TREASURY TECHNOLOGY
ANALYST REPORT

The Definitive Guide
to Treasury Technology Solutions

› Treasury and Risk Management

› Treasury Aggregation

› Supply Chain Finance and Cash Conversion Cycle

› Enterprise Liquidity Management

This special edition provides an exclusive look at the solution set offered by Kyriba.

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2022

Strategic Treasurer

- ADVISE
- ASSIST
- RESEARCH
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2022
Analyst Report

Welcome to the 2022 Treasury Technology Analyst Report, the definitive guide for thoughtful financial stewardship in the digital age. Strategic Treasurer created this report as an aid to practitioners exploring how treasury technology meets treasury needs.

Treasurers considering digitizing their processes often face a learning curve as they approach the complexity of many categories of treasury technology. AI, ML, API, RPA, and many other technological terms can sound like alphabet soup, and few feel confident about navigating selection, buy-in, and implementation efficiently. This report can help.

NAVIGATING THE DIGITAL REPORT:

Please note the following tools, which we hope will make it easy and convenient for you to reach different parts of the report quickly and cross-reference other sections as needed:

Clickable Table of Contents: You can use the table of contents on the following page to click to each section.

"Contents" & "Vendor" Buttons on Every Page: Every page after this one has two tabs along the left or right margin with buttons reading "Contents," which will pull you directly back to the table of contents, and "Vendor," which will direct you to the beginning of the vendor coverage section. If at any point you find yourself somewhat lost for the section you wanted, you can return to the table of contents.

Color-Coded Sections: Each solution category has its own color. You can see this in the table of contents, and colored tabs on each page of the sub-reports will help you to identify which section you're scrolling through.

Links: Some words throughout the report are linked to other relevant pages within the report. We are not able to include links returning you to the page you clicked from, but in some PDF readers, the Alt key in combination with the left arrow key can be used to navigate to a page you have clicked away from.

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Technology Solution Category: TRMS, TA, & SCF/CCC

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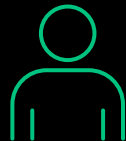
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Introduction

Today's treasurer faces a rapidly shifting technology environment full of acronyms and innovations. Those needing the help of modern technology are often those most pressed for time, and the relevant information on technology lies scattered across the internet, buried in either technical jargon or oversimplifications.

The goal of the Analyst Report is to offer a single document explaining what matters about technology to today's busy treasury department. We release a new report annually with content fully revised to be relevant and up-to-date in the current context. Our hope is that you will be able to pick up a single book (or open a single digital document) and come away with insight into the technology landscape's trajectory, a good idea of which functionality and solution types are most relevant to your company's current and anticipated challenges, and a solid framework for how to proceed.

If you have encountered our Analyst Reports in years past, you may have seen separate documents for different technology types. In 2021, anticipating the upcoming addition of enterprise liquidity management (ELM) solutions as a fourth solution category, we decided it was time to combine the reports into a single document to simplify the reader's experience.

The 2022 Analyst Report begins with an "Overview" section aimed at exploring foundational concepts and terms and discussing treasury challenges and technology innovations on a macro level. Following the Overview, readers will find four categories of solution types explained in detail: treasury management systems / treasury and risk management systems (TMS/TRMS), treasury aggregators, supply chain finance and cash conversion cycle solutions, and the more recently defined category of ELM.

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The Environment and Challenges Facing Treasury

The market for digital treasury tools is impacted by every factor that impacts treasury itself. The department's responsibilities and the environment it must cope with both shift with every major economic event and with every wind that changes the face of corporate operations in general.

What follows is a discussion of what we consider the top factors influencing treasury's needs and concerns today. Use this section to consider how your own organization and industry relate to the general factors driving treasury technology adoption and how that might impact the solutions available for your specific needs.

Adding Demands Rapidly, Adding Staff Slowly

The demands placed on treasury seem to multiply with each new economic event and corporate challenge. As more is added to treasury's plate, the department must respond either with more manpower, more tools to leverage, or both.

Treasury's core responsibility has always been to protect the organization's most liquid assets, making them managers of cash and of the risks to that cash. As events occur, corporations become aware of more risks to their cash — often through their own painful experiences, global impacts, or experiences of other companies. Economic crises, clearly increasing fraud risks, and other factors all serve to turn the C-suite's attention on their liquidity risk managers: treasury.

As a whole, treasury is glad to have the ear of the C-suite, to have the importance of treasury risk management recognized more widely, and to have more specific areas of risk management entrusted to their care. Treasurers are now considered responsible in many companies for improving organizational efficiency and overseeing payment security, and many of the expectations for its foresight and leadership in treasury risk management have climbed. Several of the other items listed in this section on the treasury environment are part of this increase — situations that demand higher risk awareness, more rapid analysis, and broader attention.

While the expansion of treasury's role is an honor, each increase multiplies treasury's workload — and these are just the industry-wide increases in treasury demands. As each individual organization grows into new regions, faces new regulations, or acquires subsidiaries, treasury's workload extends again.

The steady expansion of treasury's responsibilities has been coupled with fairly little increase in its staffing, as survey data shows treasury teams growing only slowly over the years. One added staff member alone cannot make up for the level of demand increases. Treasury needs leverage, and that leverage can most often be found in the form of technology.

Vendors have responded to seeing treasury departments stretched thin by building highly efficient tools. By automating many of the most onerous and time-consuming tasks, treasury technology extends the reach of the staff and empowers them to do what only they can, such as strategic and advisory tasks.

Some consider the technology vs. staff issue a zero-sum game, but this is not the case in treasury. Certain tasks are, without doubt, being automated in most companies. Staff whose roles are defined by easily automated tasks will need to

reskill. However, a lower headcount is not needed in treasury. Rather, technology makes the slow increase in headcount sufficient by offering staff the leverage and efficiency they require in order to do what is increasingly asked of them.

Security in the Hybrid and Remote Era

The abrupt shift in work locations and the temporary (or permanent) closing of offices around the world in the early weeks of COVID-19 brought on a storm of logistical issues as well as fraudulent activity. Some of the factors that contributed to the security situation were temporary, such as the rampant confusion that lent credence to almost any explanation for payment information changes. However, some of the complications forced long-term adaptations, such as digitization of payment processes, that will continue to be used whether the company remains remote or not.

Indeed, the pandemic gave a jolt of forward momentum to adoption of treasury technology. The percentage of payments made electronically shot up in 2020 and has remained elevated since (figure 1). Industry standards have shifted to more electronic processes, and any companies continuing to allow remote work must have the infrastructure and tools to support the logistics and security needs that come with the work from home (WFH) environment.

Despite the long-discussed and somewhat implemented "return to office," the prevalence of remote work and of companies using a hybrid model (remote some days, in office others) has dramatically and — it seems — permanently increased in the wake of the pandemic. Besides the obvious need for digital systems that allow for remote access, the remote worker's security needs require modern technology.

Meanwhile, criminals' tools and methods have continued to improve, forcing more robust security measures regardless of work location. While relying on a solution, especially one housed in the cloud with remote access capabilities, may seem a counterintuitive measure for fraud prevention, these solutions actually serve to strongly counteract vulnerabilities in three primary ways: 1) They reduce touchpoints

Q. **What percentage of outgoing B2B payments do you make electronically?**
(Unsure responses are not shown)
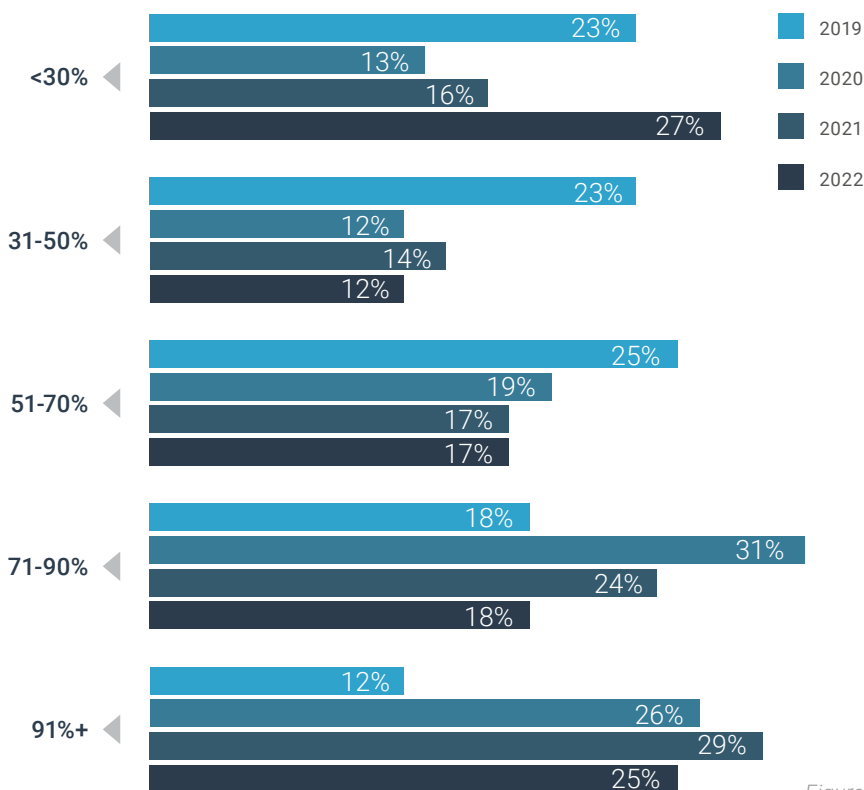
Figure 1

or manual handoffs. The fewer the touchpoints, the less opportunity criminals have to insert themselves into a process. 2) They mitigate complexity and improve visibility, narrowing the front that must be defended and making it harder for criminal activity to go unnoticed. 3) They allow for built-in controls that cannot be bypassed.

With rising industry standards, heightened risks, cyber insurance requirements, and remote work, the security environment and work location changes are challenging many organizations to speed their adoption timelines for solutions that can help snuff out their vulnerabilities.

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Efficiency and Scalability

Whether due to economic conditions, supply chain problems, geopolitical issues forcing abrupt changes, or other issues, companies today find themselves in need of efficiency, scalability, and the flexibility they offer. Efficiency and scalability are both more easily achieved by leveraging modern technology.

Efficiency has to do with processes taking as long as they need to for achieving quality results and no longer. It conserves resources (including time and manpower) so that your company can use them when and where they are most needed.

Inefficiency, on the other hand, brings with it error-prone processes (which can be costly), wasted capital, and limited options. For example, if payment approvals take the full length of payment terms, the company loses the option to avail itself of early payment discounts.

In areas such as these, inefficiency erodes the company's control over liquidity and flexibility in time of turmoil. This alone is enough to make efficiency across relevant areas of the organization a matter of import to treasury.

In addition, organizational leadership relies on treasury to provide rapid analysis and insight into the impacts and threats caused by various situations. For many treasury departments, the levels of efficiency required to rapidly analyze today's masses of data despite thin staffing are only achievable through technology and automation.

On the scalability side, recent years have proven volatile for the corporate world. Some have seen rapid growth in certain areas. Some have abruptly had to shutter operations in particular countries or lines of business. Many have had to adjust and redirect their strategies due to supply chain problems, lockdowns and travel restrictions, skyrocketing gas prices, and more.

For these and other reasons, the corporate world is finding itself in need of rapid scalability, and treasury itself may have to swiftly adapt. When processes are manual, scalability is low. Automation multiplies staff efforts, and many solutions — especially those built on more modern concepts such as software-as-a-service or microservices — make it far easier for treasury to easily adjust the capacity and leverage they are working with up or down as circumstances change.

