EMERGING TECHNOLOGIES AND THE FINANCE FUNCTION

Prepare for Disruption

CONTENTS

Foreword

The Association for Financial Professionals and our partners are pleased to present this report, which is the result of the first MindShift Summit in July 2017. That meeting could not have come at a better time for finance and treasury executives. As we gather again at the AFP Annual Conference to discuss the impact that technology will have on our profession, consider the following:

- Observers believe the government will start collecting taxes using blockchain by 2021.

- By 2023, these same prognosticators say, artificial intelligence will account for 30 percent of all corporate audits.

- One study by the University of Oxford predicted that 47 percent of U.S. jobs are at risk of automation—and in China 77 percent are vulnerable.

For these reasons and more, AFP MindShift is sure to be interesting, but it may also be unsettling. That's because AFP MindShift is where finance and treasury will begin to come to grips with the technological changes that will surely disrupt our profession, our organizations and our skill requirements in the years ahead.

The benefits of technology for finance and treasury are clear: increased productivity, reduced costs and better decision-making. However, the challenges are just as clear: lack of control over technology, cybersecurity, company-wide consistency, maintaining employee skills, and the potential loss of jobs for starters.

The endless wave of technology is not going to stop; putting your head in the sand is a quick way to get buried. The question finance and treasury executives need to ask is whether they're prepared to manage proactively or passively react to the inevitable technological progress coming their way.

Identifying the emerging technologies and applications that will impact finance and treasury the most is a smart place to begin. The next step is to prepare and educate professionals, looking specifically at solid plans that can mitigate the biggest challenges, lower costs, increase productivity and generally improve finance and treasury's efficiency and effectiveness.

This is where AFP MindShift enters the picture. AFP MindShift brings together the innovators and disruptors that will transform the role that technology plays in finance and treasury. As this report details, AFP MindShift will help you begin to make sense of the technological chaos.

Technology forecaster Paul Saffo once said "Never mistake a clear view for a short distance." Disruptive change may not happen today, but we know it will. That's why we need to prepare today.

Jim Kaitz
President and CEO
Association for Financial Professionals (AFP)

Emerging Technologies
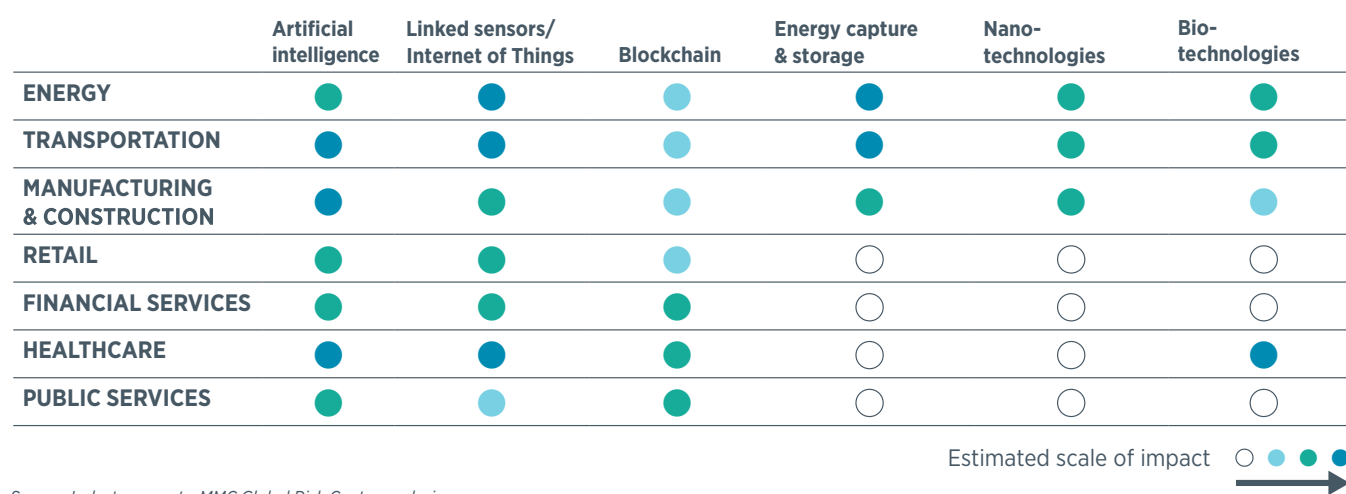# and the Finance Function:
Prepare for Disruption

INTRODUCTION

Over the last 50 years, technological innovation has played an important role in driving transformation across multiple industries. And just in the last two decades – there has been a fundamental shift in the way businesses and societies operate, interact and transact.

The World Economic Forum attributes these massive shifts to the "Fourth Industrial Revolution" – a revolution that will usher in a new era of prosperity as well as challenges for global society.[1] The Fourth Industrial Revolution is being fueled by a number of emerging technologies including artificial intelligence, blockchain and the internet of things. A combination of powerful forces, including the exponential increase in computational power, proliferation of connected devices, distributed computing, extraordinary growth of data, and rapid sophistication of algorithms are contributing to their lasting adoption and impact.

[1] World Economic Forum, Klaus Schwab: "The Fourth Industrial Revolution: What It Means and How to Respond."

	Artificial intelligence	Linked sensors/ Internet of Things	Blockchain	Energy capture & storage	Nano-technologies	Bio-technologies
ENERGY	●	●	●	●	●	●
TRANSPORTATION	●	●	●	●	●	●
MANUFACTURING & CONSTRUCTION	●	●	●	●	●	●
RETAIL	●	●	●	○	○	○
FINANCIAL SERVICES	●	●	●	○	○	○
HEALTHCARE	●	●	●	○	○	●
PUBLIC SERVICES	●	●	●	○	○	○

Estimated scale of impact ○ ● ● ● →

Source: Industry reports, MMC Global Risk Center analysis

Companies across Industries are now experiencing disruption at a more rapid pace than ever before. Tesla, Uber, Amazon and Alibaba are only a few examples of companies that have swooped in and leveraged technology to displace legacy incumbents. Companies that choose to stand still or wait it out are more likely to be disrupted, either by their competition or by entirely new players that are free of any technology and legacy integration challenges.

