, in the past, generated substantial anxiety and stress amongst professional classes, but perhaps a more appropriate designation for this activity would be delegation. Put simply, and building on the reality that certain tasks are going to automated regardless of whether the process is embraced by professionals or not, delegating lower level, lower margin, or tasks that the organization is not especially efficient at should be a component of business planning moving forward. Organizations, both accounting and financial specific, already exist in the marketplace that have employed different outsourcing and virtual functions to improve services to clients, generating additional lines of revenue, and create opportunities to attract new clients. Outsourcing or delegation, regardless of the specific terminology and phraseology used to introduce and discuss, is going to be part of the professional conversation and landscape in the near, medium, and long-term. Drilling down and examining what tasks are ripe for outsourcing is a fiduciary duty and responsibility of financial services teams across industry lines.

This outsourcing of roles and responsibilities is an intriguing application and iteration of how technology is driving change in the financial services landscape, but not in the traditional sense that most organizations and professionals have examined outsourcing through. Technology, instead of management decision making, is now the overarching force driving outsourcing, augmentation, and redefining or roles and responsibilities across financial services professionals. As indicated above and throughout this text, automation and distributing of information continues to drive the disruption and change that are causing such anxiety and stress in some professionals circles. Current roles and processes are being either automated away as a matter of course, being complicated via increasing and varied regulation, and being changed via increasingly vocal consumers and regulators.

Outsourcing or delegating different types of work and tasks either internal or external to the organization represent a question and consideration that every financial professional must be able to analyze and facto into a decision making framework. While clearly every organization is different, contains a variety of personnel, and focuses on different service offerings, the decision and criteria to evaluate the decision to outsource or not connects back to several core areas. First, core functions and services offered by the organization to both internal and external clients are usually not outsourced regardless of the short term analysis. Second, if the transfer of confidential information or intellectual property is involved this usually means that the outsourcing is not a viable option or alternative to retaining such services in house. Third, and perhaps most importantly from the point of view of financial services professionals is that if collaboration or coordination is a required part of this outsourcing that usually – in effect – means that the outsourcing will not occur. Blockchain and other emerging technologies, given the disruptive nature of the tools themselves, have the potential to change the conversation as it connects to outsourcing, developing new services lines, and entering into new marketplaces.

As has been demonstrated via initiatives and projects across different industry lines, including the financial professional landscape, there is an enhanced spirit of

coordination and collaboration between different organizations. While it is, of course, interesting from a theoretical perspective that organizations may be sharing information, this also has a tangible and real world effect on organizations as well. Usually what occurs in the financial services landscape is that the organizations and firms employed within this landscape are usually fiercely competitive in nature for clients, future clients, and new lines of business. The very nature of these emerging technologies, but specifically blockchain, is that this information should be communicated, distributed, and shared between different organizations. Such a system may seem anathema to how financial organizations usually operate, but actually is reflective of broader trends underway in the marketplace. Clients and customers, both current and potential future clients, are increasingly used to platforms, interfaces, portals, and other methods of communicating information; this also applies to financial services as well as other types of information.

Outsourcing services may be a relatively straight forward process for many organizations, but in the context of data, automated analysis of information, and the distribution of information between different partner organizations this decision will become more complicated. Rather then facilitating the ease with which such data can be communicated, the increased technological integration may actually limit or raise other issues connected to data sharing and processing. Even if the data included in this sharing and communication is encrypted in nature, organizations still must take into account the liabilities and potential exposure. Liability, analyzing the importance of assessing and evaluating liability on a continuous basis, and the integration of said risk assessments to the broader decision making process means that practitioners should be able to offer holistic solutions to these multifaceted problems.

What Managers Need to Know to Keep Pace

Managers and management professionals, especially though employed in the accounting and financial services industries, are already facing multiple pressures and forces driving change, disruption, and innovation throughout the profession. Pressure on margins, fee compression, increased competition from non-financial professionals already cause anxiety, stress, and operational concerns as far as staffing is concerned. Technology forces, especially as ones as innovative and disruptive as the trifecta of blockchain, artificial intelligence, and cryptocurrencies can seem like just one more task to go on the proverbial to-do list. That said, it is important for managers to not only understand the underlying trends driven by technology, but also an analysis and understanding of who is already using them. In addition to these other forces, it is important that the connection between technology, recruitment, and retention are well established. Even if some members of the organization do not feel, for example, like investing in, or learning emerging technologies is justified, the reality of the situation is far different. Simply stated, in order for organizations to be able to survive and thrive in the current and figure business landscape, obtaining institutional knowledge of these technologies is a requirement.

Lastly, and perhaps most importantly, it is important for management professionals to understand just how to implement these tools if the desire is to leverage said tools to improve performance. Not only are the trends of blockchain and artificial intelligence going to fundamentally change and alter how financial transactions occur and are recorded, but will also change how employees are evaluated. As the roles of practitioners continue to evolve and change, it is not a far stretch to imagine a business environment where the methods of evaluation must also change. For example, and definitely worthy of additional analysis, is the following question. How does a manager evaluate someone who supervises automated processes, software bots, or other technology driven processes? Are the evaluation criteria different from those used to evaluate a manager who only manages people? How would the manager be able to obtain feedback as to the effectiveness of the manager, and if feedback is required what counts as feedback from a machine? These are not idle questions; the development and promotion and development of a whole new set of leaders depends on how effectively or not organizations are able to move with these trends.

Additionally management professionals across different organizations are, eventually, going to have to deal with the reality that not all benefits.

What are the Trends

With all of the excitement and buzz linked to blockchain, artificial intelligence, and cryptocurrencies it is easy to get lost in the technical weeds instead of focusing on the business applications of these technology tools. That said, for financial services professionals to be able to make the most of different technology tools, it is important to focus not only on the tools themselves but how managers can use these tools. While not meant to be an exhaustive or all-inclusive list, these trends definitely include the following:

1. Increased automation – One of the most powerful implications of the increased technological integration throughout financial services is that certain tasks and processes can be augmented or automated altogether. Automating certain tasks and service is not, clearly, a new or particularly innovative part of the financial services landscape, but the current technology landscape is supercharging the automation process. Whether it takes the form of analytics, big data, or continuous reporting, the fact is that automaton is going to be a force moving forward.
2. Disruption as the status quo – disruption and innovation are, in many cases, two of the most overused terms in business discussions and conversation. Disruptive innovation is usually something that may, occasionally, strike fear into the heart of financial services professionals fearing for roles and status. That said, the reality is that processes, jobs, and entire firms are going to be radically transformed as technology tools become more mainstream, easier to use, and expected by clients and other end users.

3. Reduced margins on existing services. As current services and work continues to be automated and augmented by technology, it is reasonable to expect that the profit margins will be reduced on these services. If a program can be developed, software written, or some other form of technology applied to address a business situation, why should margins remain at current levels? As the pressure for free or extremely low cost investing options, for example, continues to increase and grow, investment banks and financial institutions will need to find others to feed operating margins. Accounting, investing advisory services, market making, and lending will all be subject to margin compression.
4. New lines of business will evolve. Of course, as existing services are either augmented or automated altogether, there will be work for the employees to do. As information becomes more readily available and accessible to employees at every level of organization, for example, these insights and analytics can be sold, packaged, and presented as stand along business lines and items. This iteration and development of new business is not something entirely new; organizations like Netflix and Amazon have built entire business models around using better data to deliver better results. The financial services landscape and profession
5. More competition – along with the increased automation and digitization of financial services processes, a related trend that must be taken into account is that, as more and more accounting tasks are automated there is going to be more competition from non-traditional sources. Whether the competition comes from technology itself in the form of robo-advisors, or from non-financial professionals who has mastered technology tools, this increased competition links directly into our last point.
6. Education will become continuous – even with the continuing education requirements that are often mandatory in the financial services marketplace, all too often this education is treated as yet another compliance project. Going forward, and with the technical tidal wave only becoming more powerful and pronounced in the financial services landscape, the underlying reality is that competition will only increase moving forward. Instead of being viewed as a threat, however, the rising specter of increased competition should reinforce the need for continued education and training.

The trends themselves, including the specific technologies are from the core of the conversation contained within this book, are going to change and evolve almost as fast as the news travels via social media in the current marketplace. Especially as social media and social media communication becomes more commonplace amongst industry, political, and thought leaders, the changing technologies and processes will have to assessed on a continuous basis. Blockchain technology, cryptocurrencies, robotic process automation, and artificial intelligence may be the buzzwords that are dominating the airwaves currently, but if the clock was rolled back to 2008 or 1998 the technology trends and forces that are discussed may have included the internet, tablet technology, and the advent of cellular phones in the workplace. The point is that the individual tools are not as important as the trends themselves.

Who is Using these Technologies?

Being aware of the trends and how these technologies will impact financial services is an excellent start, but who is exactly is even using these tools in the marketplace at this point? Clearly the majority of the investments and headlines in the areas of technology have been focused at the largest financial services firms, but there are numerous other examples of organizations implementing blockchain technology. While this book focuses on the implementation of blockchain technology and artificial intelligence for accounting and financial professionals it is important to understand that other organizations form the basis of clients and customers. Drilling down specifically into some of the industries and organizations already using blockchain technology, there appear to be numerous examples of how accounting professionals can add value both now and in the future.

This entire book could be dedicated to analyzing current use cases and implementation cases for other industries and organizations, but there are a few specific examples that appear closely aligned with the roles and responsibilities currently fulfilled by financial professionals. Without diving too much into the technical weeds and descriptions, there are two primary areas in which both blockchain and artificial intelligence are already driving innovation and disruption among tasks performed by financial services professionals, including those in both the accounting and finance subareas. Let's take a look at both of these examples to figure both the promise of these technology tools, and how these two distinct, yet related platforms are already driving change in the financial services landscape.

Smart contracts, which at the core of the idea distills contracts and contractual terms to their core functions and components, are playing a large role in the insurance, power generation, and royalty areas in the marketplace. Market examples abound, but circling back to the implications for financial professionals it is readily evident that the confirmation, interpretation, and reporting of complex information offers both a challenge and opportunity. Financial professionals, whether employed within industry or in a public practice setting, often serve the role of intermediary, interpreting information and transmitting the implications of said data, appear to be ripe for disruption with the advent of smart contracts. Contracts, at the core of the idea, are simply a combination of (if, then) statements that oblige every party involved with certain rights and obligations. Digitizing contracts and contractually information are already a process underway in the marketplace; smart contracts are simply the most current iteration of how types of information are increasingly digitally based in nature can be shared and transferred. Layered and compounded with artificial intelligence, which can analyze large quantities of information on a nearly continuous basis, the proverbial combination represents a potential game changing combination for the legal profession.

The other place where, particularly for financial services professionals, blockchain and artificial intelligence are having a profound impact is the area of digital cryptographic currency such as bitcoin. While bitcoin and other cryptocurrencies may have originally been designed as an alternative to the traditional fiat based financial system, many of the most prominent investors and user of cryptocurrencies

are those same traditional market actors. Banks, financial institutions, financial advisory professionals, and accounting professionals are all investing billions of dollars into the broader cryptocurrency space. Such investment is being done for two primary reasons, and neither one of which connects to the initial underlying aspiration of cryptocurrencies to establish an alternative financial system.

First, accounting and financial professionals are investing so much time and energy into both the blockchain and cryptocurrency space because of other investor groups investing time and energy into the space. On the blockchain side, hundreds of organizations have launched pilot programs, are beta testing blockchain based solutions, and are documenting the results of the initiatives. From logistics coordination, to food safety, to the tracking of different inventory items across national and international lines, the applications for blockchain appear to be multiplying continuously. These organizations, regardless of specific industry subset, represent current and future clients for financial services professionals. In order to provide meaningful and valuable services to these organizations, financial services firms are going to have to keep pace with at the least educating themselves. Second, the proliferation of different cryptocurrencies continues to accelerate as well as shift and evolve beyond simply bitcoin and other early market entrants. Stable coins, commodity linked cryptocurrencies, state sponsored cryptocurrencies and cryptoassets, and the still murky reporting framework surrounding all of them is combining to create an environment of both high risk and high reward.

Put simply, in order to even maintain the current market position as expert advisor, much less elevate and shift toward being a strategic advisor, financial services professionals are going to need to drill down, understand, and focus on the cryptocurrency space. Even after the market sell-off at the end of the end of 2017 and beginning of 2018, the overall market space is still worth hundreds of billions of dollars. This is not merely an academic discussion, but represents a substantial business opportunity for financial services professionals to develop and add new services lines.

How Can They Be Implemented?

It would be easy to simply feel overwhelmed and potentially out of depth when analyzing and discussing the implementation and adoption of such advanced technologies that include, but are not limited to blockchain, artificial intelligence, or data analytics. Financial professionals are, virtually without exception, already dealing with a number of changes generated by both changes to the profession and driven by external client requirements. While every organization is different, and the specific implementation steps will vary from organizations, there are several initial thoughts that should be taken into account as we being this conversation. Specifically, let's take a look at 3 things every organization should think about as blockchain, cryptocurrencies, and artificial intelligence become increasingly mainstream.

1. Determine whether these tools are a good fit for your organization – there is a lot of buzz and excitement around the areas of financial services technology and

innovation, but an important point to emphasize is the concept of efficiency. While there are many benefits and efficiencies that are able to be generated via current market offerings, many other technologies and platforms are merely in pilot or exploratory phases. Especially for accounting and finance purposes, while billions are currently being invested in some situations, current technologies are actually more business ready than blockchain and AI tools.

2. Select the platform and protocol that actually makes sense. Every single blockchain, and there are hundreds of major players in the space, can be built and programmed differently so it is critically important to understand what exactly you are investing in. Additionally, there are blockchain models and platforms that are being built for specific industry applications such as financial services, documentation for mortgages and other paperwork intensive businesses, and food safety applications so there may actually be blockchain platform in the market that is a perfect fit for your clients.
    a. This same aspect can be applied to the conversation surrounding artificial intelligence; different service providers have developed industry specific tools and platforms to accelerate the decision making process. It is also important to understand that different aspects of your business, and your clients business, may be more applicable and appropriate for automation using artificial intelligence than other parts of the business.
3. Figure out where to begin the implementation process – blockchain and artificial intelligence are exciting and innovative topics, but at the end of the day they are simply technology tools. Some of the most practical applications of technology include the ability to automate processes, reduce internal friction and float, and free up time to focus on other, higher level topics. These exact same benefits are some of the core forces driving the adoption and implementation of innovative tools. Specifically, practitioners should look for areas where automation and increased efficiency can be obtained via leveraging these new tools.
4. Have discussions with clients and customers – this is a point that cannot be emphasized enough; prior to adopting and using new or emerging technology tools, you need to make sure your clients and customers are on board with these changes. In business, and especially when it concerns the handling of financial assets, few things are less pleasant than either surprises or unexpected news. Your clients are, without a doubt, thinking about these technologies for adoption within their own organization, and will look to you for advice and guidance. While surprises are rarely pleasant, offering sound and objective advice on the topics currently generating headlines will only help how you are perceived by your clients, current and in the future.
5. Make sure the budget is in place. Blockchain or artificial intelligence are not, by themselves, going to solve your business problems nor the problems of your clients, but that does not mean that these items are not going to cost money. Getting some projects up and running will inevitably involve capital spending and budgeting, but it will also include financial and operational support on a continuous basis. Allocating capital is always a piece of the strategic planning process, but is even more important when it comes to emerging technologies.

Chapter 2 Summary

If Chap. 1 introduced and initially presented the topics that will form the technical basis, this chapter reinforces and frames the technical conversation within the more important professional context, the conversation pivots and shifts from conceptual to more concrete examples and trends. This chapter goes through and drills down into what are the core trends and forces, outside of the specific technical topics introduced in Chap. 1, highlighting the importance of adaptability and being able evolve alongside broader market trends. Of importance for professionals and practitioners seeking to understand, advise on, and consult with organizations linked to emerging technology, these definitions and technical examples are presented in a way that is user friendly. Automation, the outsourcing of some core trends and components of specific tasks, and the digitization of heretofore manual or human led tasks are just a few of the underlying market forces that are discussed and analyzed through the lens of emerging technology in this chapter. Regardless of whether an individual or organization are embracing emerging technology, or approaching more cautiously, the facts remains that these trends are indeed coming for the profession. Additionally, and incorporating the practitioner oriented mindset and framework of this text, Chap. 2 also introduces examples and applications of where said emerging technology tools are being used. Other examples will be included in supplemental material at the end of this book.

Reflection Questions – Chapter 2

1. Based on the current market trends toward market automation and further digitization of financial services, do emerging technologies such as blockchain and AI seem to complement or conflict with broader market trends?
2. Do there appear to be certain industry sectors, such as banking, trading, or auditing, that seem to be more susceptible to disruption than others based on technology tools?
3. What do you think are some of the skills and competencies that professionals will need to develop to successfully adopt to these trends, especially with regulatory updates and forces continuing to evolve.

Supplemental Readings

NY BitLicense FAQ's – https://www.dfs.ny.gov/apps_and_licensing/virtual_currency_businesses/bitlicense_faqs
Wyoming Cryptocurrency Regulation – https://bitcoinmagazine.com/articles/wyoming-passes-new-friendly-regulations-crypto-assets/
PwC Cryptocurrency Guidance – https://www.pwc.com/us/en/cfodirect/publications/point-of-view/cryptocurrency-bitcoin-accounting.html
EY IFRS Cryptocurrency Accounting – https://www.ey.com/Publication/vwLUAssets/EY-IFRS-Accounting-for-crypto-assets/$File/EY-IFRS-Accounting-for-crypto-assets.pdf
KPMG Blockchain – https://frv.kpmg.us/reference-library/2018/defining-issues-18-13-blockchain.html
Accountex Trends Report – https://www.accountexnetwork.com/blog/2019/01/accounting-in-2019-changing-priorities/
https://www.accountingtoday.com/news/the-accounting-professions-biggest-challenges
https://www.ifac.org/global-knowledge-gateway/business-reporting/discussion/future-accounting-profession-three-major
http://www.financialpolicycouncil.org/blog/blockchain-u-s-regulation-and-governance/
https://www.cambridge.org/core/books/blockchain-regulation-and-governance-in-europe/A722E0522BC6C5300AA0813340BD6C04
https://www.fasb.org/jsp/FASB/Page/SectionPage&cid=1176156316498
https://www.investopedia.com/terms/b/blockchain.asp
https://www.accountingtoday.com/opinion/why-automation-is-a-positive-turning-point-for-accountants

References

Caruso, J. J. (2016). The opportunities of finance and accounting outsourcing. *Pennsylvania CPA Journal, 87*(1), 8–9.
Winsen, J., & Ng, D. (1976). Investor behavior and changes in accounting methods. *Journal of Financial & Quantitative Analysis, 11*(5), 873–881. https://doi.org/10.2307/2330586.

Cryptocurrencies & The Financial Services Landscape

3

Prior to examining the implications and applications of blockchain technology on the financial services landscape and practitioners employed therein, it does appear appropriate to, at least at first, acknowledge the importance of cryptocurrencies on the broader conversation. Beginning during 2017, and accelerated during the fourth quarter mirroring the rise in price of Bitcoin and other cryptocurrencies, the amount of interest and investment in the broader cryptocurrency area attracted the attention of both individuals and institutions. While the cryptocurrency applications and use cases are only a part of the wider blockchain conversation and analysis, it may very well be the most high profile example of how blockchain entered the market lexicon. Drilling down and taking into account just what cryptocurrencies are, what they are not, and what they may mean for the financial services landscape appears to be an appropriate first step toward understanding how emerging technology forces are driving the profession forward.

At the core of the idea, the very concept of a cryptocurrency appears to be completely contradictory to the current financial market system. Currently, the forces of centralization appear to dominate virtually every aspect of the finance and business landscape – governments, banks, financial institutions, market regulators, and payment processing organizations. Even paying online, via a mobile device, or from logging into a payment processing VPN does not represent a difference from traditional centralized processing and verification. In addition to forming a central clearinghouse for the processing of individual payments between individuals and institutions, there is also the data and identify verification that accompanies the payment process. Although organizations, ranging from Google to Netflix to the array of financial institutions that dominate the payment and saving landscape, have invested billions of dollars and put thousands of people to work in these areas, the frequency and severity of data breaches and hacks continues to increase over time.

Cryptocurrencies may have been put forward as an alternative to traditional fiat and centralized currency and payment options, but in that context the broader cryptocurrency conversation has failed in the initial value proposition of this asset class. Due to the complexity of how the underlying technology works (more on

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_3

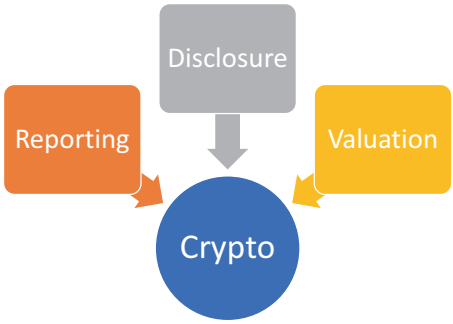

Fig. 3.1 Crypto issues for accounting & finance

blockchain shortly), actually using cryptocurrencies as a currency remains difficult. In addition to the slow processing that continues to plague many of the highest profile cryptocurrency options in the marketplace, actually using these items as a medium of exchange continues to be a work in progress. Rather, these items and assets have been, for the time being, used primarily as an investment option or tool similar to equity securities or commodities. This shift and development from a currency tool to an investment tool and option represents a fundamental change in how investors and institutions approach this situation. Figure 3.1 highlights and shows some of the core issues that continue to arise for accounting and financial services professionals connected to the treatment, reporting, and custody of cryptocurrencies and other cryptoassets.

Even following the continued development and support for cryptocurrencies, including the development and rollout of stablecoins, payment channels, lightning networks, and other emerging cryptocurrency tools, the rise of cryptocurrencies appears to be continuing virtually unabated. While the runup in prices associated with numerous cryptocurrencies and coins may have attracted the interest and attention of investors, even following the decline in prices during 2018 the levels of interest and investment appear to be continuing. Even with this increased level of interest and investment, however, an important question remains unanswered; should cryptocurrency be classified as an asset or as a currency item, which will drive further conversations (Parashar and Rasiwala 2019). Different cryptocurrencies have been developed for different areas of the economy, and specialized coins have even been introduced for distinct industry applications. That said, and acknowledging the rapid increase in in interest and development of the cryptocurrency space, it is important to recognize the following reality. Blockchain may appear to be the unsexy foundation that powers cryptocurrenices, but that foundation is what powers the entire cryptocurrency space.

That said, the true value of these emerging technologies may or may not lie in an individual cryptocurrency or even an array of cryptocurrencies, but rather the underlying technology that power the cryptocurrency space. Blockchain may have received a large amount of enthusiasm and investment during 2016 through the present, but is also an emerging technology force that is evolving nearly as fast as professionals can keep pace with these changes.

Blockchain Technology

Few technology tools or platforms have managed to generate more buzz, analysis, debate, and conversation than blockchain, especially since Bitcoin and other cryptocurrencies burst onto the scene in 2016 and 2017. Every accounting and finance conference, regardless of their geographic location, will inevitably have blockchain in the top 2 or 3 topics to be discussed and examined. Books, articles, podcasts, videos, and seminar series are also proliferating throughout the marketplace, so it is easy to feel overwhelmed by the sheer volume of opinions, conversations, and debates surrounding this technology. That said, it can also be just as easy to feel like it is too late to jump on, what seems like, the blockchain express as it barrels through the marketplace. An example of this is represented by the continuing lack of clarify and certainty with regards to how blockchain intersects with both accounting and other enterprise technology tools (Barnes 2018). This combination, the virtually limitless amount of information and the variety of opinions on the topic, can also lead to confusion and a misunderstanding of just what blockchain technology represents. Although the technology itself is comprised of facets and functions that, by themselves, are not particularly new or innovative, the combination of technology is what drives the innovation and business case generating such high levels of excitement. Before an objective conversation can be had about the potential for blockchain in the financial services landscape, an analysis must be conducted of what exactly blockchain is, what the core components of this platform are, and what those core components actually mean.

What is Blockchain?

A Brief History and Catchup

This book is not a historical text or analysis of how and why blockchain technology was developed or introduced to the marketplace, but in order to grasp just how powerful this technology is for the financial services landscape, financial services professionals must understand just why this technology exists. An origin story of blockchain and bitcoin would not be complete if the first chapter began in 2016, 2015, or even 2010, but rather it should begin in the 1980s. Beginning and growing out of the cypherpunk movement of 1980s, the movement that blended together both a libertarian political perspective and computer science expertise, the trend toward a digital and decentralized currency began to grow. Many attempts were launched during the 1980s and 1990s, seizing on the growing proliferation and integration of the internet into business practices. Ironically enough, especially given the fact that bitcoin itself may seek to disrupt the current financial system, some of the earliest developers and proponents of cryptocurrencies were financial institutions.

There early attempts, rather obviously in the current context, were unsuccessful in their attempts to develop a digital and decentralized method of transmitting financial information across geographic and political boundaries. Said failures were not the result of a lack of technical expertise, vision, or ability, but rather were linked to a

fundamental flaw in how the internet interacts with the financial system. Put simply, and boiling down all extraneous data and information, the internet is extremely efficient and effective at the following two functions. First, creating copies of information for distribution lies at the core of the true value that the internet providers to both individuals and institutions. The ability to distribute information across the world in, literally, the blink of eye completely transformed how commerce is conducted. On top of the rather obvious implications for data transmission, the way in which this data was communicated between different individuals and institutions was already permanently transformed by the proliferation of the internet. Even with these possibilities, however, the internet by itself only obtained paradigm shifting levels of adoption when personal computers become more widespread (more on this later).

Second, the ability of individuals to access, edit, and change the information that had been copied, and resend it or post it back to other users as new versions was a game changer. Think of a simple email attachment, be it a slide deck, word document, or excel worksheet that is able to transmitted back and forth between different actors, with everyone (for the most part) having the ability to make changes, relabel, and reattach this document. While this might come in handy for making changes to files in a workplace setting, or for editing media files, this exposes a core problem with the idea of a decentralized monetary unit or unit of exchange. The following point cannot be over emphasized, or stated as something that is of minor importance. In order for bitcoin or any other aspect of the cryptocurrency to exist, much less achieve the level of excitement and investor interest that currently dominates the marketplace, the underlying blockchain technology must have been operational first.

One of the most important analogies and connections to draw between blockchain and cryptocurrency technology is that without blockchain, the entire cryptocurrency economy and landscape would not exist (Limón 2018). The "crypto" in cryptocurrency would not exist, or at least not exist in its current form, if the blockchain technology had not been fully developed. Remember, and that in face of the buzz and excitement that currently dominates most conversations surrounding blockchain this can be difficult to remember, none of the core technologies embedded and that drive blockchain are necessarily new or innovative. The movement and shift toward a digital and decentralized currency has been underway for decades, and the technology used to anchor bitcoin and other cryptocurrencies is a result of that. Let's take a look at some of these foundational technologies and how they are related to blockchain technology:

Public Keys and Private Keys

The public key and private key conversation and protocol has been a part of computer programming and analysis since the first computer era first began in the business environment (Lopez 2006). Without diving too much into the technical weeds, public keys are the addresses to where data (of any kind) can be sent, and private keys can be thought of – quite literally – the key necessary to unlock and access the information that has been delivered to your public key address.

Hashing – the idea of hashing may seem like an overtly technical concept, and it is important to realize that the actual computer processing underpinning the hashing

process is complicated, but at a conceptual level the idea is not difficult to understand. In the context of blockchain technology the key points to remember about hashing are that it is (1) a one way conversion that, as of right now cannot be undone, and (2) serves as an identifying metric that can be tracked, examined, and analyzed throughout the entirety of the blockchain itself.

Encryption – clearly the concept of encryption is not something new, innovative, or an idea particularly associated with blockchain technology itself, but it is the specific encryption utilized in blockchain that make it particularly useful/interesting. Drilling down, the SHA-256 encryption methodology utilized on the bitcoin blockchain, initially developed by the National Security Agency, has proven to be unhackable with current technology and resources. This additional layer of security has proven invaluable as blockchain and bitcoin attempt to establish themselves as viable marketplace options.

Decentralized – the idea of a decentralized method of storing and communicating information has been an ideal of numerous individuals and institutions for decades, especially in terms of distributing wealth and data between different market actors, is not a new idea. That said, it was the implementation and refinement of blockchain technology that achieved this idea at scale, as well as allowing the secure and virtually instantaneous communication of information for it to actualize. That said, the true value of blockchain technology is not merely in the decentralized nature of the program, but the distributed nature of record keeping and information.

Distributed – contrary to existing information systems or databases, many of which rely on cutting edge technology and information communication, the distributed nature of blockchain records and information is distinctive versus other systems. While in a decentralized system and information there may be certain aspects of data and information that are not handled at the core, the distributed nature of blockchain is distinctive

Connecting the Two

Alluded to in the last section, the most likely point in which many financial service professionals first encountered and became engaged with blockchain technology was via Bitcoin, cryptocurrencies, or other altcoins. Understanding both the risks and opportunities connected with cryptocurrencies and blockchain technology at large is an important first step for organizations seeking to successfully integrate and deal with cryptocurrencies. Blockchain, however, is so much more than simply a methodology and technology for using cryptocurrencies; the very components that make blockchain technology interesting and exciting can also make the concept somewhat abstract and difficult to understand for some professionals. Hundreds, literally, of articles and books have been written that have definitions of blockchain included therein, but for the purposes of this conversation let's use the following definition.

Blockchain is a technology development and platform that enables members or users of the blockchain network to communicate in a near continuous manner, and to do so in a manner that is in encrypted in a manner that has remained unhackable to date.

Lying at the core of blockchain technology, and especially important for the applications it will, and already is, having for financial services professionals, is the distributed ledger technology that underpins the system. Put simply, a blockchain can be summarized and described as a distributed ledger system that allows all members access to encrypted and secure information in a near continuous manner. Now, this may not sound, in and of itself, revolutionary, but this encrypted transmission of information is augmented by the development and implementation of peer to peer applications. Namely, and something that will be examined in more depth throughout this text, the most prominent applications connected to blockchain technology seem to be cryptocurrencies and smart contracts.

Encryption and security, as opposed to being added on from a top down manner, or added as a supplemental resource to be purchased or installed after the installation of the core software, is an embedded component of how blockchain functions. Now, every blockchain is different and can be constructed with different security, encryption, and cryptographic settings, but when having conversations with clients – internal and external – this is a critical point to emphasize.

Taking a step back to view the blockchain landscape and conversation from a higher level perspective, the ramifications of decentralized ledger technology and system are profound, including from a regulatory and data security perspective (Herian 2018). It is important to remember that the entire current construct and set up of the financial services landscape is a centralized model and platform. In addition to the payment processing and other financial transactions that will be transitioned and further developed, there is also the fact that core functions of the profession will change. Auditing, attesting to the veracity and accuracy of the information published and reported by the organization is a core way in which accounting professionals deliver value to the marketplace. As information is uploaded and stored on various different blockchain platforms, obtaining approval and consensus based verification linked to the accuracy of that data, the need for auditing in a traditional sense will change. Put simply, the need for auditors to perform tasks and engage with organizations as they currently do will either decrease dramatically or disappear virtually entirely. Decentralization, however, will not simply have impacts on accounting; finance and the process of raising capital will also be dramatically impacted.

For example, traditional lending almost always takes place via a centralized model, and with the exception of an occasional gofundme campaign or other crowdfunding initiative or project, relies on a centralized source of capital to drive organizational growth. The idea of financing an organization or major business idea via a decentralized business model may seem radical or unorthodox to put it mildly, but will inevitably become more the business norm as blockchain becomes more widespread. The very idea of a blockchain business is to decentralize the access to information and data stored on the blockchain itself; whether that information happens to be financial information or other types of records. Decentralizing access to this information and data is a core principle of blockchain technology; raiding capital and securing the path forward for an organization is a traditional financial role that will inevitably result (Douaihy 2018). Financial professionals, whether taking the form of market makers themselves, or advising client organizations seeking to raise

capital, do spend a relatively large amount of time and resources in this area. More pointedly, this also represents an area of the marketplace where financial professionals are well compensated; both the time and the compensation will invariably change and shift as decentralized capital raising becomes more normal. That said, and even with the somewhat radical nature of blockchain technology, it is important to realize that blockchain itself is not an innovative or new technology platform.

One additional point to emphasize and figure at this point is to also connect the idea of a blockchain network to that of a cloud based computing network. Put simply, since the idea of a blockchain is to allow real time access to data by a variety of members on a continuous basis, a hardwired and centralized setup will simply not be appropriate. If blockchain, as it often is, represents an evolution of the Internet, or the development of an Internet of value, thae what the new internet requires is a cloud based platform. Downloading and joining the Bitcoin blockchain, the largest such network to date, can be done by simply downloading the operating program from publicly available sources. Such ease and scalability are traits core to the idea of blockchain technology, and also why centralized clearing houses such as banks and accounting firms are so interested in researching and developing this technology.

Security Concerns

Cloud computing has taken the accounting and financial services landscape by storm since it was first introduced to the marketplace, but with the advent and distribution of cloud computing there are also risks that must have been assessed. Hacking, breaches, and the deluge of consumer information that had allegedly been protected by organizations continue to dominate the headlines across media platforms. Ranging from financial services institutions, to insurance companies, to food organizations, and social media websites, the issues associated with hacking and data breaches is something that cannot be overlooked. Accounting information, financial information, and the data and information handled by financial services professionals represent a virtual treasure trove of data for hackers to exploit, steal, and hold for ransom (EWeek 2018). Now, it is also important to acknowledge the reality that bitcoin and other cryptocurrencies have been used as a method of payment in numerous ransomware incidents across the globe, but that is merely a symptom of a broader structural problem.

Centralized storage and processing of information, be it at Google, J.P. Morgan, Facebook, a health care network or Whole Foods, does present several benefits and upsides that have been readily leveraged. The centralized storage of data allows for faster processing times, reduced costs, as well as the building out of additional platforms and service such as artificial intelligence platforms. These additional services, platforms, and protocols have generated consumer benefits, expanded product and service options, as well as numerous consumer benefits and upsides. Entire businesses have sprung up around the storage, processing, and leveraging of these vast reams of data and information (to be discussed more in the artificial intelligence section), including the entirety of social media and data analytics firms. That

said, and acknowledging the wild popularity of these firms and services to the broader marketplace, the centralization of information and also presents several issues that blockchain may be able to address.

A centralized hub of information, whether it is represented by a physical data warehouse or a virtual hub of data stored in a cloud environment also creates a centralized opportunity for hackers and other unethical actors to attack. An analogy that would also make sense is to imagine that, instead of criminals having to search an entire building to discover where the valuables are stored, they are told exactly where to focus their efforts and activities. Drilling down and expanding this concept to the blockchain conversation, the implementation of blockchain technology appears to address this issue with the current trend toward increased centralization and analysis of data. Put simply, instead of relying on a specific organization – no matter how technologically oriented they may be – to secure and protect sensitive information – there is no need to rely on a single platform or technology to safeguard information. Again, since encryption and cryptography are core components of blockchain technology – instead of an additional service offered after initial sale or installation – every copy of the data records are protected.

The key takeaway here is that, instead of having to safeguard, increase controls, and continuously increase the financial spend toward safeguarding information, the very nature of blockchain technology increases the security and safety around valuable information and data. This is not merely an academic concern nor a theoretical conversation; some of the largest, most sophisticated, and most well funded financial institutions in the world have been the victims of hacking and data losses. Equipping every single copy of the record with an increased security protocol in the form of encryption, and providing every single member of the blockchain network with a copy of this encrypted record is a paradigm shift. Instead of having to hack or gain access to simply one record or copy of the information, hackers or other unethical actors would have to gain access to the entirety of the records.

For the purposes of this book, and to resolve any outstanding confusion or conflicting definitions that may have arisen, the following working definitions appears appropriate.

Blockchain is a decentralized methodology of transmitting information, doing business, and interacting with other individuals and organizations in an encrypted manner without requiring a centralized third party to verify any aspects of these transactions. An important point to understand is that Bitcoin and blockchain are not the same, but are closely connected due to the fact that cryptocurrencies require blockchain technology to function.

Cryptocurrencies can, and should be thought of as applications that run on the underlying blockchain technology. A common way of thinking about blockchain is to liken it to the protocol (TCP/IP) that underpins the current internet; websites and other portals are applications that run on this underlying technology. Cryptocurrencies are applications and programs that run on the blockchain, but are not one in the same. Just like practitioners need not understand the specifics of TCP/IP to use the internet, practitioners are not going to have to understand the technical specifications of blockchain in order to use it successfully. That said, the developing and

increased institutional focus raises the question as to where exactly cryptocurrencies fit in the current investable asset landscape (Sontakke and Ghaisas 2017).

Artificial intelligence, despite the hype, buzz, and near mania that often accompanies this conversation and discussion, a solid working definition of AI that can and should be used is as follows. AI is a program, or combination of programs that can either augment or entirely replace human oversight and engagement with certain processes.

Blockchain Breakdown

There has been quite a bit of analysis about core characteristics of blockchain technology, but it is important to make sure everyone involved in the conversation is working off of the same page. Specifically of importance for accounting and other financial professionals seeing to develop new and additional services connected to this technology, understanding how these tools can drive change in the accounting and auditing space is imperative (Mahbod and Hinton 2019). Different components of the technology itself will mean different things for different aspects of the financial services landscape, so ensuring that accurate definitions are used is critically important. Drilling down specifically, let's take a look at the four most commonly discussed traits and characteristics of blockchain.

1. Immutable – especially exciting for individuals employed within the financial services area is the fact that once data has been uploaded and verified by other members of the network (more on that in a minute), the individual blocks of information cannot be altered. While it is possible for subsequent blocks to generate, through a net effect, a change to the information uploaded in total, the individual blocks of data are unable to be edited.
2. Consensus based verification – another important characteristic of blockchain technology is that, in order for information to be uploaded and stores on a blockchain, other members of the network have to approve and verify that information. Without diving too much into the technical specifications, and acknowledging the reality that every blockchain can be configured differently, this consensus based methodology strengthens the security since every member of the network is involved in this approval process.
3. Decentralized – the decentralized nature of blockchain technology and blockchain platform forms, is perhaps the most revolutionary and potentially disruptive nature of this technology and platform. Decentralizing the storage and validation of information, of course, comes with certain risk factors that are consistent with risk factors associated with storing potentially sensitive in a cloud based environment. That said, the decentralized nature of information and technology is not necessarily a new or innovative approach. Cloud based computing, which the blockchain concept requires to operate, is not a new idea nor one that is new to anyone in the marketplace.

   a. Drilling down, diversifying and distributing the ownership and record keeping of information also helps to reduce the single point of failure risk that is, by default, a component of many current centralized networks and systems.
   b. Also, by decentralizing the approval process, and again taking into the fact that individual networks can be constructed with various approval and verification processes, the risk of any one individual actors assuming control to engage with unethical behavior is reduced.
4. Real time communication – in a fast changing business environment, and responding to client and customer demands that increasingly are centered around real time information, blockchain does present a possible solution to current bottlenecks. Even with applications and advances in current technology, there are still significant gaps in how data is communicated and transmitted between supply chain partners. Applications and examples linked to how blockchain is already impacting the supply chain angle of the market (which accounting and financial professionals are part of) include some of the following:
   a. Supply chain and food safety implications – food safety is an issue and matter of concern for virtually every individual and, important for our purposes, organization. IBM, a leader in the blockchain space but by no means the only player in this area, has launched numerous pilot projects and initiatives to assist organizations with tracking, verifying, and pinpointing pain points in supply chains linked to food transportation.
   b. Healthcare accounts for, depending on estimates, and depending on the specific report referenced, between 20–25% of the U.S. economy, or between $4–5 trillion in economic activity. Regardless of views on either the efficiency or effectiveness of current healthcare policies and methodologies, there does appear to be room for reducing errors and omissions while also increasing the efficiency of operations.
   c. Financial services – drilling down to the core concepts embedded within this book and discussion, the implications for financial services appear to be simultaneously understated and perhaps over hyped. Blockchain itself is a potentially transformative technology, but many financial services individual and organizations were introduced to this technology via the cryptocurrency Bitcoin, or other altcoins. Bitcoin and other cryptocurrencies may have received headlines and market coverage, but blockchain itself is already the focus of billions of investment throughout the financial services landscape.

Chapter 3 Summary

This book may have the words blockchain and artificial intelligence in its title, but the most likely way that many financial practitioners were introduced to blockchain was via what is arguably it most well known application; cryptocurrencies. Whether it is bitcoin (the first and largest cryptocurrency), or one of the thousands of other cryptocurrencies that have entered the marketplace

since 2016, it is certainly something that every financial services professional needs to be aware of and know about. These issues and developments occurring in the broader cryptocurrency space continue to evolve and change at an accelerating pace, including the rise of stablescoins, decentralized finance, and how blockchain technology intersects with the cryptocurrency space. Even as these technological developments accelerate and continue to weave into, there remain multiple areas and open items that have yet to be addressed for both accounting and financial reporting services. Recording these assets, developing services and business lines related to said assets forms the basis of this chapter, as well as how emerging themes and directions will continue to drive change in the financial services space. Topics that are introduced here, but are also revisited throughout the book include stablecoins, regulatory updates, the potential for new types of financial institutions to handle crypto related activities, and the implications this may have on accounting and finance at large. In other words, if a practitioner or a client are looking for an overview and introduction to the cryptocurrency landscape this chapter is a great place to get the information you need.

Reflection Questions – Chapter 3

1. Have you already experienced client questions or concerns related to cryptocurrency adoption and utilization among client or customers?
2. Based on your understanding, does the regulatory uncertainty connected to cryptocurrencies seem to be encouraging centralization or further decentralization?
3. What is a stablecoin, and how does it fundamentally differ from traditional, or fully decentralized cryptocurrencies?

Supplemental Readings

CPA Journal – Blockchain Basics and Hands-on Guidance – https://www.cpajournal.com/2018/06/19/blockchain-basics-and-hands-on-guidance/

Blockgeeks – What is Blockchain Technology – https://blockgeeks.com/guides/what-is-blockchain-technology/

Forbes – A Complete Beginner's Guide to Blockchain – https://www.forbes.com/sites/bernardmarr/2017/01/24/a-complete-beginners-guide-to-blockchain/#448887d16e60

Cryptocurrencyfacts.com – https://cryptocurrencyfacts.com/

TD Ameritrade – Bitcoin and Cryptocurrency 101: Understanding the Basics – https://tickertape.tdameritrade.com/trading/bitcoin-cryptocurrency-basics-101-16210

Ontario Securities Commission – Digital Coin Basics - https://www.getsmarteraboutmoney.ca/invest/investment-products/cryptoassets/digital-coin-basics/

References

Barnes, N. D. (2018). Blockchain redux – cracking the code on cryptocurrencies. *Information Management Journal, 52*(6), 26–30.

Blockchain, "WHOIS" Services Break Key Requirements of GDPR. (2018). EWeek, 1.

Douaihy, M. (2018). Building a digital wall with blockchain: Shared-ledger technology poised to play a key role in data security. Multichannel News, 39(8), 13–N.PAG.

Herian, R. (2018). Regulating disruption: Blockchain, GDPR, and questions of data sovereignty. *Journal of Internet Law, 22*(2), 1–16.

Limón, A. T. (2018). The wild, wild west: Understanding cryptocurrencies and their implications on financial planning. *Journal of Financial Planning*, 40–44.

Lopez, J. (2006). Unleashing public-key cryptography in wireless sensor networks. *Journal of Computer Security, 14*(5), 469–482. https://doi.org/10.3233/JCS-2006-14505.

Mahbod, R., & Hinton, D. (2019). Blockchain: The future of the auditing and assurance profession. *Armed Forces Comptroller, 64*(1), 23–27.

Parashar, N., & Rasiwala, F. (2019). Bitcoin – asset or currency? user's perspective about cryptocurrencies. *IUP Journal of Management Research, 18*(1), 102–122.

Sontakke, K. A., & Ghaisas, A. (2017). Cryptocurrencies: A developing asset class. *International Journal of Business Insights & Transformation, 10*(2), 10–17. https://doi.org/10.1080/1540496X.2016.1193002.

Consensus Methodologies

4

It is also worth noting at this point, and before diving into a conversation between the different types of blockchains, it appears logical to discuss just how information is approved, verified, and added to existing blocks to form the blockchain itself (Andolfatto 2018). There are numerous iterations available in the marketplace, and this is not meant to be an all-inclusive listing nor an exhaustive one. Rather, by understanding what these different approval methodologies are, and having a working baseline for what these options mean, will equip financial professionals with the skills and information necessary to discuss and advise on these important issues moving forward.

Taking a time out here to appreciate just have radically different a consensus based methodology is from traditional financial services processes, let's take walk through a quick and simple example. In a traditional financial transaction, such as an accounting entry, recording a trade, or verifying a counterparty has signed a document, the initial entry authority usually lies with one person at one of the organizations. Usually this individual, or even automated program, performs the role correctly and catches any errors before they are entered into the system and have the ability to cause financial damage. The key word there is usually, and there are numerous examples of how relying on an individual – or even one organization – to be the sole authority of data entry and validation has failed.

Audit failures, some of them which have failed spectacularly such as those that occurred during the financial crisis, as well as those that occur at an infrequent but unsettlingly common rate, are a prime example. Shifting gears to the market trading and liquidity conversation, the London Whale fiasco at J.P. Morgan highlighted just how weak internal controls over trading, trade limits, and supervision of these activities can be even at the largest and most sophisticated of organizations. Numerous other failures, be they associated with mortgages being sold with proper documentation or support, reports being issued and then retracted, or a lack of reliable data hampering decision making figure just how vulnerable a centralized approval and documentation process can actually be. Now, with that said, it is also important to realize that – for the vast majority of instances – a centralized data management

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_4

solution may work perfectly fine. As information and business becomes increasingly digital, global, and decentralized in nature, however, the odds of that maintaining a centralized platform for core operations will not sufficient moving forward.

Let's take a look at three or the highest profile consensus based approval options currently utilized by market individuals and organizations:

Proof of Work (PoW): Requires only a single node to submit a solution to an algorithmic problem, which is very difficult to achieve but easy to verify once accomplished. This is the methodology used in both the Bitcoin and Ethereum blockchains, but consumes more electricity than other options, reducing applicability for large scale implementation. For midsize, and even large size CPA firms and clients, this approval protocol and consensus might not be efficient or applicable for daily utilization.

Proof of Stake (PoS): Opposed to PoW, which is essential a competition to solve the algorithmic problem, the PoS protocol uses a lottery system to decide which nodes (members) will approve the transactions and information in question. The probability of being selected for approving transactions and information depends on the stake held by the organization or individual in question

Stake, in this conversation, refers to the number of Bitcoins or other altcoins held by the individual or organization

While this may result in some of the larger altcoin holders having outsize approval control over entries and blocks, these large stakeholders are also equally vested in the success and veracity of the network

Proof of Elapsed Time (PoET): Instead of the methodology underpinning the PoS protocol, the PoET assigns a random model to determine who will approve the block of pending information. The node (member) with the shortest wait time wins the lottery but will have to wait a certain amount of time before approving additional blocks. One item to keep in mind is that, in order to utilize the PoET the nodes involved must run Intel Software Guard Extension, which may pose issues for some organizations and clients.

Public Versus Private Blockchain

Blockchain, despite the books, articles, podcasts, videos, and countless presentations is often discussed and analyzed as if it is just one large and continuous construct or protocol, but that is both an incomplete and incorrect perspective on the technology. While there are more granular definitions and types of blockchain available in the marketplace, for the purposes of this conversation this topic can be boiled down to two large categories; public and private blockchains (Bussmann 2017). While there are hundreds, if not thousands of viable blockchain models available for organizational adoption, generally speaking there are two viable categories that appear worthy of additional examination. Taking a look at these two large and distinct categories, it seems like a good time to put together some definitions that are both explanatory and differentiated.

Public Blockchains

Public blockchains are perhaps what most professionals think of when the word blockchain is mentioned in a conversation, in the form a widely distributed database that any individual or organization can join and become a member of. Completely decentralized in nature, and providing large degrees of anonymity, a public blockchain can be as large as network members wish it to be. In addition to allowing anyone to join and become a member of this network, the concept of the public blockchain is also the type of blockchain that underpins Bitcoin. Even from a high level, this open access generates quite a issues and open items as they connect to ligation, governance, and conflict resolution mechanisms that are all of importance for financial professionals to understand (Webster and Charfoos 2018). This book is not about cryptocurrencies specifically, but in the following pages we are going to discuss and analyze just what Bitcoin is, cut through the hype, and connect Bitcoin to financial services. For the time being, however, the idea of a public blockchain can be thought of as the "ideal" version and type of blockchain technology as per some of the most outspoken advocates of the platform.

Some of the pros and advantages of utilizing a public blockchain model are that, by the very nature of the technology itself, there is no need for a central clearing house or an overseeing institution to verify, clear, or confirm transactions. This may very well appeal to some libertarian oriented proponents of blockchain, or individuals who are dissatisfied with the status of the current banking and regulatory system, but does present several critical issues for financial professionals. For example, and something that has seized the attention of financial professionals across industry subsectors, is the reality that if this completely decentralized financial system matures from concept to reality there will be less need and fewer requirements for intermediaries. Think about this specific example; if individuals or organizations can transact business and send information to each other without the need for an intermediary to verify or confirm this data, are banks and other financial institutions truly necessary?

Some of the disadvantages and downsides to a truly public blockchain implementation and methodology is that, as the public blockchain expands and grows and size, the actual verification and confirmation of individual transactions can become increasingly cumbersome. One of the most popular and widely utilized public blockchains is the blockchain network that underpins the cryptocurrency Bitcoin, with well over ten million members as of 2018. The size of the network itself, however, is not necessarily a problem or complicating issue; it is the combination of network size and data verification method that can complicate the utilization process. Drilling down a little bit more, and linking back to the proof of work idea introduced previously, this approval and consensus based verification methodology associated with Bitcoin and other public networks is commonly the proof of work protocol. While perhaps the most authentic, to some, form of how data should be approved when added to a blockchain environment, this can form a bottleneck in terms of many transactions and interactions can actually be verified by network members.

For example, at the midpoint of 2018, the number of transactions that can be verified and added to the Bitcoin blockchain, the largest and most well established blockchain network, can handle anywhere between 10–15 transactions per second. This is not by any means a slow or cumbersome pace of data approval, but when compared to the amount of data that can be processed or approved by existing credit card and other financial intermediaries, the significant short comings of Bitcoin as a tool for purchasing becomes apparent. In addition to not being as efficient or as fast as existing approval methodologies, the proof of work methodology utilized by the Bitcoin blockchain has two other issues worthy of note. First, the sheer amount of computing power and servers required to process and confirm different transactions and information means that, as the blockchain becomes larger, ever larger and more complex computing power is necessary to become a proactive part of the network. Second, and on top of the array of computing power and infrastructure required, all of this computing equipment draws a tremendous amount of electricity. The need for electricity has grown so large there have been cases of utility operates seeking to sublet or lease portions of locations to facilitate the blockchain approval process

Private Blockchains

Private blockchains, conversely, would not and are not considered by blockchain purists as a true blockchain model, due to the somewhat hybrid nature of a how private blockchain network is constructed and operated. Now, with that said, it is important to remember that even though a private blockchain is a hybrid model and type of blockchain, the underlying fundamentals of how data is added and approved is not substantially different. The core differentiating factor between a private and public blockchain is while there is no central hub or authority in the context of a public blockchain, a private blockchain will have an organizing firm. An organizing firm can be any type of organization, be it a bank, other financial institution or some other type of organization such as the Walmart example introduced previously.

The organizing firm is the firm or organization that, for lack of a better descriptive turn of phrase, writes and develops all of the rules and guidelines for how the blockchain will operate. Specifically, the organizing firm will, through the coding and programming language embedded in how the blockchain functions, decide and authorize what type of organization can be a part of the network, and also what these different members are authorized to do. Taking a closer look at what exactly might mean, an analogy to help connect this somewhat abstract idea to a concept more familiar to everyone in financial services. One way to think of a private blockchain is to think of it akin to a shareable document, like a Google Doc. The individual who creates the document folder or document can decide (1) who is authorized to have access to the file or folder in question, and (2) what those different individuals are authorized to actually do once they are a part of the network, just like different users can have either edit, comment, or view only ability.

Since the access to a private blockchain is more restrictive than access to a pure public blockchain this means that approval, data verification, and communicating

this information out to other network members can be done in a much more streamlined manner. Taking an objective view, these benefits make sense; unlike a public blockchain which anyone can join and therefore become part of, the approval process a private blockchain can be restricted to only include individuals who are directly involved. This combination of restricted membership and different assigned level of responsibility also means, that in addition to being more efficient and practical for business use, a private blockchain may actually be a more environmentally conscious option. Since, as a result of the oversight of the organizing firm, any approval and verification process may be used by network members, this also means that the confirmation and approval of information can happen in a more time efficient manner than if a purely public blockchain model is utilized.

Some of the disadvantages of a private blockchain stem from the very technology itself, and how it is adapted from a purely public model to a private blockchain setup, which can for all intents and purposes, be thought of as a hybrid. Specifically, and of particular importance for financial services professionals seeking to implement and leverage blockchain technology is an organizing firm can construct policies, guidelines, and requirements in a wide variety of ways. For example, in a private blockchain network if the organizing firm and protocols are written in such a way that a block of organizations, certain select firms, or a small handful of organizations can upload, verify, and validate blocks of data without oversight from other network members this poses a threat to the applicability of this technology to financial services. In addition to this fundamental flaw in the private blockchain model there is the also the requirement that, for the organizing firm to actually lead the private blockchain itself that organization must have the sufficient technical expertise to do so. In addition to placing the onus on the organizing firm, this also creates an opportunity wherein, if clients and other organizations join a private network led by an unethical actor, all other network members are potentially at risk.

Consortium or Federated Blockchain Models

Public blockchains may or may not be the most appropriate model of blockchain technology for an individual organization, especially given the distributed and open access nature of the information that is stored on the platform itself. Particularly given the price volatility (namely price declines) that have been associated with the cryptocurrency marketplace in 2018 and 2019, some investors and institutions have been increasingly hesitant to invest in public or completely distributed blockchain models. Even though the underlying blockchain technology and cryptocurrencies themselves are not exactly the same thing, they do operate in the same crypto-blockchain ecosystem, and are influenced by each other as a matter of course. Contrasting with this, an entirely private blockchain model, despite the benefits and efficiency generating characteristics of such as model, does not always appear to be appropriate for every instance as well. In order to construct and operationalize a private blockchain model, in essence, there has to be one firm or organization in charge of the operating protocols and algorithms that drive the network itself.

In some cases, such as much publicized private blockchain constructed as a joint venture between IBM and Walmart, the organization in charge may have the technical and financial capabilities to both build and maintain a private blockchain. More importantly, the organizing firm might have the leverage and bargaining position to help enforce and require different members of the supply chain or network to adopt the private blockchain model developed at the organizing firm. That said, it is important to recognize the reality that especially in areas or industries with a relatively high concentration of market power – such as in accounting or investment banking – there may be several institutions that would want to assume the role of organizing firm. Even with the appropriate safeguards and controls in place, there is always risk associated with basically outsourcing the storage and safeguarding of information to a third party firm, especially if there is a semi-cooperation and semi-competition model. This desire, and reflection of market realities has led some industries and organizations operating therein to try and develop a model and idea that meets the needs of the marketplace while still allowing the individual firms to maintain control and ownership over information and data.

Distilled down to the core idea, a consortium blockchain model is best summarized as a group effort toward developing and maintaining a blockchain. Sector specific blockchain platforms are already being developed in real estate, healthcare, accounting, finance, and the area of royalty payment and distribution, including blockchain as a service offerings beginning to enter the marketplace (Roberts 2019). Benefits associated with such a tactic and idea are relatively straight forward to analyze and document, and are most often linked to lower costs and the lowering of other implementation barriers. For example, it is much easier for a group of organizations to pool resources and information in a technically complicated area then to have one organization attempt to shoulder the burden individually. Additionally, and especially applicable for the financial services space where there is cooperation and a cross listing of clients and potential conflicts of interest connected to different classes of information, establishing a consortium model may be more appropriate given the nature of the industry especially as clients expect increased transparency and access to information.

A model that creates and distributes, for lack of a better word, joint ownership and operating of the blockchain model creates several benefits in terms of information transparency, but also raises issues connected to data governance as well as liability concerns as well. Especially as it links to personally identifiable information the responsibility is increasing shifting to the organization collecting and utilizing this information to establish and maintain safeguards over access to this information. Despite the operational and potential privacy driven challenges linked with this information and the common platform for information storage and dissemination, a consortium model of blockchain development and operation does seem to emerging as a viable model. Whether it is connected to the lower costs per organization that are achievable with costs being spread around different firms, the regulatory ease that accompanies a common platform or model between the largest players in a specific space, or the desire for standardized reporting and analytical procedures at large, a consortium model does appear to generate benefits for those organizations involved.

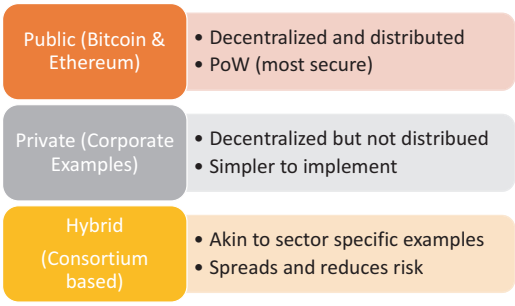

Fig. 4.1 Highlights and differences of blockchain options

Governance and liability issues connected to different blockchain models and other cybersecurity issues are discussed in more depth throughout this text, but it seems appropriate to at least mention them here in an initial venue. Figure 4.1, there are pros and cons to consider for each model of blockchain ranging from public to private to hybrid, some of which are included in the figure here:

Blockchain Investments

The vast majority of the investment in the blockchain space, both in the financial services landscape and across different industry lines, has been focused in the private blockchain arena due to the simple fact that the blockchain itself can be customized and modified to meet the needs of the specific organization. A high profile example of just how much work and investment are already underway in the private blockchain space are the collaborative work underway and developed by IBM, Big 4 accounting firms, and other large multinational companies. Microsoft, in response to investments made by IBM, Amazon, and numerous other organizations, has recently launched and made public a blockchain consortium tool meant to establish frameworks and standards in the marketplace (Hernandez 2016). In addition to leveraging and building out increased functionality and use cases with regards to cryptocurrencies, which we will link back to in a minute, supply chain and documentation appear to be the leading areas in which blockchain development is occurring.