Q. **Are there currently any responsibilities that you don't have time to perform?**

YES 46%

NO 54%
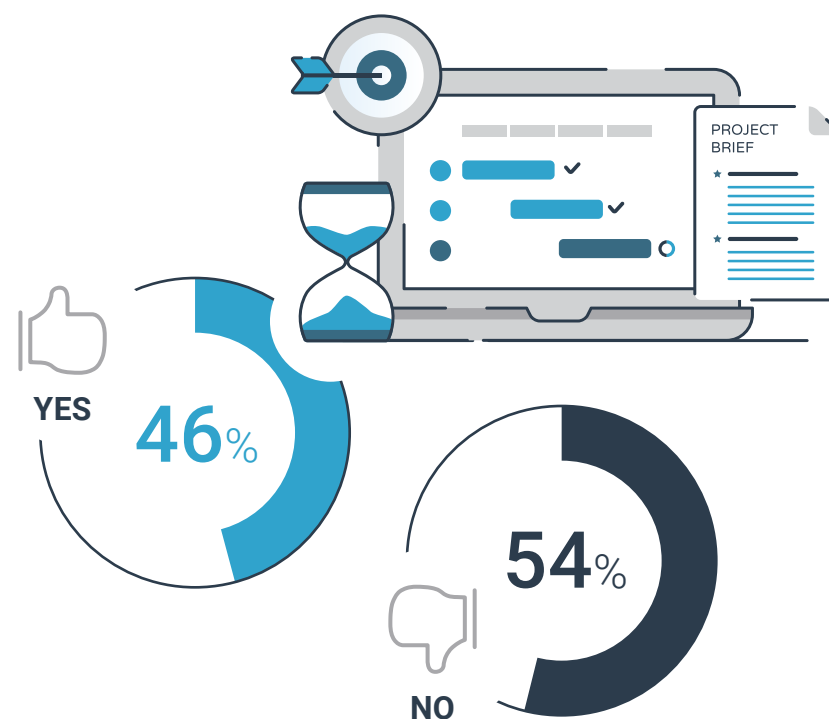
Figure 2

Heavier Compliance Burdens

A 2021 survey found that 54% of treasury and finance respondents considered the compliance burdens to be heavier than they had typically been in the past. Over the next 1-2 years, 66% expected their regulatory burdens to increase, and only 3% expect to see any decrease. The compliance and regulatory environment also ranked as the most impactful out of several options on the respondent organizations' capital spending or cash holdings (see figure 3).

From Know Your Customer (KYC) requirements, which respondents expected to be the most impactful to their operations in the next three years by a large margin, to PCI-DSS, GDPR, FBAR, etc., regulations are put in place to protect against negligence and willful actions that enable fraud and other problems. While many of these regulations help

protect companies and banks, complying with them takes time and resources. It is, without doubt, burdensome, and each year seems to add some weight.

Regulations spur the adoption of financial technology in two ways. First, some solutions directly or indirectly streamline the compliance process. For example, networks such as SWIFT are working to ease the KYC process by allowing corporate participants to upload KYC information once to the platform instead of compiling and sending the paperwork anew for each bank. In addition, complying with any regulation that requires financial or account information, such as FBAR, is much easier with solutions that give faster, more accurate financial visibility.

The second way compliance serves to push adoption forward is that some regulations have specific technical requirements that may not be possible to meet for some companies without a modern solution. These regulations are often security related.

Q. **Arrange the following areas / developments in the order that they will most likely impact your organization's capital spending or cash holdings over the next year: (Order from 1 (highest impact) to 5 (lowest impact))**
(Only top choices shown)

	1	2	3	4	5
Compliance & regulatory environment	32%	28%	25%	9%	6%
Continued interest rate risk, credit/lending considerations	32%	22%	18%	18%	10%
Cybersecurity needs/ reinforcements	17%	21%	20%	18%	24%
Geopolitical environment	12%	22%	18%	35%	13%

Figure 3

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THE DEFINITIVE GUIDE TO TREASURY TECHNOLOGY SOLUTIONS
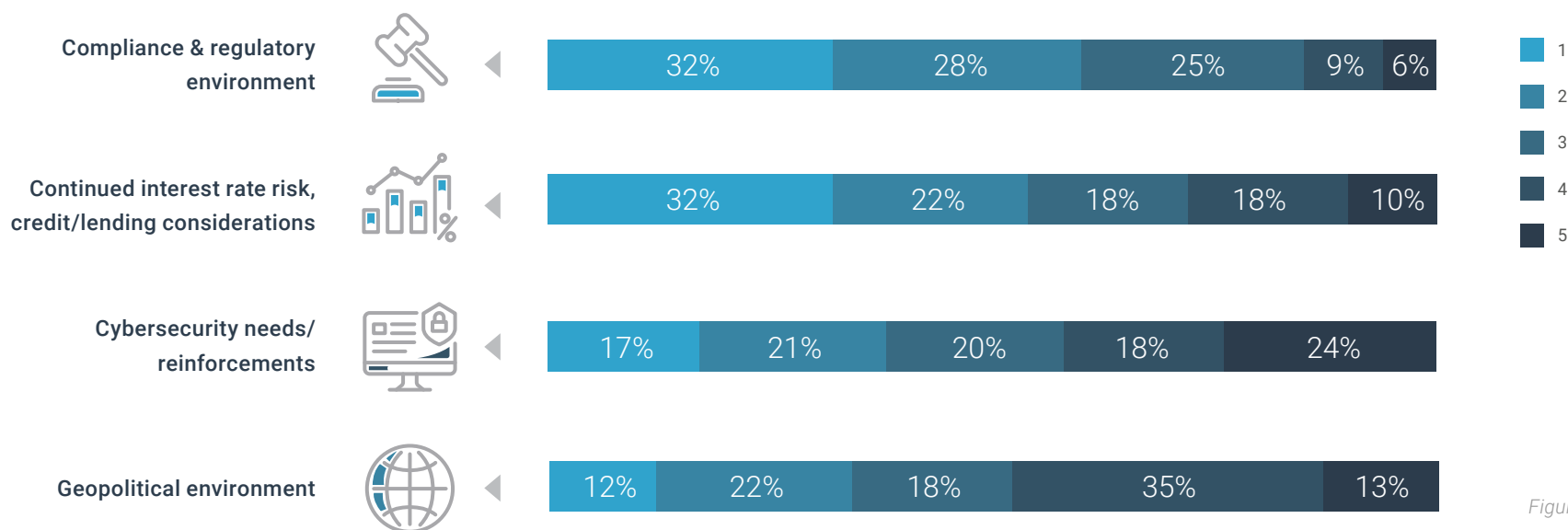
Big Data, Complexity, and Visibility

Companies and, specifically, treasury departments in 2022 do not have the luxury of ignoring data. While a strong data strategy takes time to form and implement, every company should at least have a strategy in the works. For many, implementing these strategies will require technology.

The ever-growing "big data," which denotes the overwhelming amounts of data that are pouring into and through companies in increasingly varied forms, continues to prove both an immense opportunity and a challenge. Companies that harness their data are able to gain valuable insights into everything from their own operations to market behavior. However, harnessing that data effectively requires careful management, thoughtfully architected storage, and massive processing power.

Meanwhile, the complexity that creates big data, coupled with any growth companies are experiencing, leads to complicated processes and difficulty achieving visibility. Many treasury teams that used to get by with manually logging into bank portals and managing cash positions on Excel are now facing more banks, more accounts, more portals to log into, more formats, and more internal information to manage.

Maintaining complete visibility is vital for treasury. Without it, fraud risks are higher, compliance is more difficult, and the treasurer does not have a complete view of the situation from which to advise the organization. Yet with every expansion, every added bank account, and simply every year that passes, increasing data and complexity make it more difficult to achieve that visibility without the use of technology. With solutions that can manage and also help harness data, treasury is able to thrive and support their organizations' long-term growth.

Q. **What percentage of your operating bank accounts do you have visibility to on a daily basis?**
(Unsure responses are not shown)

100%	35%
90-99%	32%
75-89%	15%
50-74%	10%
25-49%	4%
<25%	1%
None	1%

Figure 4

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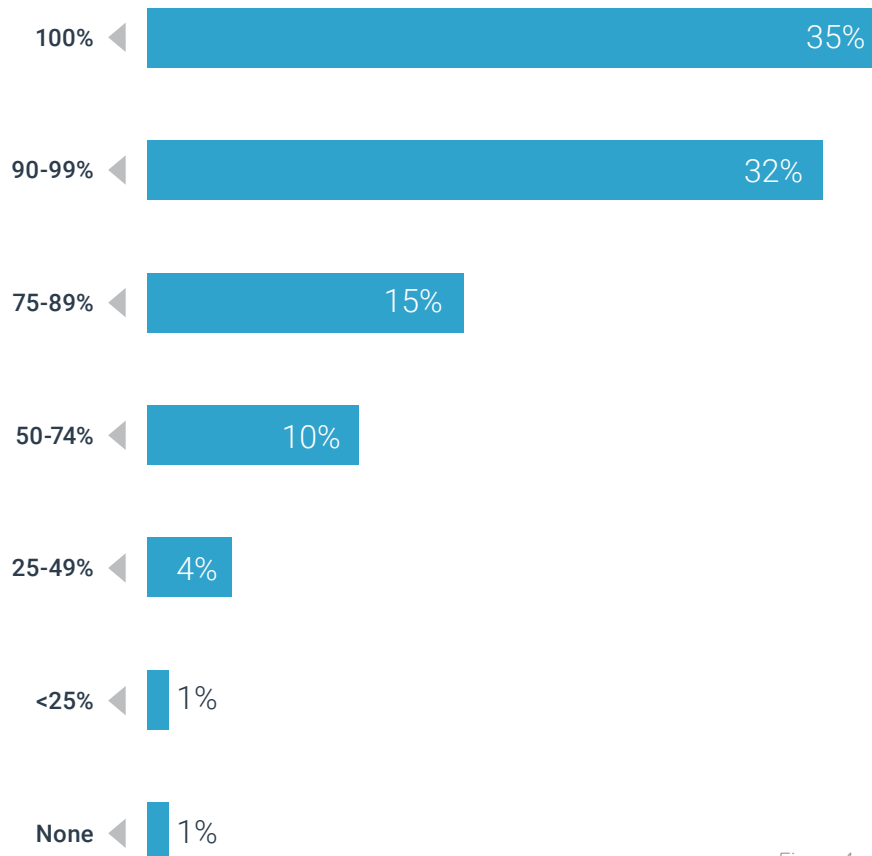
Geopolitical Tensions and Economic Stress

It should come as no surprise to most readers that 2022 and the years leading up to it have been years of some global turmoil. From pandemics to armed conflicts and from supply chain issues to soaring inflation, companies and individuals alike have had to cope with a great deal.

We've discussed how lockdowns, fraud, and the need for scalability in these scenarios have all contributed to rapid adoption of digital processes and robust solutions. The usefulness to treasury of technological support and automation during times of any kind of upheaval, however, is worth discussing separately.

When risks become realities and when economic and geopolitical events loom large, organizations need their treasurers to be ready

with rapid analysis and strategic guidance. Treasury cannot do this when manual processes are delaying their cash positions, limiting their visibility to all accounts, or when any part of the process leading up to strategic advising takes too much time and manpower.

Technological solutions such as those discussed in this report offer treasury *margin.* They automate portions of the process, reduce errors, and save staff time. This allows all members of the treasury team to continue fulfilling their roles even when there is more information to process and more factors to consider, which is often when the treasury function is most vital to the company's ongoing success.