Executives globally are recognizing these challenges, and are focused on creating agile, more nimble organizations with the ability to respond to this change. The use of emerging technologies to drive transformation and growth is also now a leading agenda item on board and leadership discussions. Many executives are scrambling to understand how to best deploy these technologies as part of transforming/digitizing their existing business models or build completely new business models to enable economic benefit.

While many firms are broadly optimistic about the perceived benefits of adopting emerging technologies, they will also need to appreciate some of the risks that come with deploying these technologies within their environment:

1. **LACK OF CLEAR STANDARDS AND GOVERNANCE** Many of these technologies still lack clear development standards and governance controls. For example, there are over fifteen cross-industry initiatives that are developing governance standards for artificial intelligence, all from varying perspectives. The idea isn't to impose severe restrictions and stifle innovation. But without a stable, predictable and transparent set of standards to act as guardrails, companies will expose themselves to additional operational risk, and loss of public confidence.
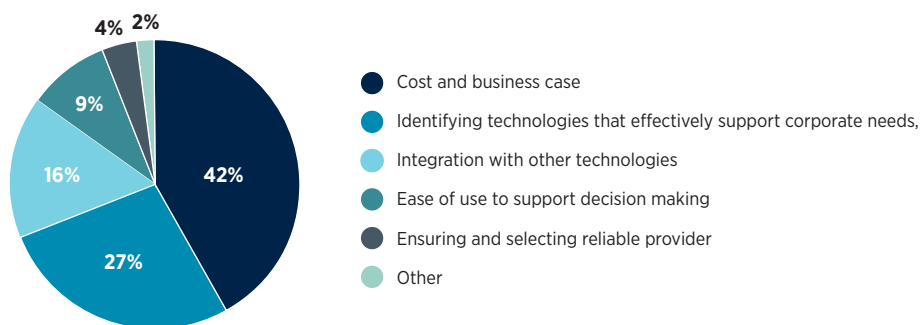
2. **EMPLOYMENT CHALLENGES AND WAR FOR TALENT** The use of emerging technologies will lead to changes in the way the business develop products and experiences, and in the way they operate in the future. Any activity that is manual, repeatable and scalable will get automated. In the "Future of Jobs" report, The World Economic Forum noted that 7 million jobs could be lost over next 5 years through redundancy, automation or disintermediation, with the greatest losses in white-collar office and administrative roles. Staff members will have an opportunity to focus on higher order value activities, but that will require a clear retooling, retraining and reskilling strategy. In addition, executives will need to source and recruit for specialist skillsets to help them successfully deploy these technologies in their environment. These skillsets are in demand and scarce, and is leading to a war for talent.

3. **RISING CYBER RISK EXPOSURE** The emergence of these technologies is happening against the backdrop of a rapidly shifting cyber threat landscape. Cyber adversaries are becoming increasingly technical, innovative and ruthless. These adversaries are monitoring for the smallest vulnerabilities in these technologies to carry out their attacks. Companies that deploy emerging technologies in their environment naturally increase their overall surface area for a cyber-attack. For example, leveraging linked sensor technology will lead to an exponential increase in the number of endpoints for a potential attack. Last but not least, the exposure only gets worse if the right security controls are not embedded into the design and development process.

FIGURE 2

Key Challenges for the Treasury department in determining adoption of emerging technologies (% distribution of organizations)

- 42% Cost and business case
- 27% Identifying technologies that effectively support corporate needs,
- 16% Integration with other technologies
- 9% Ease of use to support decision making
- 4% Ensuring and selecting reliable provider
- 2% Other

Source: 2017 AFP Strategic Role of Treasury Survey

So how does finance and treasury fit into this picture? As the gatekeepers to the financials and the managers of corporate risk – CFOs and Treasurers play a critical role in advising their CEOs and board members on the opportunities and risks associated with leveraging these technologies. The idea of transformation isn't a new topic to the finance and treasury departments either. For years, finance and treasury leaders have been evolving their functions to play a more advisory role in strategic planning, forecasting, acquisitions and navigating complex regulatory environments.

However, industry trends show a lack of finance and treasury awareness and preparedness for this next transformational wave[2]. Many finance and treasury professionals are beleaguered by their day-to-day activities, and others do not have the resources to adequately investigate the nature and implications of these technologies. Only a select few are recognizing the opportunity—and the need—to adopt these technologies and lead their organizations toward future growth.

In the 2017 AFP Strategic Role of Treasury survey, over 40% respondents cited cost and making a business case as the biggest hurdle in adopting new technology. This is expected, since most finance and treasury teams desire a concrete, unambiguous ROI for any major investment, let alone betting on the future of their firm based the promises of emerging technologies. This also highlights treasury's inherent risk aversion and hesitancy to potentially create new risks through the implementation of these technologies within their environment.

[2] 2017 AFP Strategic Role of Treasury survey

Finally, all this needs to be viewed against the backdrop that many Treasury departments are quite small (Figure 3). Even in companies with greater than $1 billion revenue, 70% of respondents have a team of less than 10 and these teams have ever-widening roles across the organization. Thus, it is hard to find bandwidth for testing and engaging with as-yet unproven technologies. This is additive to the overall employment and talent challenges with which firms will need to grapple with.

Now more than ever, it is incumbent on Finance and Treasury executives to deeply understand the opportunities and the implications of emerging technologies. This paper provides guidance for the corporate finance and treasury community through this change with a focus on the following questions:

1. What are the key emerging technology trends that finance and treasury professionals should be aware of?

2. How will some of these technologies help the finance/treasury organization? How will it impact their organization?

3. What strategic moves do finance/treasury professionals need to make in order to prepare for these changes?

FIGURE 3 Treasury staffing levels (% distribution of organizations)

Number Of Treasury Department Staff	All	Annual Revenue Less Than $1 Billion	Annual Revenue At Least $1 Billion	Publicly Owned	Privately Held
Less than 5	61%	82%	41%	45%	77%
5 to 9	22	12	30	28	14
10–19	8	3	13	11	4
20 or more	10	3	17	16	5

Source: 2017 AFP Strategic Role of Treasury Survey

Making Sense of Emerging Technologies

Although there are a number of technologies that have emerged in the past five years, there are three technologies that finance and treasury should start paying attention to: Robotics Process Automation, artificial intelligence and blockchain.