Even with these investments and activities currently underway, it does appear appropriate to acknowledge the reality that these investments have resulted in relatively few viable commercial models (Moynihan and Syracuse 2018). Commercial scale is the proverbial holy grail of blockchain adoption – proving that this technology can be scaled, adopted, and implemented even across legacy systems. That said, and even at the Big 4 accounting firms and investment organizations that have invested thousands of employees and billions of dollars in these platforms, there are few examples of blockchain adopted for mass market utilization. Specific use cases, including auditing certain classes of information and applying blockchain for asset verification and taxation purposes may currently exist, but a wider adoption and rollout of these solutions remains a work in progress.

Now, it may not appear that documentation or supply chains offer much in the way of promise for accounting and financial service professionals, but that would represent an incomplete view of just what blockchain offers in terms of potential. Mortgage paperwork, settling different transactions, confirming that payments have been made in full and to the appropriate parties, and pretty much anything to do with tracking and analyzing financial information involve confirming, tracking, and communicating large amounts of quantitative information. Instead of simply focusing on the technical programming aspects of how blockchain functions, a more appropriate conversations focuses on framing the potential of blockchain in the context of data verification and communication connects the technology to different business uses. Cryptocurrencies may have been the leading tip of the blockchain economy and landscape, but the core functionality of blockchain is directly connected to both cryptocurrencies and other applications built on top of this blockchain foundation.

Prior to drilling into two specific forward looking applications it makes sense to, first, revisit some of the progress already underway in the marketplace in the form of collaboration between information technology organizations and other industry actors. In addition to the almost usual investment and engagement by some of the largest accounting and financial services organizations, there is an underlying layer in this conversation that may have been, at least, initially overlooked. Many of the largest investments in the blockchain space have, to date, occurred in areas tangentially related to financial services but will inevitably have an impact on the work and functions currently performed by the professional subsets. Whether it is real estate documentation, supply chain implementation, improving the compliance of environmental initiatives, or effectively leveraging the internet of things, the reality is that blockchain implementation and investment is a multi-billion dollar undertaking.

Taking a look at just three of the initiatives and applications that run on blockchain technology will inevitably result in some areas and topics not being discussed; the same thing could be said of any analysis of an emerging technology. That said, let's take a look at three of the most high profile applications of blockchain that are generating some of the buzz and excitement in the marketplace.

Forward Looking Applications

Initial Coin Offerings (ICOs)

Perhaps the most buzzworthy combination of financial services and blockchain technology, outside of the cryptocurrency marketplace itself, is the proliferation of ICOs throughout the marketplace. While many examples of financial market innovation exist, it does appear that increased blockchain adoption and integrated continues to drive innovation and product development both in the United States and abroad (Lewis, McPartland and Ranjan 2017). An ICO, although it may sound like an overtly technical or abstract idea, does not differ in any substantive form, at a basic level, from an initial public offering. Financial services professionals are, almost universally, comfortable and familiar with the concept of an IPO, in which

an organization trades ownership stakes in an organization in exchange for cash to fund continuing operations. An ICO operates in a similar fashion in terms of the implications for the organization, cash is exchanged for something issued by the organization, but that is where the similarities end. Instead of exchanging an ownership stake directly with an investor for cash, the issuing organization trades something a different type of asset.

Prior to that discussion, however, it is also important to realize the reality that, in order for an ICO to even occur at all, the issuing organization (the firm seeking to raise capital) must do use using a blockchain platform. This requirement has led to a massive expansion of the number of blockchain options available in the marketplace, but is also leading to increased regulatory uncertainty. As of the writing and editing of this book there is limited guidance as to how the items and assets issued as part of an ICO should be accounted for in the marketplace. Let's take a look at some of the specifications that are usually associated with the ICO process, which appears to only be increasing in process:

1. ICOs require a blockchain to happen – the connection between ICOs and blockchain technology are very similar to the relationship between cryptocurrencies and blockchain technology. Just like cryptocurrency requires a blockchain to function appropriately, an ICO requires that all of the tokens, regardless of underlying purpose, must be issued using blockchain technology.
2. Ownership may or may not be exchanged – unlike a traditional IPO process, which is a relatively straight forward to understand (cash for ownership), the cash contributed by investors to the organization may or may not be exchanged for ownership in the organization. Depending on the overall aim of the fund raising and ideas of the management team, the investors may simply receive a token, which is a different type of asset than straight ownership.
3. Tokens are what is exchanged for cash – instead of swapping cash for equity ownership within the business itself, how ICOs have functioned between 2017 and 2018 is that cash raised by the organization is exchanged for a token. The technical details of how a token specifically works is not the purpose of this book, but a basic working definition of what a token represents can be as follows. A token is simply an option to a right, product, service, or eventually ownership is a firm that has raised money via an ICO at some point in the future. In other words, tokens can be thought of as options, which may make it easier to understand than simply drilling deeper into the technical weeds. A more thorough analysis is conducted throughout this text, but for now let's keep the conversation moving.
4. Regulation is still involving – this may not seem like a dramatic surprise, nor should it be given the nascent nature of blockchain technology. Although the concept of blockchain technology has been analyzed and discussed in the marketplace since roughly 2008 it really burst into the public awareness once Bitcoin (the first real application with scale) began to increasing in popularity. ICOs are merely the most recent iteration and evolution of blockchain technology, and by representing the next step – using blockchain to raise capital – it is open to changing regulations due to changing market forces.

5. ICOs are not substantially better – one of the biggest questions and concerns that may be raised by clients and potential customers is whether or not an ICO process is substantively better than simply raising capital through an IPO process. While the answer is unique and will be different from organization to organization, the reality is that given the regulatory uncertainty it is does not appear that an ICO is, inherently, better or more appropriate than a traditional IPO. This may be a difficult conversation to have with certain clients, especially if they are very excited about the cryptocurrency market at large, but is one that must be had.

Security Token Offerings

In the writing of this book, and always a challenge when attempting to compose a comprehensive text on emerging trends in an emerging field such as blockchain or artificial intelligence, is that this technology continues to evolve and develop continuously. As 2018 drew to a close and turned into 2019, and the various iterations of the ICO market continued to mature and develop, two distinct forces began to intersect. First, as the volume and financial impact of ICOs continued to increase, regulatory attention and focus also continued to increase and develop. This increased scrutiny was also evident in the 2018 annual report of the S.E.C., where specific mention was made both of ICOs in general as well as the increased enforcement actions that the Commission was planning to bring to bear on the market in 2019 and beyond. Such increased regulatory attention is, of course, a logical byproduct and result of the popularity of these ICOs with cryptocurrency and blockchain companies seeking to raise capital while also avoiding some of the compliance costs and paperwork associated with an IPO.

An intermittent solution, also discussed in this book, was the utilization of Airdrops to assist organizations seeking to raise both capital and increase market awareness of the different initiatives underway. While an additional step removed from the regulatory and oversight jurisdiction of the S.E.C. and other regulatory bodies, it is also clear that the accounting, financial, and compliance issues associated with this process are continuing to be explored. Taxation, reporting the proceeds initially raised via Airdrops, and the associated implications of these events still remain open items as of this writing, but are assuredly topics being addressed and examined by various regulatory and oversight bodies. Secured token offerings appear to offer, to some at least, a hybridization between what was initially the goal and mission of the cryptocurrency space at large as traditional financial markets. Again, financial services professionals will not have to become technical experts in all aspects of the cryptocurrency and blockchain spaces, but will have to understand both the applications built on these platforms as well as how they interact with traditional financial infrastructure.

At the core of the idea, a secured token offering may actually be classified as a halfway point between a traditional IPO process and an initial coin offering that many blockchain based organizations have chosen to utilize. From a compliance

and reporting perspective, the implementation and adoption of STOs in the cryptocurrency market may help resolve some of the current outstanding issues that currently may make the cryptocurrency space troublesome, confusing, or higher risk than other markets. A core difference between an ICO and an STO is that the token that is issued as a result of the STO process is backed by an underlying asset, share of an organization, or right to a share of organizational profits. Regardless of the label assigned to the tool, however, there are several key points that need to be considered when analyzing the STO space. Prior to examining some of these key points, however, one salient point that must be a part of every conversation regarding STO is the fact that these activities are approved by the S.E.C. Additionally, while many ICOs do not – in fact -grant investors any protections or share in management of the organization, the STO concept embraces both of these aspects. This may seem like a relatively simple delineation, but is a powerful difference in terms of both market certainty as well as the impact that these investment options will have on the financial conversation.

Toward the end of 2018, the S.E.C. began to take and execute enforcement actions against individuals and institutions that had been involved with various ICOs and other token offerings in the marketplace during 2017 and 2018. Included in these enforcement actions were guilty verdicts and multimillion dollar fines levied against both the organizations in question as well as the individuals running those organizations, indicating the seriousness with which regulators and oversight institutions are evaluating this emerging area. A secured token offering appears to offer a hybrid or bridge solution between an ICO or other potentially unregulated area and a more traditional model of capital raising. While still developing, this is certainly worth of consideration from a financial services perspective, including an accounting and market making point of view.

Smart Contracts

If the ICO concept and idea is the most direct connection between cryptocurrencies, blockchain, and financial services, the idea of a smart contract is arguably the most high profile and commonly discussed next step application of the blockchain economy. Different blockchain networks and protocols will, clearly, have different approval and coding processes, but the connection between blockchain and contractual law are not as abstract or disparate as they may initially appear. Contract law, and understanding the minutia of contract law, forms an entire profession in and of itself, and blockchain is not going to automatically make financial professionals contractual law experts. That said, the automation, interconnectedness of how business is conducted, and the ever increasingly complexity of business and financing arrangements means that financial services professionals do indeed spend quite a bit of time dealing with contractually oriented issues.

Background

Let's take a step back, however, before diving into an analysis and discussion as to see how exactly financial services are, without a doubt, connected and linked to contracts, agreements, and interpreting these agreements. First, accounting information is, almost by default, driven by the interpretation and analysis of contracts, agreements, and interpretation of standards. Whether these agreements and contracts are based off of agreements with suppliers, customers, and partners, or are driven by new FASB regulations and standards the underlying trends are the same. CPAs and other accounting professionals often, whether working in public practice or employed within private industry, spend a majority of time trying to understand agreements and translate those agreements into financial reports. Second, financial markets and financial services professionals employed in the full spectrum of market activities (commercial lending, investment banking, trading, credit trading) are increasingly driven by complicated agreements between originators, lenders, and third parties.

Regardless of individual opinion or perspective on whether or not the increased complexity of financial services is a value add or not, the fact remains that it continues to occur, and this complexity is potentially amplified by the intersection cryptocurrency with current outstanding accounting questions (Bruno and Gift 2019). Interpreting agreements, explaining agreements to third parties, and making sure that the financial ramifications are clear are core roles of any responsible fiduciary. This also connects this conversation back to the implications of smart contracts on the financial services environment; increased compliance and scrutiny. It is no secret that, across the globe, financial regulation has emerged as an increasingly hot button issue in the wake of the financial crisis of 2007–2008. There is an abundance of blame to go around, and has gone around, but something that is beyond dispute is that, in hindsight, there was a misunderstanding and misinterpretation of just what was contained within certain financial instruments. This connection between financial services, risk, and compliance form the basis for just how powerful the evolution of a smart contract market may very well be.

Clearly smart contracts are not going to be useful or applicable for every situation, or for every firm, but it is important for financial services professionals to be aware of just what exactly this may mean for the profession moving forward. For example, auditing itself may be transformed by the recording and automated recording of information between different organizations. For industries and situations that involve multiple counterparties, large amounts of paperwork, and the approval of multiple organizations to finalize transactions, the implementation of smart contracts can be a game changer. Data is what ultimately drives the decision making process, and the capability of different firms to process, analyze, and act on different pieces of data on a continuous basis may very well mean the difference between success and failure. Diving deeper, and realizing the applications and possibilities of smart contracts, it seems appropriate to take a closer look at what exactly these items represent.

Smart Contracts Drilldown

Contracts may seem like a complicated issue to understand, and some of them can certainly be very involved and detailed in nature, but the core concept of a contract can be summarized as follows. Regardless of industry affiliation, or even the specifics included in the contract, a contract can be thought of as a series of (IF, THEN) statements that drive business agreements going forward. These combinations of (IF, THEN) statements, in turn, generate obligations, ensure rights, and ensure that different organizations understand just what is expected versus what will be returned as a result of transactions. This is a simplistic view, obviously, but provides a solid foundation for connecting the proverbial dots between blockchain technology, contract law, and financial services.

If we can accept the reality that contracts are a combination and amalgamation of statements and clauses that, in turn, create rights and obligations connected to the involved parties, then a more in-depth analysis of smart contracts themselves becomes simpler. Taking a further examination of just what exactly contracts entail and represent also highlights just why this area is so ripe for blockchain disruption and evolution. Common pain points with regards to contract law, execution, and examination include but are not limited to the following:

1. Misunderstanding of contractual terms
2. Lack of awareness linked to contract details
3. Delays in payments after services are provided
4. Work either not completed or completed late
5. Transparency issues connected to who understands the contract
6. Float in the form of paperwork being lost of mislabeled inside the firm
7. Arguments and litigation generated from lack of transparency
8. High costs for external legal experts
9. Time delay in terms of writing and approving contracts
10. Loss of efficiency and effective use of management time

Anyone who has ever worked inside of an organization, or dealt with contracts, including but not limited to supplier agreements, mortgages, or other complicated documents realizes that the potential for improvement is large. Linking back to the idea of contracts as a combination of (IF, THEN) statements, the core functionalities of blockchain appear to create a situation where contract applications become readily apparent. Blockchain technology, virtually by the very nature of how the technology platform functions, provides a real time platform for the communication and distribution of information between network members. At the current stage, blockchain has been developed to primarily track and monitor the flow of information between parties who may not necessarily trust each other. Blockchain has often been called the "internet of trust" or some other variation on that same theme, and that circles back to the consensus based model of verification at the heart of the platform. Contracts are, even in the friendliest of situations, between organizations or individuals who have conducted business previously, are put into place for two distinct reasons.

First, by documenting terms, conditions, obligations, and rights of the involved parties there is a lower risk of misunderstanding and potential future arguments than if agreements are simply oral in nature. Blockchain enable smart contracts can also help address this trust issue by requiring that all involved parties in the contract verify and approve the terms and conditions that have been uploaded onto the platform. In addition to this required verification, which by default increases the level of trust in the final document, access to different types of information can be restricted in a private blockchain environment. This might have seemed like a relatively small detail previously, but in the context of potentially sensitive contract information it is a huge issue. Since many contracts have clauses, amendments, and involve different organizations at a variety of levels, the ability to disclose only certain amounts of data to certain users is of paramount importance. Maintaining confidentiality over both proprietary processes as well as intellectual assets is of increasing importance with regards to not only how business is conducted, but how organizations interact with each other moving forward.

Second, the real time nature of how smart contracts execute clauses, agreements, and assign roles to involved parties also represents a significant improvement over how contracts are currently managed and executed. The time delay, both in terms of processing routine contracts and agreements as well as dealing with litigation issues, are an issue that law firms and legal experts are already seeking to improve with various technology options. While the focus and implementation of technology tools have currently been focused on artificial intelligence options (more on that later) to date, blockchain technology is also beginning to emerge as a viable option. Transmission of information, both in terms of improving law firm and legal expert efficiency as well as improving the client experience are two distinct and quantitative benefits that can, and should be, realized both by individual lawyers and law firms. Reducing or even eliminating altogether the internal float related to documents and document analysis is a real upside of how blockchain can help with the pain points that are often the source of complaints from clients and lawyers alike.

Third, and building on the first two data points, is the importance and integration of encryption into the communication process. Data transmission, no matter how efficient in nature, will not add any value to the business process if that communication and data is hacked, stolen, breached, or otherwise exposed to the marketplace. This is not merely a routine warning about making sure to change your passwords; the business of data hacking, breaches, and the impact on both organizations and individuals is a big business. Whether it is state sponsored hacking and actors, corporate espionage, or individuals launching ransomware attacks for personal gain the underlying realities remain the same. As soon as data is breached and/or exposed to the broader marketplace there are negative consequences for both the institutions that have been hacked and the individuals whose information has exposed to nefarious actors. As the blockchain itself, in its various iterations, has not been hacked to date, this extra layer of security and encryption will invariably add security and protection to legal transactions. It important to draw a fine line at this point, however, and acknowledge the reality that blockchain affiliated exchanges and organizations have been breached, hacked, and otherwise compromised.

With all of this said, the combination of real time communication, encryption, and requiring that all contractual terms be underpinned by consensus based verification must still be viewed as what they are; prototypes and experimental programs. It is true that the blockchain itself has not been hacked, but numerous applications and portals that lay at the intersection of blockchain technology with the rest of the internet have been breached. Cryptocurrency exchanges, wallets that hold cryptocurrencies, and other applications built on blockchain technology have all suffered hacks, some of them leading to downfall of these programs and organizations. Smart contracts represent merely the next and more comprehensive application and program built on the underlying blockchain, so it is important to recognize the fact that any store place of information will always be a target for hackers and data breaches.

Side Chains and Off-Chain Transactions

Perhaps some of the most interesting work currently underway in the blockchain space and environment is the development and implementation of side chains, off chain transactions, and the possibility of a lightning network. It is worth pointing out that, at this point in the development process, that much of this work remains in the pilot stages or is still in beta testing at various organizations. That said, the amount of investment, interest, and coverage of these different types of advances in the blockchain space continues to increase, with some of the largest financial institutions in the world taking part in this conversation and research. Prior to discussing just what some of these tools may mean in terms of implications for the accounting profession moving forward, it does appear appropriate to construct working definitions to move the conversation ahead.

The bitcoin blockchain, which provides the foundation for the lightning network itself, has several problems and issues that have limited how broadly cryptocurrencies and the wider blockchain marketplace can be adopted. Delays in processing time, the sheer amount of computing power and electricity required to process, record, and transmit blockchain and bitcoin transactions, and the technical requirements to actually do so limit how useful this technology may actually be. Now, this analysis focuses on the lightning network for the following reason – the bitcoin blockchain is the largest, most well established, and most widely used blockchain network on a global basis. Developing this lightning network may have originated as a way to facilitate the transmission of bitcoin and associated bitcoin information, but there will inevitably be implications for other blockchain based transactions. Let's take a look at what exactly a lightning network represents, and what this means for financial services professionals.

A lightning network is, for lack of a better analogy, a way in which to conduct business and transactions – using cryptocurrency – without having the time lags and massive electrical consumption that is currently associated with traditional Bitcoin transactions. Framed in the context of business transactions, a lightning network would seem most appropriate and make the most sense for circumstances where two institutions or individuals conduct a high level of business with each other. For example, two suppliers or banks or any other components of a supply chain

environment that do business on a daily basis would make sense in this situation, and appear to be a good fit for a lightning network. Since these institutions or individuals already know each other, have some level of trust based on prior transaction history, and do business on a continuous basis, the thinking goes that not every single piece of data or transaction has to touch the blockchain proper. After determining the appropriateness of a situation for the development and implementation of a lightning network, the next step in the conversation should focus on how just to get this idea up and running.

This may seem like a relatively simple concept to understand in theory, but represents a tectonic shift in how bitcoin, other blockchain financial transactions, and how these transactions can be identified. Instead of relying entirely on a decentralized and semi-anonymous basis for transacting and communicating information back and forth, a lightning network (as is currently constituted), a lightning network does require that the counterparties identify each other. While this does eliminate some of the benefits and upsides of the initial blockchain conversation, this actually does make blockchain more applicable and useful for financial services transactions. Identifying the parties, be they individuals or institutions, involved in the transactions in question also allows blockchain to be in more compliance with regulations such as anti-money laundering and know your customer laws and regulations. Adapting to, and remaining in compliance with, these financial regulations is essential for obtaining a wider adoption of blockchain for financial services purposes.

Boiling the concept down to basic terminology, the next step would be to open something called a payment channel (more on that in a minute) and record the opening of this channel on the blockchain. Now transactions can pass between the institutions or individuals, via this channel, without having to touch the blockchain until the payment channel is closed. Such a channel could remain open for hours, days, weeks, or even years; the specific time allotted is irrelevant. Only at the closing of this channel, whenever that may occur, would a final tallying of transactions be recorded onto the blockchain itself. Now, this does undermine some of the very security and privacy options that make using blockchain attractive and the focus of such large levels of analysis and investment, but it also appears to address some of the issues that are preventing blockchain from scaling and taking a leadership position in the marketplace. Introducing the concept of a payment channel caused shockwaves throughout the blockchain landscape due to the simple reality that this appeared to solve a fundamental issue associated with the bitcoin blockchain. Simply stated, the time lag and delay associated with bitcoin and the bitcoin blockchain was going to remain. Now, there was a new term introduced here as well, the idea of a payment channel, so let's drill down and see just what exactly this means.

Payment Channels

The core of the payment channel idea is not something that is entirely unrelated to the name of this technical aspect of blockchain technology. Put simply, a payment channel is an off-chain network that runs parallel to the blockchain itself. In other words, these transactions and the associated information linked to these transactions

are not directly stored on the blockchain at every single instant. Such an arrangement addresses some of the current shortcomings associated with this technology, including the lag in processing speed and the amount of time that is spent processing certain transactions. Using smart contracts (remember those are automated agreements that have been embedded into the blockchain chain), it allows two or more connected parties to perform transactions without having to broadcast every transactions to the network. Conversely, during the lifetime of the payment channel – which again can range from days to years – the individual transactions are stored off-chain. When the chain is closed, the final balance is mined/confirmed, and then added to the blockchain itself.

Putting this concept into practice represents the next logical step in the payment channel conversation. Namely, how does a firm or individual actually go about putting this concept into practice? If two individuals or institutions would like to arrange and use a payment channel the first step in that process is to deposit funds into the channel. Sticking with Bitcoin, which supports the lightning network, the individuals or institutions would deposit BTC into the channel. Using the "multisig" address, allowing the multiple parties to send and receive BTC or other information between each other, and waiting until the transactions have concluded before broadcasting these changes to the network itself would complete the establishment of a channel. Potentially even more profound for the finance and transactions landscape is the individuals or institutions do not need to have direct channels between each other for the payment channel to function properly. As long as there is a path, using existing channels, that already exists for the individual or institution to transact with someone else, the payment channel protocol is something that can be used. The closing process itself, of any payment channel that has been constructed and used by multiple organizations or individuals, can be accomplished by any single entity that is a part of that channel. Contrasted with using the full blockchain to verify and post blocks of transactions, there are several benefits readily apparent from the utilization of a lightning based network.

1. Cheaper transaction processing. Instead of having to pay miners to verify and post each block of transactions, and do not forget that each block (on the Bitcoin blockchain at least) can only be 1 MB in size, the members of payment channel only have to pay when the channel is opened or closed. For entities conducting hundreds and possible thousands of transactions via the payment channel, this can represent a significant savings opportunity.
2. Increased speed. On the Bitcoin blockchain, the basis and support for the Lightning network, the processing speed per block of transactions can take up to 10 min (or longer) to verify and post to the blockchain. Via a payment channel protocol, however, the only limit of the speed with which transactions can be processed is the speed of the internet connection used by the involved entities.
3. Scalability. One of the most difficult problems to address when leveraging a traditional blockchain, whether it is the Bitcoin blockchain or the Ethereum blockchain, is that neither one of these options is very scalable. The slow transaction processing speed, and the cost to both establish and maintain these networks means that, with the exception of some of the largest organizations in the market, scaling blockchains

has not been a feasible goal. With the implementation and utilization of payment channels, however, such scaling is not only possible, but very practical.
4. Security. Since payment channels use both digital signatures, specifically the multi-sig protocol that requires all parties to sign off on a transaction before its validated, and hashed time lock contracts (HTLCs), to help ensure only intended recipients get intended coins, payment channels represent a secure option in the marketplace. HTLCs are time limited in nature, so the parties involved in your transactions have to declare receipt of nodes or other information in order for the transaction to actually take place and be recorded.
5. Privacy. Since the individual transactions that occur between the individuals or institutions that are part of the payment channel, there is no broadcasting out to the general network until the channel itself is closed. Once these final balances and posted ono the blockchain proper, they are virtually impossible to trace back to the individuals that were involved.

Airdrops

Although the primary vehicle for introducing new cryptocurrencies or tokens into the marketplace has been via the Initial Coin Offering process, the increased regulatory scrutiny in this area has led to individuals and organizations to seek alternatives to this process. Specifically, the S.E.C., which is still relying on the Howey Test from 1946 to determine and guide the classification and transaction process surrounding token issuance, is seeking to temper enthusiasm surrounding this area. Although numerous discussions and debates have been held around the topic of improving and updating regulations in this space, it remains a murky area that is attracting the attention of numerous regulators. In addition to the regulatory conversations, there were numerous roundtables, debates, and hearings during 2018 on the status of blockchain, cryptocurrencies, and the impact these will have on the financial services landscape at large. Now, even though airdrops are specifically related to the issuance of new or emerging cryptocurrencies, this entire process – like the cryptoasset economy at large – is dependent on the underlying blockchain technology.

Without diving too much into the technical underpinnings of how an airdrop intersects with the blockchain and cryptocurrency space, let's walk through a relatively simple example of how an Airdrop may occur. It is also important to keep in mind that the vast majority of airdrops occur or are led by organizations that are seeking to launch a new coin and/or raise funding from the marketplace. For example, an organization seeking to launch a new cryptocurrency – let's call it NewCoin – wants to gain users, increase awareness of their product, and create a market for future trading. They might airdrop a certain number coins (1,10, or 100 would all work the same way) – to the public address of bitcoin holders on the bitcoin blockchain. Through no action on the part of bitcoin holders, these holders now have access to these new coins; which all should seem like a relatively simple process. Now, items that might be driving questions and considerations as airdrops have been receiving more and more coverage in the marketplace, the following questions are inevitably being asked.

How should airdrops be taxed? The taxation of cryptocurrencies, especially those interested in the intersection of blockchain and cryptocurrencies, is something that is of particular importance for financial services professionals. Taxes, although not usually something that is a fun or enjoyable conversation between financial professionals and clients, is a part of any accounting or advisory engagement. Drilling down, as airdrops become more and more commonplace in the marketplace, both as an alternative to ICOs and as a method for creating markets for cryptocurrencies, the tax regulation in this space will become an increasingly important issue. One of the most important questions to address is as follows is how these emerging topics are going to intersect and engage with the blockchain ecosystem.

Chapter 4 Summary

Chapter 4 dives right into one of the most important topics and characteristics as it connects to blockchain and crypro to both broader technology trends as well as the implications these technologies have for accounting and other financial services. Blockchain is arguably the hottest and highest profile topics that has entered the finance and accounting vernacular during the last several years, but even with this significant amount of coverage there seems to remain a gap in understanding and comprehension on the side of both clients and practitioners. This chapter seeks to differentiate the different types of blockchain options available in the marketplace as well the methods by which data can be validated and verified by the network itself. Establishing these differences is important since these form the core of the platform and do make it stand out in an objective and quantifiable way from other databased options. Versus almost every other data entry or storage system in the world, which operates on a centralized basis, uploading and the storing of data onto a blockchain platform requires that at least a portion of the network members approve and verify the data as it is uploaded. The specifics will vary from blockchain to blockchain, but the overall common theme of group based data verification are consistent across blockchain platforms. This chapter drills into the specific types of consensus approval methodologies that exist in the marketplace as well as analyzing what these different methodologies mean for business transactions.

Reflection Questions – Chapter 4

1. How are security token offerings, initial coin offerings, and airdrops different from each other and similar to each other?
2. Can payment channels hold the key and potential promise to broader blockchain and cryptocurrency adoption?
3. Smart contracts have many potential use cases, including some for financial services; what are some of the most promising pain points that can be addressed via smart contracts?

Supplemental Readings

Blockgeeks – Basic Primer: Blockchain Consensus Protocol – https://blockgeeks.com/guides/blockchain-consensus/

Medium – What is Consensus Algorithm In Blockchain & Different Types Of ConsensusModels–https://medium.com/@BangBitTech/what-is-consensus-algorithm-in-blockchain-different-types-of-consensus-models-12cce443fc77

Coindesk – A Short Guide to Consensus Protocols – https://www.coindesk.com/short-guide-blockchain-consensus-protocols

Blockgeeks – Proof of Work versus Proof of Stake – https://blockgeeks.com/guides/proof-of-work-vs-proof-of-stake/

References

Andolfatto, D. (2018). Blockchain: What it is, what it does, and why you probably don't need one. *Review (00149187), 100*(2), 87–95. https://doi.org/10.20955/r.2018.87-95.

Bruno, D. T., & Gift, L. (2019). How businesses can deal with cryptocurrency risks. *Intellectual Property & Technology Law Journal, 31*(3), 20–22.

Bussmann, O. (2017). A public or private blockchain? New Ethereum project could mean both. *American Banker, 182*(41), 1.

Hernandez, P. (2016). Microsoft's consortium blockchain hits azure marketplace. *EWeek*, 1.

Lewis, R., McPartland, J. W., & Ranjan, R. (2017). Blockchain and financial market innovation. *Economic Perspectives, 41*(7), 1–17.

Moynihan, M., & Syracuse, D. (2018). Blockchain, tokens, and mutual funds—We're not there yet. *Investment Lawyer, 25*(7), 11–20.

Roberts, J. J. (2019). JP Morgan alums launch "Blockchain as a service" on AWS. *Fortune.Com*, N.PAG.

Webster, N., & Charfoos, A. (2018). How the distributed public ledger affects Blockchain litigation. *Banking & Financial Services Policy Report, 37*(1), 6–15.

Stablecoins & The Decentralized Organization

5

Classifying cryptocurrencies is already an emerging issue that has attracted the attention of virtually every regulatory agency both in the United States and overseas, and this does not appear to be a passing trend. As the market for blockchain based cryptocurrencies continues to expand and develop in nature, including institutional investment opportunities there is a growing need for price stabilization and clearer reporting requirements.

Clearly one of the primary attributes and characteristics of Bitcoin and cryptocurrenceis itself is the fact that these items are not tied or tethered to any fiat (or government issued) currency. Appealing both to individuals with a libertarian bent to politics and worldviews, as well as individuals and institutions traumatized by the financial crisis, this lack of association with traditional monetary supply and policy has been seen as a core benefit of cryptocurrency technology. That said, there does appear to be a market for cryptocurrencies and other such assets that are indeed supported and backed by fiat currencies. These items are called stablecoins, and a relatively new entrant into the broader cryptocurrency and blockchain space, but may also represent a shift in both of how many individuals and institutions use various cryptocurrencies and how these impact the broader financial services place.

Beginning during 2017 and continuing well into 2018, with multiple rejections and failures, but also several successes, the concept of a stablecoin holds appeal for various market participants (Lee 2018). First, by linking an otherwise cryptocurrency to an established currency and monetary system, some of the volatility associated with these items would be reduced. One need to just look at the price action in Bitcoin during 2017 to see evidence as to how that might dissuade some more conservative investors and firms from embracing these technologies and assets as a viable alternative to traditional fiat currencies. The true value add, in the context of a stablecoin, however, is not so much which currency it happens to be linked to, as that may very well vary depending on the stablecoin in question. Dollars will be the focus of this conversation, but any fiat currency can be used as a peg or support for a token. Let's take a look into just how a stable coin works and is different from

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_5

Fig. 5.1 The transition from crypto to stablecoins

existing cryptocurrencies, even though the cryptography may very well be similar in nature (Fig. 5.1).

The attractiveness of stablecoins, and the underpinning logic of a stablecoin model is increasingly evident from the reality that, on a consistent basis, organizations and different institutions have been issuing stablecoins into the market (Wieczner 2018). In addition to the lower volatility (more on that later) associated with stablecoins in general, individual organizations are also issuing individual stablecoins that appear appropriate for the broader market conversation. Organizations that include, but are not limited to the Wall Street Journal, PWC, and numerous other large institutions are either in the process of developing cryptocurrencies and private blockchain models, or have already done so. The attractiveness of the stablecoin model, however, is not limited to only the largest organizations on the planet, but can also drive the decision making process across industry lines. In order for the benefits and potential of stablecoins to be realized, however, financial professionals must be aware of not only how these tools work, but also how these stablecoins will interact with the broader financial system.

First, a solid working definition of a stablecoin is a cryptocurrency that is pegged to another stable asset, such as – again- the dollar or some gold reserves. So even though the underlying cryptocurrency technology may still be in play and be used by this asset, the resulting product has lower volatility due to the fact that it is linked to some other tangible asset. This actually allows for the practical usage of this cryptocurrency for things like paying for items, and using a cryptocurrency as medium of exchange versus simply as an investment tool. The stability of price, versus the dramatic price swings that have characterized the bitcoin market as of the writing of this research, is important for two financial reasons. Price stability in the short term allows for these items to actually be used for transactions – merchants are more likely to accept a method of payment that does not radically swing up and down in value by 20% on a daily or weekly basis. Viewed in the long term, price stability allows stablecoins to become a viable alternative investment choice for a broader range of market participants. Broader adoption and integration within portfolios will also help maintain the stability of price.

Financial Services Impact of Stablecoins

Stablecoins may sound like yet another iteration or development in the broader cryptocurrency space, but they do actually represent a fundamental shift in how the cryptocurrency market is classified, reported, and evaluated by financial services

professionals. Kicking off the transition and potential paradigm shift in the space, on September 10, 2018, the New York Department of Financial Services – considered to be among the strictest regulators of cryptocurrencies – approved the introduced of Gemini Dollar and Paxos Standard. Both stablecoins are backed by U.S. dollars on a 1:1 basis, and are subject to periodic audits to help ensure the validity of the 1:1 backing. In addition to being supported and backed by USD on a 1:1 basis, users of either stablecoin will also have the ability, at any time, to trade in coins for dollars, to be sent to whatever receiving address is specified. This increased auditability and availability of information associated with stable coins will invariably have an impact on the role that financial professionals play in this space.

As the valuations and value associated with these coins become more apparent and more easily verifiable, both attestation professionals and organizations dependent on the verification of data will be more comfortable using these assets as actual assets (Tomkies and Valentine 2019). This links back to directly to the current uncertainty and confusion that exists around the reporting, custody, and documentation of cryptocurrencies and other cryptoassets. Without firm guidance from the Financial Accounting Standards Board (FASB), and therefore no GAAP or IFRS recommendation for treatment or classification, the regulatory landscape is murky at best. The IRS classifies cryptocurrencies as property, which therefore means that anytime a cryptocurrency changes ownership – whether it is used as a medium or exchange or not – there is the possibility of an income tax event. Contrasting this, the S.E.C., in June 2018, attempted to clarify the reporting or cryptocurrency from an accounting and financial point of view, but in essence created a dual hierarchy of cryptocurrencies. Put simply, if a cryptocurrency is considered to be truly decentralized – such as Bitcoin or Ethereum – it will be treated as a commodity, but other more recently launched cryptocurrencies would be classified and categorized as equity securities. This differing treatment clearly creates an opportunity for financial services professionals to add value in this rapidly evolving asset and financial space.

Stablecoins, entering in this landscape and space, appear to offer something that may very well present an alternative to the current patchwork of reporting and compliance documentation. Since, as stated before, these tokens or currencies are pegged to some other kind of asset – be it gold, dollars, or other fiat currency – this changes the conversation. As of the point of this writing there are no definitive answers to the questions listed below, but these are items that every financial service professional needs to consider:

1. Are stablecoins fundamentally different from other cryptocurrencies such as Bitcoin for income tax purposes?
2. Will stablecoins, since they are pegged to other assets that have clear reporting and documentation guidance, be shown in the same categories as the assets they are pegged to, or as something else entirely?
3. Does the pegged nature of stable coins mean that these coins will move in parallel to the associated currencies, or will they move in response to headline similar to how current cryptocurrencies move?

4. Since these different types of cryptocurrencies or tokens are, in effect, pegged and tagged to currencies that are subject to the political and economic whims of national governments, will this reduce the interest of certain investors in joining this asset class?
5. As stablecoins are connected to existing assets or items, are these stablecoins truly cryptocurrencies?
6. Last but not least, will the implementation and roll out of stablecoins lead to a bifurcated regulatory landscape, with stablecoins receiving preferential treatment versus other crypto created assets?

Stablecoin Implications

Some of the implications of stablecoins for the financial services profession are, clearly, still emerging as the field itself continues to evolve, change, and develop in response to market needs, but there do appear to be several considerations that need to be considered. As different, traditionally non-financial services players, enter the marketplace it is going to be interesting to observe how traditional players such as SWIFT respond (Crosman 2019). Especially in a business environment and landscape as fast moving and developing as quickly as the cryptocurrency market, the stewardship function of financial services practitioners is increasingly important. Following the financial crisis, and particularly for the investing generations that are increasingly emerging as players in the space – millennial and Gen-Z – the trust factor that had been traditionally associated with expertise may not exist going forward. Drilling down specifically, and especially taking into account the volatility, failures, and associated doubts linked to the stablecoin space, there are several areas that any fiduciary in the space must be aware of moving forward.

First, how are the stablecoins actually audited or verified? Following the doubts linked to the stableoin issued by Tether (USDT) this is not merely an academic exercise, but one that can cost both you and your clients financially. Although tether may have been the first stablecoin to market, and dominate the conversation in this sub-sector of the cryptocurrency space, the breaking of the buck that occurred in the fall of 2018 has cast large amount of uncertainty linked to the entire asset class. Financial professionals must be aware of these challenges facing the space, but also must be aware of how these challenges are driving the overall market for both stablecoins and other cryptocurrencies. Put simply, these are the types of questions that are going to be asked as cryptocurrencies continue to increase both in value at large as well as utilization as a medium of exchange. Stablecoins may seem like a potentially alternative that blends the best of both worlds – and ultimately may do exactly that – but both accountants and finance professionals must be aware of how to address these issues.

Second, identifying just how the stability associated with stablecoins is established is something that everyone involved in this space must understand in order to deliver guidance. Something that might, incorrectly, be assumed is that since the different stablecoins that have been introduced to the marketplace have tended to be

pegged to the USD is that all of these stablecoins can be classified and thought of as nearly identical. Such an approach, although appealing, is incomplete and can lead to incorrect decision making (Hackett et al. 2019). A few examples of how the approach might differ can be addressed by researching the following items

1. How is the price stability actually achieved? Is there a direct backing of every stablecoin in circulation with corresponding fiat currency? Or is the price stability achieved via the execution of a series of smart contracts on a decentralized and distributed public blockchain such as Ethereum? Conversely, there is also the possibility that the token used for commercial purposes (coin A), is actually supported or backed by a "reserve" stablecoin (let's call it stablecoin B), which in turn is linked to a fiat currency.
2. However the price stability is achieved, and assuming that the issuing organization has the technical capabilities to achieved said stability, another question to ask is how are these amounts verified? Has the organizing or issuing firm behind the stablecoins gone through an audit of their dollar or other reserves? If so, was the audit performed by a reputable firm with a track record of expertise in this space? These may seem like redundant questions or topics to address, but with several of the major stablecoins – particularly tether – having experienced issues recently with regards to their valuation and validity of dollar reserves, this is not something that can be ignored.
3. Is the underlying blockchain that these stablecoins operating on a blockchain that has a robust user and developer base? This is another way of asking as to whether or not the underlying blockchain itself is robust enough to withstand the strain and usage that will accompany the broader adoption of different stablecoins. The entire blockchain ecosystem space, being relatively new and still developing in nature, cannot push this question off to the back burner.

Additional Considerations

In the context of stablecoins and integrating stablecoins within the broader financial ecosystem, there is also an additional consideration that should be taken into account. Taking a broader perspective on the cryptocurrency ecosystem, the integration of stablecoins into the cryptocurrency marketplace, this tool may also enable the wider utilization of cryptocurrencies as currency options. For all of the discussion, debate, and analysis of the cryptocurrency space, the reality is that for the vast majority of investors and interested parties use cryptocurrencies as an investment vehicle instead of for currency purposes. Several key factors include, but obviously are not limited to the:

1. Volatility associated with the price action of cryptocurrencies. While it does make for sensational headlines, lots of analysis by market commentators, and the potential for profits on both the upside and downside, this volatility limits the potential of cryptocurrencies to be used for mass market purposes. Stablecoins

reduce this price action and movement since they are tethered to existing currencies or other hard assets, making these much more practical for utilization as a medium of exchange.
2. Regulatory uncertainty. Clearly the regulatory landscape surrounding the cryptocurrency landscape is still emerging and changing, but – at the very least – having the asset underpinned and linked to existing assets and regulatory frameworks does clarify some outstanding questions. While, for example, cryptocurrencies themselves are still emerging from a regulatory perspective, the underlying assets are more well established. In terms of liability, both on individual and institutional sides, clearer and distributed regulatory frameworks make the entire process simpler to use and implement.
3. Greater investor understanding. One of the most common issues that are associated with cryptocurrencies is just how complicated and multifaceted actually using cryptocurrencies are. On top of the volatility that makes using cryptocurrencies difficult for actually purchasing and selling for goods and services, many retail investors simply do not grasp what exactly cryptocurrencies are, and how they are different from other digital assets. Stablecoins, especially those introduced and promoted by large and well-known institutions, can actually help increase investor understanding.

Classification and Regulation

This is perhaps where financial professionals can directly add value into client or industry conversations, especially as clients, colleagues, or managers are seeking to obtain a better understanding of what exactly these different assets represent and mean for business decision making purposes. Whether the conversation is focused on the accounting or the financial services landscape in general is not as important as the fact that these are considerations and different aspects of analysis that should be considered. Taking a step back, the conversation and debate around the greater adoption and integration of cryptocurrencies and other stablecoins entails several different facets and angles that must be included in any fiduciarily oriented conversation. Depending on the client itself, and the role that the financial services professional plays within the broader client conversation, the specific questions and points to consider will vary. That said, it is important to keep the following items in mind, from a compliance as well as an advisory perspective, as stablecoins and other such items continue to become more mainstream.

1. What is the reporting obligation of individuals and institutions that hold these types of assets? The current reporting framework surrounding cryptocurrencies is uncertain to say the best, and the introduction of a different, but related, class of investment options, does not appear to be resolving these current issues.
2. Is there a liquid market for both the trading and valuation of these different investment options? While several exchanges have launched indices, and Bitcoin ETF's are currently a work in progress, the lack of liquidity in these markets

remains a cause for concern. Especially from an investment advisory perspective, this potential lack of liquidity can cause issues when it comes to divesting of these items during stretches of market volatility.
3. Will there be different guidance and advice for stablcoins versus other types of cryptocurrencies, such as Bitcoin? Specifically, will these recent iterations and assets be able to be used as a viable medium of exchange, or will they be limited due to the IRS classification of these items as property?

This entire discussion around the matters of regulation and classification must also take into account that, for the purposes of this book, the focus remains almost exclusively on the United States regulatory environment. While that may be the focus of this text, it is important to remember that the cryptocurrency landscape and business market extends far beyond the U.S. border. Virtually every different country has a different regulatory landscape and regimes for how cryptocurrencies are reported, taxed, and treated by different organizations. Especially as the flows and investment trends in the cryptocurrency marketplace are impacted by new and headlines not originating in the United States, retaining a global mindset and headset is critical.

Accounting Classification

This book is not exclusively written for accounting professionals, but nor is it put forth as a text only for financial markets professionals. Rather, this text should be thought of as a tool and reference for all individuals employed within the financial services landscape. That said, the accounting treatment and classification for how these cryptocurrencies and other cryptoassets are classified and reported from a financial reporting perspective will invariably have ripple effects throughout the financial system. As of this writing, and something that will be cited throughout this text, there is no definitive accounting or reporting guidance on either a U.S. or global basis, which creates a sense of uncertainty that does appear to be limiting the broader based adoption of cryptocurrencies and stablecoins on a wider level. In addition, the accounting treatment and classification of different cryptoassets will certainly have a financial impact in the following manner.

With the lack of definitive or authoritative guidance in the space, there have been numerous white papers and publications issued into the marketplace by both industry associations and individual firms seeking to reassure both investors and users of different cryptoassets. The variety of guidance and publications can make it difficult for practitioners and organizations to accurately and consistently provide guidance or other advisory services connected to these cryptoassets, and this book is not seeking to supplant or overrule any previously issue publications. Rather, having an understanding of where the marketplace current is with regards to the accounting treatment of different cryptocurrencies, stablecoins, and other different types of cryptoassets is imperative for all members of the financial services community. Such a lack of consistent and standard guidance, in addition to muddying the proverbial waters, also opens the door for unethical and potentially fraudulent events to

occur and happen both in the United States and abroad (Voris et al. 2019). Without putting one option forward as superior to other available options, the following seem to be common points of debate and conversation around just how these new types of assets should be classified.

First, as examined and analyzed as to whether or not these different cryptoassets should, indeed be classified as currencies if they are labeled as such, continues to be an active issue in the business landscape. As of this writing, however, the treatment of crypto based assets and items as currency equivalents remains – at least in the United States – impractical due to the regulatory classification of cryptocurrencies as property for tax reporting purposes. In addition to this place in the regulatory landscape in which cryptocurrencies currently reside, there is also a practical matter that seems to be preventing the adoption of different cryptocurrencies and cryptoassets as current items. Put simply, currencies must be able to settle and pay off debts in a legal court of law, and with the exception of Ohio (which in late 2018 allowed state residents to pay state taxes with bitcoin) that seems to be an open issue.

Second, a classification and reporting structure akin to inventories or commodities has also been put forward by various parties as a viable option for reporting cryptocurrencies. On top of the rather obvious valuation issues connected to inventory items such as FIFO, LIFO, or other inventory methodologies, it also must be taken into account what the actual use case for these items are. In the case of a broker dealer, or an organization that otherwise makes a market in the cryptocurrency space, it may seem appropriate and reasonable to classify these different items as inventory. Given other scenarios, however, and since it appears that the majority of investors and cryptocurrency owners invest in these assets as investments and not as core to the business itself, an inventory classification does not seem to be appropriate for broad based adoption.

Commodities introduce an additional wrinkle to the classification and reporting conversation given the reality that in the United States the CFTC has weighed in with potential regulations and legislation to help improve the clarity surrounding cryptoassets landscape. Treating these items as commodities, however, increases the thicket of regulation and debate that is already being generated by the different regulatory bodies, also creates opportunities for financial services professionals. Depending on what the ultimate classification and reporting of cryptoassets end up being, this may actually create additional consulting and advisory lines for practitioners across the financial services landscape.

Decentralized Autonomous Organizations (DAO)

While smart contracts and ICOs may represent high profile applications of blockchain technology, it could be argued that decentralized autonomous organizations represent perhaps a sophisticated evolution of blockchain as well as a paradigm shift in just how organizations operate. The very idea of an organization, traced back through history and connected to the present day, is one of a centralized command and control structure that drives decision making, resource allocation, and

objectives from one central source (Stockard 1973). Even in organizations that have embraced a flat hierarchy or a distributed management structure there is, virtually without exception, a central decision maker or authority figure that ultimately has oversight and control over final decisions. This central command structure, even in an organization that embraced a more decentralized model of operating, poses risks in an increasingly digitized, fluid, and rapidly evolving business landscape.

While technology has generated efficiencies and effectiveness, including an increasingly decentralized platform for decision making and responding to market conditions, it has also had the inverse effect among certain industries. One need to only look across the industry landscape to see prime examples of how technology, scale, and efficiency has led to the consolidation of market participants in food, technology, manufacturing, and even financial services. Such consolidation brings with it organizational benefits – efficiencies of scale, the ability to fund and support large projects, and the capability to compete both domestically and internationally. In short, consolidation and the increased efficiency encompassed therein does come with associated benefits. That said, such a representation is an incomplete view of what exactly technology and consolidation is capable of delivering. Especially in the realm of financial services, which are literally at the whim of global markets in almost every sense of the word, the importance of being to combine global management, data management, and the protection of information is critical. Decentralized decision making, obviously, is nothing new or particularly innovative in its own right, but when combined with the effectiveness of blockchain technology, it can create an entirely new way of doing business.

One of the core fiduciary duties of financial services professionals, especially for those involved the public markets, is to oversee the corporate governance and stakeholder engagement policies deployed for management teams. Specifically, the importance of proactively engaging with stakeholders of all sizes, being able to deal with a business environment that may change at the drop of a tweet, and the flexibility associated the increased transparency connected to blockchain technology form a viable business opportunity (Zábojník 2002). Let's take a look at what exactly a DAO means, represents, and may imply for both organizations and financial service professionals moving forward:

1. DAO means blockchain technology – decentralized autonomous organizations are, rather obviously, decentralized in how they operate, function, and conduct business. Blockchain technology is, driven by the fundamental nature of how the technology operates, a decentralized and distributed system. The idea of a decentralized autonomous organization, or an organization that basically runs itself, may seem like it belongs to the realm of science fiction. That, however, is an incomplete view not reflective of just how fast blockchain technology is advancing in the marketplace.
2. Smart contracts lead to DAOs – while it is true that many of the smart contract working models are still in prototype or beta stages at the current point, the sheer volume and number of initiatives means that more advanced applications are inevitable. As increasingly sophisticated smart contracts spread throughout the

marketplace the idea of an organization whose operating bylaws and agreements are augmented and automated by blockchain technology may not appear as far fetched as might be initially surmised.

3. DAOs are not a fail safe – one of the most common issues that arises whenever a new technology, platform, or tool enters the marketplace is the possibility of buzz, over excitement, and inevitable disappointment. The same issues that currently plague organizations and management professionals, namely information security and technology issues and possible failings related to corporate governance will not magically be solved with the utilization of new technology. DAOs represent an innovative way to create and manage organizations, decentralize the command and control structure that can hamstring decision making, and create new opportunities for business development. That said, there are implications of both a positive and negative nature that business professionals and financial services professionals must be aware of.

Now it is important to remember that a DAO construct or set up is not without risks, especially if someone does eventually go wrong. No matter what preventative measures are taken, safeguard implemented, and guardrails built into the software underpinning the DAO there is always the risk that something will go wrong. This was perhaps shown in the most high profile ways on the Ethereum blockchain. A DAO, possibly the first DAO introduced to the market, but in any case one of the first rolled out for investor utilization, had a flaw in the software code that was exploited by nefarious actors. A total of $150 million was stolen and – more importantly – this actually led to the direct intervention in the Ethereum blockchain from the inventor of the blockchain itself, Vitalik Buterin. Such direct interference and direct hands on approach to resolving this issue exposed a critical flaw in the DAO concept. If the organization itself is truly decentralized and operating on a public blockchain platform, how will issues be resolved as they do arise? Demonstrated by this example this is not an academic or theoretical concern; serious business implications can result.

Business Implications

The implications of DAOs, at the current state of product development, are difficult to ascertain with any high degree of specificity, but even at this early stage there are some applications that are identifiable (Telpner and Ahmadifar 2017). First, with entire organizations operating in a decentralized and, at least to some extent, decentralized manner there will be more opportunities for larger numbers of individuals to participate. Harkening back to some of the initial euphoria and excitement surrounding Bitcoin, the democratization of information, money, and the transmission of data will be amplified with the rise of DAOs. Second, and building on this first point, as more and more individuals are able to set up decentralized and encrypted organizations, there will be an increased need for safeguards and protections. Just as many early exchanges, traders, and leaders associated with cryptocurrencies

experienced legal troubles at different stages, there will have to be protocols in place to comply with AML, KYC, the Patriot Act, and other regulations.

Overstating the importance of blockchain applications remaining in compliance with financial regulations, standards, and frameworks would be difficult, as this represents perhaps the most difficult to solve issue in the space. The question in the blockchain space is not whether or not the technology itself works; organizations are already using blockchain for some enterprise scale commercial applications. Rather, the question is quickly becoming whether or not blockchain will be able to garner mainstream adoption and implementation as regulators become more interested in the space. Both in the United States as well as overseas, hearings are being convened, testimony is being given, and the conversation around the broader blockchain ecosystem is quickly moving toward one of increasing regulation and oversight. That is not to say that increased regulation will necessarily be a negative development, but it is something that must be taken accounted for by organizations operating in the space.

Third, and interesting for financial services professionals specifically are the implications that DAOs will have on how organizations deal with corporate governance issues. Regardless of industry affiliation or geographic location, there does appear to be increasingly large amounts of pressure on management professionals to generate effective financial returns and do so in a sustainable manner. Governance, traditionally, has been handled by a small subset of individuals at an organization who, in turn, deal with a relatively limited number of external partners. With an organization that is entirely decentralized, at least partially anonymous, and with members that could literally be anywhere in the world, there is a question that must be asked. Who is it, exactly, that will be the face of the organization to interact with the public and market actors?

This is not merely an academic or theoretical question, especially in an era where transparency, inclusivity, and holding people to account all appear to be on the upswing on a global basis. No longer can organizations or management professionals restrict access to information, insights, or feedback aided by information asymmetry; data and information are available to virtually everyone interested in obtaining it. In addition to improving culture and operating philosophies at organizations, however, there is a direct financial connection and link between governance, DAOs, and financial professionals. Particularly following the financial crisis of 2007–2008, which uncovered a number of wrong doings and corporate malfeasances, there is an increasing number of campaigns and initiatives underway to change how corporate actors interact with the broader marketplace.

Whether it takes the forms of increased foci on sustainability, environmental issues, human rights compliance, employee engagement, or improving the connection between financial results and operational performance, governance increasingly dominates investor conversations. With some of the largest investment managers and funds, including the largest on a global basis (Blackrock), taking a more active role in governance conversations, the implications are clear. DAOs, opening up the market to organizations and individuals to engage in business activities also invites potentially unethical actors to be involved with organizations. Even

if the individuals and organizations are not unethical or imbued with malicious intent, different frameworks, mindsets, and outlooks may result in a muddled picture of just how the organization operates and engages with market participants. At this point, and something that can be perceived as a point of concern or opportunity, is that regulation and oversight of the DAO community are evolving alongside the technology itself.

CPAs and Decentralized Autonomous Organizations

CPAs are perhaps the subset of financial services professionals who are uniquely positioned to be dealing with the rise of blockchain, cryptocurrencies, and advanced applications like DAOs. Often the liaison between the organization, management professionals, and the marketplace of end users, CPAs and other accounting professionals are already on the forefront of cryptocurrency questions and issues that have arisen alongside the growing interest in Bitcoin and cryptoassets. As of 2017 and 2018, the majority of CPA interaction with the cryptocurrency space have been, not surprisingly, focused on the income tax and financial reporting angle, but that will inevitable continue to evolve as the market for blockchain matures and develops. Specifically, the implications of a decentralized operating model for organizations will, almost invariably, change the way accounting practitioners interact with clients and customers.

First, and perhaps most obviously, with a decentralized and encrypted method of business management, a question that must be addressed by practitioners is who is actually in charge of tax and financial reporting. If this sounds similar to the issues linked to corporate governance for an organization operating with a DAO that is because the same issues are also a concern for accounting practitioners (Carlson and Selin 2018). Having a point of contact does centralize the decision making process, but also creates a single point of failure for both technical information and operational data. Second, and linking to the concept of a single point of failure, the idea of a DAO is not substantially different from a cloud based network that allows different members to have different levels of access to data. CPAs and financial professionals are already used to dealing with a relatively diversified array of individuals with access to potentially sensitive data, but a DAO takes the concept one step further. Allowing ownership and investment in the organization to also be decentralized provides a wider array of individuals the opportunity to participate in management, but also opens the organization to more possible instances of unethical activity.

Third, and arguably most important in the context of what CPAs will have to contend with as DAOs become more widespread, financial reporting and coordinating the flow of data between different owners will become simultaneously simpler and more complicated. Complicating this process will be the possibility that, despite the intentions of management professionals or founders, the ownership of the firm may appear to be shrouded in layers of encryption. Making sure that the different transactions and business events occurring within the DAO, and between the DAO

and (potentially) other DAOs comply with existing regulations and reporting requirements will be a core fiduciary responsibility of practitioners. These conversations and decisions may appear to be contradictory when juxtaposed against the concepts of blockchain and DAOs in the abstract, but will be necessary for such technology tools to become adopted for mainstream utilization. Regulation will inevitably change and evolve over time, but that does not mean that the guidance and frameworks already in existence will become rendered obsolete or unimportant. Rather, for professionals to adapt and evolve alongside the marketplace at large, being aware of current and future regulations will inevitably be important.

Advisory Services in a Decentralized World

Especially for the financial ecosystem and marketplace at large, the possibility for advisory services based on an increasingly decentralized business landscape. It is difficult to overstate just how game changing and potentially paradigm shifting a shift toward a decentralized landscape and business model would be for the advisory landscape. As ideas, organizations, and ideas are diffused and distributed throughout the economy at large, the implication on both current services and opportunities for future services is significant. Prior to actually developing or offering these ideas and services, however, it seems important to asses the potential implications for blockchain and decentralization on the financial landscape itself. Put simply, the core functionality and role of the financial system will change as a result of decentralized or distributed business models become more and more common.

Chapter 5 Summary

Building on the content that had been covered in Chap. 4, this chapter analyzes and approaches one of the most important emerging topics in the broader blockchain and cryptocurrency space; stablecoins. Often referred to as a hybrid or halfway point between traditional fiat currencies and fully decentralized cryptocurrencies, stablecoins and other types of enterprise tokens are rapidly gaining support and momentum. Financial services professionals, be they employed in the accounting or finance fields, must understand not only how these coins operate from a technological perspective, but also what they mean from a financial structures perspective. Although not a full blown solution to the price instability and regulatory uncertainty associated with many cryptocurrencies, these asset backed coins do seem to represent a logical halfway point between traditional fiat and cryptocurrency. That said, and even though these assets may indeed be backed or supported by fiat currency or other assets, it is important to recognize the fact that these items have not yet achieved regulatory certainty. While the enterprise token launched by JP

Morgan may be the highest profile example and application of a stablecoin to date, being pegged 1:1 to the USD, there are several differentiating factors between stablecoins and other cryptocurrencies that make them applicable for broader business adoption. Practitioners seeking to not only get a better handle on the cryptocurrency market and ecosystem, but also be aware of how these assets fit into traditional financial structures and investment opportunities must have a solid understanding and comprehension of how stablecoins operate and fit within the blockchain ecosystem.