Interest Rate Volatility

Inflation

Supply Chain Problems

Market Volatility

TIME

DEMANDS

TREASURY STAFF

Fraud

FX Risk

Lockdowns

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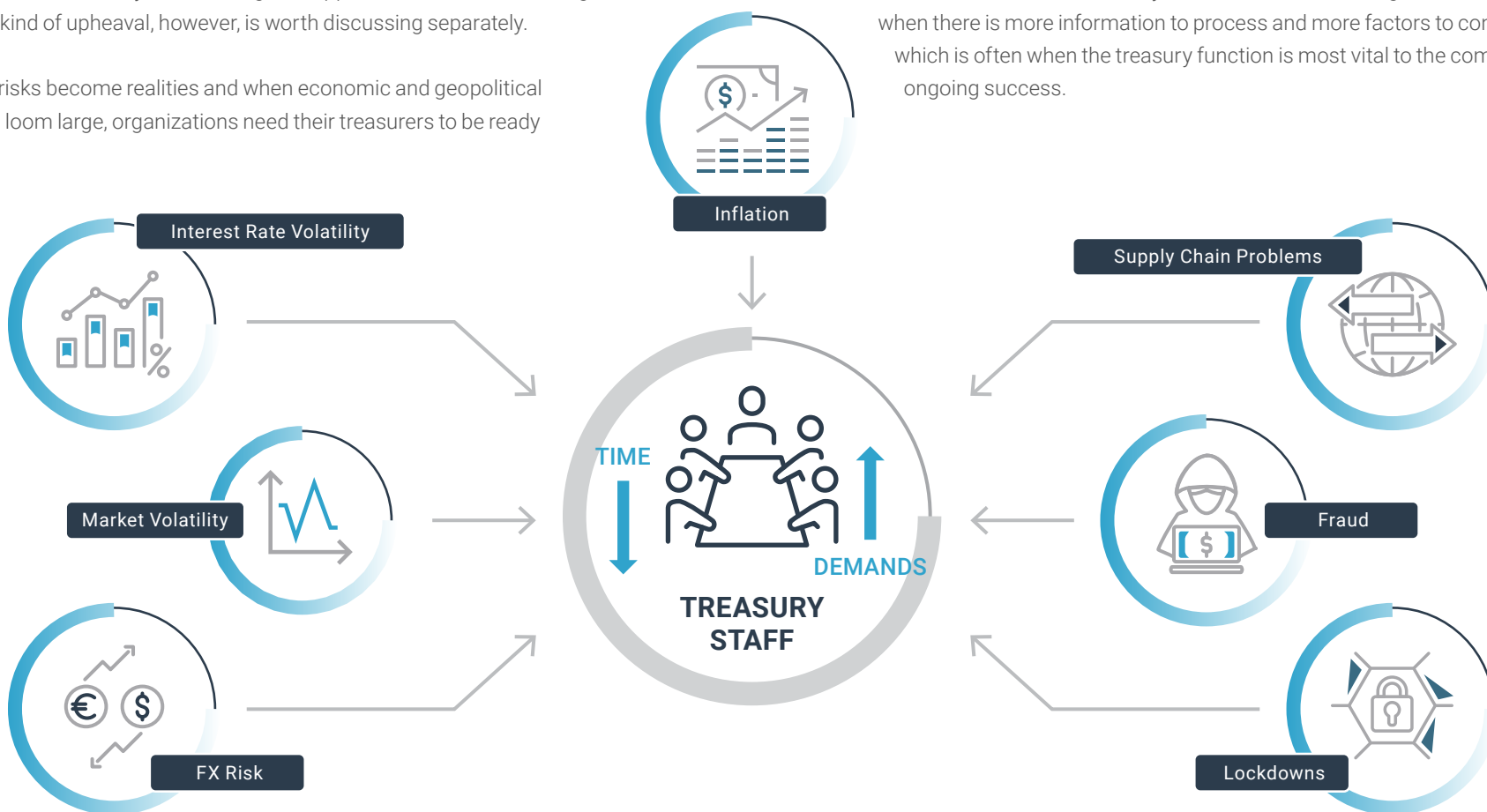
The Treasury Technology Landscape

With a variety of factors driving treasury's interest in technology, there are quite a few relevant types of solutions. Some of them directly streamline treasury's own operations. Others are primarily aimed at streamlining different areas of the corporation, but they impact organizational liquidity, efficiency, or security in ways that make them important to treasury's cash and risk management goals.

Sample Technology Infrastructure

COMPANY

DATA CENTER
- Admin System
- Data Lakes
- Enterprise Resource Planning (ERP)

DESKTOP
- Web Browser
- XLS
- Internet

WORLD WIDE WEB

DATA PROVIDERS
- FX Activity
- Calendar
- Market Data

Treasury Aggregator (TA)

Statements
Messaging Reports

NETWORKS (SWIFT, EBICS)

BANKS

CLOUD SERVICES

- ERP Cloud — Embedded TMS
- Data Lake
- **Treasury Management System (TMS)**
- Reconciliation System
- Admin System

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In this report, we will discuss the general impact of several components and innovations, from APIs to ML. We will then take some time to focus in on a few solution categories, briefly defined here:

Treasury Management Systems / Treasury and Risk Management Systems (TMS/TRMS)

A TMS is treasury's core solution for its own operational needs. When a treasury department outgrows Excel, these systems offer a more robust platform for daily tasks such as cash management and positioning, visibility, accounting, and forecasting. A TMS's benefits also extend to security, flexibility, and smoothly integrated workflows. For treasury teams that use multiple tools and need to share information with other areas, their TMS can serve as a foundation on which the other tools function and to which other areas' solutions can connect. A TRMS, while largely comparable to the average TMS, offers deeper risk management functionality.

Treasury Aggregators (TA)

A TA combines the functionality of a data consolidator with that of a payment hub. These solutions are ideal for organizations with complex payment flows or banking information. They simplify data gathering and pass aggregated banking information along to any areas that need it, and they establish connections and translate payment formats, allowing for centralized and efficient payment processes.

Supply Chain Finance (SCF) and Cash Conversion Cycle (CCC) Solutions

SCF and CCC solutions, while they do not directly help with treasury's own operations, can significantly improve liquidity and working capital. SCF solutions digitally empower programs that create win-win scenarios for buyers and vendors, whether by leveraging the buyer's superior credit and third-party financing or through leveraging the buyer's own excess capital. CCC solutions automate various portions of the cash conversion cycle, streamlining processes and, therefore, increasing the efficiency and flexibility of the company's cash management. Since these solutions tend to cut across multiple departments and impact working capital, the treasurer is often needed as a leader to help identify the real problems and the best solutions.

Enterprise Liquidity Management (ELM)

A new evolution in treasury technology, ELM systems offer a comprehensive view of liquidity across the organization. These robust solutions include the base functionality of a TMS, but with far more extensive reach. From supply chain finance and payments to foreign exchange, the data showing what's really happening to liquidity is often scattered across different departments at large corporations, making it difficult for treasury to keep close track and strategize accurately. ELM systems are built to integrate information from across the company, allowing treasury to view and manage liquidity on a comprehensive scale.

The Foundations of Treasury Technology

Treasury technology has a multi-decade history and is built on many individual innovations along the way. Understanding where the landscape is today, as well as where it's going, requires a brief study of where it has come from.

Processing Power Growth vs. Data Growth Over Six Years

X PROCESSING SPEED   2x   4x   8x   16x

1.5 Years

X DATA   2x   4x   8x
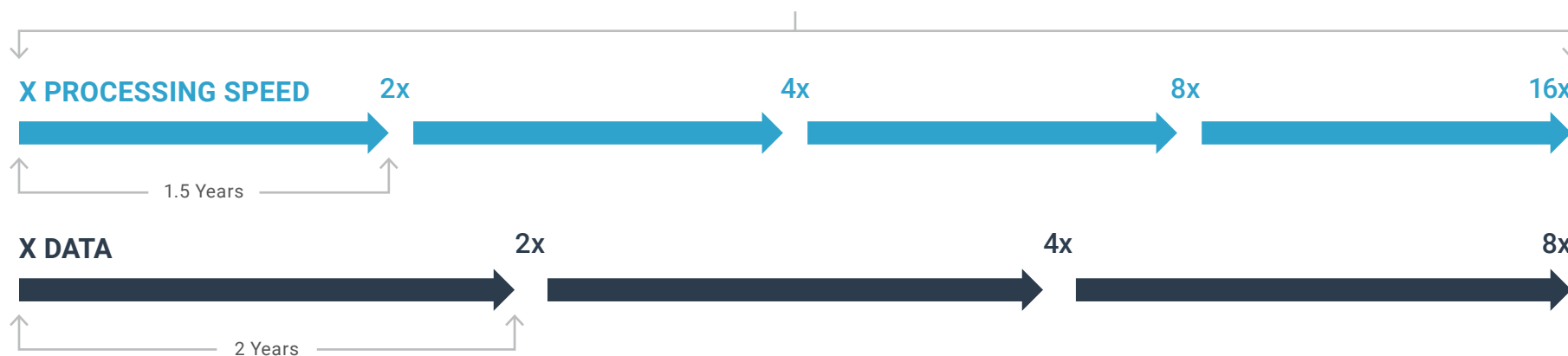
2 Years

Data

Data has a growth rate of approximately 40% year-over-year. In more recent years, this has led to "big data," but the growth of data has been challenging and driving innovation since much earlier. From formats to connectivity and processing power, many of the things we will be discussing are built to manage the ever-increasing volumes and types of data. Cash is still king, but treasury departments are learning to value data as a particularly precious resource that allows them to protect the king effectively.

Processing Power

Fortunately, processing power efficiency increases at an even faster rate than data and doubles every 18 months. This allows computers and systems to keep up with and manage the masses of data. However, coupled with data growth, this rapid growth in processing power means that technology is improving, progressing, and changing at a somewhat dizzying rate. Solutions that were state-of-the-art a decade ago are typically far behind the average solutions coming out today.

Connectivity

Connectivity has come a very long way in the past several decades. It has moved from the mail service to teletype machines, and from teletype to host-to-host (H2H) connections and SFTP. Payment Services Directive 2 (PSD2) in Europe — a regulation requiring banks to accommodate customers wanting to access their data through third parties — was largely achieved through application programming interfaces or APIs, which has spurred their adoption worldwide and brought them into the spotlight for a new generation of connectivity.

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Hosting Models

Hosting models for treasury technology, notably for the TMS, have seen a few iterations over the last couple of decades.

» Early solutions were installed onsite and hosted on the clients' servers. These solutions, often called "on-premises solutions," were difficult to upgrade and to maintain and faced inevitable obsoletion eventually.

» Application service providers, or the ASP model, attempted to solve these problems by hosting the solution with a third party tasked with maintaining it. The approach improved upgrade issues and lowered the maintenance burden on clients, but these solutions still faced obsoletion and other issues.

» Software-as-a-service, the SaaS model, is the current standard. These solutions are cloud-hosted and multi-tenant, purchased on a subscription basis, and are maintained and upgraded by the vendor. Since the vendors can directly and fairly easily update and rework the software over time, and since they are incentivized to do so through the subscription payment model, SaaS solutions are seen as holding onto their value for far longer than earlier types.

Democratization of Technology

In 2004, Texas Instruments released the TI-84 graphing calculator, selling it for around $120. This handheld calculator had significantly more processing power and RAM than the most powerful and wildly expensive computers available only 40 years before. Many of us have grown familiar in our personal lives with the experience of looking back on technology from a few years ago and marveling at how much less functionality and power that technology gave us compared to far less expensive technology available today. This applies to the corporate technology world as well. Today's treasury solutions hold drastically more processing power and functionality than their predecessors and can be obtained for far lower costs. We call this the "democratization" of technology, as the expanded functionality coupled with affordability serve to broaden the market of the solutions. Early installed TMSs, for example, were only financially feasible for extremely large and complex organizations that desperately needed them. Today, there are comparatively powerful options that are affordable enough for a small company of less than $500M in revenue, and the market is only continuing to expand.