Finance and treasury executives should aim to understand the opportunities and the implications of emerging technologies from three key perspectives:

1. The extent to which the technology can enable new levels of simplicity and efficiency within Finance and Treasury operations in the future

2. The extent to which Finance and Treasury can leverage the technology to further support their business strategy and objectives

3. The level of risk exposure that the technology creates for the organization and the enterprise

Robotic Process Automation: Bots to the Rescue

If there is one known challenge in the any work environment today, it is that people are fallible. A recent study found that business people typically make errors at work at a rate of 10 to 30 errors per 100 opportunities.[3] The best performance possible in well-managed workplaces is an error rate of 5 to 10 in every 100 opportunities. The study concluded with two points:

1. Even with highly experienced and able people doing the work, there are excessive rates of failure.

2. Letting people work from experience and knowledge always creates unwanted random variation that too often produces wrong outcomes.

[3] Mike Sondalini, Lifetime Reliability Solutions, "Unearth the Answers and Solve the Causes of Human Error in Your Company by Understanding the Hidden Truths in Human Error Rate Tables."

ENTER ROBOTIC PROCESS AUTOMATION

(RPA). Generally, when we think of robots, we think of a humanoid replica like C-3PO from Star Wars, or an automatic arm on a manufacturing floor. Applied to software, we now refer to something a little different and a bit easier to understand: the use of sophisticated computer software that automates routine and standard tasks normally performed by humans, of sophisticated computer software that automates routine and standard tasks, without the need for constant human supervision.[4]
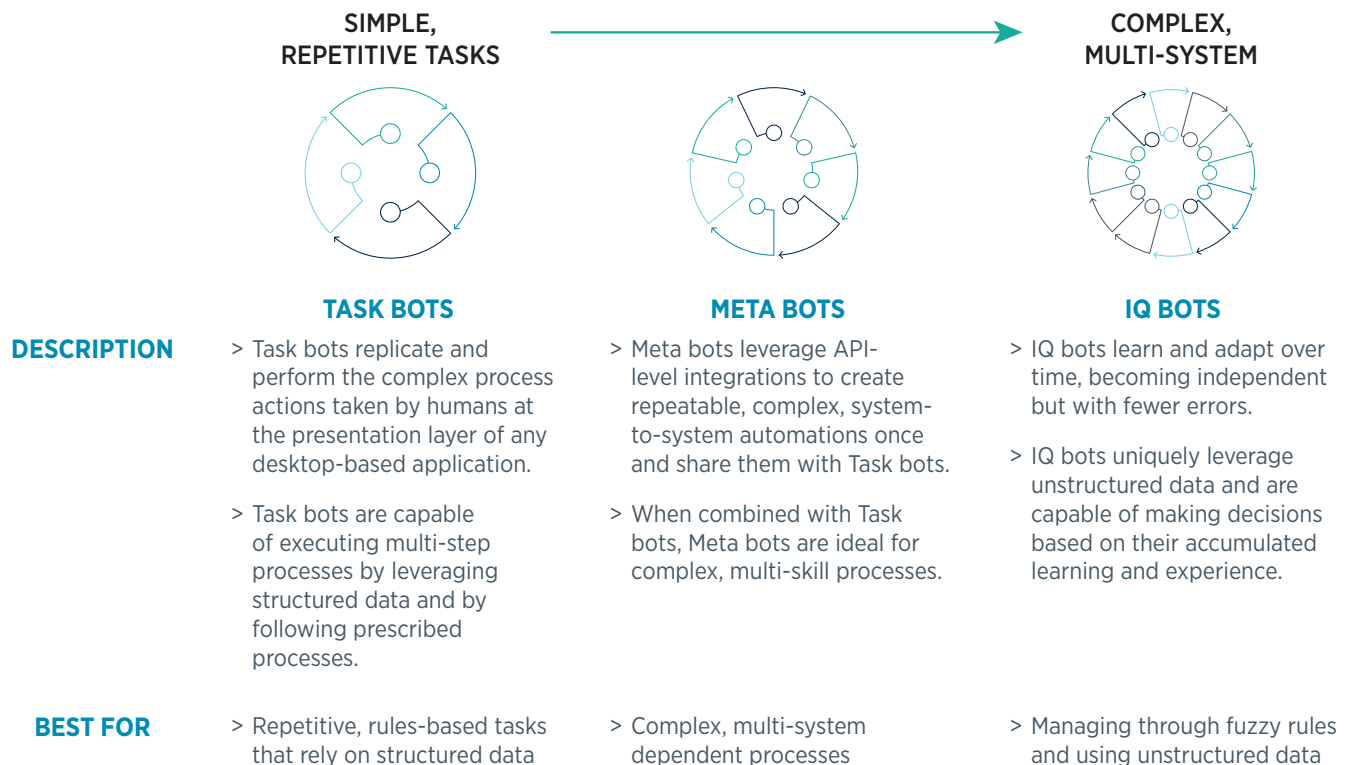
Essentially, RPA tools seek to mimic the role of the human while making the process more automatic, repeatable, faster, and less prone to error. Because RPA integrates well with legacy technologies and processes, implementation can be as short as less

than a month – and returns on RPA implementation can often be seen in less than 3 months for simple processes.

There are a number of activities across scale and complexity that can be automated through RPA. On the simpler end of the spectrum, screen-scraping technologies can take data from websites or legacy applications, manipulate the data, and key it into another system for use in other processes. On the other end of the spectrum, robots can be combined with more unstructured data and algorithms to manage more complex tasks, and become more intelligent and independent over time. This approaches the characteristics of artificial intelligence, which we will cover in more depth in the next section.