Reflection Questions – Chapter 1

1. What exactly are stablecoins? Consider 3–4 ways that they differ from other cryptocurrency options, paying particular attention to the business implications of these differences?
2. How does a decentralized autonomous organization function, and what does that mean from a business application perspective?
3. Identify some of the core accounting issues and considerations that will need to be addressed prior to broader adoption of either stablecoins or DAO's.

Supplemental Readings

Forbes – Explaining Stablcoins: The Holy Grail of Cryptocurrencies – https://www.forbes.com/sites/shermanlee/2018/03/12/explaining-stable-coins-the-holy-grail-of-crytpocurrency/#78b303394fc6

Coininsider – What is Stablecoin and How Does It Work – https://www.coininsider.com/stablecoins/

Cryptocurrency Facts – What is a Stablecoin – https://cryptocurrencyfacts.com/what-is-a-stable-coin/

Ethereum – What is a Decentralized Autonomous Organization – https://www.ethereum.org/dao

Cointelegraph – What is DAO – https://cointelegraph.com/ethereum-for-beginners/what-is-dao

Coindesk – What is a DAO – https://www.coindesk.com/information/what-is-a-dao-ethereum

References

Carlson, J. J., & Selin, A. M. (2018). Initial coin offerings: Recent regulatory and litigation developments. *Investment Lawyer, 25*(3), 18–30.

Crosman, P. (2019). IBM launches challenge to Ripple and Swift. *American Banker, 184*(53), 1.

Hackett, R., Roberts, J. J., & Wieczner, J. (2019). The ledger: Bitfinex's tether trouble, bitcoin crime, bakkt buys a custodian. *Fortune.Com*, N.PAG.

Lee, P. (2018). Are stablecoins the reinvention of money? *Euromoney, 49*(595), 54–59.

Stockard, J. G. (1973). A training strategy for decentralized organizations. *Public Personnel Management, 2*(3), 200–204. https://doi.org/10.1177/009102607300200310.

Telpner, J. S., & Ahmadifar, T. M. (2017). ICOs, the DAO, and the investment company act of 1940. *Investment Lawyer, 24*(11), 16–33.

Tomkies, M. C., & Valentine, L. P. (2019). Are cryptocurrencies on their way to becoming a trusted payment alternative? *Banking & Financial Services Policy Report, 38*(1), 1–4.

Voris, B. V., Kharif, O., Leising, M., & Bloomberg. (2019). The New York A.G. and the case of $850 Million in missing cryptocurrency. *Fortune.Com*, N.PAG.

Wieczner, J. (2018). IBM is working with a "Crypto Dollar" stablecoin. *Fortune.Com*, 1.

Zábojník, J. (2002). Centralized and decentralized decision making in organizations. *Journal of Labor Economics, 20*(1), 1–22.

Artificial Intelligence

6

The dual headed disruption tidal wave of blockchain enabled activities and artificial intelligence will invariably lead to anxiety, stress, and potentially misunderstanding of just what these technologies represent for financial services. Blockchain, hopefully, at this point has been demystified to a certain extent, but the idea of artificial intelligence may appear and seem like a more amorphous concept that is both difficult to understand but potentially disruptive in nature. While artificial intelligence has been featured in numerous media outlets, movies, and T.V. shows, the image that is most often presented to audiences and market actors is one that, almost invariably, has negative connotations and implications for the developers and users. Fortunately, while there have been numerous advances in the development and implementation of artificial intelligence, the limits of current iterations are still substantial. In other words there is no need to fear the Terminator coming for financial practitioner roles. Prior to diving into what the applications and implications of AI may very well be, however, it seems appropriate to first put forward a definition that makes sense in the context of this discussion. Not meant to be overly technical, but rather a working definition to assist financial professionals seeking to understand and explain the implications of AI, a working definition as follows is a workable option:

Artificial intelligence is either a computer program or suite of programs that can either augment or eventually replace the need for human engagement and oversight in entire processes or at least portions of processes (Fig. 6.1).

Artificial intelligence may have initially received more attention and media coverage but has subsequently received less coverage and analysis recently due to the somewhat amorphous nature of the idea itself (Lee 2018). Blockchain and cryptocurrency may also be difficult to understand and appear to be a relatively new concept in and of itself, but even in spite of this initial confusion and analysis there are similarities between these technology tools and preexisting options. A decentralized ledger system, otherwise labeled as a decentralized ledger technology (DLT) platform is, of course, different from current centralized options, but underlying components can be related to tools like Excel and Access. Additionally, cryptocurrencies are simply a representation of how several technology tools and aspects have been

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_6

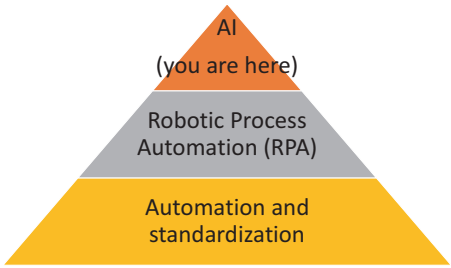

Fig. 6.1 Automation to AI pyramid

combined, namely the tools of encryption, peer-to-peer processing ability, and various components of consensus data verification are not, by themselves, innovative or unique.

Contrasting versus these tools or platforms, the idea and concept of artificial intelligence can appear to be murky and lacking a relation to current technology or processes. Also, especially for financial services professionals, the challenges and threats of automation, digitization, and increased efficiency do have the potential to displace and disrupt core functions of what financial professionals actually perform. It is true that automation and digitization are not new issues and trends in the accounting and financial fields, but these do seem to be accelerating as well as mirroring events that have already occurred in other industry sectors (Mehendale 2018). Examples abound in the marketplace, including a recently highlighted example of how J.P. Morgan is leveraging artificial intelligence tools to improve the speed and efficiency with which contracts and other paperwork are reviewed and analyzed. This example, however, is only one example of how artificial intelligence is being used in the marketplace, not even drilling down into the work underway at IBM.

An AI Primer

IBM Watson leapt to fame and media coverage with the triumph on Jeopardy, but that merely represents one application and interpretation of what artificial intelligence actually represents. Artificial intelligence is often tossed around and discussed as if it represents on type of platform, technology, or platform, but this represents an incomplete view of just what AI means and can imply for professionals and organizations. Without diving too much into the technical weeds of the different classes and types of AI, the following categories are included but not limited to:

1. Computational AI
2. Linguistic AI
3. Spatial AI
4. Reactive computing
5. Limited Memory
6. Theory of mind
7. Self awareness

Different classes of artificial intelligence are already in the marketplace, and are being used by a variety of organizations, many times in ways that are not initially apparent. Organizations ranging from Tesla, to Uber, which may appear to be more likely fit for technological integration, and even organizations like Kohl's and McDonalds – more traditionally thought of firms – are already using different types of AI in the marketplace (Garbuio and Lin 2019). GPS systems, voice activated assistants like Siri or Alexa, Roombas that are already cleaning rooms, and the self driving cars that dominate the headlines all use different forms of AI. The point that is hopefully becoming increasingly clear is that artificial intelligence is something already widespread within the marketplace, and that financial professionals must be able to adapt and evolve alongside the rest of the marketplace.

Let's take a look at just what these different classes of AI mean for financial services professionals, and what are some of the impacts this technology could have on the profession. While clearly no one definition is all inclusive or exhausting, these definitions and concepts should form the basis for further consideration and conversations.

Computational AI – It makes sense to begin the conversation with computational AI because that is type of AI most professionals are going to (1) be familiar with, and (2) think of when they think of AI in the workplace. Increasing the speed with which information can be processed requires ever increasing amounts of computing power, and as more and more streams of information are available for decision making purposes, it stands to reason that financial services will be no exception to the technology tidal wave. Quantitative brokerage houses are already using computational AI to improve performance, and virtually every business has integrated some sort of advanced processing or computing capability into their operations.

Linguistic AI – The work linguistics may bring to mind English classes or other types of non-accounting or non-financial work and services, but actually the importance of being able to analyze words and phrases, and then translate these items into business actions cannot be overstated. Whether it is used in terms of trading and/or investing in certain securities driven by headline news items or by organizations seeking to get a better handle on what certain phrases mean in a footnote or other type of disclosure, the ability to analyze in and use data like this is critical for financial services professionals.

Spatial AI – While not specifically important for financial services professionals, the rise of spatial AI will certainly have an impact on the organizations serviced by financial services professionals. Specifically, spatial AI is the core technology driving the majority of autonomous development and business sense, so it will be important for financial services professionals to understand what this terminology means for potential clients.

Now in addition for financial services professionals having to understand just what exactly AI is, and the different classes of AI for business purposes, it also seems logical to conclude that professionals are going to have a different role moving forward than is previously occupied. Specifically, the combination and integration of artificial intelligence, blockchain, and other automation tools appears positioned to drive change and innovation throughout the business landscape.

Combining these technologies allows practitioners and organizations to tap into and unlock the potential upside of these different tools, both from a financial perspective and from a broader based point of view as well.

Stacking AI and Blockchain Technologies

Some of the most exciting applications linked to blockchain, and artificial intelligence may not even by linked directly to the technologies themselves, but rather the business opportunities that these tools will generate. While not specifically related to the functional work done by financial services professionals, these are definitely items that should form the basis of advisory conversations. Stated another way, in order for financial professionals to actually become strategic partners they must be aware of the potential applications of these tools outside of the traditional financial services landscape (Preimesberger 2019). For example, a common thread that runs through the implementation conversations surrounding both artificial intelligence and blockchain technology is the need for electricity both of these tools require. Even with more efficient and platforms being developed and implemented in the marketplace, the power and energy requirements of increased technology integration does not appear to be fading.

In addition to the environmental and logistical issues associated with this increased power demands, there is also a specific subset of business opportunities that revolve around this increased demand. Drilling down there is one potential business opportunity that must be taken into account; the increased demand for commercial real estate associated with providing the power for such technologies will only continue to increase. Whether this means the repurposing of currently unoccupied commercial property, the building of new facilities and locations to supply this power, or the investment within real estate sector of the organization, the trend toward reallocating resources will be a definitive byproduct of the growing integration of technology throughout business processes. Being aware of these opportunities and implications, however, is just the first step in this advisory process. In order to truly evolve and develop into strategic business partners, financial professionals must also be able to weave these possibilities and opportunities into current business operations.

For example, in order for artificial intelligence for actually to be utilized to its full potential in a business environment it must be integrated throughout the business process. Specifically the conjunction and joining of artificial intelligence with blockchain technology represents a potential game changing combination of how data is treated, compiled and reported. While it may seem logical to examine the fact that some organizations are already making fantastic use of data and technology as a business asset itself, the general trend toward leveraging information as a business tool it something that will become increasingly critical to understand in a digital first environment.

An often stated goal of accounting and other financial professionals is to elevate and evolve from a role as steward of capital assets or compliance based practitioner to one of a strategic business partner. That said, in order to actually develop and evolve along these lines it is important for all professionals to at least have a basic understanding of what needs and expectations clients will have moving forward. Simply being aware, and understanding the working definitions of technology tools is not enough; practitioners must also be able to connect the proverbial dots. Each of these emerging technologies, from blockchain to artificial intelligence, to cryptocurrency adoption are substantive enough in their own right, but when combined and merged with each other, can truly represent a game changer for both technology and business at large (Anand 2019). Taking a look, prior to the specific implications for accounting, at some of the implications AI and other automation may have on business processes at large, leads to the following scenarios and options.

1. Increased customizable solutions and products. Whether it takes the form of a fully personalized and customizable investing product or ETF, personalized insurance products and offerings, or data driven entertainment products, the ability of AI leveraged products are a fundamental reality. Specifically for financial advisors, seeking to establish and remain credibility in the eyes of clients, being aware of customizable products is imperative. In addition to being aware of the products available in the marketplace, advisors must also be able to discern which products are the correct fit for certain clients.
2. The need for retraining and education of clients. In addition to providing investing advice and advisory services for clients looking to invest in AI augmented or improved products, financial professionals must also evolve to serve roles as educational professionals. Especially as further applications are built out on artificial intelligence or various blockchain platforms it can be easy to feel overwhelmed, which again is where financial professionals can deliver quantitative and guidance to clients.
3. Smart contact implementation. The moniker of a smart contract can be a bit misleading especially since it is repeated so often. A smart contract is neither smart nor a contract, but rather just a short series of executable code that has been embedded on to a blockchain platform. In addition to the business applications of these contracts, with the layering of AI with the implementation of smart contracts it will be important for financial professionals to understand what the potential ripple effects of smart contracts augmented by artificial intelligence are.
4. Reduction of current roles and services. Many of the current roles and responsibilities occupied by, at the very least, early to mid career professionals, will inevitably be augmented or rendered obsolete as a result increased technological integration. While this will inevitably cause disruption and displacement within the workforce, it will also generate opportunities and new business lines. Discussed in more detail throughout this text, it seems logical to introduce this concept here for further analysis and examination.

Artificial Intelligence in Accounting and Business

So, while it is hopefully clear that artificial intelligence is already having quite a widespread impact on the broader business environment, there are also going to be implications and applications specific to the financial services industry. Namely, and accelerating trends and forces already present in the financial landscape, namely the forces of automation and digitization, artificial intelligence can be thought of as adding fuel to the proverbial fire, including the ability of machines and program to continuously learn and evolve (Heaton et al. 2017). This acceleration of existing forces, however, can cause equal parts negative and positive impacts in the marketplace, especially as it pertains to the accounting and finance functions. Namely, and an important point to remember that, no matter how sophisticated the technology or AI tool actually is, if the underlying process is poorly designed and executed simply introducing a new technology platform will not improve anything.

Returning to the core of the idea, specifically the impact that AI will have on accounting, attestation, financial advising, investing, and other aspects of the financial services fields it seems appropriate to begin our analysis in the areas most likely, and which already are, feeling the impact of AI. Financial advising, financial planning, and charting an investment strategy to contend with different market forces have traditionally remained in the realm of individuals and human advisors, but there is one fundamental issue with this approach continuing in the current marketplace. Drilling down, the sheer volume of information and data that is produced and generated by both organizations and the broader market dovetail exactly with the attributes of artificial intelligence. Analyzing large amounts of information, gleaning patterns and insights from quantitative information, and creating outputs and results as a result of these analyses link directly to what investment professionals are paid to do. Digesting market information, interpreting market trends and forces, and translating the bigger picture into investment advice and insights already are being augmented by AI tools. Put simply, robo-advisors and automated wealth planning organizations already exist and will only become more important going forward (Decarlo 2018).

Again, it is not correct to say that financial services professionals will need to become programming or coding experts in order to thrive in an AI-driven environment in the future. That is actually far from the truth; much like practitioners do not need to know how to code in C++ or understand the technical specifications of how an upload process works, it is unlikely financial services practitioners will be expected to be AI experts. Rather, and similar to how computing became more powerful once graphical user interfaces become more widespread, it seems reasonable to forecast that AI will become more mainstream once the interface and user functionality becomes more sophisticated. Even though the technical aspects of AI will increasingly become built into different platforms and protocols, it seems that the majority of this functionality will on the back end versus forcing practitioners to understand the underlying coding itself.

Drilling down to the accounting specific applications of AI, several areas appear ripe for disruption and augmentation as artificial intelligence tools and processes

becomes more widespread at organizations of different sizes. Prior to discussing the concepts of artificial intelligence in broad terms, it appears a logical place to note the following. Virtually every existing accounting software provider is beginning to integrate artificial intelligence tools and processes within current offerings, so it is important to work with your software or ERP provider to ensure that no one is reinventing the proverbial wheel when seeking to implement AI tools.

Audit and Attestation Impact

First, possibly the most obvious place where artificial intelligence can, and already is, driving change and innovation in the accounting profession is in the auditing and attestation areas of the profession. Traditional auditing relies on a combination of periodic quantitative examination, qualitative conversations and dialogue with members of the organization and stakeholder groups, and additional analytical procedures to help answer additional questions arising during the process. While this model and process for auditing organizations has served numerous organizations, firms, and practitioners very well, there are substantial flaws that have been exploited time and again. The time lag, a primary points of concern, between when the information being audited was actually generated and when the data is tested presents the following problem; if errors or omissions are present in the information it may be months before they are uncovered.

Time delays and lags in between the production of information and the reviewing and attestation of this data by external experts is a significant issue in both the attestation process itself, and as it relates to market efficiency. The theory of efficient markets, i.e. that no one investor or group has access to private information on a continuous basis, is dependent on the information being distributed on an equivalent basis in terms of the time factor. At the current time, the diffusion of information is dependent on traditional technologies that are relatively well established in the marketplace, but AI has the potential redefine many of these pre-existing terms and practices.

This is where the true potential of AI, combined with the growing utilization of blockchain technology, can be truly be realized. Each technology tool by itself will invariably drive change and impact the profession as a whole, but when combined with the immutability and real time communication of data possible with blockchain it is increasingly clear that core functions of how accounting work will change over time. For example, if certain classes of information and data have been secured and recorded on a blockchain, and been approved by network members, AI tools can be leveraged to analyze these continuously increasing quantities of information, enabling the tools to augment rather than supplant human participants (Briggs 2019). Since information stored on a blockchain has already been approved, encrypted, and communicated between involved parties – and in a private blockchain environment this can include auditors and audit firms relatively simply – analysis and reporting can occur on a continuous basis rather than only a periodic basis. In addition to the continuous potential that is delivered by technology this also

allows the catching and resolution of errors before they become material or threaten the organization in nature.

Errors and omissions, of course, will continue to occur and be something that must be contended within virtually every organization, artificial intelligence represents the possibility that information can be tracked in near real time. Traditional auditing relies on a small sample if information to be analyzed and then serve as the basis for generating the entire audit opinion, but this clearly opens the door to a number of sampling errors. Although methods and protocols to prevent these different classes of errors are routinely covered both in university education and continuing education these errors continue to occur. One merely need to look at various business headlines to see that audit failures occur on a routine basis; leveraging AI to more efficiently process, analyze, and report the ever increased amounts of information can help reduce the risk of these different types of errors and failures. Clearly it will be necessary for individuals to supervise the implementation and operations of AI tools at the organization in question, but by partnering and leveraging the variety of AI tools and options available CPAs and other accounting professionals can make more efficient use of their time and efforts.

Of particular importance and interest to the various subsets of audit, attestation, and assurance services that are currently offered to the marketplace by both individual practitioners and firms itself is the potential impact that AI will have on the work done by audit and attestation professionals. Especially when stacked or merged with technologies such as automation, robotic process automation, and ultimately blockchain implementation, the implications of AI can be profound. For example, if pieces of information and data have been approved and verified by other members network, and be unassigned an unalterable hash ID, this creates a ready made audit trail. In and of itself this is a potential game changer, but when taken in the context of the increasing utilization of AI tools and other bots, it really does represent an entirely new way of how audits are performed. If this permanent trail of information and data can, in addition to be manually examined and checked, can additional be examined and analyzed by the various AI tools put into place at the organization, the entire audit process will have to evolve and shift.

The implications of this shift, evolution, and further development of the audit function as it is increasingly augmented by technology tools and platforms can take many forms depending on the organization, but several general trends do appearing to be forming related to different subsets of the accounting and financial services professionals.

Tax Reporting Implications

Taxation, both in terms of reporting and communicating the information to interested third parties may seem like an unusual place to hand over control over different parts of the process to artificial intelligence programs, or internal bots. This attitude, however, only presents an incomplete view of just how tax law, policy, and realities actually impact an organization. Taking aside the political forces that

invariably impact tax policy and the policy making process, at the end of the day tax law and tax policy represents two core items. First, tax policy and regulation are meant to direct investment and interest into certain areas and away from other areas and aspects of the economy. Directing certain behaviors and incentivizing different activities by certain market actors actually links back to exactly how artificial intelligence can assist accounting professionals employed in tax focused areas. Taxation law, and interpreting tax policy and tax code changes are, at the end of the day, the combination of interpreting a variety of contracts, agreements, and other quantitative information. We will revisit this analysis and discussion later in this book, but introducing it here makes sense. Tax law, tax policy, and driving tax actions underway at organizations relies on the analysis and interpretation of large amounts of information. AI, whether it in its current form or in iterations yet to be introduced to the market.

This is not merely an academic conversation, as the integration of AI into tax reporting or analysis is already occurring in several international markets, so it is logical to assume that this trend will only continue as the interfaces and utilization of becomes easier, simpler, and more accessible to a broader audience of end users. Specifically, the implementation of AI throughout business practices and different organizations will, almost without a doubt, lead to improved tax compliance as well as improved tax efficiency. While this might not sound like a particularly beneficial implementation aspect of AI for business and finance in general, the reality is that organizations – virtually across the board – are going to owe taxes. Being able to reduce the time and expense, both in terms of people and technology resources, continuously tasked with ensuring compliance will lead to more efficient and improved outcomes.

What AI Means for Business

Now, this book is obviously oriented toward individuals working in the financial services areas, but it would be a disservice to not at least mention what AI will do for business in a broader context. Taking a step back, a large part of what accountants, investment advisors, and other financial actually do in the workplace is advise other management professionals as to how to improve the efficiency and effectiveness of current operations. Clearly every industry and organization are different, and the management professionals at every organization are going to be wrestling with a variety of external forces. Technological disruption and innovation are, of course, having a dramatic impact on virtually every organization, including the continuing proliferation of AI tools, so there are a few general ways that financial professionals can expect AI to drive change in current and future clients.

First, perhaps the most visible impact that AI will be the simultaneous impact of automation and job displacement among entry and mid-career roles. Across different industry and organizational lines many of the roles and responsibilities held by entry, early, and even mid-career professionals are focused on several core roles. Analyzing large amounts of information, uncovering and addressing any errors and

omissions, and addressing issues linked to the incompatibility caused by different systems occupy large amounts of management time. In addition to the sheer amount of time wasted doing this redundant and time consuming work, every individual and organizational asset dedicated toward fixing mistakes is time and energy not put to work growing the business. While, virtually without exception, management professionals and organizations will be happy to hear that employees are able to be redeployed to growth focused areas, the job displacement that will inevitably occur due to this automation will also create different opportunities for proactive practitioners (Garwood 2018).

This dovetails to the second primary impact that AI will, and already is, having on almost every organization; the need for continued education and training for both financial services professionals and other professionals. Despite the buzz and hype surrounding AI, and even taking into the rapid advancements and integration that AI has already had, it is commonly stated agreed upon that were are merely in the first stages of this paradigm shift. Certifications and training are still being developed due to the nascent nature of the technology itself, but that is no reason for professionals and organizations to not start developing programs and education initiatives. Specifically, a core segment of any training and education should, in addition to drilling down into the technical aspects of artificial intelligence tools, the development of other business skills is an absolute necessity.

AI Impact on Accounting

Outside of the technical aspects of how artificial intelligence will drive change in the profession, of which there are many, it is also important to recognize the reality that AI integration will have a dramatic shift on the type of professionals needed in the finance space. Continuing to simply be subject matter experts, or focus only on certain niche aspects of audit, tax, or finance will not be enough in a business landscape where AI tools, bots, and other automation software becomes more commonplace. Individuals working in the profession at this current state, as well as the individuals who continue to enter the profession are going to have to be aware of two salient facts.

First, the idea of being – and remaining – a subject matter expert in areas of technical implementation of interpretation of certain accounting standards is going to become less possible. This is not to say it will remain impossible, but that it will be more difficult for humans to match the processing and interpretation ability of ever more powerful AI tools and platforms. Instead, and mirroring a trend that is already happening in the marketplace, practitioners working in the financial services landscape are going to have to be able to complement the speed and processing power of AI tools. For example, if an algorithm provides an answer, fact pattern, or trading suggestion, the practitioner is going to have to be able to (1) analyze that output to see if it matches the data inputs, (2) ascertain whether the recommended strategy is cost effective or appropriate given other considerations, and (3) interpret and present the recommendation to the end user in a way that is understandable.

In order to provide any of these services, the practitioner will, of course, need to have an understanding of the technical fundamentals, but instead of relying exclusively on that, will also need to develop complementary skill sets.

Second, and building on the first implications of AI on financial services, is that in order to provide consistent and high quality services to end users, a more holistic approach will be necessary. This does not mean, however, that the core of the services will stray from financial matters, just that in order to be effective it will require more input from a greater number of participants. As opposed to simply involving accounting or finance professionals in the decision making process, it seems logical that both information technology professionals and legal experts should also be included in this process. For example, if artificial intelligence programs and processes are going to be implemented throughout the organization, these programs need to be coded, programmed, tested, and debugged as they move from test to production environments; this points to the inclusion of technology experts. Additionally, as these different programs are implemented throughout the organization, the legal implications must also be assessed. For example, if an AI program is set to automate certain distributions of information or data, legal distributions of information should also be monitored.

Data Driven Decision Making

Now this may seem like a misnomer or something that should not be connected to the theme and implementation of AI tools, since every CEO and every organization states – almost without question – that leveraging data is core to the decision making process. That said, and a reality that virtually everyone who works in a business environment will agree to, is that a plurality of decisions are still driven by intuition, instinct, past track records, or a combination therein. In other words, even though there is more information available than ever before in the market, not every organization actually makes effective use of the data already available to them to. Not only is this tactic not efficient in terms of the investments made toward improving the quality of data generated by the firm, but also results in an inefficient use of managerial time. Put simply, if no one is looking at or using the information produced internally by the firm then what is the purpose of even generating the information is the first place? As more and more pieces and devices employed within the organization are connected to the Internet of Things, the volume of information produced will only continue to increase; AI can and will help organizations make sense of this information.

The assistance that AI can deliver to organizations in terms of analyzing larger amounts of information, be it structured or unstructured in nature, also extends to the accounting and financial services areas. Let's drill down specifically into two of the most common pain points associated with the work performed by accounting, audit, and attest professionals; confirmations and asset verifications. Namely, a core function of an audit consists of both confirming that certain amounts and valuations on the balance sheet actually exist, and that the values included on the balance sheet

are indeed accurate. Currently this involves, almost without exception, a string of emails sent between the external audit firm, suppliers or customers of the client, and then a presentation of results delivered to the client. Clearly in the age of 24/7 information and the increased pace with which business occurs, relying on such a manual and time consuming process to confirm data does not appear appropriate. Additionally, verifying the physical existence of assets, namely inventory, is an important part of any entry level auditors training and on-the-job experience, but may not add much in the way of value to the organization. On top of the financial impact that having an accurate count of inventory generates, it is also an area where fraud and other unethical activity has occurred with frightening occurrence. Better control, more up-to-date information linked both to inventory and the ramifications of inventory levels will, invariably, create opportunities for more efficient deployment of capital.

Artificial intelligence, in whatever stage it is presented or implemented in at the firm, also can help to augment current decision making processes that are, at least at the current moment, driven by various qualitative factors. When dealing with a global and digitized environment, complete with different streams of information coming into the organization, a rather obvious problem can become more pronounced. Every different technology system and platform, clearly, has data formatting protocols and systems that have been built around the needs of those individual users. This may make sense from a specific perspective, such for utilizing a unique system within an organization or arrangement of organizations, but when trying to transfer data between different firm or partner organizations this represents a substantial problem. Any professional who has ever spent time trying to manually format and reconcile different file types is well aware of the time and energy that is spent attempting to correct these issues.

In addition to absorbing the time and mental energy of different employees this also increases the time spent making decisions, which can cost organizations potential opportunities. Manually reconciling files and format types when performing a bank reconciliation might only take a few minutes, but for larger organizations, or with firms interacting with global counterparties, these reconciliations can add hours or days to the processing of information. Artificial intelligence tools and processes, by automating or being trained to translate and automate the translation and standardization, can – and already are – adding speed and efficiency to how data is processes and communicated. On the flip side, however, as the speed with which data is processed and communicated continues to increase and accelerate, it becomes even more important to establish internal controls over how data is handled. Controls may seem like an afterthought in a business environment where the improvement of technology is the primary conversation topic, but that does not mean it should be overlooked. Much like dominos can be arranged so that one can initiate a much larger cascading series of events, if bad information is entered into an AI-augmented or AI-driven process the ramifications of this bad data can quickly escalate out of control.

AI Disruption

With the associated improvements and opportunities created as a result of increased technological integration there will also be some roles and jobs that are eliminated as a result of automation. Circling back to the core functionalities of artificial intelligence, namely the increases of efficiency and speed with which data can be analyzed and transformed, there will be some job displacement and disruption in the marketplace. While it is important to, of course, recognize the benefits and upsides of AI, it is equally important to understand that these benefits and upsides will not come without associated downside risk. In order to acknowledge the potential risk and downsides of artificial intelligence, again it is important to recognize the reality that interdisciplinary teams will become more and more important. As organizations are better able to leverage technology tools and platforms to gain better insights into data, and do so with lower levels of headcount, professionals and organizations alike will need to think outside of the proverbial box.

The requirement to think outside of traditional methods of value generation, and to seek out new ways to deliver and connect value to the marketplace is not a new idea or concept, it is increasingly evident expected that organizations will be able to harness, report, and analyze data in a real time manner. One of the most important trends and concepts that is underway in the marketplace, however, is that even though technology continues to advance and become adopted across different industry lines, the financial services profession is – for lack for a better term – lagging in this regard. Practitioners across different industry lines and subsets will have to become more used to become technologically advanced rather than simply relying on existing tools and platforms to compete in an increasingly digitized environment.

Evidence of this is already present in the marketplace as firms like Amazon, Netflix, and Tesla are employing artificial intelligence tools and platforms to generate more customized programming and better services, all of which assist with customer retention. A basic example of how AI might already be able to add value to your organization is simply by applying it to tasks that occur on a recurring basis such as emails, scheduling, and calendar management. This may not seem like the most riveting or exciting areas to focus on at first, but the reality is that achieving early wins, building momentum, and gaining increased buy-in from management are important steps for anyone, or any firm, looking to better integrate AI tools. Now, enough of talking in generalities about how AI might change finance and accounting services; let's go through and take a look at some real examples that figure not only how AI might change how financial services function, but then apply them to work already being performed by practitioners.

As entry level roles and tasks become increasingly automated, digitized, and – in large part – rendered obsolete by technology playing a larger role in these processes, both accounting and finance professionals will need to be able to envision and evolve into new roles. At first glance this may seem like a continuation of automation processes already underway within the professional service s landscape, but instead represents an entirely new lens through which accounting and finance is

viewed. Put simply, the proverbial game is changing in terms of what is expected of financial services professionals, and how this information is delivered to the end users of financial data and information.

Finance and AI

The implementation of computers into different finance processes is not anything new; high speed trading and the dominance of algorithms in the markets is a trend that has been discussed, analyzed, and reported on at length. That said, and the key point to remember during this conversation is that, as computers become increasingly sophisticated there will also be drawbacks. As increasing amounts of trading are connected to computers, programs, and algorithms that operate without direct human oversight and intervention there is a possibility that large swings in the market (that volatility word) will become more frequent. Actually, and just gathered from anecdotal evidence and review of market commentary, it does seem that the increasing technological dominance of trading may be leading to several different effects.

First, while volatility while judged by historically levels, has been at low levels in the 2015–2018 time period this does not provide the entire picture. The decrease in volatility may not, as some has speculated, be associated with the increased efficiency generated by algorithmic trading programs, but rather a related trend. ETFs, passive investing tools, and the growing (trillions as of this writing) assets invested in these options may also be having an outsized impact on volatility and training patterns. Put simply, as larger and larger percentages of investors and funds are investing in similar, if not identical, trading tools and platforms, this may very well have a depressive impact on market volatility. This may very well seem like a positive effect to retail investors with jitters linked to increases in market volatility, but masks an underlying problem. If investing decisions are made outside of human oversight and supervision this can inadvertently lead to market selloffs, runoffs, and other actions that do not reflect the underlying economic reality.

This is a tremendous opportunity for financial advisors, planners, and other advisory focused finance professionals to offer real time, real world, and actionable business insights to clients and customers in a market that can seem as it operates outside the realm of normal possibility. Volatility, although depressed during 2017, seems to have returned to the market with force in 2018, emphasizes the important of having a professional behind the wheel of various automated services and processes. Simply executing certain processes, trades, and business transactions faster will offer no benefit to either the organization or clients if those said processes are poorly written or designed. In order for practitioners to effectively leverage technology they must understand not only how the technology itself works, but also how it can – and should be – applied to the business decision making process itself.

Another area where can, and already is, having an impact on the financial services landscape is the realm of ad hoc and management reporting, which constitutes

a rather large percentage of the actual work performed by professionals working in the space. Generating reports for management and supervisors simultaneously forms a plurality of work performed by many accounting professionals and a way that professionals can quantitatively add value to the organization. Despite of this, one of the key issues raised and problems associated with internal management reporting, or ad hoc reporting, is that data is not generated consistently, systems do not communicate with each other, and there are inevitably time lags between when different classes of information are generated. Even worse, in the context of accounting professionals seeking to elevate both themselves and the work performed internally, the amount of time spent correcting errors, manually adjusting entries and information deprives professionals of the time necessary to instead focus on higher level activities. In other words, if accountants are spending too much time manually creating reports and fixing errors, those same professionals will never be able to achieve the oft-cited role as strategic advisor or business partner.

Audit and attestation work, discussed previously and to be expanded upon throughout this text, represents a prime area where artificial intelligence will have an impact on the profession. Currently, the entire process of auditing has several pain points, namely the fact that the final audit opinion is heavily (if not exclusively) reliant on expanding on findings generated from a small sample of organizational information. Even with the subsequent analytical procedures and substantive tests added into the audit examination process, audit failures are all too common. AI tools, such as those represented by the partnership between IBM Watson and KPMG, are already having an dramatic impact on audit testing, procedures, and how auditors interact with both clients and future clients. This evolution and transition, from a compliance oriented function that focused exclusively on financial information, to a more comprehensive process that can operate on a continuous basis also connects to several other trends. Introduced here, but examined in more detail later in this book, the connection between assurance work, non-financial information, and the importance of this data to the decision making process opens up a proverbial work of opportunities for accounting practitioners.

Tax reporting and the discussion of taxation issues are normally not associated with pleasant news or something that management professionals, but that is not something that should be perceived as the final state of the conversation. Specifically, and even in the current environment beset by changes in tax reporting, this debate and analysis can, and should, be perceived both as an opportunity and part of the continuous management dialogue. Put simply, although the Tax Cuts and Jobs Acts was passed right at the end of 2017 – December 22nd to be specific – the ripple effects as a result of this legislation are still being analyzed and processed by both individuals and organizations. Processing the sheer number of changes, running scenario analyses, and putting the results of these analyses into a format and report that are understandable for management decision making is both a role accounting professionals should play, and a function enabled by AI tools. Taxes have an impact on the bottom line, will continue to guide investment and operational decisions moving forward, and will play a prominent role in the implementation and analysis of AI.

Chapter 6 Summary

This chapter focuses on a topic and idea that is simultaneously discussed very often, but is also one of the most misunderstood ideas on the emerging technology spectrum; artificial intelligence. A key point for practitioners to understand is that, even if they themselves of their organizations are not particularly interested in using artificial intelligence for business purposes at this point in time is that clients and customers are potentially already doing so. Drilling down specifically to the topics covered in this text, practitioners need to be able to understand and communicate the reality that there are different classes of intelligence that may be applicable to different industry lines. To that end, this chapter also breaks down the different types of artificial intelligence that are available in the marketplace at this point in time. Clearly not an all-inclusive listing or analysis of the types of artificial intelligence that exist, the types of intelligence documented within this chapter should instead serve as an appropriate jumping off point for future conversations and analyses. Additionally, and applicable for all users and readers of this text and associated materials is the differentiation between AI, RPA, and other automation tools that are currently available and in use by practitioners. Understanding what artificial intelligence means from both a technical and application perspective will be important not only in the current marketplace but as well as the future as automation moves from emerging topics idea to mainstream business practice.

Reflection Questions – Chapter 6

1. From an operational perspective and point of view, what does AI represent in term of automation and business process improvement?
2. What are the different types of artificial intelligence that practitioners would seem to have to be aware of moving forward?
3. Identify some of the potential applications and use cases for Ai in the financial services space, including some at your particular organization.

Supplemental Readings

Brookings – What is Artificial Intelligence – https://www.brookings.edu/research/what-is-artificial-intelligence/

Investopedia – Artificial Intelligence – https://www.investopedia.com/terms/a/artificial-intelligence-ai.asp

Forbes – The Key Definitions of Artificial Intelligence that Explain It All – https://www.forbes.com/sites/bernardmarr/2018/02/14/the-key-definitions-of-artificial-intelligence-ai-that-explain-its-importance/#6aba8c584f5d

Govtech – Understanding the 4 Types of Artificial Intelligence – https://www.govtech.com/computing/Understanding-the-Four-Types-of-Artificial-Intelligence.html

Medium – Artificial Intelligence: Definitions, Types, Examples, Technologies – https://medium.com/@chethankumargn/artificial-intelligence-definition-types-examples-technologies-962ea75c7b9b

References

Anand, A. (2019). Forensic accounting and the use of artificial intelligence. *Pennsylvania CPA Journal*, 1–3.

Briggs, T. (2019). Use AI to enhance human intelligence, not eliminate it. *Journal of Financial Planning, 32*(1), 26–27.

Decarlo, S. (2018). A new edge for pro investors. *Fortune, 178*(5), 101.

Garbuio, M., & Lin, N. (2019). Artificial intelligence as a growth engine for health care start-ups: Emerging Business Models. *California Management Review, 61*(2), 59–83. https://doi.org/10.1177/0008125618811931.

Garwood, M. (2018). Ai & machine learning. Mix, 9.

Heaton, J. B., Polson, N. G., & Witte, J. H. (2017). Deep learning for finance: Deep portfolios. *Applied Stochastic Models in Business & Industry, 33*(1), 3–12. https://doi.org/10.1002/asmb.2209.

Lee, K. (2018). The four waves of A.I. *Fortune, 178*(5), 92–94.

Mehendale, A., & H. R., N. S. (2018). Application of artificial intelligence (Ai) for effective and adaptive sales forecasting. *Journal of Contemporary Management Research, 12*(2), 17–35.

Preimesberger, C. (2019). Six advantages of human-aided, "Artificial" artificial intelligence. *EWeek*, N.PAG.

Robotic Process Automation

7

Artificial intelligence is clearly a disruptive and potentially disruptive technology tool, but it is important to take a step back and observe the overall business environment in addition to the finance and accounting specific applications that have entered the marketplace. Drilling down, and taking a realistic analysis of where both personnel and technology tools are currently positioned in the marketplace it may be logical to conclude that implementing an artificial intelligence platform may not be a practical option at this time. Additionally, and dealing with the reality that some individuals will be less engaged in the technological process than others within the organization, RPA offers several benefits that a fully fledged blockchain or artificial intelligence may not be able deliver at the present time (Fig 7.1).

First, there are a variety of organizations out in the marketplace currently that are offering RPA and other automation solutions that are tested, business proven, and have been adopted by other firms (Seasongood 2016). This differs from other ideas and concepts, such as AI and blockchain, which although may ultimately offer more promise and upside, still remain within pilot or beta phases, generating a platform to achieve additional buy-in. Being able to deliver a viable product that, for lack of a better phrase of mindset, can be thought of as a "plug and play" model instead of a radical implementation or adjustment of current technology solutions also makes the process of RPA implementation simpler in terms of coordinating with existing systems. The importance, especially as the whirlwind of technology tools and options continues to escalate and increase in intensity, of identifying realistic solutions and products that can be utilized and implemented both currently and moving forward is important for financial professionals seeking to occupy and drive strategic planning moving forward.

Second, the implementation of RPA technology and tools may very well present an opportunity for the construction of a technology and data analysis plan; not just artificial intelligence or blockchain, but a comprehensive solution. Not every situation or problem will be equally addressed by emerging technologies and innovative solutions, but it is important to put together a plan and strategy to integrate emerging technologies alongside current tools and options to improve the decision making

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_7

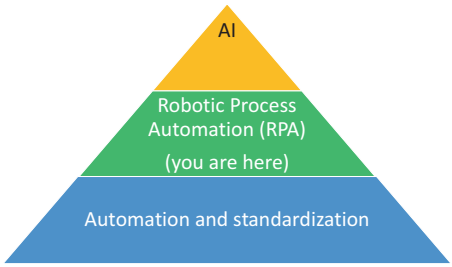

Fig. 7.1 Automation to AI pyramid

process (Preimesberger 2018). Linking back to the role of the decision making process itself, taking into account the importance of data, verifying said information, and generating insights off of this data forms the basis for how decisions and options can, and should be, evaluated. Evaluating these choices, however, is as equally important for the decision making as the ultimate choice mad as a result of these options. RPA offers a practical tactic and solution for the analysis and reporting of information that is increasingly becoming imperative in a digitized environment. As ever larger amounts of data and information are digitized, stored digitally, and transmitted through networks connecting the organization to both stakeholders internal and external.

Third, RPA also provides a template or other activities that should be underway at the organization in any case, regardless of technology implementation or adoption. This point is especially important to emphasize and highlight, especially as the pace and variety of technology tools and platforms continues to expand, evolve, and become increasingly important for financial professionals. At the end of the day, however, merely slapping a technology tool or purported solution on top of processes that are flawed will not result in any substantive improvement. Rather, the flaws and shortcomings already present in those processes will only be exacerbated and accelerated by the speed with which they are, augmented by technology, able to be completed and verified. As this book shifts from Part I, an overview and analysis of technology tools themselves to Part II: implications and applications for financial services, this seems like an appropriate time to revisit some of the key items and processes that should be underway to facilitate the implementation of technology solutions.

1. Identification and classification – a common issue in the accounting and finance space, regardless of industry affiliation, is that processes are not properly identified nor classified within appropriate categories especially for automation purposes. It is important to remember that technology in and of itself will not improve processes, entries, or procedures currently employed at the organization, but will only amplify what is currently there. Creating a classification system for different types of entries, reports, and other outputs is an important first step for any technology implementation. Not doing so, as temping as that may seem – in the name of simply getting started – creating a framework is an essential first step.

2. Documentation – like any other instruction, reporting, or communication process, documenting existing processes and procedures is, rather obviously, some that should be underway in any case. That said, and as obvious as the importance of documentation may seem on an objective basis, it is all too easy to overlook just how arduous this undertaking can actually be.
   a. Think for a minute about the simply process of making a peanut butter sandwich, and imagine the steps you would take to do so. If asked, the process would probably be something like "first I spread the peanut butter on the bread, spread the jelly on the other piece, and put them together." But is that really a realistic and accurate description of the process itself?
   b. From the perspective of an RPA tool, artificial intelligence platform, or any sort of automation this would be woefully insufficient in terms of actually automating this process. Let's take a look at just a few of the differences that may be worthy of consideration.
3. Documenting processes for automation can be complicated – revisiting the peanut butter and jelly sandwich example, let's take a look at what would actually be more practical from a automation perspective.
   a. Enter the kitchen
   b. Open the drawer and withdraw two utensils
      i. A sub-decision would be to whether select a knife or spoon
   c. Open the cabinet and withdraw a plate
   d. Place the plate and utensils on the counter
   e. Open the bread cabinet and withdraw the bread
   f. Place the bread on the counter
   g. Open the bread package and withdraw two pieces of bread
   h. Place the bread on the place previously withdrawn
   i. Open the cabinet and withdraw the peanut butter and jelly
   j. Place the peanut butter and jelly on the counter
   k. Open the jars of peanut butter and jelly
   l. Using a utensil, apply peanut butter to one slice of bread
   m. Using a utensil, apply jelly to the other slice of bread
   n. Place one slice of bread on top of the other, making sure to align the sides with toppings applied so that they meet
   o. Obviously the process of making a peanut butter and jelly sandwich is much more complicated, in terms of automation and automating processes, than it might appear to an individual. While this example may seem slightly silly it does illustrate the following point; automating processes requires that every step in that process are understood, documented, and applied consistently across the organization. It is also important to always remember that this is not a theoretical conversation, or an academic debate that can be relegated to offline conversations. The digitization and automation of accounting processes is already here and only accelerating on a global basis.

RPA Products

This is not a sales pitch book; no products are listed as recommended solutions nor are any service providers highlighted as superior to others. Continuing this theme, but acknowledging the reality that there are any going to be questions about the implementation of different technology solutions, it does appear appropriate to emphasize one salient point. Compared with artificial intelligence or blockchain solutions in the marketplace, which may or may not have succeeded as planned, RPA is a mature marketplace with organizations generating billions in market value over the last 15–20 years (Gex and Minor 2019). Different products and services will clearly be better fits for different organizations, both internally and on a client consultative basis, but the underlying point remains unchanged. RPA solutions and products are already available in the marketplace, and should certainly be a part of the technology conversation. Taking another approach may also assist in conversations held in the fast moving and fast changing technology landscape should focus on connecting RPA to more sophisticated technology options. In the scope of automation and digitization, RPA can be thought of as the foundational platform and application that can, and should, lead to more sophisticated and advanced solutions (Alarcon 2019). Building this bridge, and connecting current solutions and products to the potential of other solutions that may emerge over time also represents an additional tactic to help achieve management support and buy-in.

Whenever you are dealing with an RPA project or adoption of new processes or platforms it is inevitable that there will be questions, issues, and obstacles that come up along the way. This is the norm, and should be considered something to be avoided or a sign of failure in the adoption process. Rather, it should be perceived and seen as an eventual part of the learning and onboarding process that accompanies the technology adoption and processing curve within any organization (Jones 2017). Integrating automation into current processes, organizing processes into buckets to facilitate the automation process, and taking into account the various stages of documentation all form parts of the decision making process that should be considered.

The Pace of AI Adoption

While it may seem that, based on either your personal experience or conversations you may have very well had with colleagues and clients, that AI is still in nascent stages, the reality of the situation is more complicated (Casale 2014). Although kickstarted with the partnership between KPMG and IBM Watson in 2016, which did deservedly capture the attention of market participants, the aftermath of that has resulted in lower levels of media coverage and analysis. This quieter media landscape, however, has masked a definitive shift toward how organizations are using AI and the speed with which this adoption has already occurred. Drilling down specifically, the pace of adoption is only moving one direction; forward. The specifics of

the tools themselves, and the applications leveraged and enhanced by technology tools such as AI and blockchain will differ, but assuming that these tools will only have an impact sometimes in the future is a breach both of fiduciary and shows a lack of awareness connected to market actors. The implications of these tools will be clear going forward, but an important point to remember is that management professionals will not need to, overnight, become technical or coding experts.

What management professionals will have to do, however, is be able to analysis, interpret, and understand both how these game changing technologies operate as well as what these technology tools mean for organizations and data management. It may seem intimidating, especially at first, for management professionals already juggling a variety of needs and expectations, to learn about these emerging technologies, but it is something that will only become more important moving forward (Brazina and Ugras 2018). Whether it involves enrolling in a certificate program, enrolling in employer sponsored corporate training and education, or re-enrolling in a graduate or executive education program the necessity for continuous learning and education is apparent. Management professionals, including working in the financial services areas, will – despite whatever levels of education and training have already been covered – need to adopt a mindset of ongoing learning.

Another key point that all professionals, including those working in the financial services profession, will have to acknowledge and integrate into business operations moving forward, is the reality that many current jobs will no longer exist in 3, 5, or 10 years. Virtually every large professional association, including those associated with the accounting, finance, investing, and trading market subsets have leadership teams that have acknowledged that these changes are coming (Samuels 2019). AI adoption and implementation, for the time being, has primarily been adopted and implemented by the largest firms the marketplace, but that is merely the proverbial tip of the iceberg. Clearly, new tools and technology will first be introduced at the organizations that have the personnel and financial resources to put these processes into place, but it is logical to project a similar adoption curve to other technology tools. Desktop computers, laptops, wireless internet, and smartphones/tablets all began workplace implementation at larger organizations and since have been adopted at organizations at different levels of size and complexity.

Disruption is a word that does tend to be overused in the current marketplace, alongside such phrases as innovation, creativity, and thought leadership, but in the case of AI and blockchain disruption does appear to be an appropriate adjective. At the core of these ideas, the dual technology wave of blockchain and AI appear to have the ability to fundamentally change how financial services professionals interact with each other and with clients (Corson 2016). The phrase creative destruction may not offer much comfort to practitioners and organizations who find themselves upended or undercut by competitors leveraging these new tools, but this same change will offer opportunities for proactive professionals. As certain tasks are automated, outsources, or relegated to the dustbin, professionals must be able to identify, articulate, and operationalize some of the newer opportunities created by these processes.

Let's take a look, roll up our sleeves, and drill down to what exactly will change as a result of blockchain, artificial intelligence, and other technology tools becoming more widespread throughout the profession.

Chapter 7 Summary

Concluding Part I of this book, Chap. 7 analyzes and examines what is most likely a more applicable and practical tool for professionals looking to automation parts or entire segments; robotic process automation. This may sound like an abstract or technical idea, but from a real world point of view it is probably more realistic for organizations and individuals to begin an automation journey from this point versus attempting a full blown artificial intelligence implementation. Often discussed alongside topics that include, but are not limited to, artificial intelligence, RPA is not similar or exactly the same as AI. From a practical and implementation perspective, this subset of automation technology might seem to be a more logical step and technology to begin adoption and implementation with as automation becomes increasingly integrated into the business decision making process. Robotic process automation may bring to mind images and feelings of automation, job losses, and other potentially anxiety inducing concepts, but that is only part of the story. Standing apart from a bull blown AI implementation project or attempt, RPA software tools and platforms are both more mature as well as having the ability to be onboard alongside existing technology platforms and systems.

Reflection Questions – Chapter 7

1. How does robotic process automation differ from artificial intelligence and other automation programs, and is this a good thing or not?
2. Will the combination or RPA and AI lead to job disruption and losses, or be utilized to promote greater job flexibility and responsibility?
3. Where does it appear that RPA and automation tools like it will impact first in the financial services space?

Supplemental Readings

IRPAAI – What is Robotic Process Automation – https://irpaai.com/what-is-robotic-process-automation/

CIO.com – What is RPA? – https://www.cio.com/article/3236451/what-is-rpa-robotic-process-automation-explained.html

McKinsey Digital – The Next Acronym You Need to Know is RPA – https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/the-next-acronym-you-need-to-know-about-rpa

Forbes – Why You Should Think Twice About Robotic Process Automation – https://www.forbes.com/sites/jasonbloomberg/2018/11/06/why-you-should-think-twice-about-robotic-process-automation/#769226be5fe1

References

Alarcon, J. L. J., Fine, T., & Ng, C. (2019). Accounting AI and machine learning: Applications and challenges. *Pennsylvania CPA Journal*, 1–5.

Brazina, P. R., & Ugras, Y. J. (2018). Accounting automation: A threat to CPAs or an opportunity? *Pennsylvania CPA Journal*, 3–7.

Casale, F. (2014). How digital labor is transforming IT. *CIO Insight, 2*.

Corson, M. (2016). The future of finance. *Financial Executive, 32*, 6–11.

Gex, C., & Minor, M. (2019). Make your robotic process automation (RPA) implementation successful. *Armed Forces Comptroller, 64*(1), 18–22.

Jones, K. (2017). May the bots be with you: RPA for HR. *Workforce Solutions Review, 8*(3), 39–40.

Preimesberger, C. (2018). Predictions 2019: Why RPA stands to see even more growth. *EWeek*, N.PAG.

Samuels, M. (2019). How to create a strategy fit for the digital age. *Computer weekly*, 22–26.

Seasongood, S. (2016). Not just for the assembly line: A case for robotics in accounting and finance. *Financial Executive, 32*, 31–39.

Part II

Applications & Implications of Emerging Technology on Financial Services

The View From the Top

8

This book is a wide ranging analysis and conversation around both the emerging technologies and the implications that these emerging technologies will have on different aspects of the finance and accounting. Such an analysis and examination, however, would be incomplete without at least mentioning how these changes are being viewed from a bigger picture and macroeconomic level. Data and other quantitative information are, as has been discussed both in this text as well as numerous others, may very well represent the next competitive advantage for organizations both now and going forward. Stepping outside of the financial services arena for a brief minute this trend is arguably more evident in search, social media, and the entertainment spaces. Technology giants such as Google, Facebook, Alibaba, Amazon, and Netflix have access – and use – the vast quantities of information available to them to generate new insights, improve business models, and increase margins. These advances and business improvements, however, have not come without costs and increased regulatory scrutiny. One need merely to look at the hearings that Twitter, Facebook, Google, and Apple have had to contend with during 2017 and beyond to see that as corporate power increases governments across the globe will become increasingly interested.

That said, there are still multiple pain points that can, and often are, identified as points of friction and increased cost. Figure 8.1 presents what, from a consumer perspective is a simple transaction (the usage of a credit card), with each break in the diagram representing a point of cost, time delays and organizational friction. Such commonplace instances of cost and friction also seem to be encouraging the broader adoption of blockchain and other emerging technology tools.

Such trends and forces are not, as some may like to believe, all that different from what is already occurring in the financial services space as emerging technology play an increasingly important role. Drilling down specifically, and returning the conversation to the financial services space, the regulatory pressure facing organizations is already high and set to increase. Taking publicly available statements and memos, it does seem that financial organizations are going to come under increased regulatory scrutiny – at least in the United States – as Democrats

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_8

Fig. 8.1 Example of pain points in B2B or B2C transactions

consolidate power and assume various positions of leadership in the U.S. Congress. Not entirely unfounded as a result of both memories of the Great Recession and the increases in consolidation that have followed, blockchain and other emerging technologies may actually increase the pace of consolidation and market concentration. This might seem like a contraction to the underlying ethos of blockchain, which supporters contend will eventually disrupt the financial system entirely, but upon future examination it does indeed make sense. Information itself, including but not limited to the quantitative data that drives, and will continue to drive, the success or failure of different firms, requires scale and professional competency.

Much like regulation, which invariably tends to favor larger organizations with the ability to finance and contend with these new rules and guidelines, information and data do tend to concentrate at the larger organizations. Potentially amplifying the trends and forces already underway at different areas of the marketplace, these very technologies meant to disrupt established players may actually lead to increased concentration over time. Not as far fetched as some may assume, the shift toward centralized exchanges are already increasing in importance in the marketplace.

Blockchain and AI Applications for Accounting and Financial Services

The Rise of Lex Cryptographica

The overarching theme of section 2 of this book is not so much the fundamental technological details of any particular service or tool, but is rather connected to offering appropriate services in technologically dominated environment. In order to do so, however, practitioners need to understand one of the driving forces and trends that continues to shape the blockchain and cryptocurrency landscape. Perhaps the most significant iteration and representation of this overarching change and trend in how business is conducted is the development and refinement of what is commonly known as lex cryptographica or the creation of a new legal and business system centered around cryptography and decentralized operations versus the current centralized and traditional model.

While seemingly not something that financial services professionals should be concerned with – after all there is not usually Latin in the day to day operations of a financial professionals – this is an important trend that is critical to understand. Taking a step back, and returning to the conversation connected to financial services, there are several considerations that must be taken into account as this trend continues to emerge unabated.

Blockchain may actually increase the risk associated with the financial system. Many of the proponents and advocates for increased blockchain adoption and integration emphasize the benefits, including reduced risk associated with financial transactions and data storage. The combination of a virtually immutable record with unhackable (until this point) encryption means that data will in fact be more secure than under previous systems. Even with these benefits, however, the centralized system and model that currently underpins the financial system does generate numerous efficiencies and protections, especially for consumers. Thinking back to the origin of the current financial system and construct, the centralization trend that dominates the marketplace means that consumers are protected, insurance and other risk reducing strategies are possible, and that risk can be shared between counterparties. A distributed and decentralized financial system, lacking a centralized clearinghouse, could expose counterparties and institutions to risk that is currently offset and contained by regulations and frameworks. Certainly, a distributed and decentralized model can, and already is, allowing more and more participants access to capital markets and information, but there is also a risk from an institutional perspective that must be assessed as well.

Corporate governance, as discussed throughout this text in both Parts 1 and 2, is an important fiduciary role that financial professionals must play and fulfill in the marketplace. Specifically, and in accordance with the responsibility professionals have to protect investors, financial and accounting professionals have a duty to examine, contest, and hold the data reported by management to a certain level of scrutiny. Although the blockchain concept, at the core of the idea, emphasizes transparency and encryption; this paradox exposes a flaw in the model that could eventually undermine the validity of corporate governance initiatives.

Benefits

Now, there are clearly benefits and opportunities that can be attributed and associated to the rise of such a business model and landscape focusing on the lex cryptographica model of operating and conducting business. Cryptography, by its very nature, creates opportunities for professionals who understand not only how the cryptography functions on an operational level, but also how the impact of cryptography drives other business process improvements. For example, if consumers and organizations are more confident in the security and protection over financial information, it becomes simpler to engage in cross border and cross industry transactions. Taking a look at actual examples, imagine an entrepreneur or small business owner looking to access capital markets, but being unable to do so; something financial planners and CPAs must advise clients on continuously. Even with crowdfunding platforms such as Kickstarter becoming increasingly prevalent and widespread, these services continue to rely on a centralized clearinghouse and approval process.

A blockchain based platform, however, which we will discuss in more detail later in this text, can enable greater and more widespread entrepreneurship by allowing a more peer to peer based model of capital attraction and raising. In terms of financial analysis and accounting, however, there are also opportunities for professionals motivated to offer additional advisory and assurance services. For example, if

capital is being raised on blockchain based network – and whether or not it is raised via cryptocurrencies or fiat capital – remaining in compliance with existing regulations is something that must be addressed. One of the core components and benefits of a blockchain based model is the anonymity of pseudo anonymity provided to network members. The rise of privacy coins such as Zcash and Monero are seeking to improvement and augment the existing privacy rules and guidelines surrounding traditional cryptocurrencies such as bitcoin. Being able to track both different pieces of ownership and custody via advanced computer forensics and other software tools undermines one of the core components and benefits most commonly associated with blockchain technology.