Q. **The TMS / TRMS platform type we use or plan to use is or is expected to be:**
(Excludes "Unsure at this time" responses)

16%

INSTALLED
(on-premise)

10%

HOSTED
(offsite, single company per instance)

74%

SAAS OR CLOUD
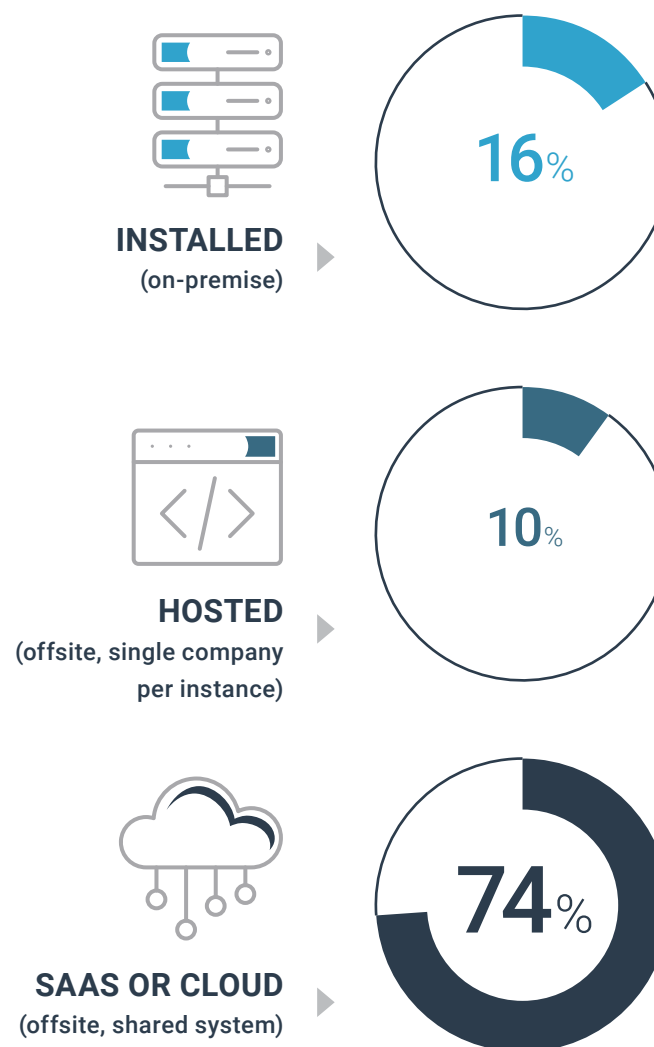(offsite, shared system)

Figure 5

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Where It's Going: The Future of Treasury Technology

The changes in technology are far from slowing down. While it is not within treasury's job description to keep up with every innovation that impacts corporate technology in detail, treasurers do need to maintain a basic comprehension of the terms, innovations, and trajectories of the technologies impacting liquidity and risk management. What follows are what we consider the terms and concepts for treasury to watch as of 2022.

Platform-as-a-Service

As can be traced in the progression of hosting models mentioned previously, software generally moves from 1) installed to 2) slightly modified but still hosted to 3) fully web enabled. As the software shifts with each move, there is more potential for rapid innovation, scalability, and openness. Platform-as-a-service, or PaaS, brings these elements to a fuller fruition. Rather than being a software innovation, PaaS is the platform side of this progression, now beginning to coexist with and support the current SaaS software environment.

PaaS solutions, which are typically embedded in other functionality with an "open" technology infrastructure (e.g., PaaS TMS functionality can be embedded in an ERP), are built on Amazon Web Services (AWS) or Azure. The use of these services eliminates many of the vendor's server issues and allows for hyper-scalability. For treasury, this means that if your needs vary regularly, this can be accommodated efficiently without having to pay for the maximum possible need at all times. PaaS also has a far shorter timeframe for development. The vendor can develop and release additional or improved functionality in a matter of weeks rather than months or years — a benefit to both the provider and the user.

PAAS FOR SCALABILITY: USE CASE

Some treasury departments may have one or two days of a computationally intense task such as end-of-month hedging reporting, requiring ten times the computational power they need the rest of the month. In the past, companies would need to pay for that highest amount of power all month just so it was there for the two days they needed it. PaaS allows the vendor to scale the power you receive up and down as needed, so you can pay for the one-tenth power most of the month and just scale up to the ten times power for the days you need it.

» Microservices, Cloud-Native, Low-Code/No-Code

PaaS runs in parallel with the concepts of microservices, cloud-native technology, and low-code/no-code environments, which have recently entered the market with excellent promise.

▸ **Microservices:** The concept of microservices has to do with how functionality is sectioned off and organized. In much older technologies, a solution's functionality came in a single chunk. If you wanted to update one piece of the user interface, the entire system had to be upgraded, as there was no componentization. As time has gone by, functionality has been broken up into more and more components. Microservices are the latest in this progression. They represent very small pieces of functionality that can be plugged into or removed from a solution without impacting the rest of its functionality. Working alongside the PaaS framework, microservices empower rapid development and customizable solutions.

▸ **Cloud-Native:** While many solutions have moved into the cloud, not all of them were originally built to take full advantage of the cloud. Many were simply modified to work in the new environment. However, being on the cloud allows for many different, advantageous ways of building solutions (microservices included). The term "cloud-native" refers to solutions that have been built to live in the cloud and use it to full advantage.

▸ **Low-Code/No-Code:** With microservices and other innovations, solutions can now be built or put together from pre-written pieces of code that slide cleanly together. Building and customizing solutions in the low-code/no-code environment requires, as the name suggests, minimal coding knowledge or even none at all. For treasury, this means rapid innovation and high customization potential.

Application Programming Interface (API)

APIs have transformed internal integration and connectivity with external partners. These small programs serve as links, allowing users to access data from other systems at the push of a button. While APIs were invented decades ago, they have become ubiquitous in recent years, especially in the commercial sector. There, they are frequently found allowing users to access data and functionality from other sources from a single mobile app — for example, the Uber app allows users to see where their driver is and to pay all without leaving the app by means of APIs.

They have recently seen a rapid rise in use in the corporate space, as well, largely prompted by PSD2 and the rise in "open banking." As noted in the previous section on connectivity over the years, PSD2 required European banks to allow users secure access to their data via third parties. Complying with this regulation meant using APIs to power secure connectivity, and the ensuing adoption in Europe sparked similar adoption worldwide.

APIs have not only been highly instrumental in the development of open banking, but also in the development of "open treasury." This term refers to the open frameworks that allow for internal integration of systems within treasury and the departments it works alongside.

» **API Libraries**

Often, there are numerous APIs for a single vendor's solution sets, with each API allowing you to call a routine. API libraries allow for the organization of those calls. This simplifies connectivity, reducing the overhead and complications of integrating with other parties. Since they facilitate the smooth cooperation of different solutions, API libraries foster innovation and openness in the treasury space.

From Faster to Real Time

"Faster" payments have been a buzzword for a few years now, but the enthusiasm for "fast" seems to be translating into a new expectation: "real time." The corporate world is discovering that modern technology can effectively eliminate float and delays, and once accustomed to the benefits of this speed in one area, they want it everywhere.

This shift in expectations is spreading across multiple areas of treasury technology, from real-time payments to real-time data. With the industry standards moving closer and closer to real time, treasury will soon be facing expectations of speed that can never be met without modern technology pulling data in, pushing payments out, and analyzing — all in real time.

Q. **Do you currently use or intend to use faster payment technologies such as same-day ACH or real-time payments?**
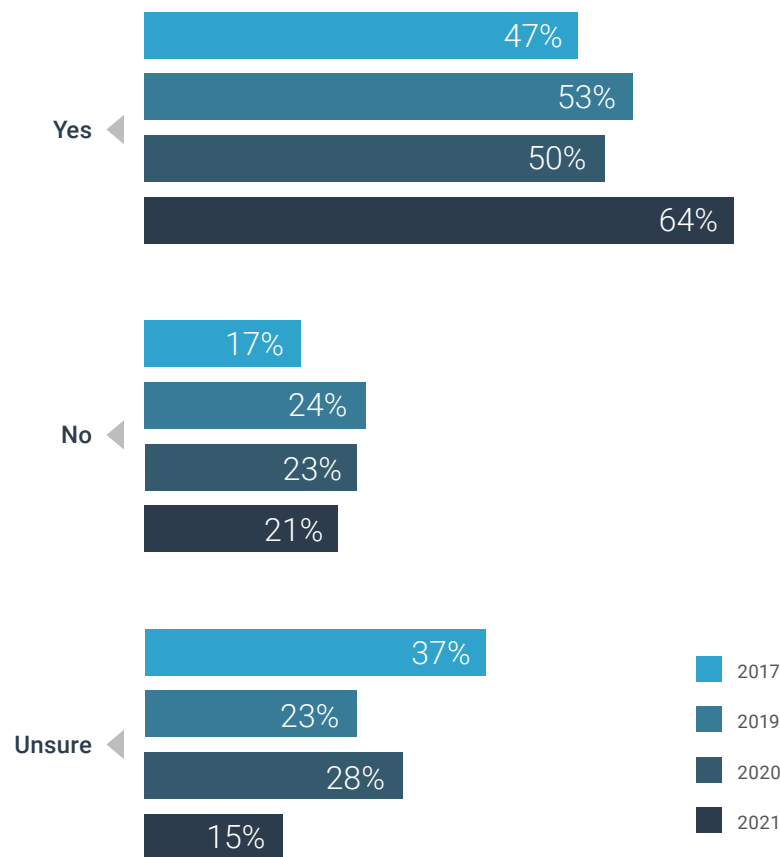

Yes	2017: 47% · 2019: 53% · 2020: 50% · 2021: 64%
No	2017: 17% · 2019: 24% · 2020: 23% · 2021: 21%
Unsure	2017: 37% · 2019: 23% · 2020: 28% · 2021: 15%

Legend: 2017, 2019, 2020, 2021

Figure 6

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The Power and Value of Networks

Every network has two primary sources of value: its participants and its functionality. These two sources of value bolster each other: no one joins the network if it has no functionality, but the functionality can do nothing without participants. Treasury has been using networks for decades, but recent years have seen innovative applications of networks, often empowered by the advanced connectivity and other technologies available today.

Three main uses of networks that modern treasury departments find useful are 1) information, 2) security, and 3) outsourcing.

» **Information**
Treasury uses networks such as SWIFT for banking information and payment data. This use has been in place for quite a while.

» **Outsourcing**
Modern networks are expanding on their information functionality by adding the outsourcing of data maintenance. This can include handling changes to payment information, since the network has the information necessary to confirm these changes quickly and accurately without the customer having to deal with the hassle, delays of information, and potential for fraud. Networks such as SWIFT have also launched functionality that helps members comply with KYC regulations. Corporate users can upload their KYC information once and have it distributed to banks as needed instead of having to recompile and upload it separately for each new bank.

» **Security**
While sharing information to keep it secure may seem counterintuitive, using networks for security is proving highly effective. In addition to reducing the hassle of payment information changes, networks can allow for enhanced validation. The network is able to confirm, for example, whether a requested payment information change is reflected across the vendor's other customers on the network and whether any other customers have flagged certain changes as fraudulent.

By leveraging both this community and the network's functionality, payments can be kept in a secure environment and changes can be handled with high levels of validation.

Big Data and Business Intelligence

We've discussed big data and the challenge it presents, as well as the opportunity it offers to those who are willing and able to harness it. Business intelligence (BI) tools are the "harness" used to turn big data from an immense headache into an immense help to organizations.