[4] Mercer Select Intelligence, Katherine Jones, PhD: "May the Bots Be With You."

FIGURE 4 Different bots depending on level of complexity

	SIMPLE, REPETITIVE TASKS		COMPLEX, MULTI-SYSTEM
	TASK BOTS	**META BOTS**	**IQ BOTS**
DESCRIPTION	> Task bots replicate and perform the complex process actions taken by humans at the presentation layer of any desktop-based application. > Task bots are capable of executing multi-step processes by leveraging structured data and by following prescribed processes.	> Meta bots leverage API-level integrations to create repeatable, complex, system-to-system automations once and share them with Task bots. > When combined with Task bots, Meta bots are ideal for complex, multi-skill processes.	> IQ bots learn and adapt over time, becoming independent but with fewer errors. > IQ bots uniquely leverage unstructured data and are capable of making decisions based on their accumulated learning and experience.
BEST FOR	> Repetitive, rules-based tasks that rely on structured data	> Complex, multi-system dependent processes	> Managing through fuzzy rules and using unstructured data

Sources: Automation Anywhere, Company information, Oliver Wyman analysis

Applying RPA within Finance and Treasury

**Finance and treasury have a plethora of processes and transactional tasks
that are ripe for automation:**

APPLICATION	WHAT IT CAN DO	EXAMPLES
DATA ASSEMBLY	RPA can automatically and routinely stitch vast amounts of data across fragmented systems	Data stitching across ERP systems, databases, custom built cross-departmental systems
BASIC ANALYTICS	RPA can perform basic analytical tasks on vast amounts of structured – and in some cases - unstructured data	Account comparisons, error and anomaly flagging
AUTOMATING BASIC OPERATIONS	RPA can carry out repetitive daily operations automatically to replace otherwise slow and error-prone labor-intensive processes	Transaction processing, invoice and expense collection and organization, payment execution, and other accounts receivable and payable support
	RPA can assist with basic human-facing interaction automation such as simple auto-email and chat bot deployment	Basic query handling, complaint responses, expense/billings training for workforce
AUTOMATING COMPLIANCE TASKS	Many repetitive manual tasks associated with compliance are ripe for allocation to an RPA system	Data entry, taxation filing
	The assembly and analysis of data makes for a clear, reliable and automated account of all sources and destinations of payment	To produce an audit trail, conduct due diligence data gathering
	More complex RPA systems can trigger a response to compliance	Block actions or transactions that do not meet compliance standards

**As organizations increasingly add bot use to their service repertoire,
there are several steps to consider:**

1. Which manual self-service processes are best augmented with bot support?

2. Which processes that now are manually managed can be streamlined or totally accomplished by bots?

3. What data can be gleaned from the organization's use of bots and how can it be used to improve processes and policies?

4. What technical expertise, if any, does the organization need to optimize bot use?

AFP **MINDSHIFT**

FIGURE 5 RPA Benefits

COST SAVINGS

> Replaces high cost human labor by low-cost robots **(up to 60–80% cost savings)**

> Frees employees' time for complex and higher value-added activities

IMPROVED PRODUCTIVITY AND QUALITY

> Guaranteed 24/7 availability of service and faster processing

> Ensures processes are 100% **compliant** with regulations

FASTER ROI

> Simple process automation can have a positive ROI in **less than three months**

> **Effects of scale** applicable from day 1 after launch

OPTIMIZED ANALYTICS

> Gives a complete **mapping** and detailed **documentation of processes**

> Provides insights through high **quality data gathering**, organization and analytics

EASY TO IMPLEMENT

> Typical implementation time for simple processes is **measured in weeks**

> Rapid prototypic technique applicable

NON-INVASIVE

> Reduced investment requirement due to direct **integration to existing infrastructure**

> **No invasive actions** to underlying systems

Source: Oliver Wyman analysis

RPA challenges

There are a number of pitfalls and challenges that finance and treasury professionals have to anticipate as they consider RPA solutions.

STRATEGY AND APPROACH RPA is one of the most widely used emerging technologies. As a result, companies are eager to deploy it as soon as possible, without fully thinking through the ramifications. Many organizations don't set a clear vision or governance and performance objectives in using RPA solutions to scale up their operations. They tend to misunderstand or overestimate RPA's capabilities. As a result, any efficiency, savings and productivity gains will fall short of expectations.

SYSTEM INTEGRATION CHALLENGES Many companies deal with the inherent challenge of ensuring that their applications can connect and share information. This is an expensive and time consuming process and is often overlooked or circumvented with manual workarounds. RPA can provide temporary relief to the manual workarounds to share information, but it cannot be considered a long term solution.

TRANSITION AND CHANGE MANAGEMENT In some cases, RPA programs can lead to resistance of managers to give up their resources, as this effort will be perceived as a loss of power and control.

MANAGING HUMAN ERROR Human error in the initial short-term programming or in the medium-term adjustment of RPA solutions can lead to catastrophic repercussions. A lack of sufficient knowledge transfer from human to RPA is usually a cause for this challenge. As a result, errors in one area of the program will likely trigger errors across other linked systems. Executives will need to ensure up-front preparation and training to catch these errors during design and maintenance of these programs.

RPA is a stepping stone to artificial intelligence and machine learning that is gaining prevalence across industries today. The ability to increasingly automate repetitive, transactional tasks will free finance and treasury professionals to be drive more strategic activities with their respective business in the future.

ALLIANZ EMBRACES ROBOTIC CASH POOLING

PROBLEM
Account reconciliations for Allianz' cash pool were very manual and took too long to complete. As a result, reconciliations were not performed frequently enough, compounding the problem.

SOLUTION
Allianz built a robotic program that automatically reconciles cash pool accounts without human intervention efforts. For the reconciliation, the robot connects to three cash pooling systems and compares and calculates a variety of data. The robotic program was coded to replicate exactly the steps that a human would take to perform this highly manual task to reconcile these accounts.