Financial professionals comfortable with discussing the various aspects of blockchain and cryptocurrencies can seize on these options and opportunities. Remaining in compliance and well informed about the emerging regulatory issues driving both the financial and broader business landscape moving forward can allow firms and organizations to expand current offerings as well as developing new options as well. That said, and acknowledging the reality that increasing amounts of cryptography inserted into business operations will create benefits and options for motivated professionals it is also reasonable to acknowledge that such a distributed and decentralized model also crates challenges at the very core of the financial services profession.

Challenges of Lex Cryptographica

Lex cryptographica, while not representing an entirely new technology or model of operating – after all cryptography has been around for hundreds of years – does pose a unique set of challenges for practitioners. The primary driver of this challenge returns to exactly what some of the benefits of blockchain and cryptocurrency are in the context of business processes and operations. Anonymity is an often cited benefit and positive attributed associated of blockchain, but not every business situation calls for or is appropriate for anonymous communication. Counterparty risk, the same type of risk that threatened to undermine the global financial system during the Great Recession, can actually be amplified in a situation or landscape with increased anonymity. The entirety of trade finance and the flowing of funds between different institutions and organizations relies on a sophisticated system and infrastructure of insurance, identity verification, and risk reducing tools that could possibly be undermined due to the identities of certain individuals or associated organizations being obscured. This is not new news or information; these attributes and potential risks associated with blockchain have been relatively well documented since the introduction of cryptocurrency and blockchain to the mainstream business conversation.

Focusing back to the financial services profession, however, there are several different implications that have an effect directly on various aspects of the financial services profession and landscape. First, from an accounting perspective there are multiple situations in which increased anonymity or encryption connected to different types of data and information, and a few of these are linked directly to audit and attestation services. For example, how would an auditor and audit team be able to accurately assess the value and ownership of various assets that are stored or governed by a blockchain based model of storage and transmission. Verifying valuation

and different types of information and data, especially those connected to assets owned or controlled by an entity, form an important point of any audit or attestation engagement. If, however, custody, transference, and value of assets are obscured or hidden via different layers of cryptography this adds extra layers of complexity to the conversation.

Confirming balances and confirmations are also an important role of how auditors and accountants perform specific duties and responsibilities connected to the reporting and communication of information. Whether or not the business does business on a purely domestic basis or engages in international trade and commerce, businesses must be able to confirm that balances – from an investment, payable, and receivable side – are accurately accounted for and reported. While the transparency affiliated with information and data stored on a blockchain model certainly helps with the communication of data, but that same transparency can actually pose issues and concerns for the auditing and attesting to information and data, both linked to operational and financial information.

While organizations are used to, obviously, allowing accounting professionals and auditors to have access to virtually every type of information produced and stored and entity, storing this same information on a consortium or network blockchain based model is not something organizations are accustomed to doing. Obviously the encryption and security associated with blockchains can help alleviate some of these concerns, but that is only a partial solution. As has been mentioned throughout this text, no encryption is perfect, and hear is where an additional items or piece of information may be helpful. Setting up a private blockchain and consortium model. Consortium based or private blockchain models offer additional benefits from an enterprise perspective via the ability to customize which stakeholders and parties of the network have access to which pieces of information.

Additional Considerations

In addition to the states benefits and challenges that are can be associated with the rise of a new legalistic system and way of doing business, there are also several implications that such a new model of conducting business and confirming information. Entire books and presentations have been dedicated to addressing the changing and evolving needs of practitioners, but for the sake of brevity let's focus on two that seem to be among the most important or wide ranging in nature. Especially if practitioners are seeking to engage in new services, businesses, or other sorts of business activities, it is important for these some professionals to understand just what will be necessary in order to do so moving forward. Let's take a look at two definitive shifts already underway in the marketplace.

First, teams of practitioners and professionals will need to become more diverse, both in terms of personnel and the skill sets that are brought to the conversation. These skills are going to include a variety of different factors, including but not limited to legal, technical, communicative, and analytical problem solving competencies. While this might not seem like news or a piece of information that is new to anyone who is actually working in the profession, the implications are just beginning to be understood. At the core of this shift is the underlying market reality that,

even at the Top 100 accounting firms, CPAs only account for approximately 20% of staff that deal with client issues, down from approximately 33% of staff just a decade ago. If even the largest CPA firms, with long held (and deserved) expertise for financial reporting, tax, and attestation engagements are only employing a relatively small percentage of employees that are CPAs this demonstrates serious implications for the rest of the financial services landscape.

Second, but connected to this shift occurring under the surface at the largest accounting organizations, is the fact that a similar shift is already underway in trading, investment, and capital market firms. Some of the most high profile hedge funds and investment pools in the world, including those based in the United States and internationally, are increasingly driven and managed by quantitative analysts and traders versus traditional financial analysts. The CFA designation is, and still remains, a robust and very much respected credential in the marketplace, but is not necessary anymore to launch a trading organization. The real question is, and will continue to be, that even if venerable designations such as the CPA and CFA designations are ceding ground to technology and quantitative professionals, what does this mean for professionals working without said credentials and experience. Not meant to inspire anxiety, but simply meant as a reality check for practitioners or firms that are not appreciating the disruptive nature of these emerging technologies; they are already in the marketplace and are driving change across different organizations. Such change, however disruptive it may be, also creates opportunities for organizations and firms willing to drill down, engage in new market areas, and be proactive members of the financial technology community.

Chapter 8 Summary

After working through some of the technical terminology and concepts that are driving change within the broader financial services profession it's a good idea to take a step back and to frame the conversation before drilling down into specific business implications. The view from the top should be thought of as an opportunity to research, view, and frame out the specific business implications of emerging technologies on financial services. While not always specifically applicable to every financial services role or professional, being able to see and understand how emerging technologies fit into the business landscape at large is an integral part of how finance can play a more strategic role in the business decision making process. Offering strategic advice and guidance to clients across any number of sector lines means that professionals must understand from a technical and operational perspective. This is what is addressed in this next section of the book; applications and implications of emerging technology tools. Part II of this book attempts to break down, and provide actionable business intelligence, related to how emerging can – and already is – being used across different industry lines. This section of the book should be thought of as a tool and framework to help professionals see how these technologies are being used, understand what future applications can be developed, and learn from leading firms in the space.

Reflection Questions – Chapter 8

1) What has your experience been regarding automation and emerging technology from a business process and business process management perspective?
2) In term of implementation, what are some of the largest obstacles that you have faced to date?
3) Where would like to see the professional landscape go and evolve into over the coming years as a result of technological integration?

Supplemental Readings

Forbes – Accounting Trends of Tomorrow: What You Need to Know – https://www.forbes.com/sites/forbestechcouncil/2018/09/13/accounting-trends-of-tomorrow-what-you-need-to-know/#61e85df3283b

Accounting Today – The Year Ahead for Accounting – https://www.accountingtoday.com/list/the-year-ahead-for-accounting-2019-in-numbers

Accounting Today – The Next 12 Months – https://www.accountingtoday.com/news/the-next-12-months-in-accounting

A New Niche for Practitioners

9

As decentralized and distributed services and products continue to enter the marketplace, and the disruption that these tools bring are felt throughout the market and by different actors it will also be important for practitioners and organization to obtain the appropriate mindset. There is a phrase used in the accounting profession, but is one that can apply to different subsets and areas of the financial services profession as well; riches are in the niches (McCausland 2000). Generalized services, lower level tasks, and virtually every aspect of workplace activity that can be automated will be automated and this will invariably cause margin compression, fee restructuring, and the importance of generating differentiated services. This is already underway, and the tried and true solutions of investing in more automation while also reducing employee headcount will simply not be sufficient to compete effectively going forward. Organizations are large and sophisticated as BlackRock, Deloitte, and numerous other firms in other industries are currently dealing with these forces with a combination of investment, hiring of different employees, reduction of current headcount, and launching of digital solutions. That is well and good, as well as being absolutely necessary, but a different tactic will be required going forward.

Returning to the basics and avoiding spending too much time in the theoretical conversation, a prime example of how this transition is underway and eminently possible is the transition that has occurred as Morgan Stanley. Following the financial crisis there was a period of consolidation and low returns among the vast majority of financial institutions, including once high flying investment banks. Taking into account the changing market conditions and increased regulations coming to the business landscape itself, Morgan Stanley made a strong pivot and shift into the wealth management business. Riding the rising asset prices that began to catch investor attention following the 2009 lows, this approach and business line has benefitted the organization in terms of profits, market share growth, and the ability to attract new talent to the firm. Now, it is true that building out such a line of business does also increase the overall exposure of MS to market prices and volatility, which did rear its ugly head in first quarter of 2019, but that is a business risk. The point of

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_9

this discussion is not to praise or criticize the specific shift or approach taken by MS, but to illustrate the fact that substantial transitions are indeed possible.

Reflecting this shift and transition to a more technology oriented and based business model, banks – including commercial and investment banks – are also increasingly investing in technology tools, solutions, and applications. Whether it takes the form a more sophisticated mobile apps, better websites and options for customers, or a digitally based banking platform such as Marcum the trend is clear. If such venerable and well establishing institutions such as Goldman Sachs are developing and launching online products and services to appeal to new and different areas of the marketplace that should indicated just how important these transitions and shits can be for the marketplace. These examples are high profile for sure, but illustrate the impact that increased in automation and decentralization are already driving in the marketplace between different actors. Regardless of what is the specific focus of the organization or the product or service that is customized, the changing transitions is clear. Being a general practitioner is a career path and arc that has diminished in viability across medical, engineering, and other consulting fields; why should financial services do any different? Acknowledging that the financial services fields are not unique in terms of what is happening in the professional landscape also means that there are opportunities to learn from the experience of others.

Drilling down into different niche offerings that are already being developed and built up by firms using emerging technology tools it is entirely possible to see what directions may drive change and innovation going forward. For example, the accounting firm Withum Smith and Brown recently launched an entire digital advisory services arm focused exclusively on blockchain, cryptoassets, and offering assurance work connected to these tools. Even more exciting, however, are the possibilities and opportunities that arise when these various technology tools are able to be stacked and combined (Greenstein and Hunton 2003). Looking for an example, the following scenario is entirely possible and not as far removed from reality as may initially be thought. In a consortium or other type of private blockchain based environment an accounting firm, an audit engagement can be- for the most part – almost entirely automated and streamlined. Leveraging the tamper resistant structure of the blockchain itself means that a large percentage of confirmations and valuations no longer need to be handled manually or be staff members. In addition to the reduced manual work and tasks that are necessary by engagement team members this also means that likelihood of errors, double counts, and other inefficient uses of time can be reduced. The lower likelihood of errors and omissions associated with the work products themselves also allows the organization to leverage automation tools to assist with the audit process itself. Increasing the options and opportunities for increased review by artificial intelligence tools and automation based platforms means that more comprehensive audit results and reports are possible.

Since the results and reports can be issued and developed this also means that different service lines and opportunities can be constructed around the opportunities enabled via increased technology integration. Other service lines can be built around the continuous attestation and reporting of information, including the ability of accountants and auditors to monitor in real time and produce forward looking

dashboards and information. On top of being able to develop these service lines for clients this also means that the forward looking data and reports can be delivered at higher margins than historical looking data and information. Such a scenario represents the most clear cut example of how different aspects of emerging technology can drive significant business changes across different industry lines.

Providing Services in a Decentralized Business Landscape

One of the core aspects of the financial services profession is that there has always virtually been an information asymmetry with regards to financial data, and this will only be amplified in a marketplace continuously infused with financial technology and applications (Ball 2017). Certified professionals, by the nature of their education and training, have long been a part of a so-called grand bargain that has existed in the marketplace. This so-called grand bargain, in terms of actual business applications and use cases, is defined by a few core characteristics. First, there are a limited number of individuals that can be employed within the professional classes that include attorneys, engineers, doctors, and financial professionals. This is due to not only the formal education in the form of college degrees, but also the continuing education and retraining that is often as part of the licensure process. Second, the limited number of individuals that can be a part of the professional class create a situation where being employed in one of these sectors – like financial services – can be quite lucrative. Margins have traditionally been healthy in the financial services sector, and regardless of individual opinions on the appropriateness of said margins, the fact remains that they exist.

Entire organizations and legions of consultants have grown up around the core two pillars of providing financial services information to the marketplace. These pillars and core drivers of the profession include both the analysis of complicated financial information, and the reporting/communication of this information to both internal or external end user group, including the most recent integration of privacy into the data management and distribution conversation (Stecking and Schebesch 2015). Both of these core components of financial services are linked to the grand bargain between the market and professional employees. Linking back to the grand bargain indicated and introduced above, the analysis and interpretation of financial information may seem like a mystery to end users, and this is due directly to the lack of information symmetry in the marketplace. Information, after all, is what drives the business decision making process across different industry segments, including the financial services. That said, in order for decisions to made effectively, both parties – be they individuals or institutions – must have equal access to the data used to make the decisions that are impacting that organization. This may seem like a relatively straight forward statement of fact; after all in virtually every other situation everyone who is involved in the decision making process would want to have access to the underlying information.

Financial services, however, have been based around a centralized model of information communication and analysis since the financial services landscape was

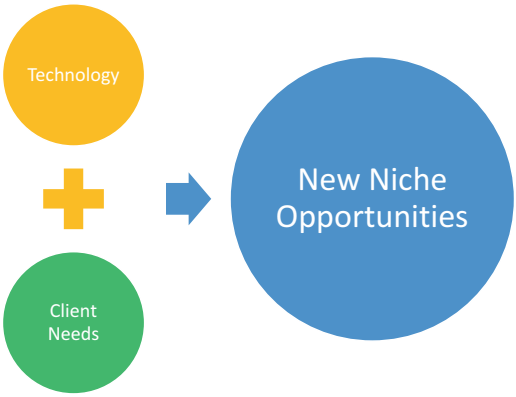

Fig. 9.1 Driving forces behind new services

developed and introduced overall. In a decentralized model of doing business, transmitting information, and delivering value to the marketplace, the traditional role of financial services professionals is being disrupted. Put simply, the entire model of how individuals and institutions .operate in the financial services space is based around the fact that the information and analysis provided to the market originates from a centralized source. Translating this into business reality, however, provides the relatively simple concept for communication; the people served by financial services professionals enter into the conversation a fundamental disadvantage. The changing nature of both client information, client needs and expectations, and the technology available to both firms and clients is beginning to create opportunities as well as challenges (Fig. 9.1).

Key Points to Emphasize

A common refrain and complaint among some individuals and institutions is that while blockchain has a substantial amount of upside and potential, that – in essence – it is merely another technology tool in a long line of technology tools and improvement projects. Obviously increasing efficiency and the speed with which data is processed, analyzed, and communicated to end users is a good thing, but that in and of itself is nothing new. Blockchain, especially private or consortium blockchains that are built, maintained, and utilized by a number of different organizations can generate a very distinctive business benefit. Traditional process improvement projects, initiatives, and efforts that are normally underway at organizations are focused on improving performance within the organization. Blockchain, in contrast, creates and delivers efficiency benefits between different organizations, or generates benefits within the broader ecosystem.

This reality also helps to explain why many of the most well known blockchain examples and applications have tended to arise in the supply chain and logistics space. Different organizations may utilize different specific processes and projects

within the firm itself, rather obviously, but a common point that can be agreed upon is that many of the pain points in the business process occur when data must be transferred between organizations. This includes, but is not limited to, the development of new practice niches centered around emerging technology and technology areas (Kahan 2001). Establishing a common platform to share and distribute information between network members is already underway via EDI and other data management platforms, but the core components of blockchain differentiates this tool from existing systems. The immutability of records once they have been approved, the consensus based protocols that are required to upload information to begin with, and the security that lies at the core of blockchain technology itself can help address some of the core issues that often accompany the sharing of information between organizations. In essence, different blockchain platforms and options can help elevate and deliver some of the improvements that, to date, have been limited to internal improvements within organizations.

Artificial intelligence, as has been outlined throughout this book, is a slightly inaccurate name for a tool or suite of technology tools that can deliver benefits to the different users. Drilling down specifically, some of the most practical benefits and upsides of artificial intelligence can and should be in alignment with other technology tools as they enter the marketplace. No technology tool or platform, regardless of how powerful it may be on an individual basis, can fundamentally change a business; different technologies must be integrated into current business processes. This is equally as true for artificial intelligence tools and options as it is for other technology projects and initiatives; the true power of AI and tools like AI are when they are meshed and can augment existing processes. An additional key point to emphasize, remind customers and clients about is that there is not one general category of artificial intelligence, but rather multiple categories and different classes that may be more or less helpful depending on the organization in question.

A final point to consistently mention and bring up when developing new lines of advisory services or building new client relationships in general is that, for every new iteration or version of an emerging software tool there will inevitably be bumps in the road. Regulatory uncertainty, most likely swinging between a hands off approach and very engaged regulation, lack of clarify from a reporting and compliance point of view, and a lack of investor or end user education and training all represent potential stumbling blocks toward broader based adoption. That said, and acknowledging the difficulty in addressing these issues across a range of clients, these do also represent an opportunity for practitioners Lombardo 2005). Being seen as, or associated with, emerging technologies that are driving value to both internal and external users is very rarely a negative connotation to have obtained. What these tools do accomplish, however, is to fundamentally change just how different professional services groups are perceived and evaluated from the perspective of clients and customers. In other words, the way in which data has been processed and analyzed previously is changing, and the actions of professionals whose job is to analyze this information must also change.

Breaking the Grand Bargain

Numerous other industries and industry groups have already been radically impacted by the increased integration of technology throughout the business decision making process. Media at large, publishing, education, automobile manufacturing, manufacturing in general, medicine, and construction represent just a few of the areas and industry groups that have experienced seismic shifts in how business is conducted. At this point, and reflecting the reality that no industry is truly that different from other businesses, it seems only natural that the financial services landscape will also evolve and change alongside organizations. Especially as technologies like blockchain and artificial intelligence continue to become both more accessible to end users, and capable of handling larger amounts of information, it is certainly going to be a challenge for professionals seeking to develop and evolve in the fact of this proverbial technology tidal wave.

Decentralizing access to information and data is a key and core shift in how financial services will be conducted and interact with the broader marketplace. Centralization of information, regardless of whether it takes the form of a bank, accounting organization, or some other trusted third party, also creates a situation in which the broader marketplace is dependent on financial services professionals to interpret, analyze, and report information. Decentralizing the storage, transmission, and analysis of data – shifting the availability of information from the hands of a few professionals to the broader market – represents a definitive shift in how financial data is analyzed and provided. Put simply, for financial services professionals that wish to not only survive, but thrive, in the marketplace of the future, these individuals must become more comfortable dealing with a democratized information environment. Automation, digitization, and the increased streamlined nature of how information is processed and reported creates numerous opportunities. That said, it is also important to not lose sight of the reality that, as technology becomes increasingly integrated, that controls and other safeguards cannot simply be delegated to technology tools.

Data and quantitative information are no longer simply the purview of a subset of trained and educated professionals, but rather be accurately thought of as the lifeblood that drives the business decision making process forward. As information continues to become more important and critical to how business decisions are actually made in the marketplace, the relevance and applicability of data to different decisions will only continue to increase. While financial information may seem the most relevant place to begin the increased analysis and reporting of different data sources, the rise of increased quantification of information has an impact on every aspect of the organization. From improved operational metrics, to more comprehensive reporting in general, and to a more continuous framework for distributing this information to end users, the vast increase in available information, as well as the ability of organizations to effectively leverage this data represents both a challenge and an opportunity.

It is difficult to overstate just how important the shift and transition away from a traditional operating and business model to one augmented and improved by

technology. Instead of relying exclusively on external experts, be they accounting professionals or financial advisors, for advice and insights, the reality is that customers and clients are going to be able to go to a variety of sources for advice and information. The shifts and changes that are discussed in this text, be it the transition from compliance based work to forward looking guidance, a shift to niche focused work, and more continuous focused work are all driven by a handful of factors, including the reality that customers and clients need not rely on financial advisors for advice. The spread of technology, both in terms of technology resources and the automation that enables much of the financial services work to be streamlined and automated means that professionals will need to acknowledge the changing power dynamic in the marketplace.

While this might be an unusual position for some in the financial services space to recognize and deal with, it is an important reality that professionals need to be aware of moving forward. In order to actually be an effective strategic partner, it is reasonable to conclude that clients and customers will need to be treated as partners. If not entirely as equals in terms of subject matter expertise, at least equal in terms of what needs and expectations mean for the relationship and dialogue. Although the grand bargain may have been broken between different professionals clients, it can be replaced or augmented via the integration of technology throughout the business processes itself.

The Privacy Conversation

It is difficult to have any conversation about emerging technology, or technology at large, without also having a conversation and analysis related to the privacy implications of this technology. As mentioned briefly previously, the roll out of GDPR is perhaps the most high profile examples of regulatory pushback and oversight in the privacy arena, but there have been many more instances of regulators, lawmakers, and other corporations taking an increased interest as it is concerned to privacy and protecting the information of both companies and individuals. Tools and technologies such as artificial intelligence, robotic process automation accelerate the pace at which data can be analyzed, created, and communicated, but may also expose organizations to greater levels of risk with regards to data integrity and security.

An analysis of the privacy implications may also be conducted as a part of the analysis connected to the necessary internal controls around new and emerging technologies such as blockchain and artificial intelligence, but is also worthy of an independent review as well. Client information, be it personal information or financial information, is certainly worth taking a few minutes to safeguard and protect. That in and of itself is not a new topic or focus of conversation, but simply an acknowledgement of just how important and valuable this information is, and the damage that can be inflicted if said data falls in unethical hands. One specific piece of advisory services or insight that may have gone overlooked in prior conversations, however, is the level of interconnectedness between different markets actors and pools of client data (Martin et al. 2017). For example, even if the data security

at accounting firm or brokerage house is secure, maintained up to industry standards, and utilized to its full potential, that does not mean that every other counterparty embraces the same sort of mindset with regards to data and informational security. Investment clients of different financial advisors will certainly have to hand over certain levels and types of information to said advisors, but almost invariably have also delivered some other sensitive and confidential data to banking institutions and/or accounting professionals. Being aware of who – besides the primary firm in question – has access to or is storing potentially sensitive and private information is an important question to ask as part of any advisory conversation.

Building on this, however, is arguably even more important, as with the implementation of blockchain and artificial intelligence throughout the business landscape it becomes simpler to monitor information in near real time. As the internet of things, which may sound abstract but may be as simple as linking together information and access between phones, tablets, and laptops, becomes less the exception and more the rule, the importance of network and institutional security will only increase. While it does not appear reasonable to expect that financial services professionals will need to become experts in all cybersecurity issues, this advisory service opportunity will require a certain level of investment and education on the part of practitioners. In addition to educating practitioners on the dangers and pitfalls that accompany an increasingly digitized environment, however, this transition and evolution also points to certain key topic areas that should be a part of any investment or advisory engagement.

Making the shift from traditional work and responsibilities to a role more akin to likely advisory focused on based information and knowledge will not always be simple or as easy as might be desired. While it is true that many of these new opportunities are indeed focused on improving current product and service offerings it is also important for practitioners to take into account the new opportunities and options that can – and already are – being improved and implemented for business purposes. Ultimately the direction and trends of how blockchain and other emerging technologies are going to evolve will change and be influenced by forces related both to the technology itself and how the applications built on top of these tools ultimately function. One of the most important aspects of technology in the age of connected technology and distributed communications is the reality that – despite safeguards and processes put in place – there is always a risk of data being lost or corrupted as a result of malicious actions undertaken by different market groups. In addition to the risks that appear and are a part of the normal operation of any organizations, the combination of emerging technology and virtually unlimited storage can create a situation that can render damage to the operations and reputation of the firm.

First, are there back up copies of sensitive or critical information, and if those backups do indeed exist, have often are they refreshed and updated? All too often this aspect of cybersecurity is treated as a onetime or periodic event, with no need to revisit and/or update the actual backup copies on a consistent basis. Implementing blockchain based solutions, even if only on the backend of operations and data processing, can help to partially automate the need to manually remember to backup information. This is due to the permanent nature, including the date and time stamp

factors, of the various blocks of data that are uploaded on the blockchain itself. If a client would, even with blockchain solutions in place, like to store a redundant copy of said information, configuring a program to automatically back up and distribute an updated copy of records and transactions that is an effective use of combining these emerging technologies.

Ownership Verification and Tracing

An offshoot of the dialogue surrounding the implications of privacy is an issue that must be discussed within different circles of the financial services profession; that of identity verification and reporting. Whether it is done simply to remain in compliance with regulations such as KYC or AML, or integrated into a comprehensive audit or attestation engagement the importance of verifying and confirming the identity of asset holders is critical. Especially as it connects to both blockchain and the cryptocurrencies operating on the underlying asset platforms themselves, remaining in compliance with these regulations is important for both practitioners and client organizations. It may seem contradictory to once again reference and return to the concept of compliance based reporting and analysis in a book focused on emerging technology and technology issues, but upon further review such a connection does appear both relevant and interesting for practitioners to take into account.

The reality is that, even with the investment and interest in the blockchain and cryptocurrency space, the sector at large is still immature. For example, the bitcoin blockchain – which is the oldest and most mature blockchain in the mainstream marketplace – is only 10 years old. Analogies to the early days of the internet and other technology resources are often repeated and used, but are done so with good reason. Bitcoin, cryptocurrencies, and other cryptoassets have generated hundreds of billions in combined market capitalization, but the regulatory frameworks and guidelines have yet to catch up. At the end of 2018 and continuing in 2019, however, various regulatory agencies and institutions began to not only enforce current regulations and standards that are on the book, but to also begin engaging with industry experts to consult on how to effectively draft new regulations and guidance.

Financial services practitioners are obviously not going to be in a position, in most cases, to dictate policy development or approval at different types of regulatory bodies; nor should any specific firm have an outsized influence over these processes. That said, there are several specific services that can, and already are, being developed and implemented in the market to assist with addressing these custody and data verification issues. Verifying the ownership and identification of different crypto assets as well as the transactions that include these different assets form a core role of what banks and other centralized financial intermediaries will have to perform going forward. Even as decentralized and distributed methods of storing and transmitting financial information become more common in the U.S. and the world, there will – almost without a doubt – be a place for comprehensive and robust financial institutions and players to serve as a clearinghouse. Focusing in on specific roles and duties that and should logically be filled by different financial institutions, there do appear to be several areas in which increased integration makes sense.

Transforming these thoughts and concepts into market actions and viable business offerings is the purpose of this book, so applying these ideas to financial services yields the following items. Every service is different, and clients not only expect but increasingly require financial practitioners to focus on not only current issues, but being also able to peek around the proverbial corner. Outlining some possible roles and responsibilities that fit this dual mandate, the following appear to represent current and potential future revenue and earnings opportunities.

Custodial and identification services are the issues that are raised quite often with regards to not only blockchain and various cryptoassets, but also opportunities for financial professionals to fill a need in the marketplace. Cryptocurrencies may inevitably become a functioning currency alterative to fiat currencies such as the USD or the Euro, but in order to bridge the gap between where said cryptocurrencies currently are, and where they could end up, is the regulatory framework that currencies must exist within. Financial practitioners will be able to address these needs, and the current market gap in this area by advising clients and customers as to what needs arise from clients seeking to ensure compliance with said regulation. Specifically, the development of custodial services linked to blockchain based assets is a business model that – in addition to already being underway – holds the potential for further investment and development.

Providing custodial services in the blockchain space is not as radical or as departed from current custodial banking services as they might initially appear. For example, in order to have a bank account or set up an investment account with a third party intermediary the customer must provide several pieces of personal information. Names, addresses, and social security numbers are common point of data that need to be verified and stored by financial institutions; these pieces of information will still most likely be necessary going forward. While the information needed to remain in compliance with different regulations may not change, the method by which these pieces of information are stored and transmitted will change. Customers and investors still often do have to provide such information, including social security numbers, in order to successfully open investment accounts for various cryptoassets. An option and vector for storing these types of information should be to store these types of information on a blockchain itself. If cryptocurrencies are stored, traded, and optimized by blockchain platforms, it does seem to make sense that the personally identifiable information associated with customers should also be stored in an equally secure environment.

In addition to custodial services, an additional role that financial services professionals should also be to assist both individual and institutional clients as they seek to contend with a changing and shifting regulatory landscape. This may seem like a run of the mill statement, but in a nascent and emerging market such as cryptocurrency and cryptocurrency regulation, remaining up to speed on the array of regulations and rules is not as straight as it may appear. Coordinating with legal experts, including those focused on international taxation issues, will be necessary, but should not viewed as a negative development. Rathe, this change should be viewed as an opportunity for practitioners to leverage technology to provide additional and more extensive advisory services.

Chapter 9 Summary

There is a phrase that has begun to gain significant popularity in the accounting and financial services space is that "riches are in the niches," and that is what this chapter focuses on. Put another way, Chap. 9 is where the book and content contained herein begins to outline specific services – reinforced by examples – of how organizations can leverage emerging technology tools to reinforce existing business lines and even develop entirely new ones. This is a shift and direction that is underway for both accounting organizations and financial services institutions, regardless of how individuals or firms feel about this shift. Developing and building out new lines of business and service offerings to cater to the needs of clients is not something that will be able to constructed in a short period of time, but rather is something that needs to become integrated within the business at large. Building on a trend already assuming a relatively dominant position in the financial services space – automation and leveraging automation for higher margin activities, this chapter connects that concept to the emerging technology that is already driving change. Regardless of the individual tool implemented at the organization, the fact is that with every new tool or way or doing business there will be challenges and opportunities at organizations seeking to implement said technology. Forward looking practitioners need to be able to take advantage of these displacements to produce and deliver value to customers. Specifically, after reading this chapter, users will be able to connect current business operations, the trend toward automation happening regardless, and emerging technology for business applications.

Reflection Questions – Chapter 9

1. Does your firm currently operate, or plan to operate a specialized niche service or business model related to emerging technology tools?
2. Is there education and educational training present in the marketplace to adequately prepare people for this new paradigm?
3. What does the shift toward increased specialization seem to indicate for generalists, either at a firm or individual practitioner level?

Supplemental Readings

Intuit – Tax Firm Niches You May Have Overlooked – https://proconnect.intuit.com/taxprocenter/practice-management/tax-firm-niches-you-may-have-overlooked/

Sage – Why Niche Markets Can Be Big Business for Accountants – https://www.sage.com/en-us/blog/niche-markets-are-big-business-for-accountants/

Forbes – Highly Profitable Practices for Accounting Firms – https://www.forbes.com/sites/russalanprince/2015/05/19/highly-profitable-practices-for-accounting-firms/#713baa1c59f1

Journal of Accountancy – CPA firms: Create A Niche Practice Serving The Gig Economy – https://www.journalofaccountancy.com/news/2017/jun/niche-cpa-firm-practice-gig-economy-201716782.html

References

Ball, J. (2017). R3 to work with Intel to boost data privacy. *Global Investor*, 76.

Greenstein, M. M., & Hunton, J. E. (2003). Extending the accounting brand to privacy services. *Journal of Information Systems, 17*(2), 87–110. https://doi.org/10.2308/jis.2003.17.2.87.

Kahan, S. (2001). Prospecting for niches. *Practical Accountant, 34*(2), 18.

Lombardo, C. (2005). Serving a niche market. *Accounting Technology, 21*(2), 16–21.

Martin, K. D., Borah, A., & Palmatier, R. W. (2017). Data privacy: Effects on customer and firm performance. *Journal of Marketing, 81*(1), 36–58. https://doi.org/10.1509/jm.15.0497.

McCausland, R. (2000). Vertical value: The lure of niche accounting. *Accounting Technology, 16*(8), 56.

Stecking, R., & Schebesch, K. B. (2015). Classification of credit scoring data with privacy constraints. *Intelligent Data Analysis, 19*, S3–S18. https://doi.org/10.3233/IDA-150767.

Leveraging Technology to Reduce Ambiguity

10

In most traditional business settings the idea of being comfortable with ambiguity is something that would be appear to be something of a contradiction. Making effective decisions, be it choices linked to investment strategy or audit efficiency, require that the decision makers involved be able to drill down and ascertain exactly which pieces of data are the most important. The simple reality, however, is that as business continues to become more fluid, digitized, and global in nature ambiguity will continue to increase. Especially since it does not look like some of the hard trends – such as changing demographics, political instability, and a rebalancing of how business is conducted on a global basis, will be changing anytime soon, it seems reasonable to expect that the profession will have to evolve in order to keep pace.

One of the biggest and most challenging aspects of a business environment that continues to produce vast quantities of data is that most of this information is appearing in an unstructured format. This is not to say that this no structure or formatting associated with this information, but that the structures and formatting that are involved do not sync with, or match, traditional sources of financial information such as Excel, .CSV files, or other sorts of standardized exported data sets. Without the integration of tools such as RPA and artificial intelligence into the decision making process, it appears reasonable to expect that professionals will need to become more used to dealing with these types of information by leveraging the efficiencies generated by using AI. This is not merely an academic conversation, however, as the tools to make effective use of that information are already in existence in the marketplace, taking the form of software companies such with billions in revenues.

As this ambiguity is reduced, or ultimately even eliminated by the increased data and information available for examination, this also leads to another important conversation that must be had. Specifically, as AI tools, bot, and other automation processes are implemented throughout the business landscape, the financial services landscape and practitioners employed therein will have to keep pace. Returning to the concept of an audit or other attestation engagement, there do appear to be several implications and opportunities that should be discussed as a result of how AI and automation will change how the audit process functions.

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_10

1. Comprehensive audits. As ever increasing amounts of information are available within the organization, and are able to be analyzed in near real time, the most direct implications is going to be that more and more data will be subjected to assurance or audit work processes.
2. Real time attestation. One of the biggest pain points, and frankly failures of the current audit process, is the multiple months that pass between the end of the period being audited and the publication of the audit results. Even with interim work, and ongoing conversations during the rest of the year, with the bulk of audit testing and examination occur only on an annual basis, there is a definitive gap between when events occur and when they are examined (Mahbod and Hinton 2019).
3. Continuous reporting. As larger types and swaths of data are able to be audited, and as the attestation/assurance over this information becomes more relevant and continuous, the ability to report data on an ongoing basis will increase. This is, of course, an interesting intellectual transition and shift from the traditional role of financial professionals, but also connects to a broader in the value that financial professionals must add moving forward.

Expanded Scope

In the past, when financial services professionals have expanded the scope within which services have been offered, the end result has ultimately been negative. One merely just needs to observe and look at the end result of when accounting professionals engaged in creative practices at organizations such as Enron, WorldCom, Tyco, and numerous other examples. It is true that those examples are nearly 20 years in the past, but there are more recent examples of accounting missteps and questionable guidance that drove underperformance and ultimately failures at organizations such as CountryWide, and Lehman Brothers. On a financial markets side, examples abound of organizations that – either through misapplication of technology or miscommunication between different parts of the organization, have ultimately also faced missteps and errors when expanding into new areas. The London Whale, flash crashes, and various other instances of market inaccuracy or overreaction to certain pieces of news enter the marketplace illustrate the need for both more consistency and more accurate information.

The growing prominence of bitcoin and other cryptocurrencies opens the proverbial door for increase assurance, attestation, and advisory services both in the United States and internationally McNally 2019). As this new asset class continues to become more widespread, and attracts the investment dollars of various institutional investors, this will invariably create opportunities for new revenue and client facing tasks. Simultaneously, the very fact that the blockchain and broader cryptoasset class is so new and fast moving also creates loopholes and openings for unethical actors to take advantage of enthusiastic, but ill-informed investors. Mentioned throughout this text, the educational and informational between what investors and clients know about these different technologies and platforms, and what they should

be aware in terms of investment risk and reward represents a unique situation for practitioners. That said, and acknowledging the reality that new opportunities will have both upside and downside risk embedded therein, the importance of traditional fiduciary and financial advisory services will continue to increase. At a basic level, the sheer amount of funds allocated to this space – totaling the hundreds of billons of dollars – means that financial professionals should be involved.

Take, for example, the rapidly growing area of stablecoins. While still cryptocurrency and subject to the rules and guidelines regulating the cryptocurrency space at large, these specific assets represent a potential hybrid between fiat and completely decentralized currency options. Such a combination of attributes has created an environment in which this specific subset of the cryptocurrency space is of great interest for institutional investors and other actors that invest funds on behalf of others such as endowments or pension plans.

All of that said, and keeping mind that the fiduciary responsibilities of financial services professionals will not change even as technology becomes more integrated into workplace activities, it seems reasonable to analyze the potential for expanded scope and operations. While expanding operations and activities is, of course, virtually always a recommended course of action, in the current marketplace it also appears to be a requirement. Driven by increasingly active and engaged regulators, the marketplace for professionals able to deliver guidance connected to both current and future crypoasset implications will continue to increase. Even with the advent and implementation of these advanced technologies among financial and nonfinancial firms, the need for the evolution and further refinement of current services does seem to keep pace (Lewis et al. 2017).

Tether, perhaps the most well capitalized, largest, and most well known stablecoin in the market, has been besieged by doubts and worries connected to whether or not the stablecoin itself is actually collateralized by the assets claimed by management. This ongoing conversation and debate between different members of the market, on both sides of the equation, points to a unique market opportunity for financial professionals, specifically the accounting subset of the profession. Prior to examining the implications of Tether on the financial services marketplace as a whole, it seems logical to first analyze and compare the difference between an audit and attestation. Accounting professionals, once again, are not always associated with proactive or forward looking advice or guidance, but the work performed during an audit and attestation engagement certainly has a role to play as cryptocurrencies and blockchain become more and more well established.

At a high level, an audit involves a comprehensive and robust examination and testing of both the financial statements of an organization and the internal controls of an organization. In addition to the testing and review of financial information itself, auditors and other external accounting professionals will perform numerous other processes to ensue the accuracy and validity of the reported data. Including, but not limited to substantive testing, analytical procedures, information counts, confirmations, and valuation tests, these processes extrapolate the conformity of financials (in accordance with Generally Accepted Accounting Principles) from the sample that is tested. In addition to the work and testing performed on the financial

results and statements of the organization, there is also an audit and examination performed over the internal controls of the firm. While it is true that the responsibility for the development of the internal control system does indeed lie with management, external auditors are brought in to audit and provide assurances that the systems as designed and reported are being implemented as management has indicated.

An attestation engagement provides practitioners and management teams more flexibility with regards to what specific work is actually being performed during the engagement. For example, an audit should include the entirety of the financial statements and the entire system of internal controls, whereas an attestation engagement may focus on a specific piece of information or data. Different pieces of information, or even individual financial statements can be subject or included in an attestation engagement, and this includes the opportunities for audit and accounting professionals. This broader scope of possible work functions and interactions with clients will inevitably extend to the blockchain and cryptocurrency marketplace as well as traditional engagements. That said, it does seem important to revisit an example of how, even with increased accounting and financial services interest in the blockchain and cryptocurrency space, issues and obstacles can still arise.

Diving deep into the issues and obstacles that popped up at Tether during 2018 the core issue that did arise seemed to be directly connected to the core value proposition of how its product, USDT, functions in the marketplace. Returning to the pitch and value of the stablecoin in the market, the reduced volatility associated with a stablecoin versus untethered or unpegged cryptocurrencies, an underlying reality quickly becomes apparent. In order for a stablecoin to function and work as advertised, there has to be confidence that the coin itself it actually pegged or tethered appropriately. In the case of a coin or token that is pegged or tethered to the USD, as USDT is, a core part of the pitch is that the organization actually has the underlying dollars to stabilize the currency. Different types of stablecoins may be stabilized differently, but in the case of a coin pegged to the USD this means that the organization must possess adequate dollar reserves to stabilize the coin during periods of market volatility.

An issue that continued to arise and plague the organization throughout the year was the fact that while Tether indicated and continued to state that every token or coin was stabilized on a 1:1 basis by dollars, no audited financial statements had been issued. Again, while not necessarily a new service line or work opportunity this points to the importance of updating, adapting, and evolving current lines and work opportunities to meet the needs of a changing marketplace. An audit involves, as mentioned above, a robust examination and testing of both financial statements, as well as the internal controls in place at an organization. In the case of an organization such as Tether issuing a stablecoin, the importance of a functioning robust system of internal controls is difficult to overstate. In addition to the rather obvious implications from a financial fraud or other unethical activity perspective it is also necessary for both management professionals employed at these organizations and external financial services professionals to have confidence in the accuracy of the information published and disseminated by the organization.

At the core of the issue was the reality that, even though the organization indicated they had dollar reserves to match and underpin the coins and tokens issued, there was not an audit performed. Instead the organization issued statements to the marketplace as well as select banking and other financial data in an attempt to assuage market fears and doubts. Even with these steps, however, confidence in the ability of management to actually produce the financial information required by the marketplace continued to decline and drop during 2018. It was only toward the very end of 2018 that, via investigative reporting by Bloomberg, that even information was gathered to piece together an accurate view as to the financial conditions at the firm. It was worth noting that, even though this information did eventually enter the marketplace, it was not distributed by the organization, which does continue to raise concerns about the transparency and clarity that market actors can provide to the market at large.

Tether might seem like an extreme example of what can occur in the broader blockchain and cryptocurrency space, but it does point to the need for transparency and clarity with regards to what exactly is happening with regards to different iterations of blockchain and cryptoassets. Even though these technologies are exciting, revolutionary, and do appear to represent a definitive shift from the ways in which financial data, there is certainly a need for financial professionals to provide services linked to these different assets. Accounting practitioners, for example, must be able to address some of the core issues related to the lack of accounting standards and reporting frameworks in the marketplace. If cryptocurrencies are ever to achieve broader appeal and adoption throughout, accounting practitioners must be able to accurately assess and report the correct methodology to value, report, and disseminate said information.

On the financial markets side, although this might seem counterintuitive, increased regulation and regulatory scrutiny will assist the crypto market and financial practitioners at large. While numerous regulatory organizations have issued proclamations and statements as of this writing, financial markets seem to still be treating different cryptocurrencies as an emerging asset class then a viable alternative asset class. Market forces, perhaps in advance of regulatory guidance and information, seem to be taking matters in stride via developments at financial institutions. That said, the clarity and guidance that inevitably emerge as a result of increased certainty will allow financial market makers to offer more insightful guidance and different types of advice to clients. For example, and only realistically possible with increased guidance and standard setting, bitcoin and other cryptocurrencies could assume the role of alternative assets and investments currently held by commodities, gold, and other types of assets not classified as traditional equity options.

In something that may appear to be contradictory or at least unusual in nature, practitioners might even actively encourage and seek out regulation, guidance, and other types or activities not normally associated with what financial markets desire. Interestingly enough, however, the increased regulation and other apparently restrictive guidance and information may actually reduce volatility and seemingly unconnected market moves that do tend to occur in the cryptocurrency marketplace. On top of the reduced volatility linked to different cryptocurrencies, increased certainty

Fig. 10.1 Connecting better technology to increased value

and clarity tied to the marketplace itself opens the door to additional opportunities and service lines. Specifically, some of the most exciting and market moving developments connected to the blockchain space itself are not always connected to cryptocurrencies themselves, but the additional lines and options that blockchain enables. Taking into account the market realities driving the billions in investment and institutional interest already underway for blockchain development. An additional facet of reporting and different class of information enabled by broader blockchain implementation and development is the ability of firms to report broader classes of information. One area that is rapidly growing and emerging is how the rise of technology options can facilitate increased reporting across a variety of different areas. Figure 10.1 presents, at a high level, some of the possibilities and opportunity enabled by more real time and continuous reporting and technology.

Benefit Corporations, Integrated Reporting

Perhaps one of the most interesting changes and shifts in the broader business environment overall is the change in the types and amounts of information that are increasingly expected of financial professionals in an environment that continues to evolve and change (Shoaf et al. 2018). While integrated reporting has become a headline factor and a topic in the economic conversation at large, the adoption and implementation of this idea by accounting and finance firms has been slower than might have otherwise been expected. This can be attributed to a number of factors, but perhaps one of the most logical reasons as to his lack of adoption has to do with

the technology currently in use by most practitioners. Although the need for more detailed and comprehensive data on how an organization is performing is relatively well known at this point, technology tools and platforms have – for the most part – yet to catch up to market needs and expectations. Artificial intelligence, the rise of the internet of things, and blockchain technology are changing this reality on the ground, and increasingly enabling organizations and financial professionals the ability to deliver and analyze broader and more comprehensive types of data and information. Prior to taking advantage of technology to offer and deliver on the potential of these more comprehensive reporting platforms and other services, however, it is important to both revisit the concept of integrated reporting, and comment on the concept of a benefit corporation.

At the core of the idea, the concept of a benefit corporation appears to represent almost an ideal merger and representation of how sustainability is being incorporated in financial services practices and protocols in the current marketplace (Zhou et al. 2017). The specific benefit corporation rules and processes will vary from state to state, but the core of the idea can be summarized as follows. A benefit corporation, via inclusion within the corporate charter, operating agreement, or other form of corporate bylaws and policies, includes the prioritization of sustainability as well as other social and governance related activities with equal weighting as the financial goals of the organization. These goals and policies will vary from firm to firm but can be focused on the environmental impact of organizational operations on the broader community, social policies aimed at range of societal goals in alignment with organizational beliefs, and the different aspects and ranges of governance that are often raised as both potential opportunities and challenges to organizations in the marketplace. Implications that can result from the desire to implement such a managerial model can include, but are not limited to following.

First, if an organization wishes to grant equal importance to traditionally qualitative issues like governance, environmental matter, or different socially oriented agenda items, the firm must be able to accurately measure, rank, and track these different types of information. Specifically, and linking back to the core topic of this book, the organization must have both the technology tools themselves as well the personnel to leverage these tools effectively. For example, linking an automation, robotic process automation initiative, or a full blown artificial intelligence project to the increasing streams of data already produced by the organization in any case represents a method by which current data can actually be made more useful for business decision making purposes. While that in and of itself may seem rather obvious, the technology tools to enable such an undertaking have only recently become available in the marketplace. Financial professionals should, especially as traditional compliance, reporting, and analysis tasks become augment or fully automated, be looking for opportunities to expand service offerings into new lines and areas of business (Bouten and Hoozée 2015). The rise of interest in more comprehensive reporting models such as benefit corporations, as well as the need for practitioners to meet the needs of the marketplace, will invariably converge in the arena of assisting organizations in the creation and issuance of said reporting models and structures.

Second the full integration of sustainability goals and policies into the corporate decision making process will lead to a market generated need and expectation that corporations and the management professionals running these firms have the ability to not only produce and analyze larger and more varied amounts of information, but also make effective business decisions as a result of this information. The ability of the organization to make effective decisions with a larger base and pool of available information is, for lack of a more appropriate term, a requirement of organizations seeking to fully accrue the benefits of establishing a benefit corporation mindset or even simply implementing a more robust reporting and analysis framework. Financial professionals have an opportunity here as well. In essence, the core duty and responsibility of financial services professionals to most organizations has revolved around the ability of these practitioners to analyze organizational information, and to also effectively summarize said information to both the management team of the firm and external end users. Such an expectation and market need has been reduced simply because sustainability issues have become more mainstream. Rather, as the variety and quantity of data at the disposal of organizations has continued to increase, the need for high quality decision making has only increased.

The Business of Benefit Corporations and B-corps

Leveraging technology to open new business lines and opportunities is a core fiduciary responsibility of any financial services professional, and this responsibility does not appear to be changing with the growing implementation of new business entity types. Although the conversation surrounding benefit corporations may seem like an odd inclusion into a text focusing on emerging technologies, upon further review it is not as contradictory as it might initially appear Hemphill and Cullari 2014). For example, in order to obtain either the b-corp certification (from B Lab) or change the choice of entity to that of a benefit corporation, the organization must produce additional information on top of the regular financial statements already reported to the marketplace. Prior to drilling into those specific reporting requirements, however, it seems appropriate to differentiate between benefit corporations and the B-corp certification.

Benefit corporations represent an additional choice of entity that is available to management professionals when organization and managing a business. Although it is an additional choice of entity at the state level, it is important to note that the selection of this business structure and entity classification does not generate accretive tax benefits for the organization itself (Benson et al. 2018). Rather, it is choice of entity, governed by state legislation and reporting requirements, that an organization may voluntarily choice to embrace. As a requirement of this choice of entity, the organization must also agree to the publication and distribution of a benefit report, deliverable at least to the state legislature and possibly additional stakeholders depending on the market itself. This, in addition to imposing regulatory and accountability onto the organization to indeed operate in a manner consistent with the benefit corporation corporate charter, also points to the need for improved

technology solutions. Put simply, in order to generate, collect, and report the vast array of data and information required to assemble and communicate a benefit corporation report, the entity must have access to these different classes of information on a continuous basis. This opens the door to both different technology solutions including the leveraging of RPA and other automation tools to gather and analyze this information as well as attracting investment opportunities overall.

In addition to the technology tools and opportunities embedded in the leveraging of technology, this can also lead to the creation of new business opportunities as a result of this technological integration. There is increasing interest and focus among the investing public to invest in organizations and companies that operate in a sustainable manner. For organizations and management professionals seeking to generate additional and accretive value, appealing to this ever increasing market segment is a logical approach. Specifically, financial services professionals will be able, by leveraging and explaining the implications of different technology tools, appeal and address the expectations of management teams seeking more forward looking and business oriented advice from financial professionals. Simply because technology is playing an increasingly important role the management decision making process does not mean that all iterations have to be directly linked to technology functionality. Using technology and the disruption generated by increased technology integration represents a quantitative method by which financial professionals can seize upon this interest to add value in potentially unexpected areas. With all of that said, however, this book does indeed focus on technology itself, and the possibilities that better and rapidly developing technology will have on business management at large.

The Technology Behind Benefit Corporations and Integrated Reporting

A common tool or tactic being put into practice at a variety of organizations, but especially those seeking to generate and create more comprehensive reporting structures, is to harness and leverage the increased interconnectedness of the internet of things movement that has continued to play a more prominent role in how business decisions are made. For all of the benefits, of which there are many, that can be generated and created as a result of more interconnected operations and pieces of equipment, this also opens the door for potential hacks and breaches (Davis 2016). Hacks and breaches of financial information can be, of course, devastating and massively disruptive, but can almost always be addressed and covered by appropriate insurance either through private channels or government sponsored means. Operational data that is stolen, breached, or otherwise corrupted can potentially have even more disruptive and damaging consequences. For example, and especially for organizations operating either in the food safety or food delivery business, a breakdown, missing information, or attack on the backend systems in these areas can lead to commercial, financial, and human damages.

Food safety appears to be an issue of growing importance for both consumers and institutions, especially as food positioning continues to happen with a recurring

frequency at any number of organizations large and small. In addition to the financial cost associated with such incidents, the sickening of individuals simply does not sync with many food producers and distributors stated goal of becoming more organic and environmentally friendly in nature. Blockchain technology is already making inroads and having an impact on this space. Although perhaps most expected to become technical leads on the implementation and application of blockchain technology, financial professionals must be aware of how blockchain and other emerging technology can assist with other, non overly technological goals and objectives of the organization, including the development of entire new operating models of doing business (Hiller and Shackelford 2018)

Even if food safety or other food related issues are not a concern for the specific organization in question it is important to acknowledge the reality that, for lack of a better word, expectations of both shareholders and stakeholders are increasingly oriented toward a more comprehensive and holistic view of how the organization is performing versus strictly a bottom-line approach. This is not, however, just idealistic talk or the focus of a few environmental or sustainability oriented groups as is sometimes incorrectly assumed. From index funds exclusively focused on investing in environmentally conscious groups, to institutional investors that are making investments directly into environmentally focused organizations it is quickly becoming apparent that the sustainability movement is both a social cause and objective, but is also big business.

Blockchain technology, for example, can certainly add value to the conversation linked and connected to how an organization can make better use of the data already produced and put into place at the organization. A permanent and continuously updated record of transactional data as it connects to both financial and operational information can help increase the efficiency with which data is communicated and the accuracy of that information. Particularly as it connects to the sharing of data between network or consortium of organizations, such as supply chain partners, accenting firms working together, or other associations collaborating on projects together, the potential upside for this communication is dramatic. Drilling down specifically to the financial services industries, the following subsets can certainly benefit from increased transparency and collaboration of information:

1. Insurance organizations. In addition to the necessity, virtually by default, of the very nature of the insurance business, or sharing data and information between counterparties, establishing and maintaining a common platform and language makes logical sense. Circling back, and layering on top of the operational benefits able to be generated from the time savings with a common information platform, insurance organizations do indeed have billions of premiums that need to be invested.
    a. If, for example, an accounting or advisory firm is able to design and implement a blockchain based – or even blockchain supported – solution to address some of these issues, it will position the firm to achieve a leadership oriented role moving forward.

2. International financing transactions. The financing of organizations, mergers and acquisitions, and generally purchasing goods and services at the global level often does require financing terms, contracts, and conditions that involve multiple counterparties and organizations. Financial services professionals can either implement internal solutions or provide templates and services to external clients seeking to implement blockchain or artificial intelligence based solutions in the marketplace.

Chapter 10 Summary

The specific subject of this book is, obviously, emerging technologies and artificial intelligence, but that does not mean that those are the only topics and trends analyzed within this text. Technology, no matter how disruptive or potentially paradigm shifting in nature that it may be, is not going to change business or improve performance in and of itself. Stated another way, the technology tools in and of themselves are not going to meet the needs of stakeholders and external users of financial data. For financial services professionals to actually add increased value, analyze broader business trends, and evolve into a strategic partner, technology tools will need to be adapted to the needs of clients both current and future. One of the largest and most well-funded, from a financial perspective, shifts and changes underway at client organizations is the importance of sustainability and sustainable investing. Taking full advantage of the increased efficiency, better data security, and enhanced reporting ability that can be generated via these tools allows practitioners to successfully meet this market need. Whether it is integrated reporting, sustainability reporting and other affiliated information, or being able to effectively analyze ESG related ETF's and other financial investments, these options are items that professionals need to both be aware of and understand for client advice and recommendations.

Reflection Questions – Chapter 10

1. Even with the inevitable technical training confusion that does tend to accompany any new technology tool, does it seem reasonable to expect that these sophisticated technologies will ultimately add value to the business conversation?
2. Have you and your firm dealt with the issues of investors or customers seeking our more sustainability oriented ETFs and investment options?
3. Are the tools and platforms currently in use at your organization or client firms sufficient enough to gather and report on the wide array of customer data, including those connected to sustainability.

Supplemental Readings

AICPA – Sustainability Accounting – https://www.aicpa.org/interestareas/businessindustryandgovernment/resources/sustainability/sustainability-accounting.html

Sustainability Accounting Standards Board – https://www.sasb.org/

iShares – What is Sustainability Investing – https://www.ishares.com/us/strategies/sustainable-investing

Investopedia – A Look At The Largest Sustainability ETFs – https://www.investopedia.com/news/look-largest-sustainable-investing-etf/

Market Watch – UBS Asset Management Launches First ETF to Integrate Sustainability Screening – https://www.etftrends.com/smart-beta-channel/ubs-asset-management-launches-first-etf-to-integrate-sustainability-screening/

References

Benson, S. S., Thomas, P. B., & Burton, E. J. (2018). The CPA's role in forming benefit corporations. *Journal of Accountancy, 226*(1), 84–90.

Bouten, L., & Hoozée, S. (2015). Challenges in sustainability and integrated reporting. *Issues in Accounting Education, 30*(4), 373–381. https://doi.org/10.2308/iace-51093.

Davis, G. F. (2016). Can an economy survive without corporations? Technology and robust organizational alternatives. *Academy of Management Perspectives, 30*(2), 129–140. https://doi.org/10.5465/amp.2015.0067.

Hemphill, T. A., & Cullari, F. (2014). The benefit corporation: Corporate governance and the for-profit social entrepreneur. *Business & Society Review (00453609), 119*(4), 519–536. https://doi.org/10.1111/basr.12044.

Hiller, J. S., & Shackelford, S. J. (2018). The firm and common Pool resource theory: Understanding the rise of benefit corporations. *American Business Law Journal, 55*(1), 5–51. https://doi.org/10.1111/ablj.12116.

Lewis, R., McPartland, J. W., & Ranjan, R. (2017). Blockchain and financial market innovation. *Economic Perspectives, 41*(7), 1–17.

Mahbod, R., & Hinton, D. (2019). Blockchain: The future of the auditing and assurance profession. *Armed Forces Comptroller, 64*(1), 23–27.

McNally, J. S. (2019). Blockchain technology: Answering the whos, whats, and whys. *Pennsylvania CPA Journal*, 1–6.

Shoaf, V., Jermakowicz, E. K., & Epstein, B. J. (2018). Toward sustainability and integrated reporting. *Review of Business, 38*(1), 1–15.

Zhou, S., Simnett, R., & Green, W. (2017). Does integrated reporting matter to the capital market? *Abacus, 53*(1), 94–132. https://doi.org/10.1111/abac.12104.

Internal Control Considerations

11

Another aspect of the blockchain and cryptocurrency conversation, especially as it pertains to the financial services, that is important to have in a comprehensive way is the discussions around the internal controls necessary for further adoption. It is true that the conversation and analysis that normally surround internal controls may not be one that attracts large amounts of attention or excitement, but it is a critical one for the blockchain and artificial intelligence conversation (Crosman 2018). Put simply, even as technology becomes more integrated within the broader financial landscape and services professions, it will still remain important for financial services professionals to be aware of, and well versed in, developing and implementing internal controls (Fig. 11.1).

The core of the idea around internal controls is that internal controls are the processes and procedures that help to both ensure that the information reported and communicated by the organization is accurate, and that organizational assets are safeguarded. Segregation of duties, custody of assets, ensuring a review of work products before they are finalized, and establishing an independent check on the data verification itself traditionally forms the foundation of controls. As computing technology has become more integrated within the financial services profession, a debate has sprung up around internal controls. Namely, as technology takes over ever increasing parts of the financial services analysis and reporting functions, the temptation is to delegate controls and processing of data to the computer programs themselves. As tempting as this methodology is, however, doing so opens the proverbial door for errors and omissions that can derail the organization.