Data — whether the "exhaust" data that is collected through the organization's daily operations or the external data that can be accessed or bought from the larger market — is an increasingly important resource. During the pandemic, companies that turned to "alternative data" to escape from the lag of their traditional datasets were often able to find insights that suggested what would likely happen the next day instead of what had happened yesterday, which was no longer relevant in such a rapidly changing environment.

Especially during volatile times, companies are finding that gathering and analyzing the right data in creative and thoughtful ways can give them important insights that other companies lack, and those insights create a competitive advantage. With more and more recognizing this, valuing data, and creating strong data management strategies, those who are not taking steps in this direction will soon find themselves at a competitive disadvantage.

Treasurers should be concerned about their organizational data strategies in general, and when it comes to technology, they must investigate how current and potential vendors view data management. Is it a priority to them now, on the roadmap, or not in the plans? Is it set up to manage the data it directly interacts with well, and is it set up to facilitate the smooth flow of data throughout the company? Will it integrate smoothly with any BI tools? Whatever the solution type, it should fit into and support the organization's overall data management strategy.

Artificial Intelligence (AI) and Machine Learning (ML)

AI and ML are fairly broad categories of technology that are made to mimic the human brain more than to directly mimic a set of human actions. They are programmed to perform analysis, make decisions, and/or learn without constant direction from a user. This often involves set goals and parameters, and the program is left to make certain determinations or, in the case of ML, to "experiment" in the process of pursuing those goals.

These tools are seeing increasing use in treasury technology for multiple purposes, and various use cases will be seen in the specific solution category sections that follow. Perhaps most notably, AI and ML have seen growing use in forecasting, where vendors are finding promising increases in accuracy, and in security and fraud prevention. AI and ML excel at pattern and anomaly detection, and fraudulent behavior is often anomalous in some fashion — a larger payment than normal, an unusual user initiating a payment, a user logging in at an unusual time or accessing an unusual number of files in rapid succession, and so on.

While most treasurers' understandings of AI and ML may not go deep on a technical level, they must understand the use cases of these innovations and that they will be increasingly vital to treasury operations over the following years.

Blockchain and Distributed Ledger Technology (DLT)

Blockchain and DLT, while not seeing extensive use in treasury technology so far, do have a few use cases that will be discussed in the relevant category sections. DLT changes the traditional model of database location by "distributing" records across a network. Blockchain, a specific type of DLT, involves the creation of an immutable ledger of changes to the distributed data. Despite the buzz and excitement around these innovations, however, their adoption in treasury technology has been fairly slow, with little indication of significant use in the near future. Treasurers should be aware of the usefulness of this technology in their solutions, but they should have tempered expectations for its increases.

Q. **Which of the following technologies are you using/interested in using in treasury?**
(Only top choices shown)

Application Program Interface (APIs)
34% | 35% | 11% | 20%

Artificial Intelligence (AI) or Predictive Analytics
10% | 31% | 30% | 29%

Blockchain/Distributed Ledger Technology
4% | 15% | 29% | 52%

Legend:
- Currently using or implementing
- Will use within two years
- Will use within 5 years
- Not interested in using at this time

Figure 7

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VENDOR
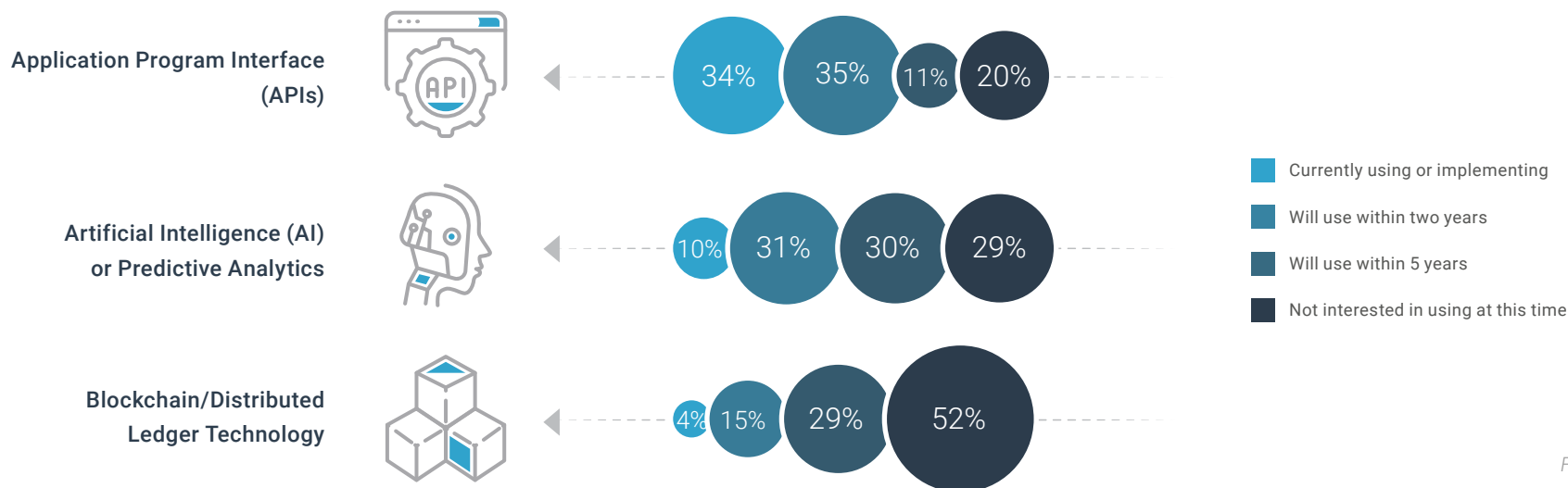
Obtaining Your Solution: General Principles

Much of this report is aimed at explaining the solution types, their applications, and how to decide what meets your needs. However, recognizing a need and identifying the general solution type opens an entirely new set of decisions to make and steps to take. From making a business case to going live with your new solution, the process of obtaining a solution is a high-stakes journey. There are many pitfalls along the way, but following leading practices can help treasury avoid them and set up a solution that will support the organization's growth for years to come. While we will give more specific tips in the individual category discussions, the practices below can help with any technology project.

Mindset for the Future

The most fundamental requirement for a successful technology project is approaching it with the proper mindset. In many cases, this requires taking an intentional step back from the urgencies and pressures of the situation to consider the bigger picture.

Past issues and present pain points are top of mind for many who decide it's time for a solution. Having developed a pressing awareness of current problems and having learned about what is available now, some become short-sighted. They look for and implement a solution as if it were intended to apply to the previous decade, when in reality, it should be setting you up for the coming decade.

Certainly, a solution should address the current pain points thoroughly, but it should not stop there. In determining your key business requirements for a solution, consider your company's plans, goals, and anticipated needs. As you explore vendor and solution options, try to identify their trajectories as well. Will the solution you're considering adequately support your organization's anticipated plans and growth? Can the solution scale to support changes, and will you be able to add functionality if needed? As will be discussed further in the leading practices for selection, finding a vendor whose attitude is one of ongoing strategic support to their customers can make a significant difference as the years pass.

Developing a Realistic and Comprehensive Roadmap

BUSINESS CASE

Strategic case
⌄
Stakeholder buy-in

SELECTION

Strategic partner
⌄
Short list

IMPLEMENTATION

Realistic approach
⌄
Phases & banded timeframes

| Research & Analysis | Internal Discussion | System Mapping | Future Planning | System Upkeep/Optimization |

The Business Case

No matter how convinced the treasurer is that a certain solution would benefit the organization, it will not happen unless the same conviction is shared by the organization's gatekeepers of funding. These gatekeepers, like treasury, are concerned with cautiously guarding the company's assets. Multiple areas typically request funding every year, and not all projects can be supported, so tight competition is common. Avoid the mistake of thinking you can walk in with a reasonable ROI and gain your funding easily. All the other projects will have an ROI to present as well.

How can treasury demonstrate clear value and obtain funding?

1. **Making the Strategic Case:**
   A reasonable ROI should certainly be part of your case, but everyone knows to show an ROI. Organizations, however, want to see projects that support overarching organizational goals, that fit into the trajectory and strategy of the company, and that offer a strategic edge that can strengthen not just one department, but many. *Your solution should do all of these things.* The task, then, is to demonstrate it. This requires having a deep understanding of organizational goals and of other departments' situations and pain points — not just financially, but operationally as well.

2. **Gaining Stakeholder Buy-In:**
   The gatekeepers are not the only ones who will need to be persuaded to support this project. Most technologies treasury is interested in assist with internal integration and impact operations in multiple departments to some extent. Whether accounting, AP, or some other area, treasury should proactively discuss the project with these other stakeholders early in the process. Probe for their pain points, their concerns, and their goals. Demonstrate to them that you are aiming to make this project a win for them as well by listening closely and truly taking their perspective into account as you lay out your plans. Again, your project should be a win for other areas and a support to overarching organizational goals, so demonstrating that should not be unnatural. Once you have worked both to listen and to build your plans with other areas in mind, you will likely find that you have much stronger support from these other areas.

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Selection

Depending on the solution type you need, you may be choosing from a fairly long list of vendors and options. Having so many choices is advantageous, as it means that most companies can find an option that meets their exact needs, but it sometimes makes for a confusing and lengthy process. The following are leading practices that can make your selection project more efficient.

1. **Aiming for the Right Target:**
   We refer to the companies providing our solutions as "vendors," but this term does not actually represent what a buyer should seek. A "vendor" typically has a transactional relationship with the buyer. They are only invested in their buyer's success and ongoing operations insofar as they are directly paid to be invested. When choosing a provider for a solution that your company will rely on daily for decades in a rapidly changing environment, this transactional, uninvested relationship is not the goal. Rather, treasury should be looking for vendors who see themselves as "strategic partners." A strategic partner takes an interest in their customers' ongoing success. As their customers' needs grow, they seek to grow to continue meeting those needs. Consider your company's trajectory and look for a vendor that thinks like a strategic partner and will be able to continue supporting your company in the future.

2. **Focus on the Short List:**
   High levels of due diligence and careful probing are necessary in order to ensure a vendor and solution can appropriately address your company's needs. However, you need not delve this deeply on every available vendor. Start by establishing your business requirements and narrowing down vendors based on which ones do and do not check these basic boxes. Dig just deeply enough to cross vendors off until you are left with a short list. The short list is where the due diligence comes in. These top contenders should be assessed with great care, from security and financial stability to functionality and roadmap.

VENDOR 2

VENDOR 1

VENDOR 3

VENDOR 4
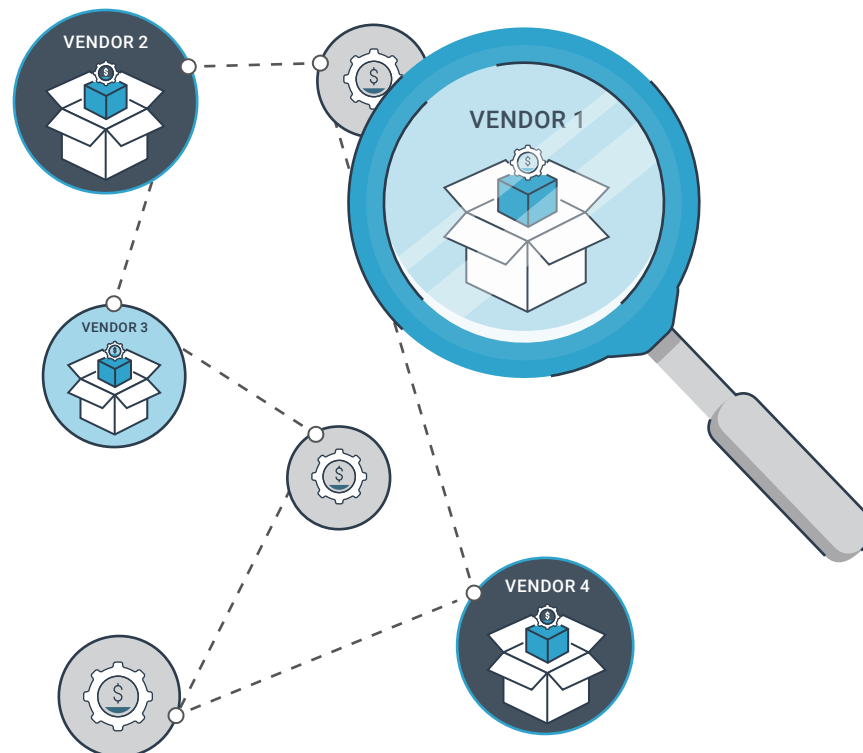
Implementation

With your project funded and your solution chosen, you are nearing the finish line, but one significant hurdle remains: the implementation. Implementation projects are known for running long and going over budget, but this is largely preventable through following leading practices in planning and executing the implementation.