RESULTS
The Allianz robotic cash pooling program replaces the 6-8 hours of manual effort to reconcile the cash pool balances with an automated process that takes just 5 minutes. In addition to the reduction of time spent on this process, reconciliation are run more frequently, ensuring a higher quality of data. Furthermore, as the first treasury-related robot at Allianz, it lays the foundation for further robotic automation.

Artificial Intelligence:
Rise of the Intelligent Machines

Artificial intelligence (AI) is one of the most anticipated technologies within the Fourth Industrial revolution because it uses computers to simulate human intelligence. Artificial intelligence amplifies cognitive abilities, providing solutions to problems where the complexity is too great, the information is incomplete, or the details are too subtle and require expert training. Learning from data — a computer's version of life experience — is how artificial intelligence evolves.

FIGURE 6 Trends supporting the adoption of artificial intelligence

AI Frameworks

ARTIFICIAL NEURAL NETWORKS
The idea at the core of the recent AI resurgence has been around since the 1940's

DEEP LEARNING
Researchers like Geoffrey Hinton spent decades refining neural networks to allow computers to mimic human learning
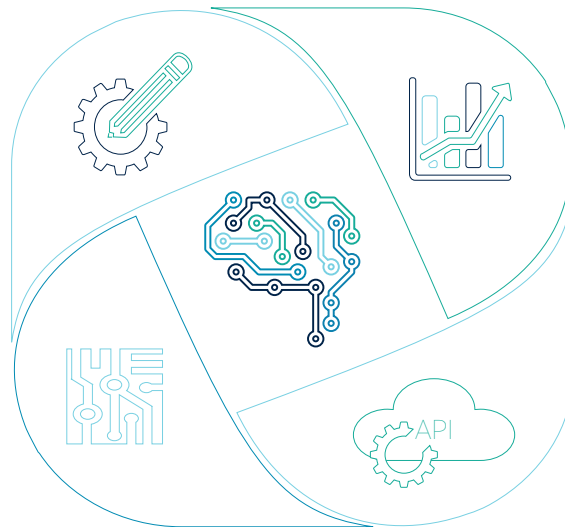
Data Science

VOLUME
The explosion of native, structured data has provided neural networks the massive training sets they need to function

MANIPULATION
Better tools exist for manipulating and analyzing data

Hardware

CLOUD COMPUTING AND STORAGE
Provides cheap access to more storage and computing capacity

COMPUTER INFRASTRUCTURE
Graphical Processing Units (GPUs) have dramatically increased computers' processing power

Business Models

OPEN SOURCE
Increased popularity has allowed for greater collaboration amongst developers

API AND MODULARIZATION
Companies have adopted a "plug and play" approach that facilitates rapid experimentation

Source: Oliver Wyman analysis

Artificial intelligence is not a new concept. Computer scientists have taken different approaches to achieving artificial intelligence since the 1950s. Today, the explosive growth of structured data, increasingly affordable computing power, and maturation of techniques and algorithms has finally laid the groundwork for the widespread deployment and adoption of this technology.

A series of fundamental technologies around machine learning, deep learning and natural language processing underpin all of artificial intelligence. 'Artificial intelligence' is therefore a kind of organizing principle – it presides over various sub-technologies that all work together in the pursuit of 'true' artificial intelligence: a machine that will one day mimic the human brain.

Applying Artificial Intelligence within Finance and Treasury

Artificial intelligence can be combined with processes like data analytics or technologies such as RPA to enhance their functionality. There are four main areas in which artificial intelligence can be deployed within finance and treasury:

1. ENHANCED DATA ANALYTICS AND DECISION SUPPORT Machine learning algorithms can make sense of vast reams of unstructured, continually-updating data, search for patterns, and produce both diagnostic insights and predictive models. finance and treasury executives could use this forecast sales for the coming year and determine appropriate cash positions required for each quarter.

2. COMPLEX TASK AUTOMATION Once deep learning and machine learning technologies are fed sufficient data, they will be able to learn over time and be able to handle more complex non-linear task variations independently. Data-heavy day-to-day tasks done by human labor can then be automated, reducing errors and increasing speed. Examples include functions such as invoice and expense clearing and monitoring for process control deviations.

3. COMPLEX REPORT GENERATION Natural language tools can tap into multiple internal and external data sources to rapidly assemble relatively sophisticated reports (e.g. report generation for investor relations or for the board). This makes the job of report generation much simpler, allowing the user to just edit rather than create a report or presentation from scratch.

4. FRAUD DETECTION AND PREVENTION Machine learning tools can enhance fraud detection capabilities by analyzing transaction behaviors with other data points that that would otherwise go unnoticed by human analysts.

Artificial Intelligence Challenges

The transformational power of artificial intelligence challenges the boundaries of what can be achieved with intelligent machines. At the same time, a number of questions that center on data maturity, governance and workforce impacts have been raised by industry and non-industry institutions alike. These are complex problems that have not yet been fully addressed, and consequently highlight the limited preparedness of many institutions. Moving forward, finance and treasury departments should consider the following potential challenges:

DATA MATURITY/READINESS Artificial intelligence machines fundamentally learn and evolve based on learning from vast and rich data sets within the organization. That said, most organizations are simply not ready to deploy artificial intelligence machines in their environment, because they are still struggling with identifying and capturing that data in a structured, centralized manner. If organizations ignore these challenges, they risk basing artificial intelligence decisions on delayed or outdated information, or running artificial intelligence algorithms on inaccurate data.

LIMITED STANDARDS There are over 15 cross-industry and regulatory initiatives in the process of dissecting the potential implications of artificial intelligence from a trust and governance perspective. For finance and treasury, it will be important to ensure that artificial intelligence machines operate under a set of guardrails so that they don't perpetuate human biases, or increase cyber exposure.

WORKFORCE IMPACTS Much debate has taken place over the impact of automated intelligent systems on the workforce – the ramifications are simply not well understood. Some workers will be replaced and others will be displaced as a result of artificial intelligence tools taking on increasingly complex tasks. Nonetheless, the general consensus is that regardless of specific details, the workforce of tomorrow will need to learn a new set of skills to interact with the future of intelligent systems.