Even though the digitization and automation of information and processes does enable increases in efficiency and more streamlined processing of information, it does remove some of the human oversight critical to financial functions. Whether it takes the form of holding off on executing trades during periods of market volatility, making judgment calls with regards to the types of data included external reports, or ensuring that the work products and information produced are relevant for decision making, the presence of controls and segregated duties is imperative (Gao and Zhang 2019). Technology, and especially technology that helps enable the

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_11

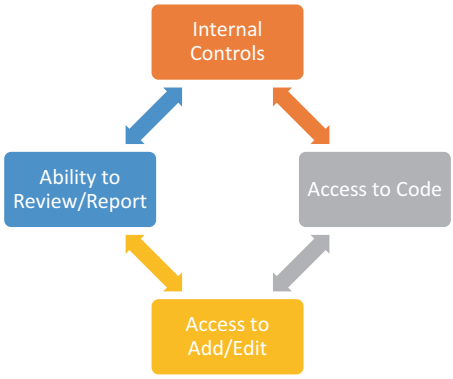

Fig. 11.1 Internal control considerations for emerging technology

automation of increased streamlining of entries, may often be seen as a tool to improve the efficiency of operations, but can also act as a proverbial black box that limits the insights available to business decision makers. Instead of directly auditing audit evidence or other associated information, auditors and other financial professionals will instead be tasked with automating either around the computer or the broader business environment itself. Auditing around the technology tools employed during the organization is not a new implementation, but the sophistication of current tools and options can make this seem daunting.

This is not just an issue for individuals working as accountants or other internal control focused individuals, but for all financial professionals, including those dealing with clients and customers in an investment or advisory capacity. Ensuring that clients and customer understand what they are investing in, be it cryptocurrencies, emerging technology companies, or other investment tools, is a clear responsibility of financial practitioners (Alexander 2019). In addition to assisting clients and customers with various investment decisions, individuals working in industry can help secure the data and information that drives the decision making process across industry lines. No matter how sophisticated the individual technology tools are, be it blockchain, robotic process automation, or comprehensive artificial intelligence solutions, the controls over the data inputs and outputs must be maintained. In fact, and taking into account the reality that the pace of information processing and decision making only continues to accelerate, the importance of maintaining information integrity is key.

Additional Services Around Internal Controls

At first glance it may seem counterintuitive to assemble a section based on the additional services that are able to offered connected to the area of internal controls around both artificial intelligence and blockchain. It would seem that the broader implementation and adoption of more technology would render the need for robust or improved internal controls less important or eventually obsolete, but that ignores a few fundamental areas in which increased automation and data management will

have a dramatic impact on data management and reporting (De Simone et al. 2015). Clearly every software tool is unique and will function differently at different organizations, but a few of the core questions and topics that should be considered when offering advisory or other services connected to AI, blockchain, or automation questions in general are as follows.

First, which parties actually have control or access to the information core information itself as it is uploaded and entered into the system. In the world of the internet of things, this is not an idle or abstract question, as data and information are being delivered to the management team from virtually every possible source. While these different flows of information are not necessarily always financial in nature, they will invariably have an impact on the performance of the organization. Inventory information, operational data, feedback obtained from market participants, and other types of information will drive the performance of the organization both in the present and in the future (Yunhao et al. 2014). This is not anything new or innovative, but what may be new is the reality that financial services professionals will be more a part of this operationally based dialogue that might have previously been the case. In order for the management team to make best use of these different sources of data, it must be trusted information. From a financial advisory perspective, this means that the organization must be able to effectively assess and understand the cost and functionality of different options available in the marketplace. In addition to have an appropriate understanding of costs and functionality, the intersection between different sources of information and funding availability should always be a part of the dialogue.

For example, if the organization has invested in sustainability projects and efforts in order, financial services professionals with a market making perspective should focus on the following matters (Lowe et al. 2018). If, for example, the organization has invested in various sustainability and environmental initiatives and projects, this may open the door to grants, funding, and other financial opportunities that might otherwise have remained inaccessible. Especially as the interest toward various sustainability and environmental efforts continues to increase, this is quickly becoming a fundamental business issue rather than just an idea to consider at a qualitative level. Market oriented professionals should, reflecting the increased financial interest and activity in this space – in the form of green bonds, ESG investment opportunities, and institutional capital wanting to become affiliated with organizations operating in a sustainable manner – generating a true opportunity for management professionals and associated employees.

Blockchain Control Questions

Now much has been written about the immutable property of records stored on a blockchain platform, and while every individual blockchain can be programmed differently that is a generally accurate statement. Once a block of information has been entered on the blockchain, and been verified/approved by other network members, that individual block of information cannot be altered. This also introduces the

following concept that, as financial professionals are seeking to develop and implement blockchain oriented service, that a good place to start may be with busting some common myths associated with blockchain technology.

Let's take a look at five of the most common myths associated with blockchain technology, and financial professionals can dispel these to the benefit of clients:

1. Blockchain is an accounting and/or finance system. This is completely false! Blockchain is, without a doubt, a hot topic for everyone associated with the financial services businesses, but that does not mean that blockchain is an accounting system or platform. There are no journal entries that take place on a blockchain platform, there are no financial statements produced on a blockchain, and there are not equity trades executed on the blockchain itself. Blockchain is an excellent tool to store and communicate information in an encrypted manner, but and is of interest for virtually everyone in the financial services landscape, but it is not an accounting platform.
2. If a blockchain is used that means there is no risk of being hacked. While the blockchain itself (specifically the bitcoin blockchain) has, to date at least, been immune to hacking attempts, that does not mean that simply by implementing blockchain that all risks are eliminated. In order to implement, develop, and stress test a blockchain option the organization must use hardware, software, and employ certain technically skilled individuals to program and maintain this blockchain. Whenever that combination of factors is involved in a project itself, there is always an opportunity for fraud, unethical behavior, or simply errors to derail the blockchain process itself.
3. Blockchain and AI are always superior to existing technologies and systems. Although both blockchain and artificial intelligence have received large amounts of investment and attention, including billions of dollars invested by financial institutions, that does not necessarily mean that these tools are always better than current options. As both blockchain and artificial intelligence transition through the adoption cycle, and move from the hype peak through the trough of disillusionment, the disconnect between practical realities and potential is becoming more apparent. Even with these periodic failures and pilot tests being shut down, it is still important for financial services professionals to be aware of just where blockchain is being implemented.
4. Blockchain is a cost effective solution across industry lines. Even though progress has been made in the development of industry and segment standards this does not mean that blockchain is either cost effective or easy to use. For example, the average starting salary for blockchain engineers, developers, or programmers continues to increase from the low six-figures to near mid six-figures. On top of these rather obvious costs, there are also costs and considerations that need to be accounted for in terms of integrating blockchain platforms and options with current technology options.
5. Using a blockchain option requires the organization to use cryptocurrencies. Although cryptocurrencies might represent the most well known application and development of blockchain, that does not mean that all blockchains must use cryp-

tocurrencies. Even more to the point of importance for financial professionals, this means that even if clients and/or client organizations are interested in blockchain options that does not mean that cryptocurrencies must be part of the conversation. This is an important point, and although it might seem relatively basic, for clients to understand and to integrate into their decision making process.

RPA Control Questions

Automation is coming for the financial services profession, whether or not individual firms or practitioners are preparing for the transition. Automated trading strategies have long been a part of the financial marketplace, but the proliferation of automation strategies continues to spread with almost relentless speed (Masli et al. 2010). Even with all of the benefits and opportunities that increased automation provides, however, it is also worth pointing out that controls and policies specific to RPA controls should be put into place. Contrasted versus previous automation and automated programming developments, RPA appears to represent a next step application and iteration of different technology processes, including the requirement and expectation of improved controls and control procedures over the custody, analysis, and handling of information. Differences, of course, will exists between different organizations, and these points of consideration are not meant to be all inclusive not exhaustive. Rather, these points should be considered and analyzed as starting points to initiative and continue a dialogue around the controls necessary to facilitate a broader implementation of technology such as robotic process automation.

First, and perhaps most importantly, conversations and analyses must be held between financial services organizations and client firms. Making internal improvements in terms of data analysis and operational improvements are important things – in and of themselves – but will never be fully realized without the buy in and support of the clients who will be impacted. A core point of RPA and other advanced automation technologies is that information must be shared and distributed more openly between counterparties. Whether or not this is acceptable or desired by different clients and client organizations is something that must be addressed first and foremost, and especially before the substantial financial investments necessary for technology upgrades are undertaken.

Second, are the employees and individuals who are going to be tasked with implementing such controls procedures and processes able to do so? This might seem like a relatively fundamental question or item to address, but is something that is vitally important to the successful implementation of a robust automation protocol. Traditional control policies and procedures simply will not be able to updated and upgraded to an increasingly RPA based and driven environment. Put simply, controls, control implementation, and the testing of said controls over the handling and processing of information are going to have to evolve and change on an almost fundamental level in order to remain relevant moving forward (Kim et al. 2018). Internal controls may appear to be an accounting specific conversation, but certainly have implications across the financial services spectrum. For example, and building

on current movements toward automated investing decisions, financial service professionals will need to be able to understand how increasingly automated trading and investment platforms operate in regards to both investment decision making and the impact such automated decisions have on the financial performance of certain investments.

Third, and of importance in a business environment increasingly concerned with controls around data and data integrity, the importance of maintaining controls even as certain decisions are automated is critically important. In order to effectively do this, for example, in the case of incorrect information being added to the blockchain, this may result in this faulty information being disseminated on a continuous basis. Such rapid distribution of data and information may actually end up damaging the business in terms of both reputational damage and financial damages as well. Controls both over the input of data into the various automation systems and blockchain options are critically important, especially as these tools and platforms are proliferating into other industries (Keune and Keune 2018). For example, as healthcare blockchains become more prevalent, the security and integrity over the patient and other confidential information it will an ever larger issue for practitioners to be aware of and able to articulate.

Chapter 11 Summary

For all of the potential and excitement that surrounds blockchain, robotic process automation, artificial intelligence, and other automation tools and platforms it is also important to take into account the internal control considerations that must be a part of the financial services conversation. Especially from an accounting and finance perspective, establishing and maintaining effective internal controls is an imperative responsibility, and even could be considered a fiduciary duty, for any practitioner seeking to offer and develop services connected to these areas. Numerous incidents have rippled through the blockchain and cryptocurrency landscape since the technology became mainstream, which only reinforces the need and expectation for practitioners to develop appropriate internal controls. What this mean from a practical point of view is that this chapter drills down into some of the considerations that need to be factored into any professional dialogue that are affiliated with emerging technology tools. Internal controls are a well established part of the accounting and financial services conversation, and this chapter connects this well established topic with the topics of emerging importance that include, but are not limited to those mentioned within this text. Additionally, an area that is explored in this text are the opportunities to develop and implement potential new service lines and business use cases developed to the need for more robust internal controls as they connect to emerging technology.

Reflection Questions – Chapter 11

1. Does your firm, and/or client organizations, have an internal control policy that is consistently updated?
2. What is the current level of transparency and data granularity that is available as a result of these analyses?
3. Does it appear that automation tools, which can automate data processing and reporting, will help or hurt the creation of internal controls.
4. How will the accounting and auditing profession evolve to keep pace with these technological evolution?

Supplemental Readings

Journal of Accountancy – How blockchain might affect audit and assurance - https://www.journalofaccountancy.com/news/2018/mar/how-blockchain-might-affect-audit-assurance-201818554.html

The CPA Journal – Audit Implications of Blockchain and Cybersecurity - https://www.cpajournal.com/2019/02/27/auditing-implications-of-blockchain-and-cybersecurity/

Udacity – Artificial Intelligence for Trading - https://www.udacity.com/course/ai-for-trading%2D%2Dnd880

Brookings Institution – The impact of artificial intelligence on international trade - https://www.brookings.edu/research/the-impact-of-artificial-intelligence-on-international-trade/

PwC – Robotic Process Automation: A primer for internal audit professionals - https://www.pwc.com/us/en/services/risk-assurance/library/robotic-process-automation-internal-audit.html

American Express – Emerging Technology: Robotic Process Automation in International Trade - https://www.americanexpress.com/us/foreign-exchange/articles/emerging-robotic-process-automation-in-international-trade/

References

Alexander, A. (2019). The audit, transformed: New advancements in technology are reshaping this core service. Accounting Today, 33(1), N.PAG.

Crosman, P. (2018). Could blockchain tech help prevent bank fraud? *American Banker, 183*(55), 1.

De Simone, L., Ege, M. S., & Stomberg, B. (2015). Internal control quality: The role of auditor-provided tax services. *Accounting Review, 90*(4), 1469–1496. https://doi.org/10.2308/accr-50975.

Gao, P., & Zhang, G. (2019). Accounting manipulation, peer pressure, and internal control. *Accounting Review, 94*(1), 127–151. https://doi.org/10.2308/accr-52078.

Keune, M. B., & Keune, T. M. (2018). Do managers make voluntary accounting changes in response to a material weakness in internal control? *Auditing: A Journal of Practice & Theory, 37*(2), 107–137. https://doi.org/10.2308/ajpt-51782.

Kim, G., Richardson, V. J., & Watson, M. W. (2018). IT does matter: The folly of ignoring IT material weaknesses. *Accounting Horizons, 32*(2), 37–55. https://doi.org/10.2308/acch-52031.

Lowe, D. J., Bierstaker, J. L., Janvrin, D. J., & Jenkins, J. G. (2018). Information Technology in an Audit Context: Have the big 4 lost their advantage? *Journal of Information Systems, 32*(1), 87–107. https://doi.org/10.2308/isys-51794.

Masli, A., Peters, G. F., Richardson, V. J., & Sanchez, J. M. (2010). Examining the potential benefits of internal control monitoring technology. *Accounting Review, 85*(3), 1001–1034. https://doi.org/10.2308/accr.2010.85.3.1001.

Yunhao, C., Smith, A. L., Cao, J., & Weidong, X. (2014). Information technology capability, internal control effectiveness, and audit fees and delays. *Journal of Information Systems, 28*(2), 149–180. https://doi.org/10.2308/isys-50778.

Implications & Trends for Financial Services

12

With an emerging area such as blockchain and blockchain based assurance and attestation services it is always difficult to know what to include as current news or current use cases, but several trends do appear worth of inclusion as current or topical news stories.

First, the trend toward more and more sector specific or consortium based model of blockchains do appear to be generating large amounts of interest and investment in the technology landscape (Culp 2008). The reasoning behind this adoption is relatively straight forward due to the efficiencies and benefits able to be generated through collaborative efforts. In addition to the Big 4 accounting firms working together, the broader trend and development toward collaboration and cooperation points to an interesting concept and idea. Even between organizations that normally compete very hard for business and clients, the idea of an industry or sector wide blockchain platform is appealing. Digging deeper into this concept, it seems logical to revisit an earlier point and perspective that has been mentioned throughout this text; the industry desire for increased regulation and oversight.

Currently the regulatory backdrop for blockchain and cryptocurrency in general is akin to a patchwork effect, which has led to different interpretations and dealings with various aspects of the blockchain and cryptocurrency field itself. On the one hand it is important for industry actors to have clear frameworks and guidelines within which they can operate, and several professional associations and advocacy groups have taken leadership in attempting to define and clarify what exactly those guidelines should be. This somewhat interesting and contradictory view, of industry actors and players seeking our increased regulation and oversight, actually makes perfect sense when a broader perspective is utilized. Specifically, and as different organizations continue to make investments on both blockchain sides or individual cryptocurrencies it is important to make sure that these investments, ideally, do not end up being contrary to what the regulators end up instituting as the rules of the marketplace (Corson 2016). From a financial systems and markets perspective and point of view, ensuring that the products and services instituted by a variety of firms remain in compliance with market movements and trends is important. Practitioners,

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_12

in addition to the work and effort involved in the building out and implementation of different blockchain options, might also be able to capitalize on the decentralization trends in terms of career plans or locations.

Future Hubs

One of the most intriguing and interesting ramifications of the increased technological involvement and integration is the simple fact that, via disintermediation, distributed ledgers and sources of information, there will be a disruption of current status quos across the board. Specifically the development of new hubs and centers of excellence connected to these emerging technologies will lead to different opportunities and openings for motivated and proactive financial professionals. This might not be as radical an idea, however, as it might initially seem to be when viewed in the context of what is already happening in the financial markets at large. For example, Goldman Sachs – a venerable financial institution in its own right with historic ties to traditional financial centers (including New York City) has recently opened an office in Salt Lake City, Utah. Driven by a variety of forces, including the talent that exists in that local market as well as the lower costs that can be obtained in Utah, this office has been the fastest growing office for years now. While there are always going to be benefits and upsides to working in a physical location, the opportunities or leveraging technology for more and more fundamental business aspects will inevitably lead to a wider dispersion of talent, capital, and information.

On top of the impact that increased distribution and decentralization will have on financial services firms from an internal operation perspective, such a movement and shift will also lead to more advisory service opportunities (Doran and Brown 2001). An example of this would increasingly be the creation and establishment of peer to peer lending platforms, ride sharing apps, and distributed rental property opportunities for consumer use. If these sound like current services and options that exist in the marketplace such as Lending Club, Uber, and AirBnb that is because they are. The true value, however, or a blockchain based business model and platform, is that even the administration and oversight involved around the managing of an organization does need to be centralized in any aspect of section. As discussed in depth throughout this text the implications of a decentralized and distributed model of founding, running, and managing a business must also be part of the financial conversation.

Taking a look back to the implications of what this means for financial practitioners working in industry, what this means is that the playing field has rarely been as level or as open to new entrants. As companies can operate and conduct business on a decentralized and rapidly automated basis, advisors and professionals are going to have to be able to keep pace with the changing expectations and requirements of these organizations (Campbell-Verduyn and Goguen 2018). Specifically, practitioners will have the ability to audit, attest, and advise clients of different aspects of client operations and business as they pertain to a variety of needs and questions.

Decentralizing financial information, as discussed in the section focusing on lex cryptographica also ties back to an important aspect of advisory services that financial and other practitioners can add to the conversation.

New Business Model Drilldown

While the topics of new and innovative business models have been discussed throughout this text, and revisited here in the context of offering new services, that initial conversation only convers the preliminary layer of how distributed and decentralized technology may change business at large. Obvious applications of said technology are, of course, the ability of organizations and individuals to access capital and other resources on a continuous and widespread basis as opposed to relying on central hubs for information. Additionally, this decentralization of access to capital and other types of technological and advisory services will invariably lead to a rebalancing of establishment of new centers of excellence as these technologies become more widely integrated throughout the economy (Simunic and Biddle 2019). These are important considerations to factor into any analysis or model, but are higher level concerns that might not directly impact current clients or services. Let's take a look at a few items that might do just that.

From a legalistic perspective, a decentralized organization still remains something of an anomaly in terms of how it should be classified and treated. As of this writing a purely decentralized organization is not formally recognized as a legal model in and of itself, but is most closely affiliated with the model of a general partnership, which may or may also impact various corporate governance and voting policies (Syeed 2018). Depending on the specifics of just how the organization is structured, and the types of tokens that are issued during the formation of the company, a general partnership agreement and operating structure is a logical choice. For those financial professionals not intimately familiar with the workings of the legal system this might not seem like an extremely important piece of information, but can have potentially disastrous consequences for investors. If, for example, individuals or investment funds have participated in ICOs, STOs, or other types of fundraising activities connected to blockchain based business models they may have inadvertently be exposing themselves to unlimited liability depending on the operations of the business. This often unaddressed fact or piece of information is something that has not been discussed all that much even during the hype and excitement related to the ICO and STO marketplace. Specifically from a regulatory perspective it is important to understanding that technology and regulatory approaches tend to not only interact with each other, but influence each other as the ecosystem continues to evolve and mature (Gump and Leonard 2016). Fortunately, there does appear to be a solution that might be able to lawyers and financial professionals advise clients; the segregated limited liability corporation (SLLC).

Prior to drilling down into just what exactly this business model may mean for organizations and their advisors it is important to point out that this example and information further illustrates the importance of working in multidisciplinary teams

moving forward. Particularly, as organizations ranging from JP Morgan to Facebook enter the blockchain financial services space, it does not appear illogical to conclude that blockchain is rapidly becoming a hot and timely topic in the banking and financial services space (Yu 2016). The advent and integration of blockchain based systems, especially when it is stacked or combined with artificial intelligence or other automation technologies, means that no one professional sector is going to have a monopoly on expertise nor the ability to offer advice. Even though financial professionals have worked together in the past with legal experts and teams this relationship will have to become more solidified in the future.

In addition to the rather obvious legal questions and considerations that will arise with the advent of new business models and business structures, there are associated questions and considerations that need to be taken into account. An SLLC, for example, is simply a method and model by which different assets and information can be segregated and structured to isolate different types of content and information from other information. How this might work, for example, is that by segregating the piece of data and information stored and managed via a decentralized and distributed business model, such a separation may result in limited liability for different stakeholders and token holders. If, as a result of issuing a security token – as defined by the SEC during 2018 and 2019 – results in token holders having shared or the profits and operations of the organization, this is not an academic question given the scope of business being conducted in such a manner. Billions have been raised via ICOs and STOs during the excitement and buzz around blockchain, and with these billions there are associated issues related to liability, exposure, and corporate governance that must be addressed.

On top of the legal issues and considerations that must be factored into the conversation and debate there is also a fiduciary responsibility that financial professionals must be aware of as decentralized organizations continue to proliferate (van Rijswijk et al. 2019). Clients, both individual and institutional in nature, may be interested in participating in, investing in, and even leading a decentralized structure itself. One of the first decentralized organizations, theDAO, offers a perfect example of what can occur is risks and associated potential liabilities are not accounted for appropriately. Running, like the vast majority of decentralized blockchain models, on the Ethereum blockchains, this organization had raised in excess of $150 million USD during the early days of the blockchain industry. Revealing a potential fatal flaw in the decentralized and distributed model of blockchain itself the code that underpinning the DAO was hacked and manipulated which, in essence, led to members of theDAO being locked out of the organization itself. After a manual intervention by the founder of Ethereum, Vitalik Buterin, the situation was ultimately resolved, but no without the loss of financial resources, reputational damage, and shaking of faith in the idea of decentralized blockchain model at large. These fiduciary implications and associated risks that can accompany a new type of business model and structure are items that every practitioner needs to be aware of moving forward.

That said, there are not only risks and potential downsides to the implementation of but also potential opportunities and benefits. For practitioners advising and working either entrepreneurs, for example, the ability to raise capital from a truly global audience on a near instantaneous basis increases the liquidity and depth of the

marketplace at large. What this means, however, is that on top of being aware of current trends and forces connected to blockchain applications and iterations that professionals will need to also keep themselves informed about emerging trends in the future as well.

AI FAQ's

Additionally, and reasonable to assume alongside the many questions and comments that will arise with blockchain, there will also be questions and issues to address with artificial intelligence. Looping back to the conversations and explanations connected to both RPA and AI, this also represents an opportunity for professionals to offer advice and guidance as to how to implement solutions and options. Drilling down specifically, there are a few components and factors that need to be part of any accounting AI advisory conversation.

1. In order to implement AI, the fundamentals must be in place first. Although AI may be the headline grabbing and buzz worthy story and tool out there, in order to effectively implement AI and obtain the most benefits possible out of this implementation, fundamental processes and procedures need to be put in place up front. Specifically, and before any AI tool should be implemented, the processes and tasks to be automated should be well documented, reviewed, and understood by both practitioners involved in their execution as well as the technical team tasked with automating these processes.
2. Pilot tests are a recommended first step. It may be tempting, from an operational as well as an optics perspective, to simply implement automation or AI tools throughout the organization from the very beginning, but that does – in turn – expose the organization to several well documented issues that often occur when attempting large enterprise level ERP upgrades, installations, or reinstallations. Budget overruns, compatibility issues, and the reality that no tool or product works exactly right the first time means that many AI projects may hit stumbling blocks prior to generating many of the promised or assumed benefits. While something that may happen with relative frequency that does not make it any easier for organizations or management teams faced with these challenges. Providing steady guidance and expertise during challenges as they arise if an important part of the function to be played by financial services professionals.
3. Different forms of AI may be more applicable. As outlined previously in this text, there are many different forms of AI that may actually work better for different organizations. For example, while financial services professionals may be specifically interested in the implications and applications of computation AI for accelerating the processing of data, client organizations might be more interested in spatial, linguistic, or other forms of artificial intelligence. Having a fundamental understanding of these different types of AI, and being conversant in describing the differences between them, is something that financial services professionals will need to understand and integrate into the decision making processing moving forward.

4. Iterations are the norm, and not the exception. AI may, and with valid reason, be receiving substantial buzz, analysis, and investment in the marketplace, but it is equally as important to realize that the evolution and transition to true artificial intelligence is going to be a process rather than a one-time event. Whether it begins via an RPA implementation project or some other form of automation, the underlying relationship is unchanged. Put simply, artificial intelligence as currently understood and discussed in the marketplace will require several iterative steps and processes to actually generate many of the expected benefits. Financial services professionals can offer advice and guidance not only on how AI may integrate with current systems, but also advise on the iterative between current processes and full AI implementation.

Something else that practitioners should keep in mind as different types of artificial intelligence become more widespread in the marketplace is an underlying point to keep in mind is that there is still home for human practitioners in a digitally based and driven economy. No matter how sophisticated the technology itself may be, the underlying processes and business controls must still be robust, reinforced, and updated to keep pace with the changing expectations and needs of end users. Decentralization, a distributed sharing and analysis of information, and the automation of different data processes will create efficiency and productivity gains, but must also be offset and framed within appropriate controls and guardrails.

Ethics in AI

Something that is becoming more of a mainstream topic for professionals to debate, especially in terms of market applications, is how ethical decision making and ethics in general can be integrated within AI programs. At the current pace of development, many industry and computer experts speculate that AI programs that are either self aware or able to act of their own volition are mere years away. Compounding this potential it is also logical to acknowledge that AI – or other automation programs – are driving and handling large amounts of the decision making process. Credit card approvals, transaction processing, stock trading, journal entry posting and reconciliations, and other financial analysis procedures are already in large part automated or at least partially automated. Let's take a look at an example that financial advisors and market makes need to certainly keep an eye as these trends continue to become more prominent. Certain investors or classes of investors may, for a variety of reasons, want to only invest in companies aligned with certain ESG goals and objectives. Even those this preference may be expressed and programmed into investing programs and algorithms, there is still going to be a need for human oversight and control. Investing decisions are certainly high profile enough by themselves, but that is not the only area in which ethics needs to be integrated into the business decision making process.

Lending, both on a commercial and individual level such as business loans and mortgages respectively is another which artificial intelligence is already being

utilized to a certain extent with more developments and tools on the way. Providing credit to creditworthy customers and organizations is a function and process that provide vital services to the broader economy at large, and is something that is important for all practitioners to be aware of as technology becomes increasingly integrated into how business is conducted. During the Great Recession of 2008, for example, was precipitated and prolonged by the fact that the lending market connected to the extension of credit had dried up, depriving organizations and individuals or much needed capital and resources. Returning to the idea of business formation and creation, the primary reason why most new small businesses fail is due to lack of capital and financing; being able to make timely and effective decisions connected to these needs is something that is incredibly important.

Automation programs of all kinds, including full blown artificial intelligence as well as RPA and automation software embedded into the lending process can increase the speed with which these decisions and choices can be made. Even in current organizations and conversations there are multiple software tools and programs that are augmenting and improving the speed with which individuals and organizations can decided upon. Drawing from publicly available information, including data posted on social media and other information available online there are a multitude of ways that approval and denials can be automated or accelerated without detracting from the quality of the decision making process. These improvements, however, can also lead to the approval process being influenced by factors and information not directly related to the financial situation of the client. Even though this information may be helpful in terms of assessing the market reach and influence of an individual or business, it can also lead to information being misused or misinterpreted in the context of business approvals.

For example, if a social media posting or even an original posting without malicious intent attract negative comments or feedback can have a negative impact on whether or not the loan or financing is approved. This risk may sound abstract or not entirely important from a financial services perspective, but it is something that should be taken into account as AI and other automation programs are implemented within organizations. While humans and other manual reviewers can assist in offsetting some of the negative feedback and news that is prevalent on social media an AI program or other sort of automatic reviewing program might not be able to discern fake news from true negative news. This lack of intellectual dexterity may not be evident in the course of normal approvals and verifications, but can rear its ugly head when potentially applied to potential customers and borrowers who might now quality for normal financing.

Accounting in a Decentralized World

Everywhere that an individual or firm looks, the vast majority (if not all) of business and other types of information is centralized in nature. Healthcare, land records, taxation information, customer data, financial information and history, and almost anything other large data set you can think of operates in a centralized environment.

Customer information, including purchase history, credit card information, and data linked to rewards programs and loyalty cards are also often stored within a centralized data hierarchy. Now, there are certainly benefits associated with this methodology, namely the speed and efficiency that has been traditionally linked with a centralized data management and processing structure. With a central hub tasked with verifying, clearing, and securing information, those somewhat mundane tasks were effectively outsourced to an independent third party. Even with these associated benefits, however, the recurring specter of hacks, breaches, and other data incident have been occurring with a frightening degree of frequency across industry lines. Both in the United States, in international markets, and across different sectors of the economy, there does appear to be a flaw associated with the current centralized model.

Accounting professionals, virtually without exception, have played and embraced the role of objective third party verifiers of information and data, which in turn has helped lead and solidify the expectations of market participants with regards to what accounting professionals actually do. Additionally, and albeit to a lesser extent than accounting professionals, every financial services professional – be it a financial advisor, financial planner, or otherwise affiliated individual – has traditionally held a role akin to third party verifier of data and information. What is similar across industry lines, however, is that the entire role of accounting and financial services professionals is to help third party users of data understand, report, and verify what exactly is being reported. In effect, the centralized nature of most data storage and processing has created the very role and responsibility inhabited and embraced by accounting and financial services professionals. Creators of information, end users of information, and every party in between are usually in need of an expert professional to analyze, document, and report that information; this is where the accounting and finance professionals currently and traditionally operate therein.

Emerging technologies, specifically the rise of blockchain platforms and networks, has created a situation where the need for third party intermediaries, verifiers of information, and institutions that verify certain pieces of data are less necessary than they had been previously. At the core of the idea, the principle value offering generated and conveyed by accounting practitioners and firms traditionally has been to serve as independent, objective, and trustworthy third parties to analyze, report, and verify that the data provided is accurate. The peer-to-peer nature of the blockchain ecosystem, however, renders the necessity of a third party or other sort of independent verifier of data less necessary. Encryption, real time communication of data, and the ability of network members to verify data as it is uploaded onto the blockchain itself means that the creators of information can, instead of third parties, actively verify and confirm the veracity of said data. This transition may seem abstract in nature, but actually represents a true paradigm shift from current market forces where central authorities dictate what is perceived as the truth to a situation where the truth is determined and verified by market participants.

This disintermediation of traditional third parties, including banks, insurance organizations and accounting professionals creates both opportunities and challenges for forward looking practitioners. Virtually every aspect of accounting, from

reporting to auditing to taxation issues, will invariably be influenced and impacted by the proliferation of "truth" from a central authority to a distributed network. Accounting and finance professionals, whether employed within private industry, public practice, or working on an entrepreneurial basis, are almost universally tasked with serving as trusted advisors, intermediaries, or other interpreters of data. Bank reconciliations, auditors, tax preparers and examiners, and other reporting functions are almost always dependent on a comparison between external data, and this underlying structure will have to evolve and shift as blockchain technology becomes more widespread and adopted.

Intermediaries, however, do not only refer to accounting professionals and accounting firms. Rather, it could be argued that the entire financial markets system and infrastructure as it is currently constituted is a centralized mode. Security exchanges, regulatory and other oversight oriented agencies, and credit rating agencies are each a centralized method of communicating data, issuing opinions on certain issues, and enforcing guidelines. As was clearly demonstrated during the financial crisis that began in 2007, these centralized models and agencies did not, at the very least, foresee some of the underlying forces that eventually caused the global financial meltdown. There is certainly enough blame to go around in terms of what specifically caused the crisis, and this book is not going to rehash those already drawn our conversations. Rather, and here is the key point; the entire blockchain and cryptocurrency conversation burst onto the scene in 2009. If that date sounds like it was associated with the aftermath of the financial crisis that would be an accurate assessment.

The accounting profession seems to periodically go through periods where there is a move toward consolidation, the value of accounting services and firms is questioned, and the future of the profession seems to be murky at best. Transitioning toward a decentralized and distributed ledger system to record and report data is not, in and of itself a radical new trend of idea in the accounting profession. Cloud based accounting, the integration of different technology platforms and tools, and the sharing of data back and forth between members of existing networks have all existed in the business landscape for decades. The shift and acceleration toward a blockchain based model of accounting, however, is a definitive paradigm in just how the data compiled and assembled by an organization. As data becomes increasingly available to all network members, who in turn have verified this information as it is uploaded to the network itself, the need for traditional accounting services such as confirmations and reconciliations will decrease over time.

It is also important to realize that the conversations connected to decentralized accounting is not merely an academic or theoretical conversation, but is something that is already underway in the marketplace. Virtually every accounting firm in the Top 100 already offers some sort of services and practice lines affiliated with blockchain, cryptocurrency, and automation tools that are already being used by clients across industry lines. Connecting to other topics and themes that are discussed in this book it is important to make sure that as new service lines and opportunities are launched and further developed that practitioners have the ability to discuss, market, and articulate the benefits of new technologies for internal and external clients.

Trading

Financial markets, even those with robust mobile apps allowing investors to buy, sell, and trade with the tap of a screen on a global basis, the back office settlement process can still take several days. This is even more important to realize when the global nature of financial markets are taken into account, including the reality that equity securities, bonds, currencies, and other financial instruments trade on a nearly continuous basis. Even if one specific market or groupings or markets (such as the major U.S. exchanges) are closed, there is invariably a market somewhere trading some sort of financial asset. Now, the delays in settling transactions, confirming balances, and verifying the identities of the involved parties are not new challenges, nor are these issues going to be immediately resolved by simply using new technology tools. That said, and especially as the fortunes or markets and organizations can be impacted by Tweets and other social media interactions, the lag and delays in how financial data is verified and communicated does not appear to sync with the speed with which business is now conducted.

Also, blockchain technology can, in addition to increasing the speed with which data and information can be verified, also opens the door for new potential investors on a global basis. Traditional infrastructure requirements for investing, banking, and trading require an investment in technological, communicative, and financial tools and platforms. Blockchain, specifically the iteration and application of cryptocurrencies, allows individuals and institutions to communicate, send financial information, and transmit data equipped only with a laptop, reliable internet connection, or even a robust mobile tool like a tablet. Financial services professionals, especially those employed in the wealth management and personal financial planning area, tend to play several roles for clients. First, and perhaps the most important role they tend to play is that of market analyst and interpreter. Namely, the job of many financial planning professionals is to ensure that clients understand what specific types of information is verifiable, accurate, and can be used to make more effective decisions. As increasing amounts of information are stored, verified, and available on blockchain enabled platforms, the necessity for manual review and interpretation will, by any reasonable estimate, decrease over time. While AI and blockchain may render some current roles and responsibilities redundant or obsolete, especially as it comes to reviewing market trends and forces, it will also create new opportunities for financial professionals. These new opportunities are, at the end of the day, the largest amounts of excitement, investment opportunity but also potential buzz and hype focus on these new potential opportunities and options for financial professionals.

Technology, specifically smarter programs and technology that automatically executes the trading and buying of securities is nothing new, nor is it something that should come as a surprise to anyone affiliated with financial services in any capacity. What this increasingly means though, can be summarized in two general areas. First, as larger amounts of the overall equity and debt markets are handled or traded via computer or automated programs it is also important to understand what these different terminologies actually mean. Explained below, what this means is that professionals need to understand and integrate what these different terms and competencies mean for investing and trading. Prior to that however, the second major

implications of increased automation is the fact that – in the face of increased automation and automatic trade execution – there will be requirements for more and more in terms of human oversight. This increased oversight can take the form of regulation, manual checks and processes, or periodic reviews but the underlying fact pattern remains unchanged.

Technology Generated Opportunities

One of the most often cited issues and shortcomings from professionals working in the broader financial services areas is that, although professionals dedicate large amounts of effort, energy, and time to providing services, these services are not always evaluated as strategic by clients. Specifically, and something that often arises in the conversation linked to accounting specific professionals is the following reality. Audits, as they are currently constituted and performed, tax returns and filings, and even the generation of monthly financial information may not normally be perceived as actually adding value to the organization. At the end of the day, and regardless of which specific industry or organization is analyzed, a core prerogative of management teams is to make effective decisions on a continuous basis. What this means in reality is that, in order to definitely add value and to be viewed as a true business partner, financial services professionals must be able to address the needs of other business professionals.

This is not something that, is particularly new or innovative, but rather has been amplified by the increased integration of technology through the entire business decision making ecosystem. Analysis of large amounts of information, seeking and verifying underlying patterns, extrapolating insights from different imperfect data, and offering recommendations all represent work and tasks that can be both forward looking and historical in nature. All too often, however, financial professionals are only focused on verifying and analyzing the accuracy and validity of information that has already happened. While performing these tasks, obviously, does add value in terms of reporting and planning it does not usually help in the decision making process moving forward. A primary cause of this gap, between what work is currently performed and what management teams increasingly expect, can be traced to a few critical areas.

First, financial professionals are often assigned tasks that require a large amount of manual time and effort in the form of confirming information, verifying the accuracy of data, and making sure that the correct types of information are delivered to appropriate end users. These tasks, while time consuming, have formed the basis of how many firms have traditionally built successful business models, but do not appear assist other management professionals with making decisions in a forward looking manner. As AI and blockchain, in whatever final stage is adopted by an individual organization, becomes more mainstream, practitioners should be able to take advantage of this tools to replace lower level work with higher level processes. Second, and something that represents a significant hurdle toward financial services professionals spending less time on historical analysis is that ensuring the accuracy and completeness of historical information is critically important. Whether it has to

do with SEC reporting, reports filed for income tax purposes, or financial statements delivered to external creditors it often falls on the financial services team to ensure that the information is accurate. While such work is obviously important from a regulatory and legal perspective, it does occupy and detract from time and effort that could otherwise be allocated toward more forward looking and strategic work.

Third, and perhaps most difficult to overcome is the reluctance some in the financial services space of innovation, creativity, and doing things different than had been previously acceptable. Such as lack of creativity may, of course, be grounded in a significant amount of truth and historical precedent. After all, some of the most profound failures, bankruptcies, and scandals linked to the financial services segment of the economy have been tied to individuals and organizations using something akin to creative finance. That said, simply because previous unethical actors had conducted themselves in an unethical manner does not mean the innovation or approaching topics in news ways should be ignored. Rather, and something at the core of this book, is that innovation and creativity in the profession are items to embrace, and to leverage with the advances available due to technological advancement.

As technology and automation becomes increasingly integrated within the accounting and broader financial services landscape it is also important to take into account the opportunities that are generated and created through automation, the streamlining of operations, and the implementation of technology solutions throughout the decision making process. Financial services professionals will, almost without a doubt, be impacted by the increased automation, digitization, and technological forces in the broader business landscape, but it is also something that can, and should, generate opportunities for financial services professionals.

1. Data experts and analysts – While the growing importance and interest in the Internet of Things, big data, artificial intelligence, and digitized information may obtain a large amount of headlines and news information, the interpretation of this information remains an obstacle and challenge to many individuals within the accounting and finance profession. Building on prior competencies and skillsets embedded within the profession, financial services professionals are well equipped to add value in an increasingly digitized and mobile first environment.
2. Forward looking analysts – Perhaps the most interesting implication of technology, namely artificial intelligence, blockchain, and the internet of things, on the professional services landscape is the forward looking ability these tools will provide to individuals. One of the core issues and complaints, from a client and customer perspective, is that while the information and data provided may be accurate, but that the information normally reported is several weeks (or months) out of date.
3. Control specialists – It is important to recognize the reality that, although the automation and streamlining of accounting and finance professions will become a powerful force in the marketplace, that the internal control perspective will otherwise become important. Maintaining a robust control environment, especially as the speed with which transactions and entries can be processed will only increase, represents a core role and responsibility that financial professionals must evolve into.

Chapter 12 Summary

Chapter 12 analyzes some of the most important ideas and topics for financial services professionals seeking to implement emerging technology. Although blockchain, artificial intelligence, robotic process automation, and other technology trends may be difficult to analyze from an implementation and application perspective it is important for practitioners to remain aware of the trends and directions underway in the space. At virtually every accounting or finance conference or event the topics and content associated with emerging technology tools is also accompanied by predictions of job losses, displacement, and erosion or market position. It is important to understand that technology trends and automation will result in a changing business landscape, but will also create opportunities and openings for forward looking professionals. Taking an objective viewpoint and perspective on the implication of emerging technology is important from both a practice management point of view as well as the ability of professionals to offer advice and guidance to different clients moving forward. Understanding both the technology trends itself, as well as the implications these trends will have on accounting and finance overall are important facts and trends for every practitioner working within the space to remain aware of as these technologies become more mainstream. Technologies may change in terms of labels and acronyms, but the forces and impacts on the professionals landscape will continue to evolve and should be incorporated into the business decision making process across industry lines going forward.

Reflection Questions – Chapter 12

1. Based on the reading of this text, and your current understanding of emerging technologies, does it appear that these technologies will benefit of harm the financial services landscape?
2. How are you, from an individual and institutional perspective, adapting to the changing technology and financial services landscape?
3. What trends and forces appear to be most important to your individual firm as emerging technology trends, including those mentioned in this text, seem to be having a larger impact on the professional landscape

Supplemental Readings

1. Forbes – The 50 Largest Public Companies Exploring Blockchain – https://www.forbes.com/sites/michaeldelcastillo/2018/07/03/big-blockchain-the-50-largest-public-companies-exploring-blockchain/#2697feaa2b5b

2. Innovation Enterprise – The Implementation of Blockchain in the Energy Sector–https://channels.theinnovationenterprise.com/articles/the-implementation-of-blockchain-in-the-energy-sector
3. Cointelegraph – IBM Patents Blockchain Implementation to Manage Data for Autonomous Vehicles – https://cointelegraph.com/news/ibm-patents-blockchain-implementation-to-manage-data-for-autonomous-vehicles

References

Campbell-Verduyn, M., & Goguen, M. (2018). A digital revolution back to the future: Blockchain technology and financial governance. *Banking & Financial Services Policy Report, 37*(9), 1–11.

Corson, M. (2016). The future of finance. *Financial Executive, 32*, 6–11.

Culp, S. (2008). Moving the finance team to the future. *Financial Executive, 24*(7), 44–47.

Doran, D. T., & Brown, C. A. (2001). The future of the accounting profession. *Journal of State Taxation, 20*(2), 41.

Gump, A., & Leonard, C. (2016). Blockchain: Regulating the future of finance. *International Financial Law Review*, 1.

Simunic, D. A., & Biddle, G. C. (2019). The big four: The curious past and perilous future of the global accounting monopoly. *Accounting Review, 94*(1), 353–356. https://doi.org/10.2308/accr-10638.

Syeed, N. (2018). Security: Is blockchain voting the future? *Bloomberg Businessweek, 4580*, 43–44.

van Rijswijk, L., Hermsen, H., & Arendsen, R. (2019). Exploring the future of taxation: A blockchain scenario study. *Journal of Internet Law, 22*(9), 1–31.

Yu, H. (2016). What wall street's obsession with blockchain means for the future of banking. *Fortune.Com*, 1.

Audit Implications of AI & Blockchain

13

Some of the most high profile work that has taken place, especially as it pertains to the accounting subset of the financial services landscape, is the work that has taken place linked to audit and attestation work. The audit process, as currently constituted, is an almost perfect fit for the increased efficiency and automation provided for by a variety of blockchain tools. Audits, and these similarities tend to exist across geographic and firm lines, tend to contain several of the same core components. An engagement letter is composed, outlining the services to be provided by the external audit organization, including but not limited to the testing of certain assets, verification of financial statement amounts, and then the issuance of an opinion based on these amounts. Even with these tests and analyses, some of which may be quite sophisticated in nature, there is a fundamental time lag issue that usually remains unaddressed despite how efficient the audit process is. Put simply, the amount of time that passes between when the data is actually generated or produced, and the time that the audit actually occurs can stretch into months. Even with interim work, or work performed at different times during the year, there is still often a substantial lag between when data (and potential errors) happen, and when that data and potential errors are reported to management. The figure below represents areas in a financial transaction (trading) in which potential audit and attestation implications will arise, and can be aided by the implementation of emerging technologies (Fig. 13.1).

This might seem like a redundant or not all that important aspect to factor into the analysis and conversation, but actually is a fundamental change in how information is processed and reported to the marketplace. Even with current automation and associated efficiencies the fact remains that financial information is not usually reported or analyzed in a real time manner. From the smallest organizations operated by individual practitioners to the largest and most global firms the month end closing and reporting process can take days if not weeks. Such a delay in the reporting of information can lead not only to omissions of important data, but also open the door for fraudulent activities to be undertaken by unethical actors. Additionally, and bridging the gap between the current financial markets and emerging

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_13

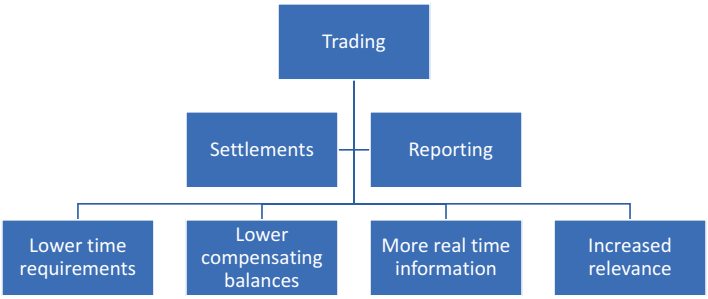

Fig. 13.1 Areas where emerging tools can assist the audit process

technologies is that, as data can be processed and reported on a more continuous basis, it also raises the potential of fraud happening on a continuous basis as well. Audit, attestation, and assurance services depend on the ability of the practitioners involved in the process having the capability to examine and analyze the information associated with the organization (Drew 2018). If, however, these pieces and aspects of information are stored and positioned on systems that operate, approve, and validate the data with minimal or virtually no human involvement this will also lead to a fundamental change to audit processes and procedures themselves.

Continuous Auditing

Making the shift, from a function most commonly associated with compliance based work to a forward looking partner and strategic advisor will require that some of the underlying tasks and processes currently performed by financial professionals must change. The concept of a more continuous auditing and attestation is not a new desire for either auditors or management professionals, but the rise of automation and AI tools makes such continuous work increasingly possible. At the end of the day, regardless of industry affiliation or geographic location, the leaders and management professionals require high quality information to make decisions. Even though strategy and strategic planning may initially appear to be a qualitative conversation and event, every strategic investment and choice requires a strong foundation of quantitative information. Financial professionals are uniquely positioned to leverage existing competencies to parse through, analyze, and interpret the virtually endless streams of information that are generated from the ecosystem of sensors, connected devices, and mobile friendly products in place at nearly every organization.

With these large amounts of information generated on a nearly continuous basis, and including both structured and unstructured data, financial professionals need to adjust attest and verification processes to keep pace. In order to provide an appropriate reporting framework and guidance to assist with the decision making process, auditing must not only become more continuous in nature but also more comprehensive (Alexander 2018). Drilling down into what a more comprehensive audit will actually mean in practice is that auditing must also focus not only on structured data (such as reports generated in Excel or .csv formats), as well as analyzing and

verifying data produced from different streams such as that data generated from social media. No matter what type of data and information is generated and what is the focus of the more comprehensive audit, the underlying principle is the more real time data is necessary to making better choices.

A real time analysis of information also seems to indicate that the current construct and operating methodology of reporting is no longer sufficient. Quarterly guidance, issuing statements on a periodic basis, and restricting the flow of information from the organization to the marketplace creates an information asymmetry that is not sustainable in the current business climate. This delay in information and the data communicated from management to marketplace is, over time, being supplanted and augmented via social media. In August of 2018 for example, the co-founder and CEO of Tesla publicly tweeted, via his own Twitter handle with tens of millions of followers indicating a plan to take the organization private. That, in and of itself, would have not been an issue, but in that seem tweet Musk also indicated there was funding already secured. Compounding the potential legal jeopardy of this tweet are previous statements and comment made my Musk indicating a desire to punish and financially damage individuals and organizations who had taken a short position in Tesla. Combining this three forces together has, as of this writing, created a situation in which the SEC is has launched an investigation in this behavior. The ramifications of this specific incident will, of course, be the subject of analysis and discussion moving forward, but also indicates the shift from periodic reporting and disclosures of data to an environment more closely aligned with continuous reporting.

Clearly the shift and evolution toward a more continuous audit function and practice is going to require that audit and attestation professionals be able to not only understand the potential of increased automation, but also the shortcomings that will be associated with this transition. For example, if confirmations of payables, receivables, and other financial balance information are no longer necessary, the basic processes by which data is created and recorded both on the income statement and balance sheet of the client organization will have to be improved. One again simply accelerating the pace with which bad or incorrect data is assembled onto the balance sheet will not improve the results of analysis of the organization. Accounting practitioners, but also any individual or practitioner employed within the financial services sector will also need to be able to balance the potential of technology tools and the realities on the ground. Investors, traders, and other individuals involved in the service areas linked to financial services will also need to be aware of how best to interpret, understand, and report the volume of information compiled and reported by different aspects of the organization.

Implications of Continuous Reporting

At first glance the potential of more continuous reporting and communication of information from the organization to the marketplace would seem to be almost a uniformly good news and piece of information for practitioners. Regardless of

where an individual is employed or what sector of the marketplace an individual practitioner looks to operate within there is always a need for more information, and especially data that is more timely in nature. With these associated benefits and upsides there are, however, several implications that do need to be taken into account as this type of reporting becomes more common. Drilling down specifically there are several implications – with both positive and negative possibilities – that need to be factored into a broader analysis.

First, and something that has been referenced previously throughout this text, is that as more and more of underlying processes are automated and streamlined the need for systems auditors, control specialists, and technology experts will increase. This is directly connected to the primary business use cases for blockchain and blockchain augmented systems, or in other words being able to identify and assess what specific problems blockchain is being used to solve (Gales 2019). Whether it comes to automated trading platforms and strategies – some of which underpin the largest financial institutions in the world, or making sure that data is initially recorded and reported correctly there will be an expectation that financial professionals will take advantage of these tools to improve client service. Especially in a business environment where a headline or single news story can move markets in substantial ways, the cleanliness of information is absolutely imperative. This aspect, the growing importance of data integrity and standardization, also connects to a second implication of more continuous data and information.

Second, the flow of data in and out of an organization on a more continuous basis makes it almost a guarantee that customers will be able to make more well informed decisions. From a value proposition perspective, in effect, customers and clients are more likely to pay for forward looking or advisory based services than current product offerings. This is not an abstract idea or concept, and is already being felt across the entire financial services sector (McNally 2019). Margin compression in trading and asset management have been sending ripple effects in the markets for years, and this is something that will only continue. Frankly as consumers and clients become used to more technological integration into other aspects of there lives, on-demand services, and reduced prices along with these trends, these are driving changes at different organizations. Fees, long a source of revenue and (more importantly) profitability for organizations, are under pressure from an industry and regulatory perspective as well. With these potential challenges and obstacles, however, there is also the fact that clients are willing to pay premiums for advice and guidance that are going to help them moving forward and deliver value to portfolios and other asset strategies. Especially from an accounting and reporting point of view this is already resulting in generating new business lines, service offerings, and also raising the fact that entirely new firms are rising to fill this need in the marketplace.

Tax Reporting

Perhaps one of the most interesting changes and developments that will inevitably arise and drive change in the financial services landscape linked to the broader blockchain and cryptocurrency environment is the importance of tax reporting,

analysis, and information. Cryptocurrencies, although they may have peaked at the end of 2017 with a market capitalization of nearly $800 billion and be trading at much lower levels currently, have certainly attracted large numbers of investors, many of which have generated millions in returns and profits since the cryptocurrency space has been introduced into the marketplace. While individuals and institutions may have become involved in this space at different times, the regulatory landscape overall has only continued to shift and evolve over time, including the role of blockchain and cryptocurrency in the business landscape (Viniak 2019). Numerous regulatory and oversight agencies have weighed in, creating a situation where – depending on what aspect of reporting and taxation a practitioner is interested in – the answer and proposed solution to the tax issues may differ. Prior to drilling down into the differences between tax reporting and analysis that may occupy the time of practitioners, let's take a look at how different cryptocurrencies may be classified and documented.

Security token – boiled down to the core of idea, a security token can – and usually is – treated as the same as equity securities by regulators such as the S.E.C. That said, the core difference between security and utility tokens is that security tokens are similar to stock or company shared held by investors. They would, if not for the utilization of blockchain technology, most likely be issuing direct share or ownership in the organization instead of a security token. That said, it is important to recognize that even though these items may be considered security tokens, and not share themselves, that these items must be accounted for the same way regular share of stock would be reported.

What these means from a reporting, compliance, and income tax perspective is that these items, although they may actually be or represent cryptocurrencies, that they are still classified and treated as property. In addition to the technical specifications and requirements that underpin the ICO process itself, including but not limited to the development and coding of the blockchain platform itself, financial advisors and services professionals must also be able to successfully interpret these items and associated implications. Although these items might be considered cryptocurrencies, attract large amounts of attention and focus from non-traditional investors, the level of fiduciary duty owed to shareholders is the same.

Utility token – in addition to wading through the terminology and technical jargon associated with the blockchain business landscape, it is also important for financial services advisors to be able to understand the business implications and ramifications of what this different terminology means. It may seem like there is a whirlwind of terminology, specific ideas, and applications that are driving change in the business landscape, but it is equally as important for financial services professionals to be able to deliver advice connected not only to the blockchain environment itself, but how the different classes of tokens and options may impact the business itself.

In the context of a utility token it is important to understand that, versus a security token, a utility token does not represent ownership or an equity stake in the organization that is issuing the token. Instead, a utility token gives the investor access to the products or services of organization at a discounted rate. An analogy

that might assist with understanding is that utility tokens are groupons or other forms of coupons that can redeemed to purchase items from the organization at some future date. Once the project itself is up and running, the initial buys and investors of utility tokens can sell tokens to new investors interested in using the products and services of organization.

It is not enough that financial services professionals understand the differences between security and utility tokens; they must also be able to explain these differences to clients in a manner that makes sense. Especially in a business environment and landscape where information is widely distributed than ever before it is critical that financial professionals not only fill the role of subject matter expert, but also one of interpreter and translator. Simply put, clients and customers – be they internal or external in nature – are going to be depend on the advice and guidance that financial service professionals provide in these emerging areas.

Tax Guidance and Implications

Given the political environment both in the United States and globally, especially the rise of populism – in whatever specific form it manifests itself within – the implications for financial services and information are profound. Specifically, there are different proposals that have been put into practice, and other ideas and concepts that have been launched in preliminary stages that are directed at taxing the wealth and assets of individuals. In addition to taxing the income and earnings of individuals and organizations, which is relatively straight forward and well established (despite the various loopholes that do exist), this presents an opportunity for blockchain to assist in the collection and reporting of information. The taxation process related to income has, as surely financial professionals area aware of, recently did change significantly in the United States with the passage of corporate tax reform of 2017. Individual and corporate tax reform, reporting, and collection also requires the analysis, reporting, and distribution of information between a number of different parties and institutions. What this means from a practical perspective, however, is that accounting, financial, and tax professionals are going to need to also factor into the integration of blockchain technology into new and emerging taxation issues.

One of the most challenging issues with implementing new tax policies – regardless of whether or not an individual or organizations are supportive of said policies – is the ability of practitioners to integrate new sources of information into current and proposed tax regimes (Gibson and Kirk 2016). Drilling down specifically to the implications and connections between blockchain based platforms and technologies and tax reporting and information, let's take a look at how new and different blockchain based tax systems can facilitate the collection and reporting of information. Two of the most critical and emerging areas related to tax reporting and analysis are connected to various cryptoassets and the proposals connected to taxing the assets or "wealth" of certain individuals. Again, regardless of any individual or organizational opinion on the veracity or appropriateness of these tax proposals it is logical

to conclude that as global wealth continues to increase and different classes of cryptoassets are increasingly integrated into the financial mainstream these are issues that practitioners need to be aware of moving forward.

For example, different cryptoassets that are stored, traded, and distributed via different decentralized and distributed, accounting and financial professionals are going to need to establish protocols and policies for tax reporting and analysis. This is yet another application of AI, automation, and blockchain based tools that can be operationalized to be implemented in tax, attestation, and other financial services practices (Hood 2018) Examples of how this would work from an operational perspective is that, for professionals seeking to advise and offer guidance on tax issues is that certain exchanges and sources of information will need to be established and certified as legitimate sources of data for both reporting and tax information. Additionally, custody procedures and the ability to trace ownership back to original owners as well as anyone who has subsequently purchased these assets will need to be established. Where this actually applies and may offer an opportunity for proactive professionals connects to how services can e leveraged to help financial professionals to advance and develop across the board.

Financial Professionals in a Continuous Reporting World

It is no secret that the vast majority of financial decisions are made by individuals taking advantage and leveraging financial and other quantitative organizational information. That said, and realizing that every situation and organization is unique, the current status and pace of how this data is compiled, analyzed, and reported to the marketplace is increasingly misaligned with stakeholder expectations. Not only do users of the financial statements wish to analyze and examine how the organization is performing, but they also want to see how the organization has achieved these goals. In addition to expecting to be delivered high quality information in a timely manner, it is increasingly expected that organizations will be able to deliver the results of said information in manner that includes other operational metrics. After all, if artificial intelligence tools are being synced up with the internet of things, why should these reams of important data be excluded from the reporting process?