1. A Realistic Approach:
Being realistic is a generally advisable mindset for every part of the process, from funding to go-live. It is, however, especially vital as you plan the implementation. When faced with the knowledge that many implementations take longer than intended, some companies are tempted to respond with an "aggressive" timeline, setting fairly arbitrary deadlines to try and force a more rapid process. This does not work. Some portions of the implementation simply cannot be sped up past a certain point, and various unexpected delays are almost certain to occur. Setting deadlines that do not take into account the amount of time that will be required and do not leave any margin for delays guarantees that the implementation will fail to stay on track. Rushed setup also leads to rework or to parts of the system functioning sub-optimally. As deadlines prove impossible to meet and/or as rush-work produces rework, the poorly planned timeline must eventually be abandoned, and the project hobbles along more slowly than it would have with a realistic plan. Acknowledge that certain portions must take a certain amount of

time, and be sure to allow that time plus some margin for the inevitable delays. This will ultimately yield the most successful implementation in the shortest possible time.

2. Phases and Banded Timeframe:
In keeping with approaching the implementation realistically and acknowledging that delays are inevitable, we recommend that companies plan their implementations in phases with banded timeframes. Technology implementations typically lend themselves to being broken into phases, and this method is helpful for identifying and planning around critical path items that must be completed in a certain order. Phases also allow for setting up different pieces in full and testing them before moving on to the next step, which helps ensure a fully functioning solution and minimizes rework. The banded timeframes for each phase offer margin and allow the implementation to remain on track while flexing as needed to accommodate the unexpected.

Implementation Phases with Banded Timeframes

FULL IMPLEMENTATION: 6 MONTHS

MONTH 1	MONTH 2	MONTH 3	MONTH 4	MONTH 5	MONTH 6

Phase 1
1-2 months

Phase 2
1-2 months

Phase 3
1-2 months

■ Estimated time needed   ■ Margin

19
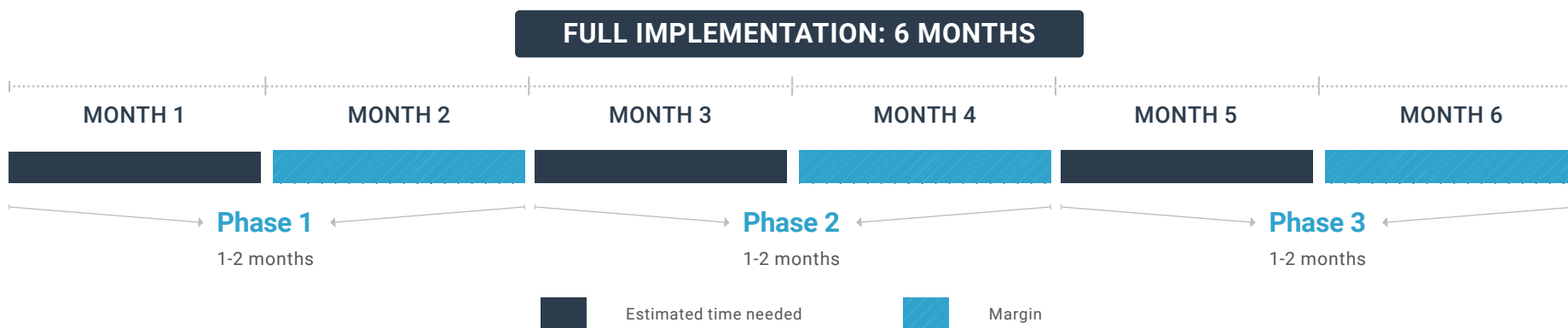
Treasury Management Systems

Defining the TMS/TRMS

Having discussed the general principles, concepts, and terms that apply broadly to treasury technology, we will now explore in detail some specific solution types, beginning with the core of treasury solutions. The treasury management system (TMS) is a central tool that aids treasury in its daily tasks and forms the core of its technological ecosystem.

The defining features of a TMS include digital assistance with the basic treasury tasks of visibility, forecasting, accounting, and cash management and positioning. Some solutions have this base functionality plus some more advanced or extended features, such as FX, payments, compliance, debt/investments, bank relationship management, and more. Those with deeper risk management are often referred to by the extended title, "treasury and risk management systems," or TRMSs. For this report, we will use just "TMS" to encompass both TRMSs and those with less intensive (but still present) risk management functionality.

If a company's needs extend far enough into these advanced areas, they may find themselves in need of a solution like a TMS but with several areas of broader liquidity tracking, which may push them into the realm of ELM solutions, covered beginning on *page 50*. However, within the TMS category, there is enough variety that most companies with only one or two areas of specialized or intensive concerns are likely to find a vendor and solution suited to their needs.

In addition to simply being another tool in treasury's toolkit, many modern TMS offerings help to bring other varied tools together. With extensive integration capabilities, foundational treasury functionality, and a breadth of data, a TMS becomes a central piece that draws the other tools together, empowers open treasury, and helps with internal connectivity and graceful data management.

For example, a treasury aggregator may pull in and standardize data, and it may even have some reporting and visibility capabilities. However, if it integrates with and passes on its information to a TMS, treasury staff can then use the far more extensive cash management functionality of the TMS. The data, including additional data (such as forecasts) formulated in the TMS, may then be passed on to a BI tool for analysis, an ERP for accounting and other uses, and so on. Acting as a foundation, the TMS facilitates efficient use of all the tools involved while streamlining treasury's daily tasks.

Hosting Models

As with nearly all technology types, the TMS has been involved in the great migration to the cloud. Over the past 20 years, the SaaS-based TMS has gone from a model looked on with suspicion to the undisputed norm. SaaS now holds around three quarters of the market share for current and planned use. Installed — once the standard — and hosted/ASP models split the remainder of the market, with 16% and 10% respectively.

The reasons for this shift are multi-factorial, but one significant motivator is the projected value proposition of each type. A recent survey asked TMS users how they perceived the value of different hosting models over time. Most (66% of those who had an opinion) saw installed solutions as "decreasing in value over time," while 58% saw ASP/hosted as having "stable value over time." However, an overwhelming 80% of respondents who had an opinion saw SaaS/cloud solutions as having "increasing value over time." Since SaaS solutions are subscription-based and cloud-hosted, vendors are both motivated and able to keep improving the product and adapting it to the modern environment, avoiding the obsoletion issues of installed and ASP solutions.

The installed TMS is by no means gone, however. While most of those buying a TMS today choose a SaaS-based solution, many solutions purchased some years ago, when on-premises solutions were the standard, are still in use today. We expect many of these legacy solutions to be replaced with SaaS options in the coming years, but each treasury department should consider their organization's unique situation, size, and needs before deciding which hosting model best suits them.

Adoption Rates

Currently, around half of the industry uses a TMS (49% in 2021). This number is expected to grow by nearly 50% in the coming years, however, as 24% expect to start using a TMS soon. When broken down by the size of the respondent companies, we see especially high TMS growth rates among smaller organizations. Of those with revenue under $500 million, the current use sat at 29% in 2021, but those expecting to start using a TMS in the coming years was 31%, which would more than double the use in this demographic.

This signifies strong democratization in the TMS space. When first introduced in the 1980s, these types of tools were designed exclusively for the needs of very large enterprises with the resources to support the expensive, maintenance-heavy technology. Four decades of innovation have found vendors increasingly able to offer more powerful tools at lower costs, to the point that more than half of smaller organizations surveyed use or plan to use one within a few years.

Q. For a TMS/TRMS by type of platform, how do you view the projected value proposition?

INSTALLED — 47%, 28%, 6%, 18%

HOSTED — 19%, 30%, 10%, 40%

SAAS/CLOUD — 1%, 14%, 27%, 58%

Legend:
- Decreasing in value over time
- Stable value over time
- Increasing value over time
- Unsure or no perspective
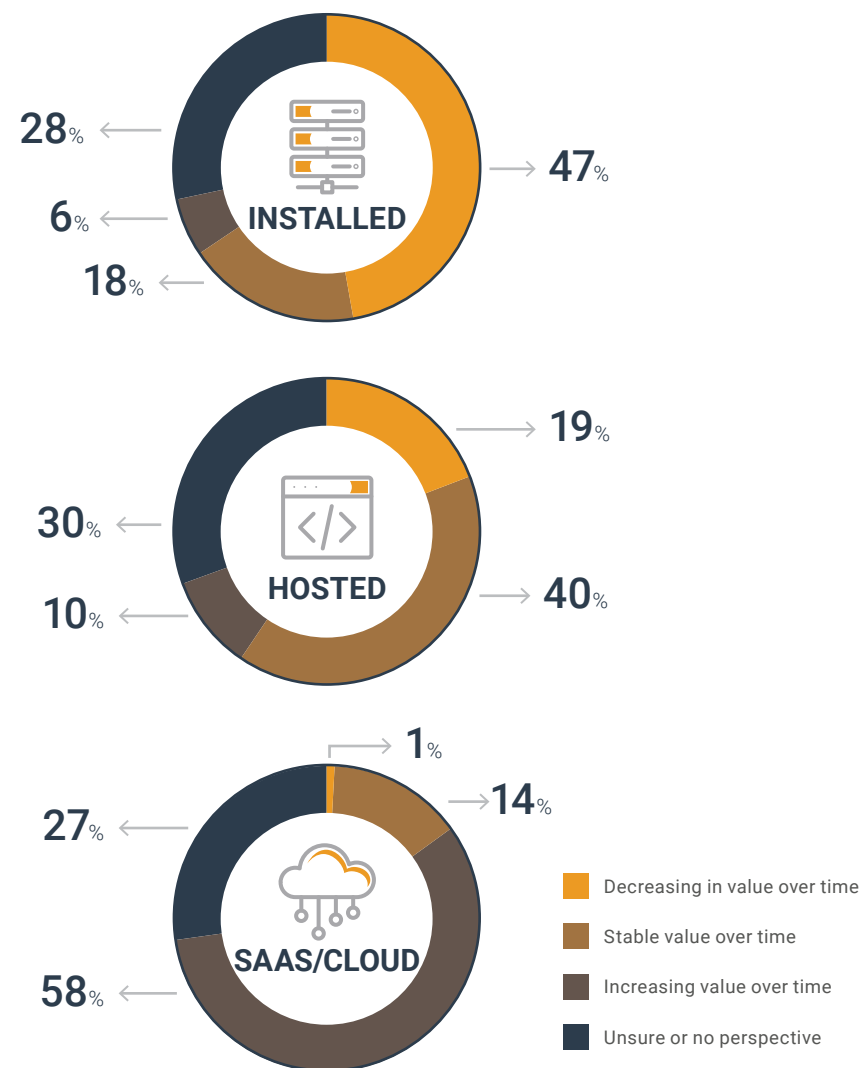
TMS-Figure 1

21

The Problems a TMS Solves

Efficiency for Overwhelmed Treasury Departments

As a thinly staffed department facing increasing demands, treasury's time is at a premium. With manual processes, much of this valuable time is spent on repetitive tasks such as gathering and inputting data.