ARTIFICIAL INTELLIGENCE CAN HELP INTEGRATED BUSINESS PLANNING

PROBLEM

Making integrated business planning (IBP) work effectively almost always is a challenge. But artificial intelligence can make a vital difference in companies' integrated business planning, according to Igor Rikalo, chief financial officer of O9 Solutions.

SOLUTION

Artificial intelligence can help organizations, and particularly their financial planning and analysis teams, make better IBP decisions as much as 100 times faster than before—even on an enterprise level, Rikalo said. What separates artificial intelligence from traditional enterprise resource planning is that artificial intelligence platforms can include natural language processing and teach themselves to adjust in real time.

RESULT

For example, a sales executive for a manufacturer might notice that a retail store is having trouble keeping a competitor's product in stock. Most companies will have some kind of user interface screen where the executive can fill out a form, or require her to send an email through her company's chain of command, or put together a PowerPoint. artificial intelligence enables the executive to make a quick note and trust that the platform will "know" who else needs the data and get it to them instantly, Rikalo said.
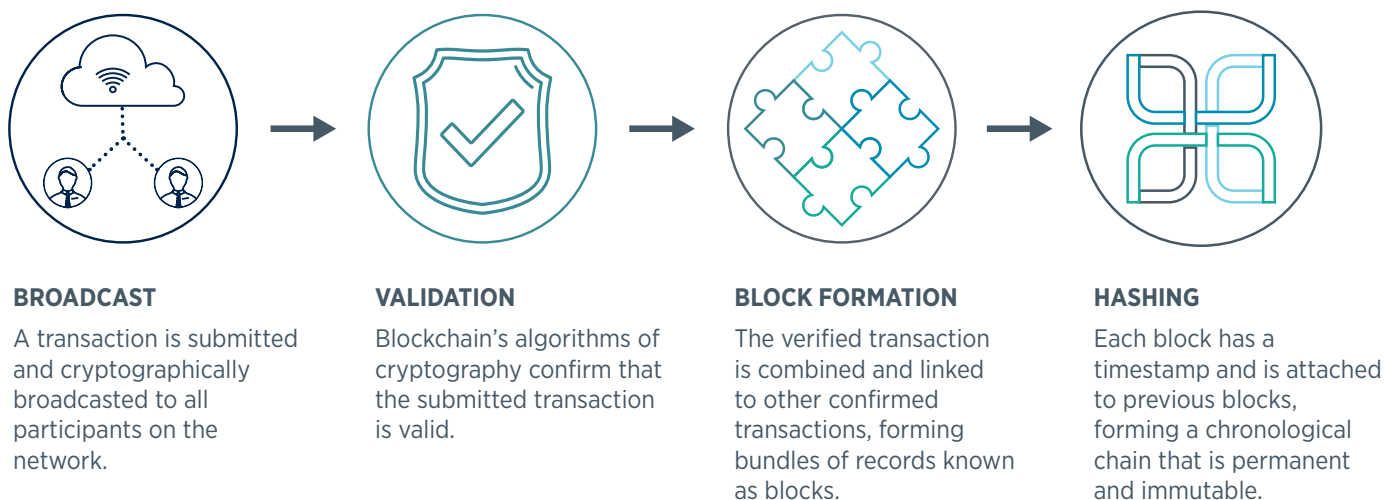
Blockchain and Distributed Ledger Technology: A Solution to the Trust Problem

Blockchain is an equally transformative and groundbreaking technology that has gained the attention and excitement among businesses, governments and venture capitalists. This is because blockchain can potentially solve the fundamental challenges of trust, eliminate the need for intermediaries and mitigate the risk of human error.

While blockchain is best known as the technology that enables the existence of cryptocurrencies such as bitcoin, it is simply a shared transaction database that provides a transparent and secure way to efficiently record and transfer information. Using a distributed ledger, it offers participants a decentralized record-keeping solution that is encrypted, digitally synched and shared across the network. Users can easily view and add information, similar to a Google document, but cryptographic safeguards prevent already stored information from being altered or removed. In principle, the distributed ledger is highly secure and relatively tamper-resistant, empowering trust between conflicting parties without the need for a central intermediary. This can remove inefficiency, human errors and frictional costs associated with validation and reconciliation of information.

Blockchain and Distributed Ledger Technology (DLT) are enabled by two key tools—cryptocurrency and smart contracts. Cryptocurrencies are digital assets that simply maintain record of ownership and transactions. Smart contracts, on the other hand, allow users to embed business logic into these transcripts and can automatically execute a transaction once certain conditions are met.

FIGURE 7 A typical blockchain transaction process

BROADCAST

A transaction is submitted and cryptographically broadcasted to all participants on the network.

VALIDATION

Blockchain's algorithms of cryptography confirm that the submitted transaction is valid.

BLOCK FORMATION

The verified transaction is combined and linked to other confirmed transactions, forming bundles of records known as blocks.

HASHING

Each block has a timestamp and is attached to previous blocks, forming a chronological chain that is permanent and immutable.

Source: Oliver Wyman analysis

Applying Blockchain / DLT within Finance and Treasury

Blockchain is still a relatively untested technology – many applications are still at the proof of concept stage. Therefore, future application of these technologies remains uncertain. However, preliminary case studies indicate the following potential uses:

1. International Payments: Because of the security of blockchain networks, it is easier to verify the initiation and completion of a transfer unlike transfers conducted through traditional financial institutions. Therefore, conducting business with international companies should become significantly easier in the near future.

2. Cheaper / Lower Risk Payments: Similarly, when transacting with companies or consumers that come from a traditionally riskier population - such as lesser-known companies or the unbanked - blockchain's extra layer of verification integrity can enable new, previously-unconsidered partnerships.

3. Automatic Payments Upon Fulfillment: Perhaps Distributed Ledger Technology has the strongest potential when combined with other emerging technologies such as the Internet of Things. For example, when a ship pulls into port, a supply chain tracking system can automatically execute a smart contract stored on a Distributed Ledger, which initiates payment to the port for their services. This way, both the exporter and importer can enter into a transaction with trust that the resulting payment reflects the original agreement.