This situation, the availability of information extracted directly from the operations of the organization itself, presents both an opportunity and a challenge for practitioners. This also highlights the need education, both in traditional courses and via continuing education courses, to evolve and keep pace as the business landscape continues to rapidly evolve and change (Decker 2017 & Ng 2019). Clearly one of the most high profile challenges associated with this situation is that the data being produced takes the form of unstructured information, or information that is not presented in an Excel, ".csv," or other standardized financial format. A prime example of how this trend is manifesting itself in reporting dialogues and conversations is the development and implementation of non-financial reporting.

Non-Financial Reporting

In addition to the transition from the traditional periodic reporting to a reporting process more closely akin to a continuous stream of information, it also appears logical to conclude that, as technology tools and processes become more prevalent, that nonfinancial data will also become increasingly included in the reporting process (Mahamuni 2019). While, framed in a traditional sense, the importance of nonfinancial data has been limited due to the lack of standards, frameworks, and consistency across industry lines, that does appear to be evolving. Whether this shift is driven or merely augmented by the technology trends of artificial intelligence and blockchain the underlying shift is clear. As more information and data is able to be analyzed across organizational lines, this does provide an opportunity for financial professionals to leverage existing competencies to directly add value to the decision making process. Simply reporting this information, however, does not in and of itself add value or generate insights for the management team; there needs to be a framework and standards to effectively work within this context. Fortunately, as more data is developed and produced within organizations, there are frameworks and standards increasingly common in the market to help effectively communicate this data. Specifically, and connecting directly to real world examples, there appear to be two shift and fundamental changes in how information is delivered from the organization to the market that align both with increased technological integration and competencies associated with financial professionals.

Chapter 13 Summary

One of the most important considerations and topics that are still evolving as they relate to the marketplace are the audit and attestation implications of emerging technology; just how can these technology tools be employed by auditors or attestation professionals? This is not merely an academic or conceptual question; as emerging technology options are adopted by an ever increasing number of organizations across sector lines there is a definitive need for professionals to be able to attest to the accuracy of the data stored therein. While definitive guidance does not seem to be forthcoming from the FASB as it connects to broader accounting issues, as per a March 2019 public statement the FASB does appear to be working on and defining audit and other attestation standards. Several considerations and facts that are discussed within this chapter include, but are not limited to, how blockchains and other automated technology tools can actually be examined and automated. Specifically, what components and considerations can professionals take to gain increased transparency and better access to the data that are stored and communicated via a blockchain platform. Lastly, and something that still remains an emerging issue are how the continued integration of blockchain technology will change the role of audit professionals. Put another way, if practitioners are more involved with different aspects of blockchain development and implementation, does this violate the duty of independence necessary to complete and engage with audit and attestation work?

Reflection Questions – Chapter 13

1. How will the roles and responsibilities or accounting and attestation professionals change as emerging technology like blockchain and AI becomes increasingly integrated into the profession?
2. Are there are other classes or business archetypes that seem well positioned to leverage these technologies even as professional standards lag?
3. What are the top three (3) items you would like to be addressed from a regulatory bodies, including tax and audit considerations.

Supplemental Readings

AICPA – Blockchain Technology and the Future of Audit – https://www.aicpa.org/interestareas/frc/assuranceadvisoryservices/blockchain-impact-on-auditing.html

Deloitte – Blockchain and it's Potential Impact on the Audit Profession – https://www2.deloitte.com/us/en/pages/audit/articles/impact-of-blockchain-in-accounting.html

FEI – What Impact will AI Have on the Audit – https://daily.financialexecutives.org/impact-will-ai-audit/

Towards Data Science – Better Internal Audits With Artificial Intelligence – https://towardsdatascience.com/better-internal-audits-with-artificial-intelligence-53b6a2ec7878

References

Alexander, A. (2018). Changing tools, changing roles: Technology is driving the audit of the future. *Accounting Today, 32*(3), 10–14.

Decker, M. A. (2017). The evolution of the CPA exam. *Pennsylvania CPA Journal*, 6–9.

Drew, J. (2018). Paving the way to a new digital world. *Journal of Accountancy, 225*(6), 32–37.

Gale, S. F. (2019). Chain reaction: Blockchain projects are going mainstream. But they must deliver real-world benefits. *PM Network, 33*(4), 30–41.

Gibson, C. T., & Kirk, T. (2016). Blockchain 101 for asset managers. *Investment Lawyer, 23*(10), 7–14.

Hood, D. (2018). Brace yourself for AI & blockchain: There's less threat and more opportunity in emerging technologies than many think. (cover story). *Accounting Today, 32*(1), –1, 31.

Mahamuni, A. (2019). How to unleash blockchain into your supply chain: Blockchain-based applications provide transparency and visibility throughout the entire supply chain. *Material Handling & Logistics, 74*(1), 21–24.

McNally, J. S. (2019). Blockchain technology: Answering the whos, whats, and whys. *Pennsylvania CPA Journal*, 1–6.

Ng, C. (2019). Blockchain in the accounting curriculum. *Pennsylvania CPA Journal, 90*(1), 14–15.

viniak, V. (2019). Beyond cryptocurrency: blockchain as a value creator & connector. *Supply Chain Management Review, 23*(1), 26–29.

ESG & Other Emerging Technology Applications

14

Integrated Reporting

Integrated reporting, at the basis of the idea, is a comprehensive reporting framework that reflects both the increasing interest from stakeholders in understanding both how an organization generates results, but also how these results are created (Zhou et al. 2017). Without diving too much into the technical weeds and details associated with integrated reporting, it can be summarized as a methodology to report financial and operational data to external stakeholders. The core of this reporting framework, which has been adopted by a variety of organizations across industry lines on an international basis, can be summarized and highlighted via the multiple capital model. Even the name of the multiple capital model itself appears to connect the concept of more comprehensive reporting to the financial services profession, and includes a wide variety of information. Drilling down into the multiple capital model itself is logical, both from a tactical approach for financial services professionals as well as a strategic headset (Fig. 14.1).

Prior to examining the individual components of the multiple capital model, however, it appears important to acknowledge just what exactly such a framework may very well mean for accounting and finance professionals moving forward. Traditionally, the view of capital is something akin to a simplistic model only connected to the financial resources and assets at the disposal of the management team. While such a perspective and view point appears logical in nature, especially with the emphasis placed on meeting quarterly earnings targets by the marketplace, that generates an incomplete view of just how organizations are increasingly evaluated. Even sticking to the evidence offered by financial assets, records, and news updates it does appear logical to conclude that there is a growing interest in the following two forces, or rather a differentiated emphasis on what these two forces mean in the current market landscape (Avery 2017).

Financial results are, clearly, the basis by which organizations and management teams are usually evaluated, but that is only part of the story, as any well educated and experienced financial services professional realizes. Specifically, the

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_14

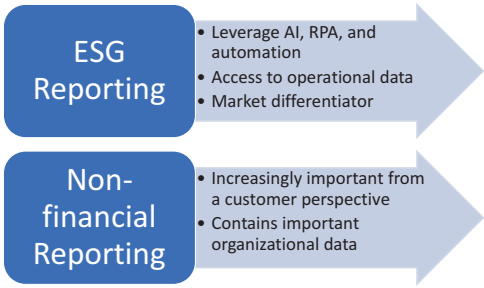

Fig. 14.1 Non-financial reporting & emerging technology

sustainability of operations, including but not limited individual sustainability projects but also the ability of the organization to generate results on a continuous basis, are both of interest to financial and nonfinancial stakeholders. Taking this into account, the development of more comprehensive and robust frameworks to fulfill the needs of end users appears logical (Moy Huber and Comstock 2017). While no reporting framework or methodology of doing business will ever be foolproof, nor address every possible contingency, the shift toward integrated reporting is a logical first step. Technology will invariably assist with this process, the more continuous and comprehensive reporting of data to end users, but it is also important to understand the underlying fundamentals, and be able to compare the data that is reported by any single organization to other comparable organizations (Chender 2019). Stated another way, while tools such as AI and blockchain may very well assist in the gathering and analysis of different types of information, financial professionals will need to understand both the technology and the underlying concepts in order to effectively advocate for, and lead, the necessary changes to keep pace with evolving market expectations.

The capitals included within the multiple capital model include the following categories, all of which are important for financial services professionals to be aware of moving forward.

1. Financial capital – perhaps the most obvious place to start is with the concept of financial capital, which is both familiar to individuals employed in the financial services fields as well as management professionals. Traditionally the primary focus of financial services professionals has been on maximizing, clarifying, and evaluating how effective management is as stewards of financial capital. Clearly financial capital and results will remain important moving forward, but will be augmented by the introduction of new forms of capital.
2. Manufactured capital – at first glance the concept of manufactured capital might seem to only be applicable for organizations who operate in a business that physically makes and produces items. This may make sense at first glance, but such a perspective only represents a partial view of the topic. Manufactured capital, in addition to being applicable for organizations involved in the production of goods, but also would be something that any organization involved in logistics and shipments should be aware of.

3. Natural capital – sustainability is, arguably, one of the hottest topics around for management professionals, market analysts, but is shifting and evolving in response to how the market itself is changing. Sustainability efforts and initiatives, including those connected to the environmental footprint of the organization may initially appear to only be a topic for organizations working in extractive industries. Mining, lumber, oil, and other extractive organizations may appear to be a uniquely qualified fit for this topic, but that only presents a partial view.
    a. Think about the following in the context of this conversation. Every technology organization, even those that rely on wireless connectivity on the consumer facing side, requires large, centralized, and power intensive data centers and locations. The operational and financial impact of these power demands have, in some cases, led leading technology firms to invest in renewable energy to power these same data centers.
4. Social and relational capital – these two categories of additional capital may not seem directly connected to emerging technologies, but that is how these types of capital were even created in the first place. Social media, regardless of individual opinion or viewpoint on the veracity of ideas shared, is increasingly how organizations and management teams interact with the marketplace. Touching on the political environment in the United States following the 2016 election it is also increasingly clear that Tweets and other social media interactions can drive changes both in market price for individual firms and overall market sentiment.
5. Human capital – while the idea of human capital may seem like a topic more closely connected to human resources or personnel issues, this is a class of capital that is directly linked to emerging technologies. Whether it is focused on financial services professionals, or professionals working in other industry groups, the need for continuing education and training is no longer optional. That said, make efficient use of organizational resources and time is a fiduciary duty all financial services professionals are tasked with fulfilling. Training and development have occurred for decades, obviously, but the importance of making sure that the correct employees are receiving the correct training should form the basis of human capital.
6. Intellectual capital – IP, intellectual capital, intellectual assets, and intangible assets continue to form an ever larger percentage of market valuation. Specifically, the percentage of valuation associated of S&P 500 organizations linked to intellectual and intangible assets has increased from approximately a relatively low percentage of market value to well over 50% of their public value in the several last decades. Emerging technology tools, including artificial intelligence and blockchain will only accelerate this shift toward organizational value connected to technology and intangible assets. Leveraging these technologies, taking advantage of the expertise of financial services professionals, and connecting these technologies to market forces will continue to dominate headlines and news both in the United States and abroad.

Now, the inclusion of these different types of capital may seem like an unusual angle to take in a book focusing on emerging technology, but there is one underlying

connection that links together all of these areas. Be it integrated reporting or some other form of more comprehensive reporting, these new models of information communication and disclosure are only possible due to the advances in technology that make the gathering and analysis of information possible (Greengard 2017). The growing interest in sustainability information and data also indicates a realization of the following reality; operational results are what drive financial performance any way. Even in the context of financial services firms, for example, it is increasingly important that management professionals track and evaluate the levels of employee engagement, training, and development. Several specific examples demonstrating that reality of this transition, integrating technology to develop more comprehensive and realistic reporting standards helps to illustrate how these trends are already driving change in the marketplace.

Adidas

Adidas appears to be a prime candidate for the implementation of technology to assist in the development of more comprehensive reporting standards, since the organization does business on a global basis with numerous external partners operating under different regulatory regimes. Despite this apparent fit and alignment with broader and technology enabled reporting goals the management team had to overcome the very same difficulties faced by organizations across industry lines. Namely, how can organizations and management professionals leverage current and emerging technology to both more effectively reporting information and communicate this data in a way is that makes for market participants? The approach embraced by Adidas, and establishing a connection between sustainability reporting, financial results, and the impact of these initiatives on the organization is that sustainability projects are treated as part of a portfolio of efforts.

Partnering with the Environmental Defense Fund (EDF) and treating financial projects and undertakings similar to how other projects are evaluated allowed the finance function to achieve a more prominent role in these broader conversations. Additionally, by using similar tactics and efforts allowed projects that may have not survived or been funded in a traditional conversation to be successful when viewed as part of a broader effort. This success, resulting in millions in operational savings and financial improvements would not have been possible without the appropriate technology to track, monitor, and communicate the results aligned with said projects. Adidas is not the only organization that has, to date, been able to effectively use technology to facilitate the broader based reporting and analysis of information. Nor is this undertaking limited to retail focused institutions in the apparel and footwear space; another household name has also embraced this concept.

Coca-Cola

Coca-Cola is, rather obviously, an organization that has global operations, is tasked with delivering products, services, and information to a global audience and market. In the case of Coca-Cola, however, it was not a sustainability project or portfolio in

particular, but rather an approach closely aligned with the core operations of the business. In the case of Coca-Cola the resource and focus that formed the basis for more comprehensive and technologically enabled reporting was water, and specifically the stewardship of water by the management team at the firm. Partnering with individuals both internal to the firm, as well as external partners – totaling over 300 as this research – the results have been markedly impressive. With hundreds of millions invested, this represents definitive proof that the intersection of operations, technology, and reporting is not merely an academic conversation, but is transitioning to reality.

Although the resources in place an organization with the size and scope of Coca-Cola invariably give it an advantage and proverbial leg up when trying to implement a nice reporting structure, the connection between operations and bottom line results is clear. Having an appropriate mindset and correct strategic approach to embrace a wider array of information is obviously an important step, but the organization must also have the tools in place at the firm to translate this desire into reality. Building that bridge, and linking together the trends of technology integration and increased expectations from the marketplace presents an opportunity for both blockchain and artificial intelligence to create effective use cases. That said, and acknowledging the reality that operational data is important for both management and reporting purposes, there are direct connections that can be drawn between technology trends and other financial data. Specifically, and perhaps one of the most logical places to begin the technology rollout is connected to analyzing the implications of continuous reporting driven by blockchain and/or artificial intelligence.

Consulting Implications of Blockchain and AI

As with any new or emerging technology the opportunities and implications of this tool will not be limited simply to traditional roles, tasks, or responsibilities. In addition to the dramatic impact that these tools may very well on the traditional roles and responsibilities of financial professionals these forward looking applications are certainly something that should be analyzed and understood by practitioners. That said, and in addition to those somewhat obvious changes and developments are the changes and implications these tools and technologies will have on the consulting sphere itself. Consulting and other advisory services represent a lucrative revenue stream for many accounting practitioners and firms so the effect that new and emerging technologies will have in this space is not something that can, or should be, ignored.

Financial services organizations and firms might represent the subset of users that are most interested in the application and utilization of blockchain, but the reality is that this technology is having broad effects outside of traditional financial applications. Specifically the emergence and greater adoption of blockchain and artificial intelligence will create consulting roles, jobs, and opportunities for CPAs and other financial professionals. Consulting, especially in the fields and areas surrounding emerging technology, presents many questions, concerns, and topics that clients need answers to both now and going forward (Sharma et al. 2018). Financial

professionals need to be able to offer and deliver advisory services related to the following areas:

1. Does blockchain make sense for the organization, either now or going forward?
2. If the answer to the blockchain question is yes, what type of blockchain is most appropriate for the organization?
3. How would this blockchain option be introduced to the organization, including the training and educational sessions necessary to update current and future employees?
4. Does the organization have the resources, both financial and personnel-wise, to successfully implement and maintain a blockchain platform?
5. Would artificial intelligence be appropriate for the organization, especially as it connects to the quality of information currently in place at the firm?
6. Are the data processes and procedures up to the level necessary to successfully implement and gain efficiencies linked to AI?
7. Do other AI related processes and concepts such as robotic process automation actually make more sense for the organization in question?
8. Are the documentation and processes linked to current processes well established enough?

In order to deliver consulting services, being able to answer these questions, address the needs of clients and customers, and provide advisory advice throughout the process financial professionals need to understand how these different technologies work and function. That does not mean that financial professionals will need to become technology experts, programmers, or coders, but they must understand how the basic functionality of these different platforms operate and interact with current technologies. Grasping and obtaining this fundamental understanding of the variety of technology options sweeping the marketplace is something that must be taken into account by both practitioners in every aspect of the financial services landscape. In terms of action steps for practitioners to take into account and act on before making any final decisions on these potential areas of new business, they can be distilled down into several following categories.

1. Education and training – to succeed and thrive in a business landscape that is increasingly reliant on professionals being able to effectively leverage emerging technology tools as well as understand the implications of these tools going forward, practitioners need to keep themselves up to date. This goes beyond traditional education, however, and must take into account access to different sources of information on these emerging topics. Open source educational materials, free seminars hosted by industry groups, and leveraging the developments already underway at organizations such as the Big 4 accounting firms represent surefire ways to remain current, relevant, and able to deliver value additive services moving forward.
2. Client communication – even if the practitioners themselves and organizations are well educated and versed in emerging technologies, this expertise and knowledge

must be communicated to clients, both current and potential future customers. Managing this distribution of information, both in terms of technical advice as well informational updates about firm expertise and knowledge is critical for organizations seeking to maintain, develop, and expand market positioning. Developing a communication strategy, honing in on which platform(s) work best for the organization, and making sure clients are aware of this communication process are definitive steps that can be taken without substantial investment.

3. Connect emerging technologies to current practices – One of the most common pain points is that, with all of the emerging technologies sweeping the financial services landscape, it can seem difficult or nearly impossible to connect these topics to existing products or services. Bridging this gap, outlining how emerging tools and platforms can, in face, connect to the current product and service offerings already underway, is a function that should be fulfilled by the financial services staff either in current practices or emerging areas.

Tax Implications of Blockchain and AI

Obviously income taxes are a topic and issue that almost every organization has to deal with, and even in the case of nonprofit organizations that do not have to pay income taxes, there are other types of taxes that must be collected, reported, and communicated to different end users. Returning to the focus of this conversation, namely the preparation and verification of tax information, it is also important to recall one particularly salient fact. Although the passage of the Tax Cuts and Jobs Act (TCJA) occurred at the end of 2017, and was put together and passed into law within the United States, the ramifications of this legislation are going to have to be profound as well as global in nature. Of particular importance to financial services professionals is that, on top of the actual changes to the tax code itself, that some of these alterations are either phased in, phased out, or only applicable to some types of organizations. Drilling down specifically to the two core technology tools analyzed within this book, artificial intelligence and blockchain both appear well positioned to drive changes within the taxation landscape.

Artificial Intelligence and Taxes

With numerous tax software packages and tools, entire organizations, and tens of thousands and individuals tasked with addressing the issues that arise due to tax policy it should be no secret that technology already plays a prominent role in the tax landscape. In spite of these numerous options and tools that already exist, however, they all do tend to rely on the same basic parameters, and do involve a relatively high amount of human oversight. Individual returns can be complicated enough, but when combined with the preparation of business returns, as well as the connections between, the various tax scenarios can become quite complicated. Artificial intelligence and blockchain, in whatever form is eventually adopted by the

organization in question, appears to be a logical tool to adopt in an attempt for financial professionals to get a better handle on tax issues.

At the end of the day, the tax code and tax policy are an amalgamation of policies, concepts, and guidelines that require both analysis and interpretation. As mentioned previously, entire firms and organizations exist exclusively to service the needs of organizations seeking to better understand and contend with the changing regulatory background it makes sense that technology will play a more prominent role. Complications associated with tax law and tax policy are not an unusual or one-off event, but rather are part of how organizations must be managed and led in the marketplace. Drilling down to the direct connection between artificial intelligence, tax reporting, and the financial services profession there appear to be several different areas where this intersection becomes most evident.

1. Reduction in time delay – one of the most often areas in which financial services professionals cite as an issue, and one that is echoed by management professionals, is that there is a significant time delay between organizational data is produced, and when it is available for external users. Whether it is associated with regular financial reporting, the auditing and attestation of various types of data, or the preparation and dissemination of tax information, this delay represents a substantial area for improvement.
    a. Let's look at an example here, and one that is especially important in the current market environment; online sales and the associated taxes aligned with online business and e-commerce. Even though sales may happen, from a consumer perspective, in real time, the settling and reporting of sales and use tax data is, at best, an opaque and time delayed process. With the installation and implementation of AI tools, the sheer processing power of these platforms can help reduce the confusion and lack of transparency surrounding these areas.
2. Improved collection of tax revenues – although not usually perceived as a benefit or a positive aspect of financial services work, the payment of different types of taxes is a fundamental part of the business. In addition to improving the efficiency with which taxes are collected at a local, state, and national level, there is a definitive benefit of this increased efficiency as it connects to the practitioners and organizations that employ them. Even after the passage of the TCJA at the end of 2017, a common point of contention among market actors is the following reality; even though the headline rates and implications associated with tax rate are presented at one level many organizations do not pay those statutory rates.
    a. In addition to providing revenues to governmental entities that enable them to more accurately fulfill duties and expectations, increased transparency associated with income taxes can also help the perception with which organizations are analyzed. Put another way, increased transparency and effectiveness associated with income tax preparation and the paying of income taxes can, in addition to providing much needed resources for governmental activities, can also help burnish the reputations of different organizations.

3. Blockchain and real time information – one the biggest pain points and concerns as it is related to different tax reporting and analyses is the fact that there is usually a significant time delay and lack of timeliness with the communication of data between taxation entities. The utilization of blockchain, regardless of what specific platform is put into place at the organization, allows information to be communicated and disseminated in an encrypted and continuous basis. This also connects directly to another quantifiable benefit of blockchain technology; the reduction of time spent confirming and verifying different sources of information.
    a. The preparation of tax returns and other tax reporting documentation occupies valuable time, and this process is even more time consuming when framed in the context of changing tax codes and regulations. For example, for organizations with operating on a global basis, which in the current environment can include any organization with a reliable internet connection, the preparation of tax documentation can take weeks.
        i. The recording and translation of local currency transactions, for one, can take time as the financial professionals need to account for both individual transactions and the consolidated financial statements as a whole. Subsequent to this work, and only after this translation has occurred, can the income tax components of the process begin to be addressed. In a global business environment this not an academic concern but rather something that has financial implications that total trillions of dollars.
4. Cross border tax transactions – the vast majority of tax transactions occur either between organizations that are doing business overseas, or that conduct business transactions between different divisions of the organization. In terms of global valuation and development, the nominal value of these trade transactions is worth tens of billions of dollars to both the organizations in question as well as the client advisory services offerings able to be offered in this environment. Specifically this represents a definitive and tangible effect of how artificial intelligence can be applied to address current business issues that can cause issues for even the most sophisticated organizations in the marketplace.
    a. In addition to saving dollars in terms due to the efficiencies generated via a more automated and digitized tax reporting and collection process this also provides the organization an opportunity to redeploy resources within to more value additive tasks.
    b. Decreasing the amount of time, paperwork, and manual labor that is involved in the preparation of tax returns at a multinational level might very well also increase the ability of national governments to collect taxes in an efficient manner.
    c. It is important to note and acknowledge the reality that this is not simply an academic or theoretical conversation, but is something that is already underway in some non-U.S. markets. The connection between blockchain technology, artificial intelligence to parse through large amounts of information, and the capability of these tools to help improve the efficiency of data analysis is already generating benefits in several markets.

Sector Specific Functions

One of the most powerful areas in which financial services professionals can add value in terms of blockchain, artificial intelligence, and other emerging technology functions is the development and refinement of sector specific and industry driven platforms and standards. Specifically, public accounting firms and the employees therein should attempt – if at all possible – to harness emerging technologies to redefine how firms function, and how firms engage with clients throughout the year (Eisenstaedt 2019). Blockchain, for example, is a wide ranging and broad based technology application that has implications and potential across multiple industry lines, but there remain many open items, questions, and areas of concern as organizations seek to implement and refine blockchain based or blockchain augmented solutions. Every sector of the economy is obviously different, and each organization is different, facing different opportunities and challenges, but there are considerations that need to be addressed if financial service professionals wish to enter this lucrative market area.

First and foremost, an assessment of current industry risks and challenges must be assembled, which may both include general items as well as company specific issues. Of particular note for an assessment of industry to be comprehensive is the reality that – as of this writing and publication – the regulatory landscape as it is connected to these areas is still evolving. Data privacy considerations are discussed throughout this text, but analyzing broader rangers of changes and information are additional options for financial professionals. Offering advisory services requires that financial professionals understand not only the technical implications of emerging technologies, but also how said technologies may very well change due to the integration of said solutions. Without proposing the following as an exhaustive or all inclusive listing, there are the following items and considerations that apply to the following industries.

Delivering these advisory services and insights is an important part of the role that financial services professionals currently play, and should form a role for future services augmented by technologies.

Real estate clients. Perhaps one of the most common analogies or thoughts that arise when analyzing the real estate industry is the amount of paperwork and counterparties that are involved. Between the mortgage originators, commercial lenders, lenders and financiers to individuals, lawyers, realtors, title search agencies, and the real estate purchasers themselves the amount of paperwork and back and forth can rapidly become immense. Placed squarely at the center of this web of intersected parties is the reality that the financial implications and ramifications linked to real estate transactions can be quite large. While financial professionals will not play a leading or dominant role in the real estate process going forward, they can, and should, be involved in assessing control, financial and logistical issues with blockchain integration in the real estate space. Benefits and opportunities connected to increased blockchain technology can be accrued by virtually every party involved in a real estate transaction, even if those benefits are limited to paperwork reduction at the current state.

Insurance customers. It may seem like the insurance field is mentioned numerous times throughout this book, but that is because an industry such as insurance is almost tailor made for blockchain implementation. At the core of the idea of insurance is that it is a series of contracts and agreements made between unrelated parties or institutions that entitles one party (the insurer) to consistent compensation to finance payouts that the other party (the customers) is entitled to if certain conditions are met. In addition to the fiduciary duty that is embodied in any financial institution in charge of managing funds on behalf of others, insurance contracts and organizations also must deal with a fundamental lack of trust involved in the underlying business process. While fraud represents a relatively small percentage of total claims filed on an annual basis, the total amount estimated to be paid out in fraudulent claims totaled billions of dollars during the last several years. On top of the obvious financial implications and bottom line costs associated with paying out of fraudulent claims, the possibility of said fraudulent claims also increases the complexity and cost of the insurance payout process immensely.

Establishing a common platform or even an industry specific blockchain platform or set of protocols to govern insurance policies and regulations is somewhere financial professionals can certainly deliver value. Even as insurance organizations have launched blockchain based programs and models, many of said projects remain in the pilot or introductory stages. With the amount of capital put to work on behalf of the insurance organizations, coupled with amounts being invested into the blockchain arena alone it is logical to conclude that such implementation and development will continue. Specifically, and linked directly to blockchain itself, the continuous sharing and encryption of information between stakeholders in the insurance will reduce a large amount of the electronic float that can delay payouts linked to valid claims. Advising and offering services linked to data sharing regulations, building and testing automated payout processes via smart contracts, and developing protocols to invest the newly freed up capital due to the increased efficiency generated as a result of blockchain implementation.

Food logistics and shipping. With the all too often headlines linked to food contamination, poor communication, and the lack of ability to trace back goods and good services back to the point of origin represent clear issues that must be addressed going forward. This also represents an intersection between how technology forces may be driving innovation directly with the financial services profession as well as being driven by implications and applications outside of the finance space. In the U.S. alone the food and restaurant industry is worth billions and employees tens, if not hundreds of thousands of people so the total potential market for advisory work in this space is significant.

That said, one of the common pain points that can often arise when attempting to change or augment technology solutions affiliated with a certain industry subset or sector is internal control implications and operational logistics of doing so. Specifically, the sharing of information and data between different stakeholder groups may be common in some situations – such as between Walmart and suppliers – but may not be common between other firms and suppliers. Layering blockchain solutions and protocols on top of and alongside current technology solutions

such as RFID and EDI may seem contrary to the underlying promise of blockchain technology, but upon further reflection is apparently logical. This raises another issue that must be addressed during any consultative engagement; the reality that organizations have already invested millions – if not billions – in developing and maintaining current technology solutions. Introducing blockchain as a complementary and incremental solution, especially at first, may help lessen and reduce the potential push back and budgetary questions that may very well arise during such a robust technological implementation.

Risk Assessment Services

One potential area that is overlooked, in addition to the costs that are an inevitable part of the conversation, are risk assessment protocols and services that are going to have to be implemented across the financial sector at large. Obviously this text has touched on the implications for internal controls and automated trading, but in addition to those rather obvious implications of blockchain there are number of different services and functions that should be developed, built out, and expanded as more technology tools become increasingly mainstream. What is also important to note, however, that as technology tools become more sophisticated and robust, that the roles, challenges, and opportunities will change over the coming years.

For example, in terms of the financial system and institutions at large, risks connected to blockchain and other emerging technologies such as artificial intelligence must be a part of any financial conversation. No matter where a CPA, financial advisor, or other financial services professional works within different organizations or advisory aspect of the finance field there is going to be contact and interaction with banks and other financial institutions. Without diving too much into the technical weeds of how the banking system functions – that in and of itself is an entire book on its own – there appears to be a 2-track system developing and becoming entrenched as a result of these emerging technology tools. While it is not always a bad thing to have a dual track system, or different options for individuals and institutions to utilize, these differences can have an impact on the services and advice professionals can offer to clients.

Traditional banking institutions, many of which are household names, have – after tentative interest and adoption – begun to move into the blockchain and cryptocurrency space with significant enthusiasm. What this has resulted in is the development of different types of blockchain based applications and models, particularly those that modify the original proof of work methodology and consensus based process for approving and distributing information stored on a blockchain platform. Ultimately what this may result in, which would undermine some of the initial enthusiasm and hopes for the ecosystem as a whole, is the creation and entrenchment of siloed blockchain and cryptocurrency based platforms. Drilling down specifically this might actually undo, and potentially replicate, some of the very issues and concerns currently cropping up around the sharing of other types of intellectual property and quantitative information.

Based on information available as of this writing the internet and broader financial system does appear to experiencing trends and forces that may very well push it toward increased fragmentation. Clearly there are nefarious actors and rogue nations that are, with purpose, excluded from certain financial tools and systems, but even in the case where that is not always true there does seem to alternate structures being formed. Regardless of an individual or organizational opinion on the veracity of these different options, or the underlying cause driving the development of these new systems. Increased fragmentation in the global finance and trade system, no matter what the underlying political or geo-political positions of the countries or organizations involved does point to something that might underpin the very concept of blockchain; decentralized and distributed storage and sharing of information. Returning away for a minute from the broader global financial implications and focusing on sector specific applications and effects, there is a distinction and differentiation that seems logical to conclude.

In terms of the blockchain and cryptocurrency ecosystem there are distinct and different business models that seem to evolving and developing alongside one another as the blockchain and cryptocurrency ecosystem and business model continue to develop and become more integrated into mainstream financial conversation. For practitioners seeking to offer any level of advice or guidance related to cryptocurrency or blockchain services it is important that these individuals and associated organizations become familiar with the different business models. Trusts, most notably the models launched by Fidelity and Coinbase, have seem to have taken point position and leadership spots in the arena of offering different blockchain and cryptocurrency services from a financial services perspective. From an outside point of view, including the perspective that many clients and customers may very well have, there may not seem to be any difference between trusts and other types of banks or financial institutions, but there is one powerful different that must be taken into account. Trusts, even those as large and sophisticated as Fidelity and other global giants, must apply for trust licenses to operate across state lines. Put differently, if a trust wants to offer trust services related to blockchain and cryptocurrency they need to apply for trust licenses across states lines. Discussed in more depth later on in this book, the trend and market dynamic does appear to be shifting from a trust based model to one more closely affiliated with banking institutions.

In February of 2019 this shift took a high profile turn when JP Morgan, one of the largest and most sophisticated financial institutions and banking groups in the world, launched an in house cryptocurrency to settle commercial transactions. Additionally, and leveraging the interest from both a commercial and regulatory perspective stablecoins, this coin – the JPM Coin – will also be pegged and redeemable for one USD. What this means from an application and implementation point of view and perspective is that these coins (or tokens) can actually be used to settle transactions that are part of the current financial system. It is true that such a partnership and coordination might be against the core ethos of original blockchain adopters, but it does seem to be the way that the overall ecosystem is shifting. It remains, of course, to be seen if the adoption of cryptocurrencies and tokens by major financial institutions actually does take off and become mainstream in nature,

but this development does point to the. Stablecoins, by the very nature of the asset and coin itself, does seem to address a core issues that has, to date, prevented adoption by financial markets and institutions. While the initial blockchain model that will be utilized by JP Morgan to underpin the cryptocurrency marketplace may actually be much slower than the current model utilized by the DTCC it does point to an interesting development in the broader blockchain ecosystem and space.

As more enterprise based and ready solutions and products make way to the marketplace it is also important that financial professionals can play the role of intermediaries in the transition phase as organizations shift away from traditional systems to blockchain based solutions. Maintaining control over both the underlying processes as well as the information impacted by these processes is something that cannot be overstated as a responsibility and fiduciary responsibility of accounting and financial services professionals. This may seem like an unusual role or task for employees associated with CPA, CFA, or financial advisory roles, but is something that needs to become part of the conversation. In addition to helping organizations and the individuals employed therein understand the implications of new technology systems, there is also a role to be played for these same professionals being tasked with explanations and assisting internal and external clients understand more comprehensively the implications of these changes that are already happening inside and outside of firms.

Blockchain Definition and Standards

Another area in which financial practitioners should play a leading role in the professional conversation and dialogue is the refinement of blockchain standards and definitions. Whether these definitions and standard settings are linked directly to existing services and product offerings or if they are connected to emerging topic areas is not as important as who is providing these services to clients. As of this writing there is very limited authoritative or definitive guidance that has been issued either by domestic or international accounting bodies or industry groups. A dearth of official guidance represents both a challenge and opportunity for practitioners across different subsets of the financial services landscape. From the perspective of a challenge it means that clients – as well as practitioners – are working with incomplete or even inaccurate information as implementation projects are launched and developed, including bonds, networks, and other types of data (McLellan 2018). Establishing working definitions and models, however, requires that practitioners be able to articulate and explain what exactly these emerging technologies are, what they represent and how they connect with broader industrial and sector shifts.

A recommended tactic and strategy for both individual practitioners and firms seeking to help establish working definitions and terminology to increase the clarity in the space is to join industry or professional groups doing work in this area. The phrase thought leader or thought leadership may be on the verge of being overused in the current marketplace, but as it connects to items such as blockchain and artificial intelligence it does appear to represent an opening and opportunity for

practitioners. It is appropriate to mention that, as with any industry or professional association, that taking into account the possibility of conflict of interest and collusion allegations are items that need to be taken into account and documented. As long as these items are appropriately considered and classified, there is no reason why financial professionals cannot deliver value to the marketplace in such a manner.

It is also important to realize that anytime financial professionals offer advice or guidance, and especially if these pieces of advice are offered outside of the traditional areas of accounting and finance, there is a risk of exposure and/or liability. Especially in a business environment that, and particularly in the United States, is framed and categorized by the litigious nature of organizations this is something that cannot be overlooked. As demonstrated by the Big 4 accounting firms as well as many of the largest financial institutions in the world, all of which offer advisory services and have entire business lines and divisions built around offering these services, offering advisory services in such a litigious environment is difficult but not impossible. Even more important to the current conversation, and drilling down to a core point and piece of information driving change and disruption within the broader financial services landscape. Technology tools such as blockchain, robotic process automation, artificial intelligence, and cryptocurrencies present an array of opportunities and options for accounting and finance firms, but are also laying the groundwork for the fundamental restructuring of how services are provided. This is already occurring, with other technology and fintech firms beginning to muscle into many of the traditional roles and duties filled by accounting and finance fiduciaries.

One strategy that organizations and individuals can use to combat the encroachment of other organizations into traditional service areas would be to ignore the ascension of other firms, but that is neither sustainable or logical. As indicated by news headlines linked to the large financial institutions, brokerages, and accounting firms an alternative strategy is becoming increasingly common. With numerous accounting organizations offering advisory services linked to digital assets and blockchain, banking organizations issuing in house cryptocurrencies and blockchain based services, and firms like Ripple presenting a hybridization.

This leads to an additional point of emphasis and potential value service that many financial services professionals may have previously overlooked in the hustle and bustle of embracing emerging technologies. Corporate training, education, and development may have traditionally been perceived as a qualitative, optional, or otherwise non-core aspect of the services and value provided to the customers and clients, but that misses the broader opportunity that lies in this area. Although most, if not all, accounting firms and practitioners are members of various industry or sector organizations, there does appear to be a mismatch between the services provided by many of these industry organizations, and the needs of the firms themselves. In order for organizations to effectively leverage and maximize the technical capabilities of emerging technologies such as artificial intelligence, blockchain, and robotic process automation there are two distinct areas in which many practitioners and firms need to improve.

First, in order to use and make the most of these tools the individuals employed at various firms, as well as the firm leadership itself, need to be aware of what

exactly these tools are and how they function. Again, while it does not appear to be necessary that financial professionals will have to become programmers or technical experts, it will be necessary for those same practitioners to understand the fundamentals of these different tools. For example, practitioners will be able to articulate and communicate the differences between the various blockchain options including but not limited to public, private, and hybrid blockchain models. Each type of blockchain has positive attributes, negative qualities, and factors that must be assessed on a firm by firm basis. In addition to analyzing these traits and characteristics prior to implementation and adoption, it is also important for practitioners to maintain and track the process made by during the blockchain implementation project. As the project and initiative gets underway and begins to reach fruition another facet of blockchain technology must be assessed; the integration and intersection of blockchain with existing technology platforms and processes. Despite the possibilities and opportunities delivered via blockchain technology and platforms, it is critical that the intersection, bridges, and portals between blockchain and other technology platforms be maintained, updated, and reconciled as the inevitable changes occur.

Artificial intelligence, as difficult as it may be to believe, may even have received more hype and buzz than blockchain itself, and this is due to a contradiction that seems to exist in the marketplace. While AI may have been in the mainstream media and commercial conversation for the last several decades, there does appear to be a gap between the expectations that are associated with AI and what current AI applications and tools are currently capable of actually doing. Put simply, practitioners may have to play the role of both educator and reality check in conversations with both internal clients and external customers both current and future stakeholders in the marketplace.

Chapter 14 Summary

Chapter 14 drills down into a trend and force that has appeared to emerge alongside the rise of greater technological integration across both accounting and non-accounting liens; the importance of ESG and other sustainability reporting. Integrated reporting is a global trend that has attracted thousands of organizations, billions in investment, and numerous accounting organizations generating standards. This chapter dissects this trend, including both a technical and informational breakdown, as well as examining how different types of technology tools are changing the types of reporting that clients and investors expect from organizations. ESG reporting, including integrated reporting and benefit corporations, are potential game changers from a social responsibility, corporate governance, and reporting perspective. Emerging technologies such as blockchain, AI, and RPA are game changers in and of themselves, but are even more powerful when leveraged to compile and distributed such important and comprehensive reports such as integrated reporting.

Reflection Questions – Chapter 14

1. What is an integrated report, and how does it differ from a traditional financial report
2. Name the six (6) capitals and think of how the descriptions provided in this book might also apply to your business or firm?
3. How do you think greater ESG investing will change, if at a11 the capital allocation process among institutional investors

Supplemental Readings

Integrated Reporting – https://integratedreporting.org/
The International Integrated Reporting Council – Integrated Reporting – http://integratedreporting.org/resource/international-ir-framework/
PwC – ESG: Understanding the issues, the perspectives, and the path forward – https://www.pwc.com/us/en/services/governance-insights-center/library/esg-environmental-social-governance-reporting.html
Investopedia – Environmental, Social, and Governance – https://www.investopedia.com/terms/e/environmental-social-and-governance-esg-criteria.asp
Forbes – ESG Reporting Reshapes Global Markets – https://www.forbes.com/sites/christopherskroupa/2017/04/24/esg-reporting-reshapes-global-markets/#6870c99a5d5e
Adidas–http://business.edf.org/blog/2013/05/03/did-you-know-that-the-adidas-group-has-a-sustainability-venture-capital-fund
Coca Cola – https://www.coca-colacompany.com/stories/about-water-stewardship

References

Avery, H. (2017). The stewardship revolution: Esg-focused asset managers finally grasp the power of their proxies. *Euromoney, 48*(584), 38–44.
Chender, L. (2019). Nasdaq Nordic launches first ESG index future. *Global Investor*, N.PAG.
Eisenstaedt, L. (2019). Among the ways accounting firms can stay relevant: Embrace AI and soft skills; kill "Busy Season" mindset. *Public Accounting Report, 43*(3), 5–7.
Greengard, S. (2017). CIOs are turning to Blockchain technology. *CIO Insight*, 1.
McLellan, L. (2018). World Bank grabs A$110m with first public blockchain bond. *GlobalCapital*, N.PAG.
Moy Huber, B., & Comstock, M. (2017). ESG reports and ratings: What they are, why they matter? *Corporate Governance Advisor, 25*(5), 1–12.
Sharma, D. S., Sharma, V. D., & Litt, B. A. (2018). Environmental responsibility, external assurance, and firm valuation. *Auditing: A Journal of Practice & Theory, 37*(4), 207–233. https://doi.org/10.2308/ajpt-51940.
Zhou, S., Simnett, R., & Green, W. (2017). Does integrated reporting matter to the capital market? *Abacus, 53*(1), 94–132. https://doi.org/10.1111/abac.12104.

Cybersecurity & Insurance

15

A related conversation and potential area of revenue and advisory services that financial services professionals may have traditionally overlooked is the importance of cybersecurity advisory services in a business environment that is increasingly digitized. Cybersecurity policies and training may have, in the past, focused on ensuring that the organization had in place sufficient password controls and safeguard to protect data against unauthorized access to client information and ensuring that anti-virus software was kept up to date. While these are still, rather obviously, still important for every organization, they now simply represent a good starting point in the conversation rather than the end point in the debate. Stated differently, cybersecurity has moved beyond merely an IT or technical concern, and is increasingly a concern for the entire organization at large (McLane 2018). None of this is news, however; every professional is going to be aware of just how important data integrity and cybersecurity it. Let's connect this trend and topic area to the same topics we have been discussing throughout this book; blockchain, artificial intelligence, and cybersecurity tools (Fig. 15.1).

Blockchain may be a potentially paradigm shifting technology tool and platform that can revolutionize almost every aspect of the financial services industry, but at the end of the day it is simply a technology tool like any other. With that context in the mind, and taking into account that some of the strengths of this technology may also become weaknesses given the situation, several areas of consideration being to crystallize. First and foremost, which individuals and institutions actually have access to the underlying code, which is after all how blockchain functions. Despite the other applications and iterations of blockchain that have entered the marketplace, at the core of the idea the functionality of blockchain is driven by the programming and coding language. Given the reality that many organizations will simply not possess the internal expertise to build and develop these tools internally, how are the external consultants and advisors vetted? For example, if consultants or advisors were brought into consult and help develop different engineering processes those plans and processes would be safeguarded with both electronic and physical

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_15

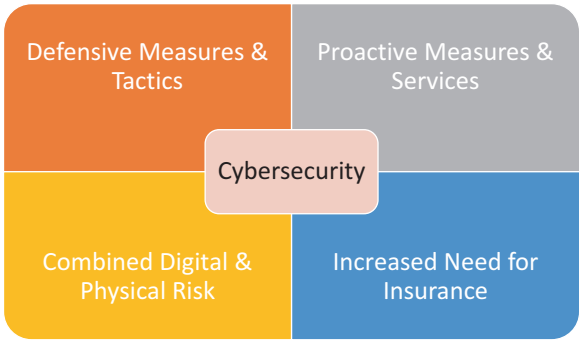

Fig. 15.1 Cybersecurity implications connected to emerging technology

controls; the security processes around the IT team working on blockchain development should be any less.

In addition to the controls and policies that are in place to regulate and control the access and custody of coding and programming language, there is also the fundamental issue that employees need to be trained and developed in order to use these news tools, including blockchain. Like any other new tool or device, and in order to accrue the benefits of using such a technology tool and system, individuals and teams must know both how these tools function and how these tools can be applied across the proverbial board (He et al. 2018). Without establishing training and development programs for employees, it is reasonable to forecast that tools such as blockchain will not only not be realized, but that such tools may actually increase inefficiency and errors throughout different processes and procedures.

Artificial intelligence may indeed represent an advancement toward increasing institutional compliance, record keeping, and real time monitoring of information, but that does not mean that internal controls or insurance policies are less important given these developments. In addition to understanding what specific class and category of AI is being implemented, or if it is even AI at – versus RPA or other automation platforms – there are additional considerations that need be factored into the advisory conversation. Technology can only amplify and accelerate the current processes and policies that are in place, and will have no impact on the underlying processes themselves. Particularly and especially important in a business environment and landscape where information and data is increasingly treated and classified as a critical organizational asset, the importance of instituting and maintaining proper controls over the flow and dissemination of information between stakeholders and partner organizations cannot be overstated (Banham 2017).

For example, and something that should appear rather obvious but is all too often overlooked, is the documentation and testing of said documentation. Documentation has been discussed throughout this text previously, but the underlying process and importance of documentation was not discussed in as much detail. Specifically, and following the documentation and publication of processes under consideration for automation, these processes need to be tested, analyzed, and compared. While artificial intelligence, robotic process automation, and other automation processes and procedures may not represent traditional roles and responsibilities for accounting

and financial service professionals, they do augment and expand roles and duties linked to internal control, information system integrity, and updating these roles and processes over time.

Additional topics and considerations that are connected to the topic of internal controls, cybersecurity, and emerging technologies also include the burgeoning area of cryptocurrencies. It is true that, as of this writing, the market capitalization of the cryptocurrency space at large had lost the vast majority of its value, as denominated in fiat currencies, institutional interest and investment had continued to increase. Be it Fidelity, Coinbase, or other mainstream financial institutions investing both people and financial capital into the space, this trend and fund flow also creates a potential issue in terms of controls, security, and risk management. This, however, is differentiated from other emerging technology areas such as blockchain because it has implications for clients as well as the firms themselves. In addition to offering a variety of advisory services and advice linked to cryptocurrency accounting and reporting, financial services organizations may offer be accepting payment or maintain custody over cryptocurrency assets.

Maintaining and safeguarding the custody of a swatch of different cryptocurrency assets and associated personally identifiable information also represents an entire new realm of considerations, opportunities, and concerns that may not have otherwise be a factor. In terms of maintaining cash balances the processes and controls around these assets are well established, grounded in cross industry policies, and reporting frameworks. Cryptocurrencies, on top of the underlying technical fundamentals that require education, training, and development, also can pose a challenge from a control cybersecurity and risk management perspective. Although these new technologies do pose challenges, they also present opportunities for motivated and proactive CPAs seeking to capitalize on growing client interest and adoption (Brazina et al. 2019). Expanding upon this fact below, there are several considerations and points that – in addition to providing potential service and revenue lines for practitioners – are also fiduciary responsibilities. These considerations, pain points, and potential obstacles include, but are not limited to the following:

1. Custody and control over private keys is paramount. Given that, as of this writing and publication, little to no insurance exists in the broader cryptocurrency space, maintain control and custody over the private key (indicative or ownership) is of paramount importance. Even if that means simply jotting down the private key information on a piece of paper (or in some cases, etching it into metal for a more permanent solution) and storing it in a safety deposit box, communicating the importance of doing so is a responsibility of financial professionals. Although there is a bit of irony in storing information and data linked to cryptocurrency in a traditional centralized institution such as a bank, that should not prevent logical steps from being taken.
2. Different cryptocurrencies operate on different blockchain models. Bitcoin, through the rollercoaster that has been its price history during the last few years, has dominated both the headlines and the investment conversation into the broader cryptocurrency space. That said, and in spite of the weighting (in terms

of market capitalization) toward bitcoin overall, it is important to note from both a financial and cybersecurity perspective that different cryptocurrencies and blockchains can function in vastly different ways. These different underlying blockchains, and the computer programming that drives that blockchain itself, can also result in different levels of exposure and/or risk for client funds and information. Doing the due diligence, and ensuring that clients are aware of and understand these differences is a new area, but one of emerging importance.

3. Data management is going to become increasingly important moving forward. This book began with a brief discussion about how information and data is going to become increasingly important moving forward in a business landscape that is increasingly digitized. An additional consideration and idea that is going to have to become part of the financial services conversation is a paradox that is increasingly relevant and present in the marketplace. Storing information, even that of a digital nature, was traditionally quite expensive and required some level of technical expertise to operate, maintain, and expand over time. With the development and continued refinement of cloud based data platforms, however, storing and maintain records and copies of information has become cheaper, faster, and a core component of how many individuals and firms operate. This is all well and good, but if this information is being stored in a permanent nature, such as on a blockchain, or is being mined – no pun intended – by different types of AI or automation protocols, does this change with the new data regulations coming down the pipeline. Discussed in more detail in the coming pages, merging and juggling the advances and core facets of emerging technologies with the importance and necessity of complying with regulations is something that is going to have to be addressed.

Storage Implications

Another area of service and advisory work that may seem to be contradictory in nature are services lines and products affiliated with helping clients deal and contend with the issues affiliated with data storage and management. This may seem contrary because, with virtually no stop or pause since the implementation of Moore's Law during the 1960s and 1970s, information and data has been decreasing in cost, increasing in efficiency, and also increasing with the ease with which these tools and services and be used. From a board level, maintain appropriate levels of control, custody, and instituting appropriate controls over customer and consumer data is an imperative requirement of financial institutions across the board, and especially at the executive and board levels of those organiations (Morrison and Kumar 2018). Taking a step back from the specific machinations affiliated with accounting and finance and instead viewing the this shift from a broader perspective, the following conclusions can be analyzed and reported. The rise in storage as a core part of business innovation and development has, actually, indirectly led to the rise and development of the entire fields of big data, business intelligence, data analytics, and ultimately the very automation and data oriented tools that this book and much of the current market debate and commentary focuses on. The very ease

with which data is stored, however, and even though it has led indirectly to the rise of entirely new industries, also poses a paradox for financial professionals seeking to develop and offer new services. Put simply, the intersection of data storage, the analytics that are based off of these data sets, and the new services offerings that can be built on top of means that an old trend, highlighted by headline hacks and breaches, may actually be new again in terms of client demand and expectations (Allodi and Massacci 2017). In other words, the very compliance and reporting functions that have been moving out of the conversation as technology has moved in may be coming back to the forefront.

Remaining in compliance may seem like a throwback that runs against the very spirit of both this book and the trends that are driving the profession forward, but in actuality this represents a new step in this development. Regulations are a fact of life for organizations, and remaining in compliance with them is not anything new or particularly exciting, but the interesting part is not connected to the regulation itself, but rather how emerging regulations connect to emerging technologies (Griggs and Gul 2017). Be it regulation originating overseas or in the United States, contending with the regulation themselves as well as how regulation will change and alter underlying business models is not something that can ignored (Goldin et al. 2018). For example, the very FAANG stocks that drive much of the market volatility in the United States are, virtually without exception, based on the collection, storage, and analysis of consumer information. While clients or every firm may not contend with the scope or scale of issues related to the largest information technology organizations, almost every organization collects and retains information linked to customers.

From dental offices to auto dealership and mechanics, information related to credit card data, addresses, payment history, and even social security numbers are collected on a routine basis, many times without consumers even realizing this is happening due to how routine these events have become. Simply because a transaction or transfer of data has become more routine, however, does not mean that it will continue to operate in this manner going forward. In fact, and present both in the United States as well as in international markets, the shift and conversation toward increased regulation of how data is treated and regulated is continuing to dominate the professional landscape and conversation. This debate and conversation, in addition to having an influence on how data is treated and stored moving forward, will also mean that professionals and practitioners can also play a role in just how different types of technology are defined and classified within a business context. Specifically, the differentiated versions of AI that have recently entered the marketplace also generate potential revenue and service line opportunities for forward looking and oriented practitioners.

AI Refinement

Mentioned previously throughout this text, an area in which financial services and increasingly expected to be able to deliver value both currently and going forward in the realm of assisting clients and colleagues to actually understand and analyze

the various classes of information and information technology tools. In the case of artificial intelligence, and building on previous points that were raised throughout this text, practitioners and professionals must be able to help define, classify, and take into account just how AI tools and various iterations can assist organizations. Testing, developing, and refining the various AI and other automation tools that are currently entering the marketplace is a key role for practitioners moving forward, and also connects to the next point to be analyzed within this text; level-setting and rationalizing expectations of both fellow practitioners and clients.

Additionally, and connecting to blockchain, artificial intelligence, automation, robotic process automation, and spanning different industry lines, is the importance of financial service professionals to be able to both understand and articulate the different facets and implications of these emerging technologies. Understanding the functionality of these different tools is, clearly, quite important for advisors and consultants seeking to offer services, but it is also an important aspect to assist with expectation and implication level setting as these technologies become more mainstream (Tashea 2018). As exciting and as many opportunities as these different tools provide and deliver, financial professionals must also be able to point out potential shortcomings, obstacles, and challenges to implementation.

Expectations

Technology is certainly a buzzword and has been for decades as both the potential and reality associated with different technology tools continues to increase and evolve, but the reality of the situation is that not every organization is equally as prepared for the potential embedded within the various tools. Additionally, and important to remember, is that not every problem that arises over time is also going to appropriate to be addressed with the different types of AI, automation, or blockchain based technology tools. On top of that, and realizing the fact that many of these tools do come ready to be implemented across different types of organizations, not every technology tool is going to be useful for each and every problem and issue facing an organization. Better yet, and no matter how applicable the technology tool may be to address a specific problem or issue, the training, education, and communication associated with these technology tools must become a part of the professional conversation (Lai 2018).

Technology, no matter how buzzworthy and evolved the specific tool may be, needs to be tested, developed, and retested prior to full on implementation, and whenever that happens there will inevitably be various setbacks along the way. Being able to logically and rationally analyze these topics and concerns, and deal with them in a proactive and forward looking manner are skills that every financial professional must be able to asses and leverage moving forward. Especially as technology tools become mainstream in both consumer and professional situations, the necessity of financial professionals to set expectations, and to rationalize these expectations along the way, will only become more important moving forward.

Chapter 15 Summary

Cybersecurity and cyber insurance may not be topics or concepts that are considered to especially sexy or interesting among large swaths of professionals, but these businesses are only going to grow increasingly important as blockchain and other emerging technology become integrated into business operations. Hacks, breaches, and other types or data security concerns have become increasingly commonplace as data sharing and communication has moved from the realm of expensive to plentiful in nature. Automation, RPA, and iterations of artificial intelligence continue to create situations in which data is both plentiful and share on a nearly continuous basis. With this increased sharing of information, however, comes an increasing focus on how cybersecurity fits into the business decision making conversation. Cybersecurity is a core issue that has been fundamentally altered by the implementation of blockchain; since data becomes more widespread and shared between network members ensuring that data management and integrity as built into business models and practices. Cyber-insurance, alongside the increased importance of cybersecurity, is also positioned to play a larger role and occupy a larger percentage of professional's time moving forward. This also means that practitioners and professionals will need to understand how cybersecurity and cyber-insurance operate from a technical perspective as well as how these becoming mainstream so it does appear reasonable to expect this to increase in both value and importance.

Reflection Questions – Chapter 15

1. How do the topics of cybersecurity and cyberinsurance connect to the integration of technology such a blockchain into mainstream data analysis?
2. Will the rising importance of cybersecurity create new business lines and opportunities for practitioners and organizations?
3. What do financial services professionally need to know in order to keep current with the implications of increasing digitization on controls and data

Supplemental Readings

CPA Journal – What CPAs Need to Know About Cyber Insurance – https://www.cpajournal.com/2017/03/20/cpas-need-know-cyber-insurance/

Journal of Accountancy – Cyber liability: Managing Evolving Exposure – https://www.journalofaccountancy.com/issues/2019/jan/cyber-liability-exposures.html

AICPA – Cybersecurity Resource Center – https://www.aicpa.org/interestareas/frc/assuranceadvisoryservices/cyber-security-resource-center.html

AICPA – Cyber Liability Insurance for CPA Firms – https://blog.aicpa.org/2015/09/cyber-liability-insurance-for-cpa-firms.html#sthash.NooPqIs6.dpbs

Cyber Security Masters Degree – https://www.cybersecuritymastersdegree.org/accounting/

References

Allodi, L., & Massacci, F. (2017). Security events and vulnerability data for cybersecurity risk estimation. *Risk Analysis: An International Journal, 37*(8), 1606–1627. https://doi.org/10.1111/risa.12864.

Banham, R. (2017). Cybersecurity: A new engagement opportunity: An AICPA framework enables CPAs with cybersecurity expertise to perform new services for clients. *Journal of Accountancy, 224*(4), 28–32.

Brazina, P. R., Leauby, B. A., & Sgrillo, C. (2019). Cybersecurity opportunities for CPA firms. *Pennsylvania CPA Journal*, 1–5.

Goldin, N. S., Kelley, K. H., Lesser, L. E., & Osnato, M. J., Jr. (2018). SEC issues statement and interpretive guidance on cybersecurity disclosures. *Corporate Governance Advisor, 26*(3), 6–8.

Griggs, G., & Gul, S. (2017). Cybersecurity threats: What retirement plan sponsors and fiduciaries need to know—and do. *Journal of Pension Benefits: Issues in Administration, 24*(4), 17–21.

He, M., Devine, L., & Zhuang, J. (2018). Perspectives on cybersecurity information sharing among multiple stakeholders using a decision-theoretic approach. *Risk Analysis: An International Journal, 38*(2), 215–225. https://doi.org/10.1111/risa.12878.

Lai, K. (2018). Blockchain as AML tool: A work in progress. *International Financial Law Review*, N.PAG.

McLane, P. (2018). Cybersecurity: Every enterprise is at risk as attacks diversify and adversaries get smarter. *Mix, 42*(7), 10–48.