For companies that are small or fairly simple, this may be the best option. However, as companies expand, add bank accounts, acquire subsidiaries, and grow more complex in various ways, manual processes absorb more and more time, but the C-suite increasingly needs treasury's time spent on strategic guidance. Eventually, staff end up straining at repetitive processes just to reach basic information. Errors are common and difficult to track down and correct, and treasury is left with little time and late, defective data and analysis for its vital strategic work.

As complexity grows, efficiency becomes an increasingly key piece of treasury operations, and offering treasury efficiency is one of the main purposes of the TMS. These systems were designed to provide treasury staff with accurate, timely data and ample bandwidth for higher-level tasks.

A Single Source of Truth for Data and Analytics

When you have fairly little data, managing it does not seem too difficult. As that data expands almost exponentially with time and organizational growth, however, it rapidly grows out of control without careful management strategies. Out-of-control data in the treasury department causes problems not only for treasury itself, but also for other departments and for the entire company.

With manual processes or with scattered tools that fail to integrate, data cannot flow smoothly everywhere it may be needed. This results in silos, repurchased data, bottlenecks as departments wait for someone from another area to manually send them information, and poor use of BI tools that could be producing helpful analysis if they had access to all the data.

In order to effectively help treasury with its daily functions, a TMS needs strong internal connectivity. It works as a central dashboard, pulling in information from other treasury tools and from cross-departmental solutions as needed — and sharing information with everything from ERPs to BI tools. This strong connectivity and centrality allow it to support the "single source of truth" model, in which the most current data is found in one place and is accessible to all areas that need it, preventing silos, repurchased data, and version control issues.

As time goes on, building and executing a thoughtful data management and analysis strategy is becoming more important to companies. A TMS that aids overall data flow in the organization and that integrates with the company's BI tool in particular, feeding it centralized information for analysis, supports these strategic efforts.

Straight-Through Processing (STP)

In addition to its usefulness for data management and analytics, a TMS's integrative capabilities support "straight-through processing," or STP, for higher efficiency and smoother workflows. STP refers to the automation and digitization of financial processes such that they progress "straight through" without manual handoffs.

Without STP, a company's back office (accounting/reporting), middle office (settlement/confirmation), and front office (trading) are often stuck in a siloed workflow with poor or no integration. While they all require much of the same information, they need it at different times and in their own specific solutions. The TMS facilitates internal connectivity and STP between these areas, preventing bottlenecks and powering stable and efficient workflows with accurate, consistent information.

External Connectivity

Treasury's connectivity needs are, however, not limited to internal integration. The department also requires external connectivity to banks, networks such as SWIFT, FX portals, and market data providers. The more sources a company accumulates, the less feasible it becomes to gather all this data manually.

In the past, TMSs helped solve this external connectivity problem via SFTP connections. To this day, many vendors build in SFTP connections to common sources such as Reuters and Bloomberg. However, the rising prevalence of open banking and API use is causing a shift and an improvement in the TMS's external connectivity, as APIs power more flexible connectivity to multiple sources as needed.

Security and Control

As a department that initiates payments and handles sensitive information, treasury must protect its processes, data, and access. A TMS helps with this in several ways:

01

BUILT-IN CONTROLS

Manual controls are often easy to circumvent. Built-in controls are enforced by the system and are, therefore, much more effective.

02

REDUCED TOUCHPOINTS

The more touchpoints a process has, the more vulnerable it typically is. Moving to electronic processes through a TMS results in far fewer touchpoints than are found in manual processes.

03

A SINGLE, SECURE ENVIRONMENT

The narrower the front in the war on fraud, the easier it is to defend. Centralizing treasury's data and payments processes through a single TMS that has robust security built in narrows the front into a process that is clear, consistent, and protected.

04

VISIBILITY

By giving treasury staff a clearer view of bank accounts and activity in a timely manner (often real time or near real time today), TMSs help keep fraudulent activity from going unnoticed.

05

SCALABILITY

Attempting to scale rapidly with manual processes can be difficult to do without compromising operational security. The TMS provides the efficiency and margin to allow staff to manage a rapid scale up or down, as well as typically offering additional functional-ity and power that can be purchased to support growth.

Managing Economic Volatility

From lockdowns and supply chain issues to interest rates and international conflicts, treasury has had to deal with quite a few volatile factors threatening liquidity in recent years. With more storms potentially looming on the horizon, treasury must continue to expect the unexpected and prepare for unknowns.

How can the unexpected and unknowns be prepared for? Largely through providing sufficient margin and robust, automated processes — such as in a TMS — so that when an event does occur, staff have the data and the time they need to analyze, strategize, and advise.

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Do You Need a TMS?

The need for a TMS is multi-factorial, yet often boils down simply to "how much pain do your current processes cause?" This year we are highlighting some specific factors that are stressing operations in the current environment. While they impact most or all organizations to some extent, their level of impact will raise or lower the threshold for TMS need.

01 »

ESCALATING INFLATION

The 2022 surge in inflation has brought stress to both consumers and corporations. From facing elevated material and labor costs to adjusting sales strategies, companies must grapple with multiple complications and threats brought on by escalating inflation. However, it hits some industries and organizations harder than others. For those hit hard, treasury needs all the help it can get in terms of rapid, accurate data and efficient processes so that it can reduce waste in both costs and time and can focus on strategically managing the situation.

02 »

RAPIDLY RISING INTEREST RATES

In an attempt to stabilize soaring inflation, many governments around the world are raising interest rates quickly and significantly. After a period of minimal rates, these hikes demand urgent reconsideration of debt, investments, and more. Again, if you are keenly feeling the need to adjust quickly or the strain of the higher cost of borrowing, this adds to your need to leverage a tool such as a TMS.

03 »

FOOD CRISIS AND OTHER ISSUES

International conflicts have brought on a food crisis, intensified supply chain issues, pushed companies to change globalization plans and redistribute operations, and more. This menagerie of problems is affecting every company somewhat differently. If the food crisis or any of these other issues are posing much of a problem for your company, this moves you a major step closer to needing a TMS.

How much do these factors impact your organization? The more of a problem they pose, the more the strain of continuing without a TMS. When shopping for groceries, a couple of small items can be carried by hand, but too large of an item and/or too many small items, and you need a basket. Similarly in treasury, even small issues, when there are enough of them, become impossible to juggle without the right tools. Add in one or two major issues, and leveraging technology becomes a necessity.

Emerging Technologies Impacting the TMS

In the Overview, we noted that several innovations are impacting treasury technology in general, but how are they changing the way specific treasury tools, such as the TMS, work? Below are those most relevant to the TMS, with details about their uses and other effects.

AI/ML

Artificial intelligence and machine learning have seen increasing use in TMSs for various tasks, but the most prominent and revolutionary have been anomaly detection and cash forecasting.

Since AI and ML excel at pattern recognition and, therefore, at recognizing activity that breaks a pattern, they are able to help prevent and detect fraud through monitoring for anomalous behavior. Criminal behavior tends to break the normal pattern of TMS use — an unusually large transaction, a login at an unusual hour, going through many files in a short period of time, etc. AI and ML fraud detection functionality can flag this behavior as anomalous and bring it to the attention of staff.

Cash forecasting, meanwhile, has been an ongoing pain point for all areas of finance for some time, with many finding their forecasting methods time-consuming and the results inaccurate. ML is making headway in relieving this pain point by analyzing historical data and "learning" to more accurately predict cashflow. Some vendors are now building ML for forecasting into their TMSs, and more are likely to follow.

BI Tools and Dashboarding

As the importance of data grows, companies are having to develop robust data management strategies, and BI tools are becoming a more integral part of tech stacks. TMS vendors are moving to either provide strong integration capabilities with BI tools or to offer BI tools themselves. The need for strong data management and dashboarding is likely to become more impactful and a more vital aspect of functionality in the TMS space as time goes on.

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APIs

APIs are changing how TMSs connect both internally and externally. As noted before, the modern TMS usually comes with just a handful of SFTP connections, but API-enabled open banking is allowing these solutions to exchange information with more banks and sources than ever.

Internally, APIs are improving open treasury as well, leading to more integration within the organizational tech stack. Those interested in purchasing treasury technology should be mindful of the potential for change APIs bring to ecosystem structure and data flows. Consider your company's current tech stack, its integrations, and the integrations that are needed before choosing a solution, as APIs are opening the door for innovative ways of connecting data with functionality.

Cloud-Native or Miniaturization

As APIs are adjusting how solutions integrate and are bringing up questions about ecosystems, cloud-native (discussed in general in the Overview), microservices, and other forms of "miniaturization" such as Kubernetes (a system of managing containers of technology) are also changing the TMS landscape. Cloud-native and miniaturization are allowing for dramatically more rapid development and innovation, and they allow vendors to apply updates without interrupting customer use. For TMS users, this means a solution that can quickly — and without interruption — adapt and scale as the environment or the individual company's needs require. Treasurers operating in the current volatile era and looking for a solution that will serve their needs for years, through changes and growth, may find this a notable benefit.

These advantages pose both an opportunity and a challenge to existing vendors as the landscape adjusts to compete with and embrace these innovations. The shift from bigger to smaller groupings and containerization of technology has been happening across all platforms and systems for quite some time, and it is only expected to continue.

Q. **Through our TMS/TRMS vendor, we use APIs: (Select all that apply)**
(Only top choices shown)

For connecting to banks for information reporting	56%
For connecting to banks for payments	37%
To connect to ERPs	28%
To connect to information/data providers	19%
To connect to other BI tools (Power BI, Tableau, etc.)	13%
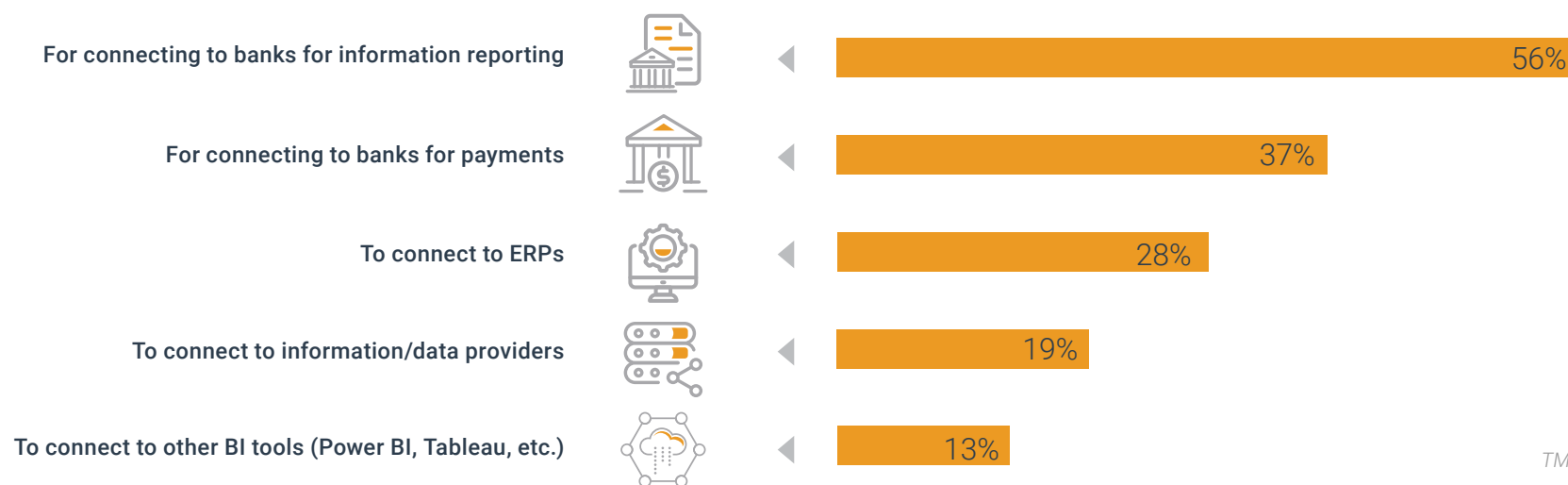
TMS-Figure 2

Selecting and Implementing a TMS

The points on selection and implementation found in the Overview section of this report apply broadly to all treasury technology. Below are a few points to keep in mind specifically for choosing and deploying a TMS.