BNY MELLON LEVERAGES BLOCKCHAIN TECHNOLOGY TO PROTECT DATA

PROBLEM
BNY Mellon's broker-dealer service plays a pivotal role in the government clearance and triparty repo markets, so resiliency is a top priority. The goal was to protect itself from tail events that could result in data loss or corruption.

SOLUTION
BNY Mellon decided to create BDS 360, a third, separate system with which it could reconcile clients' transactions and balances in its primary systems. BDS 360 is built on blockchain technology. The data structure's immutable and traceable characteristics provide a separate and correct record of transactions and balances which BNY Mellon can use to cross-validate those recorded by its primary systems. BDS360 does not replace BNY Mellon's primary systems, but is used in conjunction with them.

RESULTS
BDS 360 is used to detect position breaks in the primary clearance and tri-party systems. In addition, it was a cost-effective and quick way to create an additional layer of protection.

Blockchain / DLT Advantages

Because of the structure of blockchain and DLT networks, some inherent benefits are realized in their implementation. These benefits include:

DECENTRALIZATION By their very structure, blockchain and DLT transcripts are not controlled by single entity. Instead, because they permanently store and distribute information across a network of personal computers, their data is significantly more secure from individual cyberattacks.

TRANSPARENCY Although private versions can be created, popular blockchains and DLTs are public and can provide information about all transactions to all participants—not just those involved in the transaction.

IMMUTABILITY Because transcripts are specifically configured to ensure validity, records cannot be altered or counterfeited. As a result, their data are virtually hack-proof and incorruptible (in principle).

SINGULARITY Blockchain and DLT provide a single version of truth that is updated simultaneously across the network. As a result, every member of the network has a copy of the data and can verify their own version with other members. This key feature ensures the integrity of data across the network.

Blockchain / DLT Challenges

Recently, there's been a lot of hype around these technologies as well as a lot of confusion. Uninformed claims about the potential applications, are on the rise. Clearly, the technology still has a long way to go before the dust settles. As a result of the nascence of blockchain and DLT, the industry faces many challenges before practical use cases become available:

LACK OF STANDARDS There are multiple competing groups looking to set the standards on blockchain and DLT, including R3 and Hyperledger. Blockchain really only works if everyone adopts a clear standard. Until a clear winner is determined, implementing a solution using either of these two standards could potentially result in redesign and rework of solutions..

LACK OF REGULATION As with any new technology, the law of what can and should be done with these technologies has not been fully determined. Therefore, any moves made before the dust settles could put companies at risk of process redesign. Additionally, when smart contracts involve the transfer of physical goods, uncertainties emerge regarding their legally binding nature.

SECURITY CHALLENGES Although the data within blockchains is relatively secure, the points of interface could still be at risk. For example, an Internet of Things device that automatically triggers a payment via smart contract could be hacked and incorrectly trigger payment whereas the smart contract itself remained secure.

DATA VISIBILITY Currently, public blockchains make all transactions visible to any party interested. In order to resolve this, private parties would currently have to develop their own blockchains in order to protect their data, thereby introducing additional cost and risk of accurate implementation.

In a relatively short period of time, Blockchain has created excitement across industries because of the promise of the vast range of problems that it could potentially address. As a result, a number of companies and initiatives across industries are pushing to experiment and create potential solutions under the blockchain banner. However, the technology still at its infancy, and the standards are still evolving. Fortunately, there are a growing number of professionals, with a solid understanding of the underlying technologies, who are prepared to think deeply about how they can be best applied to each industry. [5]

[5] Celent, Zilvinas Bareisis: "Blockchain: Beware the Hype."
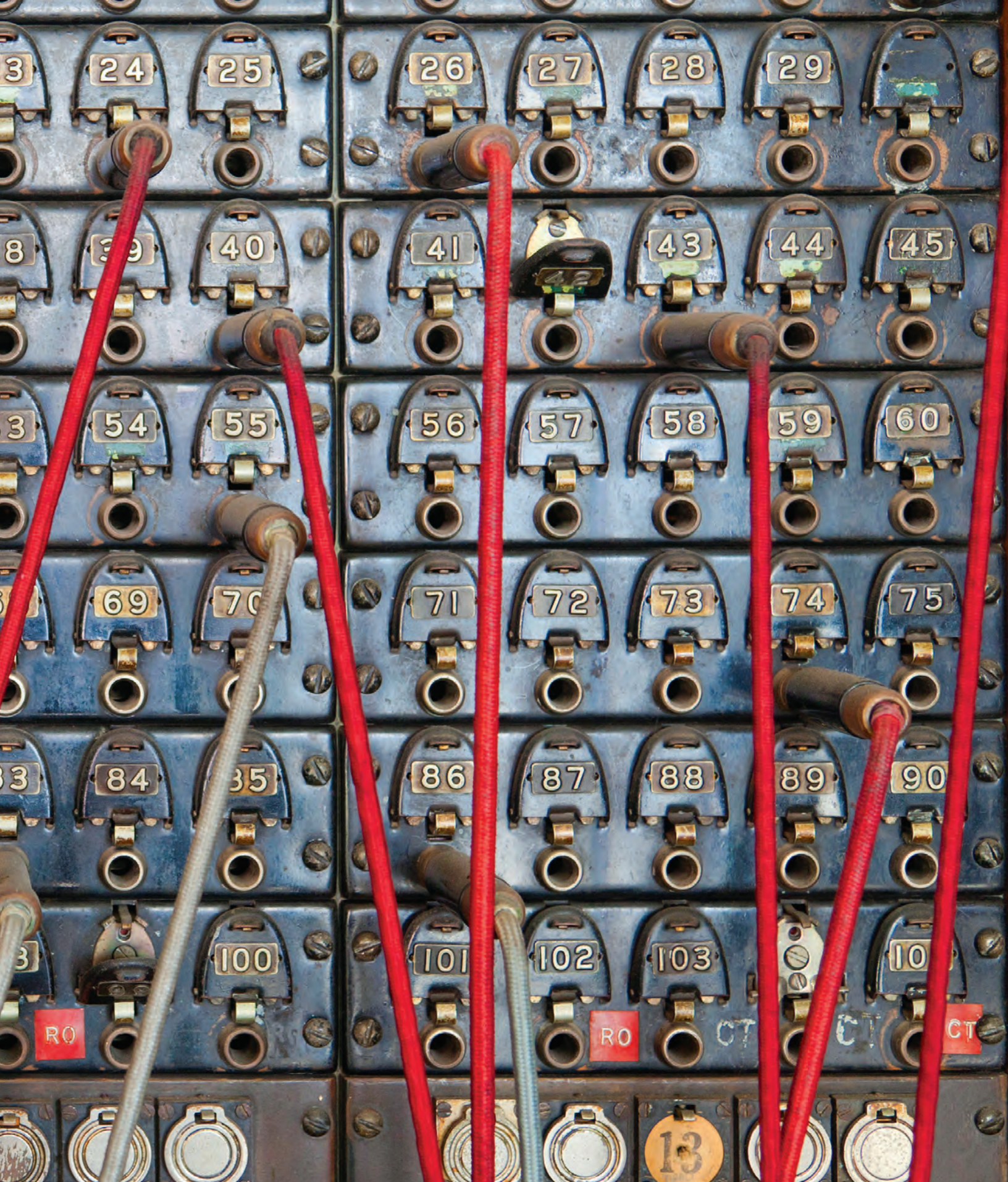
Conclusion
Trying Out These Technologies