Morrison, A., & Kumar, G. (2018). Corporate boards may be more likely than regulators to scrutinize cybersecurity program effectiveness this year. *Journal of Health Care Compliance, 20*(4), 49–52.

Tashea, J. (2018). What do AI, blockchain and GDPR mean for cybersecurity? *ABA Journal, 104*(12). N.PAG.

Next Stage Applications

16

With the launching of JPMCoin in the early days of 2019 there was a renewed discussion and debate around both the future of blockchain and cryptocurrencies at large as well as the implications that such a launch means for existing options and companies already operating within the broader space. There was an abundant amount of discussion and analysis in the space following the announcement of the new token as well as the blockchain it operates on, but regardless of specifics that have been discussed, it does appear that there are a few core themes and topics that are driving this and other conversations.

First, and despite the countless headlines that heralded the launching of a new cryptocurrency by a large financial institution, in this case JP Morgan, the underlying reality is that this token – JPMcoin – is not a cryptocurrency by the definitions that have already been established. Rather, these more recent iterations and applications seem to instead build existing stablecoins, decentralized coins, and other banking affiliated cryptocurrencies and coins such as XRP (Roberts 2019). Instead of being a decentralized and distributed cryptocurrency or token operating outside or in parallel to the current financial system, this coin (or token), is controlled entirely by JP Morgan. In addition, and instead of operating on decentralized blockchain platform such as the bitcoin blockchain or etherum blockchain, the JPM Coin runs on a private permissioned blockchain. Seemingly against the up front promises and expectations associated with blockchain in general, this shift toward more of a private or permissioned blockchain platform is seemingly epitomized by the launch of this system. In addition to this change, this launch also leads to another question that should be considered as platforms like this continue to enter the marketplace.

Second, and something that strikes to the core of the idea of any blockchain or other financial system or platform is who is going to use blockchain systems. As discussed throughout this text, the public and virtually completely open sourced blockchain platforms do not appear to be well positioned for enterprise adoption. Centralized, private, or public permissioned blockchain models do seems to have

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_16

more potential for greater enterprise and corporate adoption, but this can present the following contradiction. Forming such a private or centralized blockchain model means that, by default, the total member of network participants is going to be capped. This is no different for the blockchain model underpinning the JPM Coin. As of this writing, in early to the middle or 2019, the only proposed customers and clients of the JPM Coin and blockchain platform are the enterprise and commercial clients and customers already connected to JP Morgan in any case.

This might seem like a basic or anecdotal point to analyze, but means that despite the hype, excitement, and discussion around this roll out and implementation that the market ceiling for this product and service remain relatively low. More to the point, and the true conversation and debate in the marketplace, is the competition and challenge that such a model poses to an organization like Ripple and the cryptocurrency XRP that functions and runs on the Ripple blockchain. As of the of the initial launch there were immediately critiques and comments from both sides of the topic as to whether or not this was a viable business idea or simply another sizzle first attempt to capture mind share or market position. That said, and acknowledging the fact that it is still early days in the conversation around JPM Coin and the underlying blockchain that it runs on, there are a few key considerations that should be part of an analysis moving forward.

First, and something that cannot be overstated is that the blockchain model and JPM Coin that runs on this model is a centralized, private, and permission blockchain, and is not open to clients and customers outside of existing JP Morgan clients. Contrasting this to Ripple, which has made a concerted effort to attract large financial institutions and banks to join the network and begin using the bridge currency of XRP to assist in settling transactions, the difference is readily apparent. This closed and self contained system will, invariably, limit the potential users and applications for JPM Coin at the beginning, but that does mean that the system and model will be deprived of scale. With trillions of dollars passing through the payment processing and transaction settling business the implementation of this system – even if only utilized by JP Morgan clients and customers – will have profound ripple effects. That aside, let's take a look at some of the key accounting and financial reporting considerations that are sure to arise as JPM Coin and, potentially, other similar models become more prevalent in the marketplace.

The first place to begin any related accounting analysis would seem to be around just how these different coins or tokens are going to be classified from an accounting perspective. Such a dialogue reveals, however, just how ambiguous and confusing the accounting rules and regulations continue to be for this space. In addition to the differences that are going to arise in any case, the accounting rules and guidelines for different types of cryptoassets continue to be represent a plethora of options. Drilling down, what this means for practitioners is that – for now at least – there are a number of options that organizations can embrace as long as they are also able to defend and justify these decisions.

Second, the internal control conversation continues to become more important as blockchains and different types of cryptoassets become increasingly integrated into

the broader financial market conversation. In addition to the traditional controls over the storage, communication, and reporting of information to both internal and external stakeholders, such integration also points to emerging areas of concern and consideration. In essence, and in order to establish and maintain confidence in the business validity and use case for coins or tokens such as the JPM Coin end users, customers, and clients are going to want to be able to examine the underlying controls and processes surrounding these tokens and coins. Especially if banking and other commercial clients are, in essence, outsourcing part of the payment processing this also leads to significant considerations that need to be factored into the control conversation.

Third and also important to recognize is that, given the benefits and of scale and efficiency, that the odds of this being the only centralized payment processing platform is unlikely at best. While it is true that JP Morgan is larger and more international than some of the competitors in the space, other large financial institutions also have substantial heft to bring to the proverbial game. This is not as entirely abstract or radical in nature as it might initially appear, especially given the reality that many financial players already have internal platforms and payment systems in place in any case. Bringing and applying this next step, via blockchain or other distributed ledger technologies, to the financial conversation is a logical step and application of these technologies.

The term distributed ledger was included here for a reason, and what this means is that not every distributed ledger is going to be classified or count as an authentic blockchain platform. Distributed ledgers are different from blockchains in a variety of ways that are different from blockchains in a number of technical ways, but that goes beyond the scope of this text. Linking back to the earlier conversation about internal controls this differentiation also leads to the control conversation and debate moving to the forefront. As different distributed ledgers are implemented and put into practice at different organizations and consortium models these different variations are going to need a variety of control and market based considerations. Accounting professionals, already versed in the control conversation and analysis around financial and operational information, should also be a part of the dialogue surrounding blockchain implementation and distributed ledgers. Taking a step back, however, reveals a much larger and much more substantial conversation and debate that should be had at a different number of organizations and institutions.

Underpinning the global financial institution is the SWIFT payment network – in the United States – that facilitates the payment processing and transfer of funds between countless institutions on a daily basis. How this applies to the conversation in this book is that a blockchain based payment platform and processing structure built on a blockchain based platform represents a viable alternative to the current structure that is in place. By itself this might not seem like a radical or innovative idea, but it also means that Ripple, which up until the announcement by JP Morgan was the leader the distributed ledger payment processing system, is potentially under threat. Ripple has, from the very beginning, been an advocate and motivated

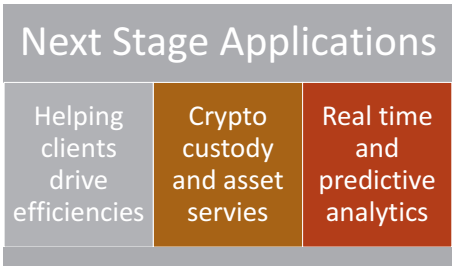

Fig. 16.1 Leveraging emerging technology to develop service lines

participant in trying to work and coordinate with establishment plays and regulators to gain market share and network members, and this has worked to some extent. To collaborations with Western Union, and linking in establishment financial institutions such as Santandar, it did seem that Ripple was the leader in this aspect of the distributed ledger and blockchain space. The launch at JP Morgan, however, means that this space is rapidly evolving and changing even as investment levels continue to increase to the tens of billons of dollars. All of these headlines and trends, however, are merely symptoms of a broader shift leveraging emerging technologies to develop new product and service offerings (Fig. 16.1).

Future of Accounting and Finance Functions

As this book has hopefully demonstrated, the pace of technological change and shifts within the landscape are uniquely positioned to have a dramatic impact on how organizations operate both internally as well as how they engage with externally stakeholders. Although technology has been a part of the accounting and financial services landscape for decades, the pace of change appears to be accelerating at an increasing pace. Professionals, put simply, are going to have to be able to keep up in order to succeed and thrive in the marketplace moving forward (Esposito 2017). While there will inevitably be some disruption and challenges that come alongside the rapid changes within the financial services landscape, it is equally as important to be aware of the opportunities and benefits that will occur as a result of this technological innovation and disruption.

Regardless of whether this technology is perceived as a threat or an opportunity there are several fundamental realities that must be taken into account by financial services professionals, regardless of industry affiliation. First, blockchain and cryptocurrency technology are going to continue to proliferate and spread through the business landscape, and will have a dramatic change on fundamental aspects of how financial markets operates. Accounting, attestation, and offering assurance services over different types of information, including financial and nonfinancial data, will be transformed due to the core components of how blockchain functions. Prior to returning to the technical and specific analyses of how financial services will be changed and disrupted by emerging technologies, it is important to circle back to the underlying themes and forces that will drive change within the profession.

Becoming Better Teammates and Team Players

The underlying reality of the situation is that, despite what might have been stated at different conferences, events, and other organizational gatherings, and even throughout this text, is that accounting and finance professionals are going to have to become more familiar with collaborating with other professionals. What this means is that, in addition to the discussions and analyses presented throughout this text, is that the changing dynamics of the marketplace are going to drive such change in a number of tangible and business ready ways. Put another way, in addition to the conceptual understanding and examination of these changes, practitioners need to also understand how these changes will emerge and develop in terms of different roles and responsibilities in the marketplace going forward.

First, the legal implications of the increasing integration of blockchain, cryptocurrencies, and artificial intelligence tools throughout the business landscape logically mean that financial professionals will need to coordinate more closely with legal experts. From ethical complications that will inevitably arise from the developing and refinement of different artificial intelligence tools and robotic process automation procedures, to how blockchain will change legal obligations, to the different custody and control requirements necessary to safeguard cryptocurrencies it is increasingly evidence that regulation and compliance are moving back to the forefront as business applications continue to mature and develop (Flinders 2018). In terms of action oriented business tasks and plans this means that the current relationships and dynamics between financial and legal experts, already existing via partnerships in conjunction with JD's, LLM's, and financial professionals will need to be increasingly sophisticated, entrenched, and embedded into business models.

Second, from a legalistic perspective these developments and changes also emphasize the importance of maintaining and implementing comprehensive insurance and cyber insurance policies. Not always the most scintillating part of the conversation, nor the most exciting aspect of the financial services profession or professional landscape, this is something that is going to be increasingly important moving forward. It is important to recognize that the legal intersection of insurance, law, and finance is not anything new, but that the cybersecurity conversation and policies are more extensive than most practitioners and organizations might realize. For example, the paper perspective of accounting and finance – despite the growing technological integration and forces in the profession – is still a dominant factor that must be accounted for, controlled, and factored into the debate around cyber policies.

Third, and finally, these relationships and conversations connected to the emerging areas at the intersection of accounting and legal practitioners is that this relationship is going to have become more continuous and ongoing in nature versus one off arraignments of periodic conversations. Having continuous dialogues and conversations between these professionals and practitioners is going to be essential in order for either profession to succeed and thrive in the marketplace moving forward. As these emerging technologies drive change, disrupt current positions, and make doing business as usual unsustainable these changes and fact patterns are going to only become more important. In addition to these relationships, the third leg of this proverbial stool is different professionals are going to have to become more comfortable and familiar with working with a different subset of professionals.

Developing a Strategic Headset

Strategy has long been the mainstay of upper management, external consultants, and the senior leadership of the organization, but almost exclusively relies on the same types of quantitative information that lie directly in the core competencies embedded in the financial services function. As strategy and strategic planning become, almost without exception, increasingly dependent on the very information that financial services professionals deal with on a continuous basis, this presents an opportunity for financial services professionals to obtain a more strategic and leadership-centric role (Page 2014). That said, in order for these expectations and possibilities to transform from a simple expectation to actual reality, there is a definitive shift that must take place among the professionals currently employed within these fields. In short, and acknowledging the reality that technology can drive change throughout the professional landscape, simply being aware of technology is not enough to enable financial service professionals to become more strategically oriented.

Adopting a strategic headset, embracing the strategic planning process, and actually becoming the business partners and strategic advisors that financial service professionals want to be, requires at least two definitive steps that every professionals can and should embrace. First, financial professionals have to be open to job automation, digitization, and displacement of some current market opportunities. This is obviously easier said than done, but is something that must be taken into account due to the following simple reality; technology will continue to become more integrated and professionals must be able to understand, implement, and use these tools. Second, financial service professionals must be willing to partake in planning and strategic conversations, which may require having difficult conversations that may have been avoided in the past. While financial service professionals may have been involved to some extent previously, it is usually just at the end of the process to verify, check, or analyze the information that has already been generated.

Becoming part of the planning process, and actually effectuating changes within the organization must a part of every financial professionals responsibility. In order to do this, and in order to have those difficult conversations that position professionals to actually drive strategic change and planning, technology must be effectively leveraged. Drilling down, in order to have the time to partake in strategic planning, thinking, and execution, time cannot be spent doing tasks that could otherwise automated. Automating lower level tasks will, of course, require some trial and error and different iterations, but the drive toward automation is not a passing fad. Rather, it is a dramatic shift in how organizations interact with information and how financial professionals must engage with other management professionals. Third, and perhaps most importantly, is that financial professionals must be able to evaluate just how technology is going to change and shift the overall professional landscape. Instead of focusing on specific tasks or jobs that will be changed by the greater integration of technology, the mindset and approach should instead be on the different classes and types of work that will need to performed moving forward.

From Controller to CFO/CDO

Financial services professionals have long held role associated with compliance, reporting, and getting certain pieces of information delivered to the marketplace in a manner that is in alignment with both industry and regulatory expectations. These roles, be they the compilation of financial statements, compliance with investor security laws, or operating in adherence with fiduciary rules and responsibilities, will not change. In fact, and as mentioned in this last section focusing on the importance of remaining in compliance in a fast moving and fast changing regulatory environment, ensuring that clients and customers remain in compliance with applicable laws and regulations will only become more important as both technology and regulation continue to change and evolve at what seems to be an accelerating rate. That said, simply assisting customers, clients, and partner organizations keep pace with regulatory changes and developments will not be sufficient going forward. Financial services professionals will need to evolve, become forward looking, and become more proactive; this is not anything new or particularly innovative to say. What may be a bit more unusual, however, are some of the tactics and strategies that both individuals and institutions can leverage to facilitate this transition. Let's take a look at a few simple examples of how, using artificial intelligence and/or blockchain technology, this transition can more from concept to reality.

First, in the case of an accounting practitioner or accounting firm, this transition may be the most obvious one to make and the most clear cut one to implement. The accounting profession itself is experiencing a pace and swath of change unlike nearly anything seen before, and the profession is indeed slowly waking up to this reality. Transitioning from a less controller like function to a function more akin to a CFO is something that has to done in order to help ensure the relevance of the profession moving forward. Distinct action steps that can, and are being taken are as follows:

1. Embrace the technology and automation already being used clients and customers both in their personal and professional lives in other capacities
2. Be proactive in advising clients about the importance of embracing automation and other technologies within existing business lines. Remember that if clients are not getting that advice from an accounting firm, they will most likely get it some other firm anyway.
3. Do not be hypocritical and ignore the potential benefits and upsides of these technologies for utilization within the firm itself. All too often consulting and advisory services are treated as a one way channel, with information and guidance being issued by an accounting or finance firm yet not implemented internally.
4. Hire and develop people who are on board with this new paradigm, which is often stated as a requirement of organizations moving forward, but this simply step can all too often be overlooked in the hustle and bustle of satisfying client demands and expectations.

Evolving into a True Advisor

Now of course there is, literally, an entire industry that has sprung up around the importance of individuals employed in the financial services sector to act in the best interest of clients, but that does not mean that clients are also aware of what exactly is going in the background of trying to provide these services. Particularly among millennials and Gen-Z investors, which are comprising an ever increasing portion of the investment marketplace, there does seem to be lack of trust or faith in the both the ability of traditional financial advisors and the value that they can actually deliver in the form of returns. This is not an idle concern or something that can be put on the proverbial back burner; automated investing services such as Betterment and Wealthfront continue to accrue and capture greater share of these new investor classes. Advisors who do not take these changes and evolutions into account will, invariably, find themselves on the wrong side of these demographic trends moving forward.

Additionally, and something that everyone reading this is surely aware of, is the rise of automated investing options that are managed or overseen by humans at some point in the process. Whether it takes the form of index funds that track a certain index, or passive funds that automatically rebalance in accordance with price changes of different asset classes, the underlying trend toward more automated investing does seem clear. Advisors, regardless of age and technical expertise, however, can take several steps to help augment current offerings with the technology that is arriving on the professional landscape in any case. A few of these action items and steps include, but are not limited to the following

First, technology must be embraced in every aspect of how an investment advisor, brokerage, or other type of firm offering investing services operates. Whether it takes the form of building, or even just piggybacking off of existing mobile apps, hosting investor meetings via Zoom, Skype, or other mobile compatible platforms, or being flexible with when, where, and how clients wish to engage and solicit advice this is something that can usually be done with minimal or no cost. XRP, a blockchain based currency that poses an alternative to traditional fiat, and whose sponsor organization has coordinated closely with banking institutions, continues to position itself as an alternative to current banking relationships and structures (Crosman 2019). Second, the product offerings that are delivered by the organization to the marketplace must also keep pace and evolve with the expectations of investors. For example, index funds, lower fees, and more passive allocations are trends that – from every visible indicator – are continuing to accelerate as younger investors continue to enter the marketplace. At the very least, advisors need to be aware of both the trends themselves as well as the implications these trends have on investment returns as well the viability of current business models. Last, but not least, is that advisors must be able to effectively harness and leverage the advances in automation tools.

Customizable Financing Arrangements

A repeated concern and issue with many traditional financing arrangements is that consumers and customers are not evaluated on an individualized basis, but rather lumped into large categories based on broad arrays of identifiable information. Even the largest and most sophisticated financial institutions rely on several relatively basic and not technologically oriented methods to assess the creditworthiness of potential customers. This is the same technique and tactic used regardless of whether the potential client is an individual or an institution, which can cause many of the issues that have been repeated during various economic bubbles. Instead, and already occurring in the marketplace, several financial institutions and groups are leveraging different types of arrays of data and information to help make better lending and customer acquisition decisions. For example, and already being used by several institutions and organizations, a composite score and broad based array of data to more accurately asses the ability of a potential customer or client to successfully handle and repay the loan. Such data includes, building on the discussion from previous chapters, the importance or transparent and consistent pricing with regards to the impact that carbon driven events may have both on business projects and the shares of an organization overall (Liesen et al. 2017). This may seem like a relatively simple evolution and step toward a more technologically oriented and driven process, but represents a substantive shift from many traditional loan policies and procedures.

For example, a start up enterprise or an entrepreneur who is in the midst of establishing and building a brand in the marketplace traditionally would have had issues obtaining sufficient or adequate financing to expand and further develop a business. Using traditional, and often incomplete, information and data such as credit scores, current levels of income, debt levels, and occupation, many aspiring – and ultimately successful – enterprises and individuals may be denied the financing so necessary for continued growth and development. Leveraging artificial intelligence platforms to gather and compile data from a more holistic array of sources such as social media impressions may actually create a more accurate representation and analysis of both current and potential future earnings. Applications of such comprehensive data gathering may include, but are not limited to social media impressions, media interviews and appearances, the number and scope of speaking and other public engagements, and relationships with other professional organizations. While not specifically linked to current financial status or earnings in the traditional context, these may indeed be more appropriate on a forward looking basis.

Developments such as this also, once again, illustrates the importance and trend toward financial services transitioning from that of a more customized and personalized level of service to be provided by suppliers and financiers to the end users and recipients of the financing. Put simply, and reiterating statements and discussions from earlier in this text, if customers and clients are experiencing more customized and personalized service and products in every aspect of life except from financial

services providers, this does not bode well for the future competitiveness of the sector itself. Regardless of the specific technology tool that is leveraged by practitioners, be it blockchain, artificial intelligence, robotic process automation, or some other sort of technology tool, the underlying importance of this asset is connected to the information itself. Managing, reporting, and analyzing the troves of data that are produced and compiled by organizations any way will only continue to become increasingly important moving forward. Put simply, and something that has been stated in both this text and in other places, data and information – plus the analysis of said information – will form the competitive advantage of the twenty-first century.

Chapter 16 Summary

It is always difficult to document or present anything as emerging of importance in such a fast moving space including blockchain, RPA, or AI. That said, what this chapter attempts to do is to break down the headlines, sector specific trends, and product development in a way that provides readers with real world evidence of where these trends are headed. Emerging trends and forces tend to change labels and names as industries and organizations evolve over time, but that does not usually lead to a changing of how the changes impact professionals. Change is inevitable, but the pace of change appears to be amplified as technology stacks and combinations allows practitioners and organizations greater access to data and analytics associated with that information. Taking into account that this text was provided and written with professionals in mind, the examples and trends listed in this space are put together with the intent to generate actionable business intelligence. In other words, actionable business intelligence in the context of this book will be to help professionals putting together frameworks and business plans, to do so in a way that is logical and objective. After reading this chapter, users should be able to understand what trends and forces seem to be emerging and how they connect to blockchain forces.

Reflection Questions – Chapter 16

1. What has your firm done, or has in the pipeline with regards to business use cases for these emerging technologies
2. Based on your understanding of both the technologies and applications are thee definitions set to cause disruption within the existing service stack
3. If not have you set in a motion a plan or process to help integrate these tools than what appear to be the strategy for said oosl

Supplemental Readings

JP Morgan – JP Morgan Creates a Coin for Digital Payments – https://www.jpmorgan.com/global/news/digital-coin-payments

Ethereum World News – Samsun Coin on the Horizon? https://ethereumworldnews.com/samsung-coin-on-the-horizon-anonymous-source-claims-yes/

EY – EY Launches Next Stage Blockchain Analyzer Tool – https://www.ey.com/en_gl/news/2019/04/multimillion-dollar-investment-in-ey-blockchain-analyzer-delivers-new-upgrades-for-blockchain-and-cryptocurrency-audit-and-tax-services

Deloitte – Blockchain Applications – https://www2.deloitte.com/us/en/pages/consulting/solutions/blockchain-solutions-and-services.html

Goldman Sachs – Blockchain – https://www.goldmansachs.com/insights/topics/blockchain.html

References

Crosman, P. (2019). Could ripple's XRP replace correspondent banks? This bank says yes. *American Banker, 184*(6), 1.

Esposito, D. (2017). The fiction of the "trusted business advisor". *Accounting Today, 31*(9), 57.

Flinders, K. (2018). Making the leap from blockchain to business. *Computer Weekly*, 7–9.

Liesen, A., Figge, F., Hoepner, A., & Patten, D. M. (2017). Climate change and asset prices: Are corporate carbon disclosure and performance priced appropriately? *Journal of Business Finance & Accounting, 44*(1/2), 35–62. https://doi.org/10.1111/jbfa.12217.

PAGE, M. (2014). The failure and the future of accounting: Strategy, stakeholders, and business value. *Accounting Review, 89*(2), 798–801. https://doi.org/10.2308/accr-10391.

Roberts, J. J. (2019). Can XRP catch on? Ripple touts new banking partnerships. *Fortune.Com*, N.PAG.

Data As An Asset

17

Linking back to the initial conversation and introduction of the topic relating data to the financial services profession, this also connects to the subtopics of blockchain, artificial intelligence, and the services that can be constructed off of these trends. The trends of blockchain, increased encryption, and the intersection of greater technology integration with traditional accounting and financial services will, of course, cause disruption within the industry, but will also cause a paradigm shift as to how professionals view and evaluate assurance, audit, and other advisory services. This is an important topic to keep in mind, especially as different technologies and technology tools continue to enter, evolve, and disrupt the marketplace over time. Regardless of the specific tool or platform that is utilized as a component of this process; RPA, AI, blockchain, or other automation tools or processes, the underlying trend is that professional services are going to become increasingly connected to the data that is produced, stored, and disseminated by organizations both internally and externally. No two firms as the same, and the applications and implications of data and information technology will have different end effects depending on the specific vector and business model of the practice.

Additionally, the specific implications and considerations that should be taken into account will differ depending on the size of the firm and the specific clients that are involve in the conversation. Different clients and organizations will have different interest and end use applications based on the information that is produced by the entity, and that is where practitioners can take a forward looking and more proactive approach as to how these different sources of information can be implemented, integrated, and delivered to both internal colleagues and external clients. This realization and shift, that data and information is an asset, also connects the idea and concept of the Internet of Things as it applies to both accounting and finance professionals. For example, accounting professionals can and should have conversations with both current and potential future clients about the possibilities embedded in the more effective utilization of organizational information. If a manufacturer or inventory based organization is interested in improving operational efficiency they might be interested in installing sensors and other information gathering

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_17

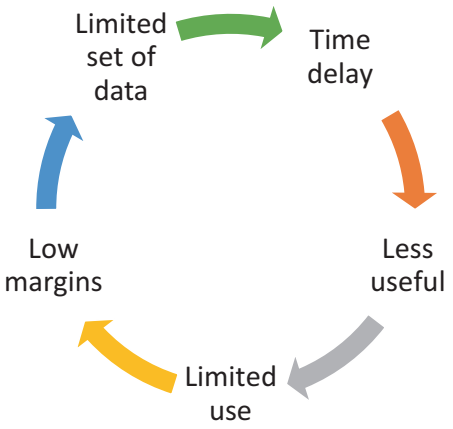

Fig. 17.1 Pain points with current reporting protocols

products linked to how customers are actually using information. A hands on application of this desire and interest might be monitoring when consumers are withdrawing products from a smart fridge or cabinet, and being able to deliver digital coupons or other information to those customers to encourage or motivate certain future purchase behaviors (Fig. 17.1).

From a financial services perspective and advisory role, the applications of this increased transparency and access to information and data can lead directly to new lines of business. Client organizations are, in virtually every instance, more interested in how advisors and partners can assist them in growing their business going forward, and this is exactly where the effective leveraging of technology can be of direct assistance and help (Drew 2018). Building this bridge, and connecting the dots between operational information and financial results lies at the heart of the value proposition now enabled by advancing technology tools. No matter what geographic location an organization or practitioner happens to be located within the ability to scale and offer services on par with the largest multinational organizations is possible. This is a simple sentence to write and an even shorter one to read, but it has the potential to have profound implications on the structure and nature of the profession going forward. Let's take a look at a few of the ways that the increasing technological integration between different emerging tools and platforms can have, both on practitioners and the firms they service, including a few innovative solutions and business models that may be of interest to practitioners across industry lines. The Figure below highlights the potential and opportunities from making better use organizational data and existing reporting technology to address current reporting and disclosure issues:

First, a joint venture or value network may be an idea that is applicable to different types of practitioners or organizations, and while initially this may not seem particularly innovative, represents a new way of thinking for many leaders of financial organizations. Traditionally firms were constructed and managed by the partners and other senior leaders at the organization, who were in turn compensated via a combination of factors, including the book of the business that they had brought

into the organization. This, in turn, has driven a wave of consolidation, mergers, and acquisitions between different types of organizations in order to provide clients will an array of specialized service offerings. While there is nothing wrong with that, and that trend continues to occur in the field of accounting, asset management, and investing advisory services (just to name a few), the reality is that technology advancements is rendering such an approach less necessary moving forward. Financial advisors, leveraging technology for marketing and practice management, as well as taking advantage of passive and index based investing funds, can accumulate assets in the millions of dollars, serve as the principal of an organization that provides top notch service and advice to clients with a minimal staff.

Insurance brokers and advisors, which while not also thought of as the most sizzling players in the financial services space, place an absolutely critical in an increasingly data driven and data based financial landscape. In addition to providing the essential coverage that organizations so often may not even realize they need, these advisors and consultants can – and increasingly are – playing a role akin to cybersecurity advisor and expert. Who else is more qualified to asses the risks embedded in a particular system or policy construct that individuals and firms whose job – literally – it is to perform these functions? Linking together automation processes to help reduce manual exposure to and handling of potentially sensitive client information in and of itself can result in efficiency gains and benefits accretive to the bottom line. In addition to the services that can be expanded on in terms of existing client advisory work and cybersecurity risk assessment, the proliferation of technology also allows other options to enter the marketplace.

The key takeaway and core point to remember, not matter what specific subtrend is indicated and analyzed, is that this greater availability of information – as discussed – allows practitioners the ability to compete and do business in much broader and more encompassing areas than otherwise would be possible. Between the actual information itself, which can be thought of as a raw input resource, and the technology tools and platforms that can be brought to bear for analytical purposes levels the proverbial playing field (Whittemore et al. 2017). No matter if the individual in question is employed at a large organization or operating as a sole practitioner, leveling the playing field in terms of competitive advantages and service offerings is a disruptive shift that is already being felt in some areas of the marketplace.

Data Science

The buzzwords and labels that have surrounded the production, storage, and communication of information between different institutions and individuals have changed and evolved over the last several decades. Business intelligence, big data, data analytics, and increasingly data science and data scientists seem to share a common thread of theme; that data does indeed drive the entire decision making process at virtually every organization. While this may have been a relatively well known truth and fact for several decades, the advances and improvements in the

technology tools that form the core of this book increasingly allow financial practitioners to turn data based concepts and ideas into reality (Savva and Straub 2018). Taking a quick analysis as to how this increasingly data driven – some would say data saturated – environment will change and change the role of practitioners. Not meant to be all inclusive or exhaustive in any capacity, but rather a brief summarization of core changes, the following does seem to be logical to discuss.

First, client expectations – both current and future – will be shaped and driven by the availability of information in the business landscape. Clients and customers are going to want, and will only continue to expect, forward looking advice and guidance as its linked and connected to organizational performance. The true value add that is desired by different clients from different backgrounds and industry lines is that advisors and professionals that are brought in will be able to help with decisions that have not yet happened. It can be predictive analytics, real time dashboards, or even just more efficient utilization of existing resources and tools, but the purpose and point of these analysis is similar. Data drives the decisions made by the senior leadership of the organization, and this is the same no matter what specific industry or organization is analyzed. It is true that data has traditionally played an important role in how options are evaluated and choices are made, but the emerging technologies of artificial intelligence and blockchain have the potential to supercharge existing analytical procedures.

Blockchain, virtually by default of how the technology itself works, creates a data platform and storage system that enables more sophisticated and comprehensive data analysis via the permanent nature of how this information is stored. Additionally, the near real time and continuous nature of how data is distributed and communicated between network members allows – potentially – the greater sharing of information. Joint ventures, industry relationships, and coordinating with suppliers and other partners are increasingly common, but understanding the financial ramifications and impacts of these relationships is something that can prove challenging. Particularly with blockchain, this transmission and encryption of information, financial services professionals can certainly put together reporting frameworks to extract this information in a timely manner.

A rather obvious application of blockchain consulting and applications is to allow financial services professionals to improve the controls over the transfer of funds between entities. In addition to the use cases for financial institutions such as banks, this immutability and continuously updated nature of the information transmitted between entities can also deliver value and insights linked to the transfer of information in the non-profit sector (Fambrough 2019). Whether it is charities, NGOs, sending financial resources internationally is often rife with misallocation of resources, funds that go missing, and uncertainty as to what percentage of donated or contributed funds actually end up in the hands of the appropriate end user and recipients.

Artificial intelligence, perhaps even more so than blockchain, seems to hold potential for different applications connected to the financial services sector. In addition to finding patterns for trading and investment purposes, different AI tools can also enable predictive and proactive advisory services to be offered. For example,

if the data feeds of an organization are connected to an AI tool or platform, the financial services professionals can continuously monitor the financial health of the organization. Versus only receiving limited amounts of information on a periodic basis, such a connection will allow practitioners to render real time advice, insights, and commentary (Perols et al. 2017). Specifically, and reflecting the importance of social media and other media outlets, being able to create a dashboard to track and report the impact of different news stories and headlines is definitive use case of AI for business purposes at large.

Applying Emerging Technology to Data Analysis

Different emerging technologies are clearly already having an impact on data analysis and reporting, but it is also worth exploring how exactly these tools and platforms link up with the needs and expectations of the marketplace. Blockchain, for example, has the potential to streamline and improve the speed and efficiency with which large amounts of information are processed across organizations. This is nothing new, and has already been discussed both in this book and in numerous other setting, but let's now take a look – prior to offering or even preparing to offer consulting services, how blockchain and different automation tools can change the operational, financial, and reporting aspects of how organizations operate.

From an operational level, and linking back to an earlier conversation about the importance of different professionals becoming more comfortable with working together on a continuous basis, one of the most important considerations for professionals to keep in mind are the effects that these tools will have on the operations of an organization. Management professionals, some of which may or may not be immersed in the accounting or financial information, are most likely to be more focused on the tangible in-house benefits at first rather than financial implications. For example, if an organization is able to simply eliminate some of the internal float that often accompanies the transferring of information or funds between different parts of the organization that, in and of itself may make the implementation of such a technology more realistic. In the case of JPM coin a primary selling perspective and point is the reducing reliance on nostro/vostro accounts, or funds kept at affiliated institutions on a daily basis to facilitate intercompany transitions. Perhaps not as high profile as cryptocurrency trading or speculation, these back office benefits and upsides represent just how powerful these tools can be.

The true power of emerging technologies, drilling down to the back office emphasis that has begun to dominate the implementation conversation, is that these tools and platforms can actually make it simpler to gather and report data already produced, stored, and analyzed at the firm. Increasing the speed of availability linked to data, as well as increasing the security associated with this data are core benefits of utilizing a blockchain based platform. Transmitting this data between different stakeholders will inevitably occur and represent a potential pain point for organizations, and here is an area in which accounting and financial professionals can and should play a prominent role. Stacking technologies, again remaining

focused on the operational and data analysis implications of emerging technology, amplifies the real time transmission of data. From a client advisory perspective this means that practitioners and advisors are going to have adapt and evolve to meet the changing needs and expectations of the marketplace.

Financially there are clearly a number of different options and considerations that should be a part of the conversation as emerging technologies are implemented to the data analysis conversation.

Consulting Service Offerings

In general, whenever an emerging technology enters the marketplace there will also be opportunities for unethical actors to take advantage of the information asymmetry to engage in fraudulent or other types of unethical activity. Blockchain, artificial intelligence, and the implementation of cryptocurrencies are no exception to this trend. In fact, with the increased speed with which these new technologies have moved from the periphery discussion to mainstream market analysis and debate, the potential for making decisions based on erroneous information is arguably larger than with other technologies. Drilling down, and taking into account the reality that accounting and finance professionals are not going to instantly evolved into computer programming experts, there are several core concepts and thoughts that certainly be explain and covered during consultative engagements.

Blockchain Consulting As has been communicated throughout this text, the implementation and application of blockchain technology has the potentially to radically change and disrupt the financial services landscape. That said, and even with all of the investment and attention that this area has received there still remains significant confusion and consternation over what exactly blockchain represents. Specifically some of the areas that financial professionals can offer advice and expertise on include, but are not limited to, the following:

1. The critical components that drive blockchain and cryptocurrencies
2. Differences between permissionless, permissioned, and other categories of blockchains, and depending on the expertise of your client it might also be appropriate to drill down into public-permissioned, consortium, and federated blockchain options.
3. The different applications and implications that blockchain technologies are already having on a variety of industries, ranging from food transportation, global logistics, and other paperwork heavy fields.
4. Status updates and information related to the professional guidance connected to the regulation, classification, and reporting of blockchain augmented information and cryptocurrencies.
5. Building on the previous point, the issue may also arise where data has been put on a blockchain, but now the primary difficult task lies with the exporting, analysis, and utilization of this information for business decision making.

The potential of the blockchain consulting space is difficult to overstate based on the current pace of adoption and investment within the space, especially in emerging areas of application and commercialization (Marinova 2018). Banking and financial services institutions, put simply, are positioned at the intersection of potential increased regulatory scrutiny, push back against current business models, and a virtual tsunami of technology that has the potential to disrupt the entire industry itself. Assisting organizations as management professionals wrestle and contend with the forces of change represents a vector through which financial professionals can develop and market new business opportunities even as some current options are augment or event replaced as a result of technology tools.

Cryptocurrency Perhaps the most high profile and well developed application that runs on and operates with blockchain technology, cryptocurrencies appear to represent the most well developed use case, as well as the most likely way that individuals and institutions are introduced to blockchain technology. Specifically from a financial services perspective, this is perhaps where the blockchain ecosystem intersects with the financial services ecosystem in the most obvious way. Drilling down, several areas appear reasonable for financial services professionals to render advice:

1. Storage of cryptocurrencies is an area that can, in addition to being technically complicated, can also pose a risk in terms of compliance and data security at your clients. Again, while not attempting to become data experts in every way or method that is connected to how cryptocurrencies can be stored there are several pieces of information and advice that can and should be offered forward. Again, without seeming to overstep the boundaries of expertise or training, financial professionals can certainly point out the pros and cons of utilizing different types of data storage technologies.
    a. Hot wallets, which are basically situations where an individual or institutions stores cryptographic information online or via some sort of web based portal. This is similar to how many passwords are stored for other websites, and certainly offers significant convenience and efficient for induvial seeking to maintain a sense of normalcy with regards to how they access cryptocurrency information. That said, if these passwords and/or private keys are stored via a web accessible platform that also opens the door to possible hacks, breaches, or other types of unethical activity by market actors. These web platforms, whether desktop or mobile first, only have the regular type of security employed by organizations. A hacked email or social media account can certainly be bad news, but a stolen private key or hacked hot wallet can lead to the complete loss of cryptocurrency investment value.
    b. Cold wallets. The biggest difference between a hot wallet and a cold wallet is the simple fact that, unlike a hot wallet, a cold wallet is virtually never directly connected to the internet itself. Many cold wallet options currently in the marketplace tend to resemble USB drives or external storage devices, and several organizations manufacturer said cold wallets specifically for the stor-

age of cryptocurrency. While slightly less convenient and requiring slightly more work to access prior to usage, the offline capability and nature of these cold wallets does reduce the risk of hacking incidents. That said, any hardware or tool may be susceptible to breaches of trust or other types of hacking attempts, as was indicated in an accusation leveled at certain Chinese governmental agencies during 2018 in a Bloomberg Businessweek article. Regardless of who is involved, however, it is important to make sure that any hardware purchased is indeed free from potentially malevolent influence.

   c. Paper wallets. The aptly named paper wallet concept for cryptocurrency storage simply means that, instead of storing private key information and other associated data in an electronic format (on either a hot or cold wallet), password and private key data is simply stored or written down on a slip of paper. While apparently contrary to the idea and underpinning of an electronically based currency alterative, this may very well represent the most secure way to protect this information from hacking and breaches.

2. Classification, taxation, and reporting of cryptocurrency data is an additional area that will inevitably become more important moving forward. As of the writing of this book the only definitive guidance in this space comes from the IRS in the form of a 2014 memo where it is stated that, for U.S. tax reporting purposes, that all cryptocurrency assets are to be treated as property. This has caused the following pain points to emerge in terms of the advice and guidance that financial professional can offer in this space.
   a. In terms of how to classify and report certain types of information related to cryptocurrencies it is increasingly clear that there are multiple forms of guidance and information available for marketplace actors to analyze. As of this writing there is guidance and information produced by the IRS, the SEC, the CFTC, and preliminary advice and information produced by the Big 4 accounting firms as to how these items should be classified. That said, and taking into account the reality that there is a significant amount of non-authoritative guidance in the marketplace there is no authoritative guidance or advice that has been issued by either the FASB or the AICPA. This lack of certainty, in addition to adding stress and anxiety for practitioners seeking to report information accurately, also means that any reporting frameworks that are implemented are likely to not mirror exactly whatever guidance is ultimately generated.
   b. As murky as the U.S. regulatory landscape may be, it is also important to recognize the reality that much of cryptocurrency market is international in nature so it is important for financial professionals to factor that reality into any advice or guidance that is offered. For example, although much of the cryptocurrency trading and investment has taken place in the U.S. and Western Europe, a large percentage of the mining activity is taking place is Eastern Europe and China. The Chinese mining is or particular interest because, while cryptocurrencies and ICOs are banned, mining is how certain types of cryptocurrencies are introduced into the marketplace.

3. Emerging issues continue to represent a challenge and an opportunity. At the current market state, most professionals are aware of what blockchain is, how it works, and some of the potential implications for the broader business environment. Simply maintaining this current level of understanding, however, will not sufficient moving forward if practitioners seek to offer guidance and advisory services in this area to new and future clients. As discussed previously in this text, some of the emerging issues that are quickly moving to the forefront of the financial services conversation. Including the below, but certainly not limited to the items listed, here are some emerging topical areas that will inevitably be of interest to practitioners in the financial services industry.
    a. ICOs – the process of initial coin offerings began, according to some market participants and actors, as a method by which organizations operating on a blockchain platform could raise capital without having to endure or comply with the regulations surrounding IPOs. That said, even though the initial attempt may have been to avoid regulation or compliance issues, there is increasing evidence that regulation is becoming to firm up around the ICO process, leading to both increased regulatory certainty in this space, but also driving the fund flows linked to emerging cryptpcurrency topics and trends into other areas.

Tokenization

One concept that, as of yet throughout this text, has remained unaddressed or uncovered it the shift and evolution toward the implementation and linkage of real world assets to blockchain technology. Smart contracts, stable coins, decentralized autonomous organizations, tokens, ICOS, and the cryptocurrency space at large have sprung up in parallel to existing market assets. In essence, these different applications and developments that have grown out of the bitcoin blockchain ecosystem has remained in the virtual world, whereas demand for more sophisticated and comprehensive blockchain applications continues to build in terms of real world applications and practices (Diaz-Santiago et al. 2016). This, however, is changing, and the process by which this is changing is called tokenization. Stated another way tokenization is the representation of physical assets such as real estate, art work; for financial rights and obligations. Perhaps the best way to demonstrate some of the applications and possibilities embedded within tokenization is with an example. It is important to note that even this example is real estate focused, the underlying purpose and possibility of tokenization will extend to other asset classes and business sectors with equal impact.

Let's say there is an apartment, condo, or other type of residence that is worth $200,000, and the owner is seeking to both monetize some of the ownership they have in this asset, and wants to do so in a crowd based manner, i.e. not actually selling the property out right (more on that in a minute). Tokenization is, in essence, a method by which the rights to an asset are converted into a digital token, and in this

example let's say they are converted into 200,000 individual tokens. Based on some publicly available platform, like Ethereum, that has the ability to run and execute smart contracts, this will enable these tokens to be traded, have increases and decreases in value, and do so outside in a manner that cannot simply be overwritten or erased via a third party action. Quite different from the land and ownership registries that currently dominate the real estate and other fixed asset conversations, the potential impact of this change should be relatively evident. Now, let's circle back to the actual process that has occurred as a result of the tokenization of this real world physical asset, and ask several pertinent questions.

First, do the token holders and investors actually have legal rights to the profits and ownership of the physical asset itself? Remember, and at least as of this writing, there is no worldwide regulation (or even nationally consistent regulation) as to what exactly different token holders and entitled to in terms of physical ownership and rights. So, if the company that created the tokens on behalf of the physical owner decided to sell the physical asset, would token holders receive any proceeds? At this point it is clear that the technology works, but it is less clear as to whether or not the marketplace is prepared to regulate and adjudicate potential issues that will arise. Second, and basically an inevitable result of the merger of decentralization and financial investments, there is the possibility that the ultimate result will be the creation of a more centralized clearinghouse, authorizer, or centralized body to approve and resolve these and other associated conflicts. At first glance this may seem reasonable enough, but when advising clients both now and going forward the following question must be asked – if a centralized authority or clearinghouse is the ultimate end state, is that really any different from current operations and crowdfunding platforms?

Additional implications build off of and mirror some other hybrid choices that currently do exist in the marketplace are related to other fractional ownership options and practices that tend to revolve around assets like artwork, collectibles or all kinds, or fine wine collections. Tokenization may very well offer increased transparency and access to virtual ownership of these assets, but financial professionals must be able to understand and state with certainty just what those physical rights and obligations actually are. While this may mean waiting until some regulatory certainty emerges it may also mean that practitioners are going to have to be aware of what these terms and technologies mean for business. Drilling down specifically, there are several different avenues that should be the focus of advisory services and information delivered to clients and customers on behalf of financial professionals.

1. Distributed ownership of high assets such as real estate, collectibles, and other higher priced items that may very be out of the purview of most retail investors. Obtaining access to different investment options is a clear cut methodology and approach for investors across the spectrum to increase net worth. Being able to offer these services and investment options may also be a way by which professionals can address both current client needs as well as obtain new clients. That said, when contemplating these different options and approaches, the following legal and accounting implications do need to be considered:

a. In an era of distributed ownership, what level of ownership is necessary to take action with regards to these assets? For example, if an asset is tokenized into hundreds of thousands of different tokens, is the ownership driven strictly by democratic means, or a consortium based model? This may seem like an abstract or academic concept that is not terribly important, but can make all the difference from an investment perspective.
b. If one specific investor obtains over 50% of all available tokens that are derived from the underlying asset itself, does that mean that this individual investor or owner can unilaterally sell, liquidate, or otherwise convert the real world asset into cash? This would, in effect, relegate the other token holders or owners to non-controlling or minority investors who are driven strictly by the actions of the singe larger token holder. For retail investors this may not be terribly important, but for institutions seeking to invest and retain stakes in certain assets this may actually violate the terms and conditions that drive investment choices.
    i. If, however, the level of token ownership does not correlate to the ability to make decisions, and instead just pertains to some other form of virtual ownership, this raises several other potential issues and concerns that may have to be addressed.
c. Another issue or item that should be a part of the investment thesis and conversation is whether or not token holders are entitled to a share of any profits generated as a result of owning this asset. This again links back to the underlying question – does tokenization and token ownership legally entitle those token holders to ownership of the physical asset itself?
    i. Or conversely, are the profits from the real world asset or investment instead delivered to the real world owners like is traditionally the case?
    ii. Another option that may arise, given the fluidity of this space, is whether or not the profits and returns are pooled and assigned to a centralized administrator?
    iii. This uncertainty and ambiguity given the connection or linkage between real world ownership and token ownership is something that must addressed prior to blockchain tokenization emerging as viable investment choice and option

Real World Applications

As hypothetical and interesting as the applications of tokenization may appear to outside observers, it is not merely an academic or theoretical conversation. Tokenizing physical, or real world assets, is a trend that began to enter the market lexicon as a possibility to not only offer new investing opportunities, but to also open the market itself to new investors and investing vehicles. Perception and hypothetical applications began to merge into market applications with the debut of Tesla on a blockchain for trading purposes. The specifics of the organization involved, and the business model of this entity are not as important as the trend and

underlying shift in the market that this seems to represent. Publicly announced in the early part of 2019, this organization has issued blockchain based tokens associated with 10 organizations that are listed and traded on U.S. marketplaces. Headquartered in Estonia, which has made significant investments and progress on a nation-state level to stake out a leadership position as a technological and blockchain based leader, the trading concept and business model has achieved approval to operate in the E.U. zone.

From a financial markets perspective this transition and development, of a market ready and demand driven tokenized product connected to real world equity securities also raises a number of questions and considerations for practitioners. Even though, for example, these tokenized items are connected to real world securities and physical assets, how are the underlying items secured, verified, and valued (Lai 2018)? If these sound similar to questions raised as they are connected to stablecoins that is because they are quite similar; whenever a derivative like security or asset is mentioned or introduced to the marketplace, the responsibility lies with practitioners to ensure appropriate financial regulations and guidelines are followed. An additional consideration is also connected to the liquidity of these securities, namely will investors will purchase these digital tokens be able to exchange or liquidate these digitally based items as easily as traditional securities. Drilling down to the next layer, are the liquidity factors that are, if they are, going to be impact the digital tokens going to mirror the considerations driving liquidity flows for traditional securities.

From an accounting and financial reporting perspective, the accounting and reporting for digitally linked tokens remain to be an open issue, especially since it does seem that these items are derived and relatively derivative in nature. While there certainly are accounting and reporting standards in place or reporting, disclosing, and documenting the financial effect of derivative instruments, there does not appear to be similar guidance yet issued for stablecoins or digital tokens. Additionally, and even though the record of asset ownership is stored on a blockchain, the processes and controls in place to establish and verify custody and rights to different assets remains an open issue. Especially as the actual asset itself can be held by any individual or institution at any location, ensuring that accurate controls and track records exist is especially important.

Blockchain Education Opportunities

The idea and concept of blockchain education is something that has been mentioned throughout this text, and that is because the importance of learning and education are critically important for practitioners seeking to capitalize on the opportunities generated via blockchain technology. Bringing to bear a broader perspective, however, indicates that additional opportunities and methods for advisory services may be emerging; those linked to the higher education institution. Higher education and emerging technology may not seem like a thriving market or

opportunity for financial advisory services connected to emerging technology, but that is missing the real picture. With the most recent nationally collected revenues (2016) exceeding $550 billion, this is not an insignificant market for advisory services nor one that can be ignored by financial practitioners. One of the key challenges, as well as a challenge that is often cited by politicians and pundits alike, is that cost of higher education has resulted in an educational system that may – almost by default – exclude certain individuals or socioeconomic groups. No technology, be it blockchain or any other technology, is not going to be able address the fundamental issues with any specific industry. That said, blockchain has the ability to lower costs, reduce institutional friction, and enable greater innovation across organizational lines.

1. Changing the currency of higher education. Higher education if, for lack of a better word, a big business and like most other businesses it has a currency and unit of value unique to itself. Credentials are the currency and language of higher education, and are how individuals and institutions are evaluated, but the current system of recording and communicating these different degrees and credentials can be unwieldy. Establishing a sector specific platform for storing and transferring this information can remove a major pain point for students, academics, and institutions at large.
2. Restarting the research engine of academia. Institutions of higher education have always been drivers of research, advancement, and innovation; many of the breakthrough inventions of the twentieth century were a result of public-private-academic collaboration. As intellectual property and assets have become more valuable, however, the sharing of innovative ideas has become more problematic in terms of tracking providence, etc. Once again, setting up a consortium blockchain would allow individual professors and institutions to share information openly while also having an undisputed track record as to who owns what information.
3. Increased affordability of education Despite the initial investments that will invariably be necessary to institute and maintain blockchain platforms throughout different organizations and institutions, one of the core benefits of standardized information storage, sharing, and codification will be lower costs. Especially in the United States, where the annual cost of college education can range between $7000 and over $21,000 per average student, expanding the possible pool of applicants is something that every institution of higher education would certainly be interested in moving forward.
4. Increased market share and mind share of the education marketplace. Although the higher education market has annual revenues in hundreds of billions of dollars, that does not mean that the marketplace is uniformly healthy. The U.S. alone has over 3000 colleges and universities and for the last decade or so (depending on the specific reference cited), the total number of college bound individuals has been flat or declining. Introducing new and innovative curriculum and course concepts represents a definitive way in which institutions can

differentiate themselves from the competition. Making this connection, and explaining this reality to different layers of higher education management and bureaucracy is a core responsibility of any consulting or advisory engagement.

Specifically, greater blockchain and artificial intelligence adoption and integration throughout the broader business landscape it is reasonable that students and faculty will expect institutions to implement these solutions (Huerta and Jensen 2017). While this might seem like a rather obvious ripple effect and impact of blockchain adoption, the reality is that the marketplace is currently in the middle of a severe mismatch between the skills individuals needs and the skills being taught and covered in many higher education curricula. Other industries are certainly more traditionally aligned with advisory and consulting engagements, but the importance of offering new and expanded services to institutions of higher education represents a unique opportunity for a number of reasons. First, accessing this industry group and sector of the market provides financial professionals an opportunity to engage in new methods. Opposed to traditional consulting or advisory engagements, which tended to focus on managing investments for the institution, the integration of technology is a new area. Blockchain will have an effect on both back office and student facing operations at colleges and universities, and since financial service professionals are already – in many cases – tasked with understanding and interpreting the impact of blockchain throughout the economy at large, taking advantage of the growth of interest in emerging technology is perfectly logical.

Second, and something that will provide benefits to both the financial firms involved as well as the institutions themselves is the development and education of more well equipped students to enter the marketplace. Specifically, in order for financial firms to be able to offer robust services, and build out current offerings, new and future hires will need to have the skills necessary to succeed in the marketplace. Working together with institutions of higher education, mirroring efforts already underway by technology firms like Google and Amazon, is a logical path forward.

Third, the need for institutions to reinvest in curricula across the institution provides an opportunity for advisory services both from a budgetary perspective and a strategy planning perspective. Offering courses and different certificate programs that appeal to the needs of the marketplace often go against traditional course offerings and planning processes that are in place within the institution. Changing strategy is almost always a difficult conversation, so bringing in external expertise and advice can assist in smoothing over the inevitable obstacles and challenges facing institutions seeking to pivot in a rapidly changing educational and business landscape. This also connects back to the second point indicated above; coordinating and collaborating with institutions of higher education. Financial services professionals can also add to the development and finalization of different course materials; that of different perspectives and points of view than are normally in place within a college or university.

Blockchain Driven Finance

Blockchain, as has hopefully been explained and broken down within this book in a manner that is both interesting and understandable, potentially will create an entire paradigm shift within the financial services landscape. A decentralized ledger system that enables the virtually continuous transmission and storage of information between network members, and do so using an almost unbreakable (to date) encryption protocol will fundamentally alter the role financial services professionals play in the marketplace. Taking a step back first, before really drilling into finance specific applications, appears appropriate. In the current marketplace, regardless of which specific function is analyzed, centralized systems and institutions tend to dominate the conversation. Regulators, banks, accounting firm, lawyers, and other institutional authorities operate as central arbiters of data, truth, as well as the verification of different information. Blockchain, by the very nature of the technology itself, represents a complete shift away from such a centralized model and a drift toward a decentralized method of doing business.

On top of the changes that this decentralization will have in terms of opportunities and the development of new services, there are also risks and potential downsides that have to taken into account (Richins et al. 2017). Namely, in a decentralized or even partially decentralized system of conducting business transactions there may not be a readily available central authority to resolve conflicts, disputes, or even settle unusual transactions. This lack of a central authority or clearinghouse is contributing to the increased interest in the private blockchain space, which can be thought of as a hybrid between an entirely decentralized blockchain and a more traditional network. In such an environment, where confirmations, verifications, and settlements of different transactions are not as much the responsibility of financial services professionals as they currently are, this will require a shift in just what actually occupies the time of these professionals.

The implications for audit and taxation professionals should be, by this point, relatively straight forward to identify and understand, but taking a look at the broader financial services landscape reveals numerous additional implications. For example, the settlement of trades, the issuance of letters of credit, and the monitoring of bills of lading to help determine ownership of assets for insurance purposes all will be altered. In the current marketplace leveraging current technologies these individual transactions take days, if not longer, to settle and clear between the involved counterparties. IBM, in an industry partnership with Maersk, has attracted (as of this writing) over 100 different organizations to establish, maintain, and utilize a common platform to cut down on the manual processing and interpretation that so often accompanies international shipping and transportation. In addition to the rather obvious operational benefits associated with these improvements, there are financial implications that also need to be considered.

For example, if the time required to settle and process different forms of paperwork and transactional data is drastically reduced, is the need for counterparty insurance and other hedging financial instruments still as necessary? In addition to the impact this will have on shipping and transportation industries in particular, it

will also have quite a large effect on the general insurance business at large. Processing insurance claims, obtaining information from the variety of actors involved in the verification, processing, and settling insurance claims and payments is a time consuming activity that can result in hardship for negatively impacted parties. On top of insurance and financial market implications, the impact on banking is difficult to overstate in the sense that a decentralized financial system will, taken to its logical conclusion, result in either the transformation or elimination of traditional banking arrangements.

International trade finance is also an area in which blockchain is almost tailor made to drive innovation, change, and disruption, and has the potential to generate significant savings and efficiency gains for every institution involved. Trade finance exists for almost every organization that does business in the global business landscape, and represents the proverbial lifeblood of how trade flows on a global basis. Specifically enough, while external float – in the forms of paper checks of different paper processes – is less prevalent in the internal marketplace, internal float still represents a serious issue for different organizations. Back office processing, delays in credit cards settling between banks, and the archaic paperwork that can hamstring even the most sophisticated of deals represent areas for internal efficiency gains, cost savings, and operational improvement.

Roles of Practitioners in a Blockchain Driven World

After analyzing the potential impact and effect of blockchain on the financial services landscape and the professions located therein, it does appear difficult to overstate just how drastically blockchain may change many of the roles that currently exist (Appelbaum et al. 2017). Blockchain, at the core of the idea, is a complete departure and different structure than any current financial system of centralized payment processing and verification. Since accounting and finance professionals often play a role in the data collection, reporting, and verification process, it stands to reason that many, if not the vast majority, of current roles will no longer exist in current forms moving forward. Specifically in the case of an either blockchain-first, or at least blockchain-augmented financial services landscape, the core role of data collection, comparison, and analysis will either be either be eliminated altogether, or fundamentally changed to the point that it is barely recognizable.

Entire aspects and parts of the current accounting and financial reporting process will be changed, so let's take a look at some of them in particular.

1. Audit and attest services. Stated throughout this book, the current role and process by which audits and other attestation engagements are conducted is, at best, a relatively shaky proposition. Only conducted on a periodic basis, external experts and consultants make on-site visits to an organization to help verify both the accuracy of reported data as well as the strength of the processes generating and recording this information. As the storage of information onto different blockchains becomes more commonplace, and remembering that as data is

uploaded onto the blockchain it is continuously verified by the other members of the blockchain, the audit itself will have to evolve alongside the broader business environment.

a. Confirmations will not be necessary, or if they are necessary at all they will be vastly reduced in nature due to the fact that data is confirmed and verified as it is added to the blockchain environment. Acknowledging this reality, however, it is also important to realize that even as some roles – such as confirmations – become redundant, new roles will become even more important.
b. Knowledge of blockchain fundamentals and controls will inevitably be necessary for practitioners occurring at all levels within the organization. Even if, as is widely expected and anticipated, accounting and finance practitioners will not have to become coders and programmers, a fundamental understanding of this technology will be necessary. Especially in terms of building controls, systems, and processes to establish and maintain integrity over the blockchain environment itself, accounting practitioners will need to be able to deliver value on an effective basis.
c. Tackling regulatory uncertainty and confusion will also be something that is going to represent an ever larger part of the role of accounting and attestation practitioners play during the audit process. As if blockchain itself was not creating enough uncertainty and confusion by itself, there is the entire maelstrom surrounding the security and utility token environment. Drilling down specifically, accounting practitioners will have to be able to not only distinguish these items for themselves and be able to translate these concepts to clients and customers.
d. Audits and attestations will expand to include not only financial information, but also non-financial information, especially as sustainability and other operational data becomes a greater point of focus going forward. Especially as the ESG scene continues to increase in size, scope, and investor interest, auditors and attest professionals, there will be a need to develop these services into productive lines.