Executives across industries are getting serious about assessing and deploying technologies like RPA, AI and blockchain across their enterprises. It is only a matter of time before these technologies will become table-stakes in enabling more competitive offerings, and doing work better, faster and cheaper. Sitting still and waiting it out simply is not an option. Finance and treasury executives need to embrace this reality and see the new competitive world as it will become. At the same time, the challenges and risks of deploying these technologies within the enterprise need to be well understood.

Below are six practical recommendations that finance and treasury can take to accelerate awareness, testing, adopting, and deriving value from these technologies:

1. **BE CLEAR ON YOUR RESPECTIVE FINANCE STRATEGY:** and determine how technology will fit into this strategy. Make sure this strategy is well understood by your peers in the organization as well as your own team.

2. **KEEP AN EYE ON THE MARKET AND THE LANDSCAPE:** The emerging technologies, standards, and associated technology providers are evolving rapidly. It will be important to monitor major developments in the market for specific technologies that are applicable to your organization. In most cases, you may be looking to buy a solution vs. building it yourself. It will important to understand the tipping point in choosing a buy vs. a build as part of your overall Finance strategy.

3. **ENGAGE THE BROADER ORGANIZATION ON OPPORTUNITIES AND RISKS OF EMERGING TECHNOLOGIES:** these include the Board, leadership, your technology counterparts and internal finance/treasury teams.

    A. Chances are that technologies such as artificial intelligence and RPA may cause trepidation within the organization. Determine how to address some of these concerns head on and be transparent about where these technologies can enhance productivity and employee experience, and where the risks and challenges will surface.

    B. There is a high probability that the CIO is already investigating a subset of these technologies – being involved in the technology roadmap will ensure CFOs and treasurers have visibility into upcoming initiatives.

4. **IDENTIFY A SPECIFIC PROBLEM TO SOLVE:** Pick one potential scenario with your existing environment that can be solved using emerging technologies. Ideally, it should be a scenario that showcases the potential of the technology but does not disrupt your existing operations.

5. **INVEST IN A PILOT VS. GOING ALL IN:** In many cases, succeeding with a small implementation is more important than a major failure. Manage your risk and resources through a focused effort with a small team.

6. **DETERMINE WHERE IT MAKES SENSE TO PARTNER WITH AN EXTERNAL FIRM:** One of the reasons that many of these technologies are not implemented today is the lack of skillsets – both within the Finance teams as well as technology teams. The very nature of emerging technologies implies that we are still in a market with few experts. In specific cases, having a trusted partner can help accelerate and de-risk specific initiatives.

Appendix
Emerging Technology Overview

3D printing	Advances in additive manufacturing, using a widening range of materials and methods; innovations include 3D bioprinting of organic tissues.
Advanced materials and anomaterials	Creation of new materials and nanostructures for the development of beneficial material properties, such as thermoelectric efficiency, shape retention and new functionality.
Artificial intelligence and robotics	Development of machines that can substitute for humans, increasingly in tasks associated with thinking, multitasking, and fine motor skills.
Biotechnologies	Innovations in genetic engineering, sequencing and therapeutics, as well as biological-computational interfaces and synthetic biology.
Energy capture, storage and transmission	Breakthroughs in battery and fuel cell efficiency; renewable energy through solar, wind, and tidal technologies; energy distribution through smart grid systems, wireless energy transfer and more.
Blockchain and distributed ledger	Distributed ledger technology based on cryptographic systems that manage, verify and publicly record transaction data; the basis of "cryptocurrencies" such as bitcoin.
Geoengineering	Technological intervention in planetary systems, typically to mitigate effects of climate change by removing carbon dioxide or managing solar radiation.
Ubiquitous linked sensors	Also known as the "Internet of Things". The use of networked sensors to remotely connect, track and manage products, systems, and grids.
Neurotechnologies	Innovations such as smart drugs, neuroimaging, and bioelectronic interfaces that allow for reading, communicating and influencing human brain activity.
New computing technologies	New architectures for computing hardware, such as quantum computing, biological computing or neural network processing, as well as innovative expansion of current computing technologies.
Space technologies	Developments allowing for greater access to and exploration of space, including microsatellites, advanced telescopes, reusable rockets and integrated rocket-jet engines.
Virtual and augmented realities	Next-step interfaces between humans and computers, involving immersive environments, holographic readouts and digitally produced overlays for mixed-reality experiences.

Source: World Economic Forum 2017 Global Risk Report

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