Blockchain Impacted Finance

Although accounting will certainly be impacted by blockchain, it is also important to realize that many of the core functions of financial advisors, market makers, and providers of capital will also be impact by the increased utilization of blockchain technology in the financial services landscape. From a finance raising and capital accumulation perspective, the implications of blockchain might perhaps be actualized first. In a traditional setting and landscape, organizations seeking to raise capital through an initial public offering (IPO) process need to use an investment bank, other market maker, or some other financial intermediary. While the organization seeking to raise capital benefits from the utilization of subject matter experts, having to use a financial intermediary does both slow down the process, and add extra cost into the system by and large.

Blockchain, by virtue of its nature in general, is a decentralized system that allows the network members of the network to store, transmit, and communicate information between themselves and other different members. This is, of course, interesting from a technical and academic sense but also from a capital raising and markets point of view as well. Drilling down specifically, let's take a look at few of the way – obvious or not – blockchain may very well drive change throughout the finance profession.

1. Decentralized capital raising and financing. Even for the most sophisticated organizations, the prospect of raising capital to finance a project or initiative can be daunting prospect. Entering the capital markets, regardless of whether the organization seeks to raise equity or debt, requires a substantial amount of preparation, planning, and consistent execution. More to the point, however, raising capital has always traditionally necessitated the utilization or a third party to assist with this process. Be it a consulting firm, investment bank, or some other type of lending organization, these gatekeepers always have played an outsized role in the preparation and execution of an IPO.
   a. ICOs, however, appear uniquely positioned to disrupt and perhaps radically change how the capital raising process actually works. Instead of relying on a third party to connect the organization seeking to raise capital with interested investors, the management team is able to connect directly with the marketplace. Of course there are still technical specifications and limitations that need to fulfilled, but the overarching methodology of how an ICO works is different from that of an IPO. Additionally, instead of the weeks or even months that go into planning and executing an IPO, once the underlying blockchain itself is up and running, an ICO can be concluded in as little as 30 min.
   b. One other important note to discuss is that as raising and storing capital becomes more democratic, it is also going to be important that the individuals investing in ICO organizations are able to understand just what they are buying. A more thorough analysis of what constitutes a security or utility token is conducted earlier in this text. The long and short of it is, however, is that different investing options are made more available to the marketplace, financial advisors are going to have to intelligent conversations on these topics.
2. Increased speed of settlements. From a consumer perspective, or from any consumer sentiment reading or research report, there is one that that every consumer desires; the ability to process transactions at higher speeds, and are not hesitant to use technology to do just this. Virtually every other profession and landscape has evolved along these lines, so it makes sense that finance is not going to want to be left behind. Mobile payments, the ability to swipe and pay using a phone, smartwatch or some other type of payment platform, has drastically improved the consumer and front facing part of the organization. That said, and even with the dramatic improvement that has been achieved with regards to customer payment the back end processing of these transactions remains. Blockchain, and especially the cryptocurrency Bitcoin, appear positioned to radically change this process.

   a. Transactions can, depending on the items being transferred, bought or otherwise exchanged, can take days to transfer and settle correctly. Due to this, and other factors – such as the rise of convenient online shopping options – the utilization of credit card and other electronic payment tools has continued to increase at a rapid pace. Even as advances in speed and efficiency continue to enter the market from virtually every side, however, the final settlement of credit card transactions continues to lag other business trends. Blockchain, although taking longer initially to upload and verify blocks of data (especially in the classic framework proposed by Bitcoin blockchain enthusiasts, is much faster at creating a ready made, auditable, and secure record of the transaction.
      i. Such a shift will inevitably trigger a change and shift in how credit card and other electronic payments are processed, how often they are used, and the accounting for this information as part of the settlement process itself.

3. Broader array of investable assets. Even though there remains a large degree of regulatory uncertainty with regards to cryptocurrencies and the investing options available for investors, there is one underlying fact that remains true. As the cryptocurrency and broader cryptoasset marketplace becomes more mainstream and widely adopted by both individual and institutional investors, this adoption will create new and augmented classes of assets for different classes of investors. For example, some of the items that will have to be analyzed, evaluated, and explained to both current and future investors includes, but is not limited to the following:
   a. Cryptocurrencies. The iteration and class that began this entire crypoasset and crypto environment conversation – Bitcoin – still dominates the conversation and landscape as it connects to the investable options in this space. As of this writing, and the estimates will vary depending on the source utilized, Bitcoin by itself still constitutes between 40–50% of the total market capitalization of the cryptocurrency market. Such concentration, and the outsized effect that one specific asset can have on an entire asset class is an entirely separate issue worthy of analysis.
      i. Cryptocurrencies are evolving alongside the market as great amounts of interest and investment flow into this space. Taking the form of both a broader and more diversified asset class for investing purposes, as well as a class that is impacted by ETFs and other such indices, cryptocurrencies do not appear to represent a trend, but a rather permanent addition to the investment conversation.
   b. Tokens, both security and utility in nature. It may have been the year of Bitcoin in 2017, but as 2018 rolls into 2019, and 2019 into 2020, a differentiated type of asset and business event seems to be taking front stage. An ICO is, as has been discussed in this book, merely a way by which an organization running with either a blockchain idea, or actually operating a business, is able to raise capital. Remember, and as explained previously, there are two broadly different options for an organization seeking to issue a token as part of a blockchain based capital raise; security and utility tokens.

i. **Note:** Many organizations have seized on the utility token band wagon to state they are issuing something akin to a utility token, but there is no defined or widely accepted definition of what exactly a utility token represents.

AI Augmented Finance

As disruptive as blockchain technology may very well end up being to the accounting and financial services landscape, the roll out of artificial intelligence may well end up having an impact before the blockchain revolution gets fully underway. Returning to the core concept underpinning the concept of AI, namely that it is computer program or a suite of programs that can either augment or entirely automate processes currently conducted by individuals within the firm seems to capitalize on trends already in existence in the marketplace. Arguably even more powerful to understand is the fact that, in addition to the excitement, investment, and debate in the AI space, there is already a realized market demand and home for artificial intelligence in the financial services space. Even just looking at the investment aspect of the marketplace, including buy-side and sell-side institutions there are entire firms aligned and based on using AI to drive trading decision making. The merits of such tactics, including the potential imbalances caused by the utilization of these technologies is a debate for another book and conversation, but the facts remain unchanged.

While AI may already be in the marketplace and be utilized by leading investment firms, but the utilization of AI also has potential to continue automating financial markets, investing decisions, financing choices, and how accounting professionals interact with clients and customers. For example, and something that is building on activities already underway in the consumer space, a future application of AI can allow potential businesses and business plans to be evaluated nearly instantaneously. Such a state will have two potential effects on the financing and lending landscape. First, the need for loan officers and associated staff to compile, analyze, and make decisions based on available for information will be reduced as the algorithms built for these exact tasks become more sophisticated and more affordable. Second, if the speed with which applications are approved increases there will also be a need for a more efficient method of transferring funds. Put another way, one aspect of the commercial lending and financing mechanism cannot be improved and streamlined without the other associated aspects of that ecosystem also accelerating.

Increased efficiency is a great thing, especially in a business like market making and financial investing that is increasingly facing margin compression, but does not come without risks. Obviously every market and investment class is different due to market variations and trends, but there do appear to be a few common themes and concepts that every financial advisor and professional needs to keep in mind as AI becomes increasingly prevalent in the broader marketplace. Let's take a look at a few of roles, traits, and characteristics that financial advisors and professionals will increasingly need to think about and/or posses moving forward.

1. Make sure that the terminology is understand. Artificial intelligence is a buzzword and trends that has swept the marketplace, but there is a large amount of jargon and terminology that might very well make this seem more confusing than necessary. For example, the word algorithm is tossed around quite a bit in the marketplace, but if a financial professional is seeking to provide valid advice it is important to differentiate protocols, algorithms, and artificial intelligence.
   a. Protocols can be thought of as the framework and guidelines that establish what is necessary to run different algorithms and programs that underpin the artificial intelligence in general. For example, in order to start working on a woodworking project you would need to make sure you possessed the correct equipment, supplies, and had these items set up appropriately.
   b. Algorithims by themselves are not the framework nor any extremely sophisticated program, but otherwise can represent the recipe or set of direct instructions to put the protocol into action. An algorithm may seem like a trendy buzzword, but in general only represent a set of instructions or steps to execute a process or set of processes outline in the protocol.
2. Volatility may actually increase. A common trend and market force is to try and reduce the risk of volatility and the risk of losses associated with investments, especially for individual investors that may have been negatively impacted by the financial crisis. Two specific iterations of this desire to reduce the risk of loss are the rise of passive investing funds, and the increased automation of how investment decisions are made for both individual and institutions. Such automation increases the efficiency with which decisions are made, reduces costs, and allows investors to access opportunities that may have otherwise been too expensive. Passive investing, piggybacking off of this increased favoritism toward automation and digitization of investing decisions, has also allowed ever larger swaths of investors to become shareholders in largest percentages of public organizations. Such a coordination between both automation and passive investing, however, may also be creating an opportunity to advise on the following issues:
   a. Herd behavior. If more and more investors and funds are investing in similar, if not identical items and assets, the risk of an asymmetric can gather unnoticed will inevitably increase. If this seems unduly complicated to explain to clients, think of the following analogy; if everyone on a boat knows that standing on the right side is safer, everyone will stand there. That said, the first time the boat encounters safe water, the risk of the boat capsizing has actually increased due to the fact that risk and market actors have concentrated risk.
3. Connect AI forces to business trends at large. An aspect of artificial intelligence that may have been overlooked by many financial professionals is that while there certainly are organizations directly engaged in working in the AI space, that artificial intelligence will impact virtually every type of organization in the marketplace.
   a. As different technology become increasingly integrated within the business decision making process, financial advisors will also need to be able to offer advice to internal and external clients. In order to do this, however, the ripple effects – good and bad – must be understood

Bot Driven Organizations

While the mention of bots for business purposes may initially conjure or bring to mind an impression closely aligned with science fiction media, the reality on the ground is actually much more mundane. Building off of the continuing integration of the internet of things, AI and other automation tools and tactics, it appears to be a logical next step to integrate AI and deep learning into existing processes and programs (Sullivan 2018). Bots do not, in most cases, actually reference physical robots but rather the software and operating programming that drive efficiency and automation within the organization. This is an important point to highlight and emphasize as the shift toward a technologically integrated accounting function. A common misconception and rather worthwhile cause for concern amongst current employees is the fear and expectation that physical robots will 1 day be deployed in the workplace to replace humans. Even commercials and news documentaries focusing on the continuing integration of robotics and technology into the workforce seem to focus on the physical presence of robots replacing human employees. In the current business landscape, however, it does seem appropriate to touch on the reality that, even in the midst of technology integration and automation, bots currently do appear to be most recent iteration and force driving change in the professionals landscape.

As bots and other technology tools become more widespread and increasingly integrated within the financial services landscape, there is another force and trend that professionals need to be aware of going forward. Especially in the accounting and finance subsets of the financial services landscape, there do appear to be several forces and trends that need to accounting for:

1. Bots will augment accounting and finance functions – this may be perhaps the most important point to emphasize and highlight during the onboarding and training process with regards to technology resources. Although technological innovation and disruption will invariably drive changes and displacement throughout the professional landscape, the more important to emphasize is that it will also create opportunities, including those that do not currently exist. Instead of viewing bots, artificial intelligence, and blockchain as technology forces to be feared it would seem more appropriate to classify these tools as options able to further refine and develop skills within the professional landscape.
2. The implementation of bots will create new jobs – as bots become increasingly integrated within the professional landscape, there will be job losses, displacement, and friction in the workforce, but that is only one aspect of this transition that should be analyzed. Another angle that may, or may not have been analyzed previously, is that as more and more bots and technology tools are implemented, there will be increased opportunities and jobs that currently do not exist.
    a. For example, as bots become more integrated and implemented throughout the organization across different industry lines, financial professionals will be expected to conduct audits and other internal control related activities linked to these technologies. This development will vary from organization to orga-

nization, but the fundamental fact remains true; as automation and digitization occupies and completes increasing amounts of managerial tasks, there will be a need for professionals to review, examine, and test the parameters that drive these bots.

b. Control specialist – in addition to examining and reviewing current controls as they connect and relate to bots and other autonomous technology tools, there will also be jobs and opportunities connected to the rise and increased integration of technology on fundamental financial services functions. While controls will always be important the reality of the situation is that specific controls will invariably change. Realizing that the control environment and structure are going to be changing creates both an opportunity and a challenge for financial services professionals.
c. Network experts – creating, developing, and actually writing the code that drives these different technology tools, including but not limited to blockchain networks and decentralized organizations also provides financial professionals opportunities to augment and further refine roles and responsibilities. Certainly it is not expected that accounting and finance professionals will need to become experts in coding, programming language, or developing the underlying protocols that secure the networks. That said, implementing and tweaking general information technology controls do represent a viable and quantitative opportunity to further development and refinement.

3. Bots merely represent the first step – it is true that hot topics such as artificial intelligence and blockchain technology are garnering the bulk of investment and attention but that there is no need to drive headfirst into this journey without taking preparatory steps. Bots may seem like a radically advanced technology and application, but upon further review merely represent the next logical stage and iteration of technology tools. Building on the functionality already embedded in chat tools, scheduling applications, and other semi-autonomous technology options, bots are just applying a similar mindset and technology to other functions
   a. Think of the following. While adopting emerging technology tools such as bots and other types of applications may seem like something that may not be required at this time it is being adopted by other organizations in the marketplace. Put another way, if one specific firm does not invest in these technologies the competition will be doing so.
4. Bot implementation can, and should be, viewed as an opportunity for practitioners to elevate themselves into more strategic and advisory services. Specifically, as bots are able to handle more baseline functions within the accounting function – both for practitioners employed within industry and those employed at accounting firms – the remaining individuals will be able to instead focus on the higher level advisory and business planning services that both add more value and generate higher margins. Although the focus of bots may initially be in the accounting space, the reality is that bots and other software automation will also enable financial professionals to spend time reviewing financials for accuracy, and instead focus on analysis based on that financial information.

A common theme or refrain that all too often accompanies the discussion around automation, bot integration, and other technological advances is the fear – some of which is founded – that as technology becomes more sophisticated that there will be less work for financial professionals to do. Of course there will be some displacement and disruption within the broader business landscape, including financial services, but the important point to remember is that even as some roles and augmented or changed altogether, new roles and responsibilities will emerge.

Decentralized Organizations and Financial Services

Linking back to the concept of a decentralized organization, the ramifications and ripple effects of this shift from a centralized model to a decentralized method of doing business, especially from a financial services organization are the impacts that these changes will have on financial institutions. Banking, commercial financing, lending, investment banking, the settling of trades and transactions, and virtually the entire audit and attestation field are dependent on a centralized method of conducting business. Without rehashing arguments and statements of fact previously outlined in this text, drilling down to takeaway items and implications of DAOs on the broader financial services landscape include, but are not limited to the following:

1. Audits will have to change and transform from a periodic event to one that occurs on a nearly continuous basis, as well as increasing in scope to include both financial and nonfinancial business. This may seem like a simple concept to introduce and discuss, but the ramifications of this shift are difficult to overstate due to how different it is from how audits are currently conducted. Instead of periodic examinations of a sample of financial information and transactions, auditors will – and in some cases already are – performing attestation and assurance engagements on nonfinancial/operational data.
2. Transactions can occur in near real time between organizations regardless of the level of trust or familiarity these institutions have with each other. This may not seem like a dramatic change from current operations, but the implications of a DAO are profound. In order to actually implement and utilize a DAO in a business context, that same organization must also utilize an underlying blockchain.
    a. Don't forget that transactions that take place on an underlying blockchain may take (at least for now) initially longer to settle, but after that the back end will be processed much faster.
    b. Even though a DAO may operate on a blockchain itself, that does not entirely remove the risk of a breach, hack, or security incident that would otherwise occur within a different type of organization. A classic example of a DAO breach actually took place on the Ethereum blockchain, when $150 million in assets were frozen due to a bug in the code that were uncovered. Although eventually it was corrected, the reputational damage and direct intervention

that was necessary did somewhat tarnish the concept of using DAOs for widespread business applications.

3. If the organization or association of organizations are operating on a decentralized autonomous organization, the lack of a governance structure and reporting framework might very well represent a significant governance issue for both individual organizations and investor relations personnel. This is not merely an academic conversation, or an idea that can be tossed to the side as something that is not core to business decision making. Numerous examples abound of how corporate governance failures and shortcomings can have a dramatic impact on how the bottom line is impacted. A few of the implications of this shift are outlined below:
   a. While Tesla and Elon Musk may have been the most dramatic and pronounced example of how corporate governance has caused distress in the marketplace, but it is far from the only one.
   b. As organizations become increasingly decentralized and operated on a virtually remote basis the importance of consistent channels and pathways of communication will only increase over time.
   c. Ensuring that strategy, strategic plans, and higher level initiatives put into place by the senior leadership of the organization are then operationalized and transitioned into ideas that can tracked and monitored over time across industry lines

Although some of the originators of bitcoin and other types of cryptocurrencies may have embraced the decentralized part of cryptocurrencies to help establish an alternative financial system to the current fiat infrastructure, the impact of decentralized decision making is much broader. Decentralizing how financial capital is allocated and delivered between the lenders of credit and the receivers of said credit is, in essence, completely different from how financial capital currently flows in the marketplace. In addition to the operational changes and shifts that will inevitably be a part of the decentralization conversation, it is also important that financial professionals be aware of the governance and management considerations that must be updated. Managing change, making effective decisions, and executing these decisions in a proactive and productive manner is difficult enough even when the decision making process is centralized and well established. Seeking approval, obtaining sign off, and making sure that all involved stakeholders are kept informed is something that is a critical responsibility of financial professional seeking to add value and drive the business forward.

In a decentralized environment, however, the decision making process – virtually by default of a decentralized structure – will become more complicated. It is true that different protocols can, and already are, being written and developed to help streamline this process, but this also raises an additional question. If, via the protocols written and enforced by blockchain members, some of the decision making and approvals are assigned to members with the most stake or processing power, this does resemble a level of centralization moving contradictory to the idea of a decentralized network structure. As organizations become increasingly interested in both

raising capital, and then operating on, blockchain technology and platforms, questions, concerns, and opportunities for additional advisory work will also emerge. This shift, from compliance and reporting to a role closer to that of strategic advisor and business partner, also mirrors the development of the professional landscape overall. Technology is becoming less expensive, easier to scale, and simpler to use for non-technology specialists; this is hard trend that will, without a doubt, drive changes in the types of work performed by financial professionals.

Chapter 17 Summary

Data has been referred to as perhaps the defining competitive advantage of the twenty-first century, and this chapter dives into what this means for financial services professionals as emerging technology becomes increasingly integrated into current products and services. Harnessing data and organizational information represents a core responsibility and fiduciary responsibility that CPAs and other financial professionals are already familiar with providing. That said, it is important for professionals to realize that the expectations for information and data are changing and evolving as clients and external stakeholders continue to evolve. Real time information, the ability to evolve and make decision making on a continuous basis, and the implications of these changes are continuing to change services provided to both internal and external clients. Technology such as robotic process automation and artificial intelligence can assist professionals in gathering data, but using these tools in a proactive manner to assist with the business decision making process represents a definitive next step. Data represents a tremendous opportunity and forces to enable expanded value creation, but in order to maximize these opportunities it must be used and framed in a logical framework.

Reflection Questions – Chapter 17

1. Is the data produced within your clean, able to by relied on, and consistently communicated to external and?
2. How can automation assist in making better use of organizational data?
3. Ho can automaton and other emerging technology make it more difficult and less efficient to communicate and store organizational data?
4. Has the decrease in digital storage cost been helpful or hurtful to organizations seeking ot make better use of data?

Supplemental Readings

Deloitte – Data as an Asset – https://www2.deloitte.com/insights/us/en/industry/public-sector/chief-data-officer-government-playbook/data-as-an-asset.html

Forbes – Turn Your Data into a Valued Corporate Asset – https://www.forbes.com/sites/gartnergroup/2017/11/13/turn-your-big-data-into-a-valued-corporate-asset/#36c87c0a6ae3

McKinsey – Smarter analytics for banks – https://www.mckinsey.com/industries/financial-services/our-insights/smarter-analytics-for-banks

References

Appelbaum, D., Kogan, A., & Vasarhelyi, M. A. (2017). Big data and analytics in the modern audit engagement: Research needs. *Auditing: A Journal of Practice & Theory, 36*(4), 1–27. https://doi.org/10.2308/ajpt-51684.

Díaz-Santiago, S., Rodríguez-Henríquez, L., & Chakraborty, D. (2016). A cryptographic study of tokenization systems. *International Journal of Information Security, 15*(4), 413–432. https://doi.org/10.1007/s10207-015-0313-x.

Drew, J. (2018). Merging accounting with "big data" science. *Journal of Accountancy, 226*(1), 47–52.

Fambrough, G. (2019). Introduction to the fraud reduction and data analytics act of 2015. *Armed Forces Comptroller, 64*(1), 45–46.

Huerta, E., & Jensen, S. (2017). An accounting information systems perspective on data analytics and big data. *Journal of Information Systems, 31*(3), 101–114. https://doi.org/10.2308/isys-51799.

Lai, K. (2018). Singapore banks using DLT to tackle money laundering. *International Financial Law Review*, 1.

Marinova, P. (2018). Why VC firm fifth wall ventures is bullish on the tokenization of real estate. *Fortune.Com*, 1.

Perols, J. L., Bowen, R. M., Zimmermann, C., & Samba, B. (2017). Finding needles in a haystack: Using data analytics to improve fraud prediction. *Accounting Review, 92*(2), 221–245. https://doi.org/10.2308/accr-51562.

Richins, G., Stapleton, A., Stratopoulos, T. C., & Wong, C. (2017). Big data analytics: Opportunity or threat for the accounting profession? *Journal of Information Systems, 31*(3), 63–79. https://doi.org/10.2308/isys-51805.

Savva, N., & Straub, G. (2018). Making big data deliver: Investment in data science can reap great rewards — but if it doesn't yield what you want, ask where you're going wrong, say Nicos Savva and Gabriel Straub. *London Business School Review, 29*(1), 40–43. https://doi.org/10.1111/2057-1615.12215.

Sullivan, C. (2018). Gdpr regulation of Ai and deep learning in the context of Iot data processing—a risky strategy. *Journal of Internet Law, 22*(6), 1–23.

Whittemore, A., Freese, P., & Lucido, A. (2017). Leveraging data analytics as a force multiplier. *Armed Forces Comptroller, 62*(4), 49–52.

Elevation to Strategic Advisor

18

This transition, from compliance based reporting and analysis of historical financial information, to one more closely aligned with forward looking guidance and advice, is not one that can happen given the current status of technology and education within the financial services landscape. Elevating and becoming more of a strategic partner within the business decision making process will require better integration of technology tools, processes, and procedures and strategies leveraging technology must become a part of the financial services conversation. What makes the current era seemingly different from prior technology trends and forces is the fact that, instead of representing an iteration or step development building on current technologies, blockchain and artificial intelligence are two disruptive tools. Let's not forget, and avoid getting lost in the technical jargon, just what exactly both artificial intelligence and blockchain might change about the financial services landscape and conversation (Fig. 18.1).

Blockchain Impact

The rise of blockchain technology represents perhaps the most radical departure from current accounting and finance infrastructure, virtually all of which is built around a centralized idea of how information and financial resources flow between market actors. Creating a third independent, and community based ledger and storage platform for either financial or non-financial data has tremendous upside potential for financial services and non-financial services alike. In fact, blockchain implementation and adoption has, depending on which report and information is cited and documented, accelerated in the non-financial space ahead of the adoption in the financial space. Next step applications such as ICOs and DAOs hold virtually untapped potential to transform and augment how financial data and information passes between providers of credit and the seekers of financial information.

Artificial Intelligence Impacts

AI may be attracting the most attention and information within the technology landscape in terms of automation and efficiency creation, but there are different steps

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_18

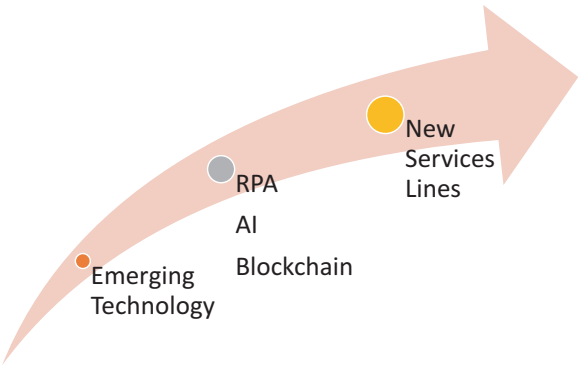

Fig. 18.1 Linking emerging technology to business development

and iterations that can be implemented prior to diving full force into the AI pool. Robotic process automation is perhaps the most logical first step in the automation conversation, but it is important to recognize just what else is necessary for automation and efficiency to deliver a true impact to the professional landscape. Even with the promise and potential of AI, RPA, or any other of the acronym-first technology platforms, it is important to recognize the importance of underlying documentation. Put simply, in order to gain the benefits and upsides of automation and efficiency by more fully integrating technology solutions current processes and documentation must take priority.

Ultimately technology is just that, technology, and any tool that by itself will not be able to solve or address the needs, expectations, and requirements of marketplace actors. The most advanced and sophisticated technology in existence will not be able to solve fundamental business problems, improve the communication and dissemination of information between different internal and external groups, but will rather augment and accelerate current trends and forces. For example, the trend toward short-termism, quarterly reporting, and the expectation of market actors to receive information on a nearly continuous basis from organizations has, according to many, contributed to the degradation of both business and financial decision making. Financial professionals, far from being perceived as possible problem solvers and an ability to address this issue, are all too often categorized as drivers of the very short termism that has driven the decision making process from strategic to tactical.

Now, it is important to note that the efforts a few financial services professionals are not going to be enough to change or even challenge the status quo with regards to how financial information is analyzed, reported, and documented to the marketplace. That said, and made all the more possible by effectively leveraging technology, financial professionals will be able to generate and maintain a more effective voice at the proverbial table, especially as it links to more effective business decision making. This process, the effective leveraging of technology, represents both a challenge and an opportunity for financial professionals. Clearly, some of these tools are complicated and multi-faceted in nature, but that does not mean that mastering them is out of the realm of possibility for professionals. In fact, even though these tools may be technical in nature, it is entirely possible, and is already

occurring, that financial services professionals can master and effectively leverage these tools.

Given the advancements in technology, however, it is increasingly impossible for financial services professionals to play an increasing role in analyzing the reams of data produced on a daily basis by the organization. Operational information, the vast quantities of structured information already analyzed by financial professionals, and the even larger amounts of unstructured information generated through interactions with different stakeholder groups all have an impact on how the organization performs. Regardless of the origin of the data, be it operational, financial, nonfinancial, or some other type of information, all of it can be quantified, compiled, and reported to both internal and external stakeholders. In essence, quantitative data drives the decision making process at every level of the organization, and financial services professionals are already well versed, trained, and educated in doing that exact same thing. Simply acknowledging this reality, however, is not enough; financial professionals must also be able to turn this reality into actionable business ideas

Current Use Cases and Future Applications

With any emerging technology tools or platforms it is important to recognize the fact that attempting to document and discuss current use trends is always going to be challenging simply given the fact that this technology continues to move rapidly. Just in 2018 alone the conversation and debate around blockchain and cryptocurrencies has evolved from traditional IPOs, to ICOs, to the most current iteration of airdropping tokens. Alongside the evolution in the blockchain space and area, it is also important to acknowledge the changing nature of the artificial intelligence market as well. Even though AI tools, programs, and algorithms are already being put into place to help with trading, settling transactions, and executing certain confirmations this merely represents the proverbial tip of the iceberg. Automation, regardless of the specific subset of the financial services market is being analyzed, is coming and is already driving change as to what practitioners actually do on a daily basis. As if the underlying technology changes were not enough to contend with from an implementation and educational perspective, it is also worth pointing out that the entire blockchain-artificial intelligence-cryptocurrency ecosystem could be disrupted at any point given the uncertainty with regards to regulation and oversight.

Regulation and engagement with the various regulatory and oversight bodies in the financial services space, of which they are many, represents an interesting point of debate for the emerging technology space. As the broader marketplace evolves and matures, it is inevitable that regulators will have both increased interest and increased motivation to enable effective regulations. While some initial or early adopters of different emerging technologies may not be ecstatic about this development, the very nature of this technology means that – in essence – regulators have no choice in the matter. Powerful as blockchain and artificial intelligence are for practitioners and market actors, the implications for regulators are equally as

powerful for regulatory bodies. In order to remain relevant and continuing to add value to the broader conversation, regulators must – and have increasingly done so – become well informed, conversant, and able to hold substantive conversations with practitioners.

That said, and with all of that taken into account, let's drill down into a few market examples that have entered into the marketplace since June of 2018:

1. All of the Big 4 accounting firms have collaborated to implement and operationalize a common accounting and auditing platform with a consortium of 20 banks headquartered in Taiwan. This points specifically to a broader development in the arena of blockchain technology, that of developing industry and sector specific blockchain platforms and technologies. While the space of blockchain technology has indeed been attracting quite a bit of investment and attention from different market actors, the vast majority of this investment has been focused in the private blockchain space.
   a. While practical and logical from an implementation and application perspective, this also means that the true benefits of blockchain technology will be able to be obtained
   b. Developing sector specific and industry affiliated methods and frameworks for how to use, develop, and maintain blockchain platforms will also help ease the uncertainty and lack of clarity that has to date surrounded many of the projects underway in this space.
   c. Lastly, by taking a proactive position and willingly collaborating, the Big 4 accounting firms have positioned themselves strongly to have a firm voice in the inevitable conversations and debates around just how to regulate and enforce regulation in this space.
2. Smart contracts are already being used by several organizations in the marketplace, but rather than drill down into specific company applications, it seems reasonable to examine just how these smart contracts can be applied to a number of different industry settings.
   a. Insurance – one of the most painful and time consuming transactions underway in the financial marketplace is that of insurance payouts, reimbursements, and claims. Amplifying this is the fact that the global insurance market is worth trillions of dollars, and also creates huge amounts of capital that must be invested to generate adequate returns. Leveraging the automated nature of a smart contract to facilitate the payment of claims and reimbursement of third parties can free not only internal resources, but allow for the more efficient investment of capital on a macro scale.
   b. Speaking of payments and confirmations, the audit and attestation sectors of the financial services market are already experimenting with the potential embedded and created by smart contracts. Manually confirming outstanding balances, reconciling unresolved payable and receivables, and having to physically count inventory may very well soon be a thing of the past. Even something as, apparently, simple as ensuring all counterparties know the terms and conditions of shipping contacts can, and already is, reducing costs and freeing up management time.

c. Real estate mortgage applications and title searches represent another area of the broader financial services market that is already experiencing some disruption and change due to the implementation of blockchain, AI, and other emerging technologies. One of the most current pain points that have had an impact on this sector is the complexity of paperwork, counterparties involved, and the approvals necessary as part of the mortgage application and approval process. Establishing a common platform that enable these difference counterparties to communicate in near real time and to do so in an encrypted manner, ensuring security over the information involved, does represent a potential game changer for the industry.

A core point to remember as different use cases continue to evolve and develop in different arenas of the marketplace, there do appear to be several fundamental trends and directions that are driving these developments and changes. It is clear that different industries will, and already are, have to grapple with the variety of legal regulations and obligations that shape institutional actions, but even with that taken into account it is also reasonable to expect that these core and underlying trends will not change all that radically over time. Drilling down to some of the use cases and applications underway in the marketplace, including but not limited to the developments and banking and other financial institutions, several core characteristics appear to be key. Not only are these issues important from an organizational and operational perspective, but are also going to drive changes in what offerings are communicated to the market from a client advisory point of view.

First, the shift in institutional flows and interest appears to, almost without exception, be focused in the private or consortium based model of blockchain applications. Developing these blockchain networks from a technological and programming perspective is obviously something that is going to attract quite a bit of attention, but there are additional considerations that need to be part of the financial conversation. Controls over the custody and transmission of personally identifiable information is already something that is becoming an area of focus for practitioners; this trend and shift will only continue as digital information becomes more integrated into almost every business. As private blockchains continue, at least based on market evidence, to obtain and maintain a leading market position, there are also additional concerns that need to be factored into the dialogue.

One of the underlying issues that is not normally discussed in the debate and analysis surrounding private or consortium blockchain models is that these private networks are usually based on the proprietary code of the developing organization. For example, if a large organization develops and implements a blockchain model for suppliers and partners to utilize, these affiliated organizations are going to, in essence, have to use this network. This raises the specter of coding, hacking, and other computer issues that are going to have be addressed with any technology tools, including blockchain. Especially in the financial services industry, or any other industry that has developed sector specific blockchain based models or applications, this reliance on proprietary code may actually create a contradictory or paradoxical situation. One of the most integral benefits and attributes of blockchain

technology was the distribution and decentralization of information and operation. As these private or consortium models become more and more common, this actually may create a situation where – inadvertently or not – blockchain based applications shift toward an oligopoly type of model and structure. Practitioners, in addition to being able to assist with the development of these platform, must also be able to advise and make recommendations based on both the needs of the client and the internal expectations of internal stakeholders.

Entrepreneurship

An associated effect of the digitization and increased technical integration between different parts of the finance landscape is that these technical forces may indeed spur increased entrepreneurship within various aspects of the professional landscape. Taking a step back, the lowering of costs associated with technology itself, as well as the ease with which many applications can be set up at least at first, means that different entrepreneurs and organizations can more easily enter the workforce. Options that do exist for new entrants to the marketplace include the FinTech subset of the workforce, but also include, but are not limited to the following:

1. Operational efficiency expertise – a common pain point in organizations of any size, and where financial professionals can add value, is that many internal processes and procedures are not always as effective or efficiency as possible. The approach can be simple information management and other colleagues of the benefits possible from increased automation, including robotic process automation. Additionally, however, if payment options are added to the website or physical location of the organization these different options and portals needs to be integrated with current solutions.
2. Payment efficiency and expansion – an additional aspect of entrepreneurship that increased technology integration can deliver to the marketplace is the full integration is the end to end acceptance of either mobile payment solutions or cryptocurrency based options. Clearly not every firm needs to take payment in bitcoin or other cryptocurrencies, but understanding how this process may very well work is something that financial services professionals can help organizations of any size more fully understand.
    a. Actually, and what is particularly interesting for small to mid-size organizations, is that payment tools are increasingly affordable and simple to implement regardless of organizational budget or technical expertise.
3. Making compliance cool and accessible – compliance may seem, to many entrepreneurs and business owners, like simply another cost and issue to contend with that does not add value to the enterprise. While this certainly is an accurate statement with regards to certain types of regulation, particularly if there is not tangible bottom line benefit to the organization, but this is only an incomplete perspective. Especially for financial institutions, or companies that are dealing with personally identifiable information, remaining in compliance with both new and existing regulations is an imperative.

4. Identifying growth opportunities related to cryptocurrencies. While it is not necessary for every firm to invest in, use, or accept cryptocurrencies for payment or trading purposes, there are certainly opportunities for organizations wanting to expand into the cryptocurrency space. Launching custody related services to cryptocurrencies that help investor maintain accurate and up to date custody records represents a substantial market opportunity for investors across different and industry lines. For example, an accounting firm may attract and appeal to the growing millennial and potential Gen-Z client base by offering said custodial services. Identifying new opportunities and market possibilities will invariably result in some disruption and obstacles along the way, but the cost of not taking action far exceeds the cost associated with technology implementation.
5. Cost of inaction compared to taking action. Traditionally the costs of investing in a project would be able to be analyzed via a traditional analysis such as net present value or discounted cash flow modeling, but that only presents an incomplete view as to what actually is going on in the marketplace. Given the rapid pace of change underway in the professional landscape, that shows little sign of abating or reversing any time soon, practitioners and professionals will need to keep pace by taking risks. Taking risks, but reasonable risks, represent a core component of what both practitioners and firms will need to embrace moving forward.

Resources for More Information

In such a fast moving space, such as the areas of blockchain, artificial intelligence, and cryptocurrencies, it is arguably more important than ever before for practitioners to remain well informed as to what exactly is happening in this space. Clearly it is no longer sufficient to simply rely on previously obtained formal education to form the foundation for a career of work in either the accounting or broader financial services space. Alongside this increased importance of education, however, it is also important to recognize the reality that not all resources all equal; there is a lot of bad information, fake news, and data in the marketplace that is only issued with a product or services sales pitch included. The point of the resources listed here is not to provide an all-inclusive nor an exhaustive list of all potential sources of data, but rather to provide practitioners with a firm foundation from which further insights can be gleaned. Let's take a look at some of these institutions, news outlets, and organizations.

First and foremost, the AICPA – the largest professional society of accounting professionals in the world – is a reasonable place to start this conversation. In terms of both thought leadership and analysis, as well as providing action oriented papers and definitive guidance on certain issues, the AICPA is a logical place for accounting professionals to begin the educational and training journey. In addition, and even though the association is most clearly affiliated with accounting practitioners, it is also developing guidance, programs, and training materials for a broader audience. Cybersecurity, blockchain fundamentals, robotic process automation, and blockchain for specific industry subsets are just a few of the educational and

training programs that have been implemented by the AICPA since 2018. In addition to these technology specific programs, there are also partnerships that have been formed by the AICPA with other organizations.

A key differentiator between the programs offered and delivered via the AICPA, including those that this author has helped create, monitor, and distributed is that these educational are offered in both on-demand and live formats. Leveraging the volume of expertise and membership of the AICPA, these courses has brought together thought leaders, industry professionals, and subject matter experts in the arenas of emerging technology to create and deliver this content. Drilling down into a key difference between these courses and other offerings in the marketplace is the fact that, in addition to introducing subjects and expertise at an overview basis and methodology of these subjects, practical real world examples are also included within these courses. Real world examples of how blockchain, artificial intelligence, robotic process automation, and other digitization and automation programs are already being implemented in the market add substance and legitimacy to these courses. In addition, there are industry specific silos and courses being introduced to address questions and concerns that may arise as implementation becomes more mainstream.

CPA.com and the Wall Street Blockchain Alliance (WSBA) are two industry organizations that have formed agreements with the AICPA to promote business education, thought leadership, and other types of materials related to improving knowledge and understanding of emerging technologies as well as further applications. CPA.com is the official business partner of the AICPA, although classified as a subsidiary of the AICPA, and is responsible for partnering with industry firms as well as technology partners to address and find innovative solutions to address emerging challenges. In addition to these partnerships and liaisons with various industry organizations, CPA.com also hosts various conferences, webinars, and podcasts to discuss, analyze, and examine both the current and future applications of blockchain technology on the financial ecosystem. An additional benefit of the information and data garnered from CPA.com is the reality that, since it is a subsidiary and partner organization of the AICPA, there is limited commercial influence or pitches from solution providers.

Speaking of the Wall Street Blockchain Alliance, it also seems appropriate to address just what this organization does, provides, and represents for both the blockchain ecosystem as well as the financial services landscape at large. Partnering with the AICPA, and leveraging the expertise of the AICPA to help lead the audit, tax, and attestation projects underway in the blockchain environment, the WSBA has achieved leadership status in this fast moving and emerging space. Serving as a resource of thought leadership and a source of industry affiliated expertise is also amplified by certain actions that have been undertaken by the alliance. Specifically, the creation of working groups that are focused on different aspects of blockchain implementation, as well as the impact of cryptocurrencies and cryptoassets are already having, and will continue to have, on the broader business landscape.

In addition to these resources, which are – logically enough – oriented more toward financial services rather than blockchain technology and the technical

underpinnings of this technology, there are also open sources courses and information to learn more about the technical underpinnings of how blockchain functions. Again, it does not appear reasonable to expect financial services professionals to transition from financial information to coding experts within the next several years. That said, having a strong foundational knowledge of how emerging technologies function is an imperative for professionals seeking to deliver value additive services moving forward. Whether it is artificial intelligence, blockchain, different cryptocurrency applications, smart contracts, or other next level applications, financial professionals are going to have to be aware of how these tools function.

Current Updates and Information

This book began and opened with a splash of cold water on the hyper, excitement, and buzz that surrounds the emerging technology space, specifically the areas of artificial intelligence and blockchain. Many organizations and management teams, swept up in the excitement (most of it justifiable) around these new technologies, did launch initiatives and pilot projects that may or may not have been applicable for their specific industry. Even as the technology itself moves from the virtually inevitable hype cycle into the trough of disillusionment, there do appear to be many projects and initiatives leveraging the potential and opportunities of blockchain technology. This section was put at the end of this book for a very simple reason – the reality that this part was added and updated last. In such as fast moving space that continues to change and evolve on an almost daily basis, putting together a list of current market examples is always difficult, but this section was assembled less to represent an up to the minute listing, but rather examples of what future opportunities could resemble and look like.

Echoing the analysis provided earlier, any attempt to document and analyze current market applications and implications of such a fast moving space such as blockchain and cryptocurrency is difficult. That said, there do appear to be several core areas that are rapidly adopting blockchain based solutions, and even cryptographic options to help address some core business problems. This analysis is not meant to be exhaustive nor all inclusive, bur should serve as an illustrative point to demonstrate just how far ranging and diverse blockchain can actually be for financial services professionals. Let's drill down and look at some of the most cutting edge applications in the blockchain and artificial intelligence space.

First, and perhaps most obviously, IBM Watson is already being put into practice at hospitals and other medical facilities to help nurses, doctors, and other medical professionals asses and evaluate different medical treatments and diagnostic options. While the focus of this book is not specifically on the healthcare sector, it is impossible to have a conversation about business applications and implications of emerging technologies without mentioning healthcare. At nearly 20% of the U.S. economy, any areas or opportunities for process improvement projects to deliver improved efficiency or results can, virtually immediately, deliver results and benefits that are accretive to the bottom line. For example, and demonstrating a potential stacking of

different emerging technologies is the following. In the greater Boston area alone, there are 26 medical information and enterprise resource systems that are used to manage, record, and analyze patient information. Establishing a common platform to share and disseminate this information represents a definitive benefit for both the organizations and individuals involved.

Second, and something that is going to be interesting to watch as the blockchain ecosystem continues to become more refined and developed, is that different industries and areas will, almost inevitably, become leaders in the space while others lag behind. Particularly in the arena of artificial intelligence there is also a geo-political component to any conversation or analysis held by market participants. Organizations, corporate partners, and think tank affiliated organizations are clearly investing quite a bit of energy and funds into these spaces and arenas, but there are also other factors at play in this space. What this means is that, as different regional trading blocks continue to monitor each other and keep pace with market developments, that regulatory and compliance based approaches are going to also need to evolve. Interesting from a conceptual level and political perspective, this also will have an effect on the roles and responsibilities of professionals seeking to leverage tools such as artificial intelligence and robotic process automation.

Drilling down to how these trends and forces connect to current applications in the marketplace the connection becomes readily apparent. Countries such as China have publicly announced nationally supported plans and initiatives to fund investments and developments in areas of emerging technology including but not limited to AI based platforms. Interesting from a conceptual level, this also means that organizations seeking to do business and operate across different national and market lines will have to understand the implications of these different sets of rules. Much like different stock exchanges have different rules and guidelines related to corporate governance and other organizational policies, the implications of different AI platforms must also be considered. Linking back to earlier analyses within this book, as AI continues to become increasingly integrated within a wide array of business applications and platforms there are also programming issues that might appear to become more important moving forward.

Third, and building on these first two points of importance is that these emerging technology tools are going to spur the creation and development of new business models. As new, potentially decentralized and distributed business models begin to enter the marketplace, this is also going to change the nature of how capital is raised and allocated between different organizations. Connecting back to the entrepreneurial angle raised previously, the sourcing and funding of capital can be a potentially impossible roadblock to overcome for entrepreneurs seeking to disrupt incumbent firms. Turning a bright light on the financial services sector, for example, is it truly surprising to think or forecast that not every financial lender or organization is going to eager to fund potential future competition? The ability to bypass, with a combination of smart contracts and automated programming, traditional sources of financing means that political and established incumbent players cannot prevent these organizations from becoming obstacles to the development and refinement of these business models.

No matter what specific application is cited, and there are numerous; real estate, healthcare, digital record keeping, royalty management and payment, intellectual property valuation and management, and other financially driven applications, the fact of the matter is that these technologies are still developing. Keeping an eye on different trends, both inside and outside of the financial profession, is something all practitioners need to do as these tools move from experimental and conceptual to tangible and real world in nature.

What to Watch Going Forward

One of the most common questions that arises when these topics are discussed, especially among financial professionals at organizations that might – and already are – being changed and disrupted by the emergence of these emerging technologies is where professionals can go to learn more about these topics. Fortunately those resources have already been provided earlier in this text, but a more important question for practitioners are what areas to keep an eye on moving forward. From a client service perspective as well as a firm positioning point of view, remaining up to date and current on the forces driving and forcing change in the blockchain and cryptocurrency landscape. With so many radically disruptive technologies entering the marketplace at the same time it is inevitable that there will be some pushback, false starts, and misallocation of capital and other resources during this build out and implementation processes. While not meant to be an exhaustive or all inclusive listing of areas driving change and, potentially, client questions as it connects to the blockchain ecosystem, these include areas that should be monitored for changes and developments in 2019, 2020, and beyond.

Regulation is something that is talked about on an almost continuous basis between different members of the blockchain community, including individuals and institutions that are both in favor of increased regulation and those that would like the industry to remain – for the most part – outside of too much regulatory oversight. No matter the position of an individual professional, an employer firm, or client organizations, the reality is that regulation will inevitably come to the blockchain arena. Whether it takes the form of state by state legislation such as those underway in Wyoming, New York, and others, or the form of national legislation at the federal level, keeping an eye on these areas is something that must be taken into account. Outside of blockchain, however, regulation and developments around AI must also factored into the conversation. This once again raises the important point that, despite the excitement and buzz surrounding certain technologies, that these different tools seem to be impacting the marketplace all at once.

Building on this line of thought, an additional service and client advisory opportunity that may very well arise over time is assisting clients with understanding the implications of different regulations on how businesses are managed and grown over time. While it is also true that such differences may eventually converge to a standardized set of reporting and disclosure standards, one needs just to look at the different state and local tax structures to realize that is far from a given. Especially

as the rise of virtual firms and virtual continues to grow almost unabated, it is easier than ever before for an organization to operate across industry lines. Operating across state, much less national, lines will invariably open the organization to questions and other considerations related to the different disclosure and reporting requirements connected to blockchain. Particularly since the leadership in terms of updated guidance and regulatory thought leadership seems to be originating at the state rather than the federal level this does seem to indicate a patchwork effect and implementation of regulation seems to be the direction it is moving.

Technology Specific Applications

As tools such as blockchain, artificial intelligence, and robotic process automation software it is also important to keep an eye on several specific changes, trends, and directions that can – and already are – having a direct impact on the financial services space at large. In addition to the rather straight forward applications and implications outlined throughout this text, it is also important to recognize that bigger picture changes and events are already underway. Regulation, shifting corporate structures, and the eventual unveiling of codified accounting standards are going to have large effects and changes on how these technology tools impact banking, accounting, and financial services. Taking a look at both these implications as well as the impact that these changes will have on organizations includes, but are not limited to, the following.

One of the largest changes that may be flying under the radar, but may actually end up having the larges potential impact across different areas of the financial services profession is the fact that current financial institutions do not appear to be fully equipped to handle the burgeoning cryptocurrency marketplace. Trusts and banks, obviously, are not going to go away or fade into obscurity; the launching of JPM Coin by JP Morgan is simply the latest indication that incumbent financial institutions are pivoting into the cryptoasset arena. In addition, the largest accounting firms across the global are busy working on standards and policies to assist with performing audit, attest, and other assurance related services linked to blockchain platforms and cryptocurrencies. That said, these do appear to only represent stopgap measures in attempting to solve and address the emerging issues connected to blockchain and cryptocurrencies at large. Particularly as a result of the work underway in Wyoming, the possibility of new types of organizations entering the marketplace is not something that can dismissed out of hand.

It is one thing to monitor the conversation and dialogue related to internal controls at existing institutions, with decades of precedent and legal history, but it is an entirely different matter to propose solutions to problems that may arise as new types of organizations enter the marketplace. A specialized depository organization focusing and developed specifically to handle cryptocurrencies, different types of cryptoassets, and to deal with client organizations using blockchain as core to business operations will require a number of different considerations. Perhaps most clearly are the considerations that need to be developed and refined with regards to

internal controls over the custody and financial controls over different cryptoassets, but that is simply one piece of the conversation. In addition to the controls and control policies necessary to be developed to contend with these issues are the disclosure requirements that must accompany the changes expectations of organizations.

Disclosures are a tricky business for financial professionals because while they are legally mandated to disclose certain classes and types of information, it is important to not disclose confidential or proprietary data. Traditional controls and processes exist to safeguard the disclosure of information, but as the integration of different automation tools become increasingly prevalent it does seem logical to expect that different controls are going to have to be developed and rolled out over time. Specifically and from a practitioner perspective it is evident that controls are going to have to evolve and change alongside the changing market forces that are driving blockchain adoption for enterprise utilization. For example, and highlighted by the rolling out of different enterprise blockchain options and information at some of the largest financial institutions, the accounting and finance associations are going to have to evolve and keep pace with the changes already underway at different institutions.

It is beyond the scope of this text, or any other text for that matter, to illustrate and examine all of the implications and ramifications associated with blockchain, robotic process automation, and artificial intelligence. These technology tools are potentially going to reshape virtually every aspect of public and private life, and must be assessed as the powerful potential change agents that they are. Financial services also play a potentially outsized role in the lives of virtually every individual, but are also in the midst of several broad changes and disruptive trends. Price pressure, increased competition, different applications based on these emerging technologies, and increasing regulatory forces are combining to rapidly force the somewhat staid financial services field to evolve in relatively short order. Whether it is accounting, finance, investment advisory services, or lending funds to the marketplace, it does appear that several conclusions and future directions are going to have to be assessed and factored into the analysis of financial services and metrics moving forward.

Chapter 18 Summary

Elevating and elevation to strategic advisor and true business partner is something that has been discussed, presented, and debated as something that is critically important for every professional and organization working in the financial services space, but that does not mean that it is a simple or straight forward task. Taking into account the reality that virtually every financial professional wants to play a more important role in the actual decision making process it is also important to recognize that doing so will require a substantial change in how accountants and other financial services professionals approach business problems and situations. Whether it comes down to developing and

refining a different business solving headset, analyzing problems from a new perspective, or determining how to leverage new and emerging technology tools all represent methods and pieces of information that should be taken into account by practitioners. Taking into account that this is the end of the core content of this book, the ultimate goal of professional are to elevate – both to advise clients ad work inside organization – readers should finish this chapter feeling prepared to embrace emerging tools and technology to assist clients, retain market position, and provide more value now and going forward.

Reflection Questions – Chapter 18

1. Are you ready to become a strategic advisor, from both an operational and technical perspective?
2. Do you feel that the emerging technology topics as discussed in this text will help or hinder this process?
3. What do you feel are ingredients to the "secret sauce" for you to successfully transition to a true strategic business partner and advisor?

Supplemental Readings

AICPA CPE – The CPA as Strategic Advisor – https://www.aicpastore.com/the-accountant-as-strategic-influencer-and-advisor/PRDOVR~PC-165278/PC-165278.jsp

Accounting Today – Building an Advisory Business – https://www.accountingtoday.com/opinion/building-an-advisory-business

KPMG – Advisory Services – https://home.kpmg/xx/en/home/services/advisory/risk-consulting/accounting-advisory-services.html

Conclusions & Future Directions

19

Hopefully by the time of you have finished reading this text and book you feel a little more confident and comfortable about both the emerging technologies themselves as well as the applications and implementation issues that may arise along the way. No single book or manuscript is ever going to be able to cover or effectively address the full scope of how technology or other changes will be changing the profession going forward. The buzzwords of the day do seem to focus on technology and technology applications, including blockchain, artificial intelligence, robotic process automation, and other automation software packages, but that does not mean that these will always be the force driving disruption and change in the financial services landscape. As mentioned previously, if the clock was dialed back to the early or even mid-1990s the terms that are driving change and innovation throughout the business landscape would be more related to the internet or cellular technology.

Regardless of the specific technology or tool, however, some of the underlying facts and patterns that are connected to the financial services landscape will remain undeterred. Automation, pressure of fees and compensation packages, increased competition, and the global development of finance itself are powerful external forces that do not appear to be decreasing in intensity of frequency. While practitioners will not have to become technical experts, programmers, or other technical experts associated with the details or minutia of different technical tools, practitioners will have to understand how these tools functions. Understanding the applications and implications of technology represent, simultaneously, an opportunity and a challenge for practitioners and firms to embrace, contend with, and utilize as the landscape changes quickly.

Additionally, the influx of technology and technology integration into the numerous aspects of the financial services profession will also generate opportunities for those willing to take calculated risks. Risk, by its very nature, is both part of how businesses operate as well as trend and force that can make even seasoned individuals feel uncomfortable or anxious. That said, making best use of technology tools and processes remains the responsibility and task that financial professionals need

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9_19

to understand. Automation and technology remain forces and trends that will undeniably come to the professional landscape, but that does not mean that the profession will be made obsolete and or sidelined in the face of a changing business landscape. Taking all of these different forces into account, there are a few core directions that the financial services profession is moving toward.

First, and arguably most importantly, the roles and duties associated with different aspects of the financial services practitioners are going to change and be almost unrecognizable as a result of the emerging technologies impacting the profession. Accounting is already feeling the effect of decentralized record keeping tools such as blockchain, and artificial intelligence is also playing a role in the market making aspects of the professional landscape. Trading algorithms leveraging deep learning and artificial intelligence are already playing a role and significant force in the volumes and total financial assets traded and exchanged. Smart contracts can amplify the effects of computerized trading by, in effect, removing several intermediaries and steps in the trading process. Currency swaps, interest rate swaps and trades, and the effect of foreign currency reporting and analysis on bottom line performance can be improved, sped up, and facilitated via the integration of emerging technologies.

Second, and as a direct result of the changing roles and responsibilities of practitioners, the reality of the ground is that some roles and positions will be eliminated. Lower level tasks and roles that form the basis for many practitioner workloads will be either augmented or eliminated altogether as a result of increased technological integration. With these job losses, however, will also come different options and opportunities for professionals motivated and proactively oriented. As certain tasks can be automated or streamlined, such as pieces of the audit or financial trading process, this will open the door to new and more sophisticated options. For example, if practitioners are not spending time doing manual work or tasks, this means that they are, at last, able to truly evolve into and become a strategic partner or trusted advisor. On top of being a goal cited by professionals for years, this is also a reality and trend that must be completed by practitioners in different areas of the financial services role.

Third, the shift in mindset and perspective that is necessary for practitioners to succeed is one a strategic partner and advisor versus just a compliance based role. Although compliance and remaining in compliance with new and emerging regulations will undoubtedly be important moving forward that is only one component of the work performed by financial services professionals. Even as new regulations, including GDPR, MiDi, and other financial regulations become increasingly integrated into the workforce, professionals are going to need to play a variety of roles. In addition to analyzing and understanding what the regulations mean both from an abstract and theoretical perspective as well as how to implement these rules into the organization. Also, interpreting the impact of these regulations on the firm itself, as well as any counterparty risk generated as a result of implementation is also something practitioners will need to be aware of moving forward.

Last but not least is the simple reality that by the time this book makes it to your bookshelf, be it virtual or physical, some of these trends, directions, and forces may be very different. Indeed some of these forces and trends may have been replaced,

augmented, or otherwise rendered nearly obsolete by other forces. That said, it does seem reasonable to forecast that, despite the machinations and permutations of the market or the specific technology tools that are put into play by organizations. Whether it is focused around robotic process automation, full blown artificial intelligence, or other kinds of automation software it is going to be important that biases and other guidelines are factored into the development and implementation of advanced technology tools. Coupled with these automation tools, which are going to accelerate the processing speed with which data is analyzed, processed, and reported to the marketplace the rise of blockchain augmented platforms is going to also impact the work and functionality associated with financial services professionals.

Moving forward, and taking into account that every organization is different, accounting and financial professionals are going to have to become more comfortable with partnering with different subsets of the professional landscape. Whether it means that the organization acquires or forms a joint venture with other organizations, expands into new areas, or develop current business lines into new areas. Whatever the case may ultimately end up being, the reality on the ground is that accounting and other financial services professionals are going to have to evolve and change how they operate and engage with current and future clients and customers. The future is permanently uncertain, and that will not change regardless of how much technology into factored into the conversation, but it does appear clear that with every challenge or obstacles that may arise there will also be opportunities and openings for proactive and forward looking entrepreneurs. Will there be challenges and stumbles as these different technology tools become increasingly integrated throughout business at large? Absolutely. Are there going to be job changes and losses as these tools displace some of the work currently performed by professionals? Yes. All of that said, as automation and digitization continue to come to the financial services community it is also readily evident that these forces are to be treated as allies and forces for good.

The future is bright, and financial services professionals are well positioned to seize these opportunities.

Index

S. Stein Smith, *Blockchain, Artificial Intelligence and Financial Services*,
Future of Business and Finance, https://doi.org/10.1007/978-3-030-29761-9