Selection

Since the TMS is the treasury department's core tool that should support daily processes for many years to come, choosing the right one is both difficult and absolutely vital. Your search should take into account how your organization is likely to change and what needs your treasury department may have in several years. It should also contemplate the changing landscape and the innovations revolutionizing how tools are developed, distributed, and integrated (see APIs and cloud-native/ miniaturization on *page 26*).

A broad variety of TMS options are available. Some are hosted via newer models, some are cloud-native, some can come with a massive ecosystem of related tools, and some embed into an ERP. All have their advantages, and identifying the one that most suits your needs is worth the time it takes. After considering all the options and narrowing down to a short list based on business requirements (not on which vendors you expect to be best at the outset), carefully consider the short-listed vendors' roadmaps and how they match up with where your company's needs are heading as well as where the TMS landscape seems to be heading.

Implementation

Similarly, implementing a key tool that will need to connect to all your other tools and will impact daily operations for years is quite the project. When it comes to a TMS, a good implementation makes every day for the next decade easier, while a poorly executed implementation can make every day a frustration, resulting in underuse and underperformance. This, in turn, leads to the company not getting the functionality and benefits they bargained for in the solution, which damages your department's

track record and your chances of securing buy-in for your next project. The steps below can help you avoid this outcome.

With high stakes and a complex project, there are several areas of focus for treasury:

1. **Ensuring Adequate Resources:**
    Implementing a TMS properly takes the right resources at the right times. Do not assume this is a project your treasury team can do off the side of the desk. You will need support. This support may come from the vendor, your IT team, and/or a third party. Different types of support may be especially needed at certain phases of the implementation, so consider not only the total resources you will need throughout, but also whether the right resources will be available at the right times.

2. **Ensuring Adequate Time:**
    When approaching a TMS project, pay special attention to the section in the Overview on phasing your implementation using banded timeframes. You will need the step-by-step planning, testing, and margin this method involves. Be sure to plan time for critical path items early in the process and test each component thoroughly to ensure that it is working appropriately before moving on to the next phase.

3. **Adjust the Process to the System:**
    It can be tempting to try to directly translate your old processes to your new system. Typically, however, logic and efficiency are lost in translation, and the old processes do not make as much sense with the new system as its built-in processes do. If your processes are so important and rigid that they cannot be adjusted to whatever works best with a new solution, you should probably consider building your own solution instead. In most cases, however, purchasing a solution and adjusting your processes to match it will work very efficiently.

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Treasury Aggregators

Defining the Treasury Aggregator

As treasury departments grow in complexity, their connectivity needs multiply. Eventually, technology specializing in deep connectivity and payment functionality becomes a necessity for treasury teams to continue working efficiently and securely.

Treasury aggregators (TAs) are built to serve these teams in two primary ways:

1. **Information Consolidation:**
   TAs pull in and consolidate data. A prime use of this functionality is retrieving bank statements (summary and detailed) and reformatting the data for use in a TMS, ERP, reconciliation platform, or other solution. They may collect information through various means, including SFTP, APIs, and networks.

2. **Payment Hub:**
   TAs also have payment hub functionality. Like traditional payment hubs, they are able to take payment files from other payment or administrative platforms and originate the payments. Users can also enter or manage payment requests directly with the TA's workflow management tools, and payment files are formatted and delivered to the bank in any of several ways, once again including SFTP, APIs, and networks. Validation and confirmation serve to strengthen the process.

Differentiating TAs

The functionality of an aggregator overlaps that of certain other solutions. For example, payment hubs, payment factories, data consolidators, and TMSs all share some of the functionality described above. What distinguishes a TA from each of these?

Most of these other solutions — payment hubs, payment factories, and data consolidators – only handle one of the two functions, whereas a solution that qualifies as a TA must do both. A TMS, however, may have elements of both, so what is the difference there?

In its core purpose, a TMS is more focused on consuming the data provided by a TA and applying it to daily treasury processes. Most TMSs lack the robust connectivity, information consolidation, and payment validation and compliance features that are standard to TAs. That said, a few TMS offerings specialize heavily enough in connectivity and payments that they actually qualify as TAs in addition to being TMSs. This is the exception, however, while the rule is that most organizations with high enough complexity would need a TA along with their TMS.

Data In

AGGREGATOR

Payments Out

How a TA Helps: Simplicity for the Complex Treasury Department

Payment Complexity Calculator

	PAYMENT ORIGINATION AREAS	PAYMENT SYSTEMS	PAYMENT TYPES	PAYMENT FORMATS	PAYMENT BANKS	PAYMENT CURRENCIES	COUNTRIES	COMPLEXITY DIRECTION	
9		>20		>31	>20	>30	>40		
8	>20	16-20	>20	21-30	16-20	26-30	31-40		
7	16-20	11-15	16-20	16-20	11-15	21-25	21-30		
6	11-15	9-10	11-15	11-15	9-10	16-20	16-20		
5	9-10	7-8	9-10	9-10	7-8	11-15	11-15		
4	7-8	5-6	7-8	6-8	5-6	6-10	6-10	Increasing Rapidly	x 1.5
3	5-6	**3-4**	5-6	4-5	**3-4**	3-5	3-5	**Increasing**	**x 1.2**
2	**3-4**	2	3-4	**2-3**	2	**2**	**2**	Remaining Constant	x 1
1	1-2	1	**1-2**	1	1	1	1	Decreasing	x 0.75

FINAL SCORE RANGES	
HYPER COMPLEX	**51 +**
HIGHLY COMPLEX	**37 - 50**
COMPLEX	**22 - 36**
MODERATE	**15 - 21**
SIMPLE	**7 - 14**

Sample Raw Total	15
With Factor Applied	18

Data Aggregation Complexity Calculator

	SOURCES OF DATA (BANKS)	SOURCES OF DATA (EXTERNAL INFORMATION)	SOURCES OF DATA (INTERNAL)	FORMATS OF DATA	RECEIPT / DELIVERY ENDPOINTS	TRANSFORMATIONS REQUIRED (INTERNAL)	COMPLEXITY DIRECTION	
8	>20	>10	>20	>20		>20		
7	16-20	9-10	16-20	16-20		16-20		
6	11-15	7-8	11-15	**11-15**	>25	11-15		
5	9-10	5-6	**9-10**	9-10	16-25	9-10		
4	7-8	4	7-8	7-8	**11-15**	**7-8**	**Increasing Rapidly**	**x 1.5**
3	**5-6**	3	5-6	5-6	6-10	5-6	Increasing	x 1.2
2	3-4	**2**	3-4	3-4	3-5	3-4	Remaining Constant	x 1
1	1-2	1	1-2	1-2	1-2	1-2	Decreasing	x 0.75

FINAL SCORE RANGES	
HYPER COMPLEX	**43 +**
HIGHLY COMPLEX	**31 - 42**
COMPLEX	**19 - 30**
MODERATE	**13 - 18**
SIMPLE	**6 - 12**

Sample Raw Total	24
With Factor Applied	36

Calculate Your Complexity: Two primary elements determine your need for a treasury aggregator: the complexity of your payments and the complexity of your banking information structure. To determine each, use the calculators above. The lefthand column numbered 1-9 is your score for each of the following columns (3-4 Payment Origination Areas = score of 2, 3-4 Payment Systems = score of 3, etc.). Your "Complexity Direction" should be multiplied by the sum of your score for the other columns, yielding your final result. The bolded selections for each column show a sample score, with the corresponding sample results shown below the final complexity ranges for each calculator.

Bank and Bank Account Complexity

Banks and accounts tend to multiply fairly rapidly in times of organizational growth (although other factors may also increase bank account complexity). With a couple of banks and a handful of accounts, companies can often manage their data fairly well through manual processes. However, as complexity increases, staff find themselves spending far too much of their time logging into portals, downloading statements, and trying to corral data into spreadsheets for cash management and reporting.

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This inefficiency draws staff's attention from strategic tasks and hinders timely and complete visibility. Poor visibility increases the risk of fraud and leads to bottlenecks and poor decision-making due to incomplete or delayed information. By automating the collection and aggregation of bank data, TAs allow treasury to maintain necessary visibility while also unburdening staff for other matters. This not only helps treasury operations run efficiently, producing accurate and timely data for the best possible decision-making, but it also improves security by preventing any account activity from flying under the radar.

Payment Types, Formats, and Intensity

FIXED FORMATS

DELIMITED

EXTENSIBLE

| 00000000000 | 000,0000,0000 | {pMT AMT} 0000.00 {pMT AMT/} |
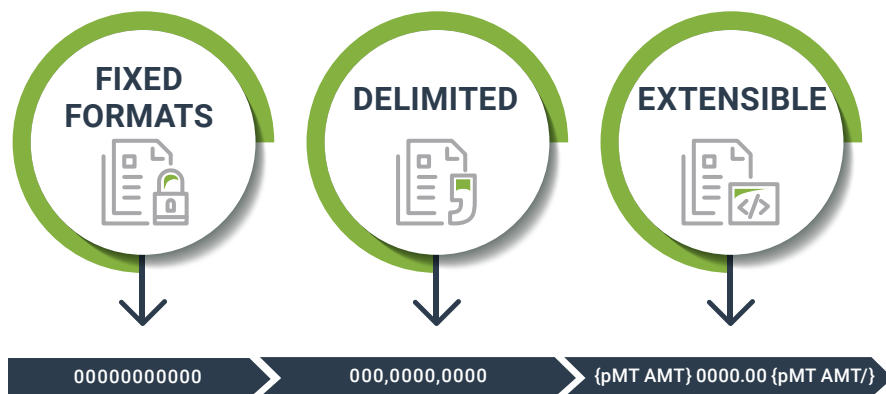
Recent years have seen many advances in payment types and formats. From faster payment rails such as RTP and Same-Day ACH to richer, more flexible formats like XML, these innovations have brought numerous benefits to the corporate world. Still, adapting to them takes work. Older methods are often phased out far more slowly than new methods are adopted, so the pool of options companies must support seems to expand over time. Scaling up also means needing to support a fuller range of options and needing to find ways to support the organization's own payment intensity.

For companies facing high volumes and complexity of payments and struggling to manage the growing multitude of payment types and formats, a TA can make a massive difference. As connectivity specialists, TAs maintain fluency in both new and legacy formats and translate incoming and outgoing data as needed. They allow companies to handle complexity and intensity surrounding payment types, formats, and volumes with efficiency and ease.

Security

Fraud and its prevention are areas of deep concern for modern companies, and the way any payment-related solution or process impacts security should be examined. The impact of TAs is good news for buyers and bad news for criminals.

We've noted previously that wars are easier to win if the front is smaller, and that this applies to the war on fraud as well. When dealing with the payment and banking complexity that calls for a TA in the first place, the front is typically broad, stretching across every payment process and channel. Many companies who inventory their payment processes discover that they actually had even more than they realized. It's difficult to protect what you cannot even find.

Q. **Within the past two years have any active bank accounts been discovered that were previously unaccounted for by treasury?**
(Not all choices included)

YES 18%

NO 72%

UNSURE 10%
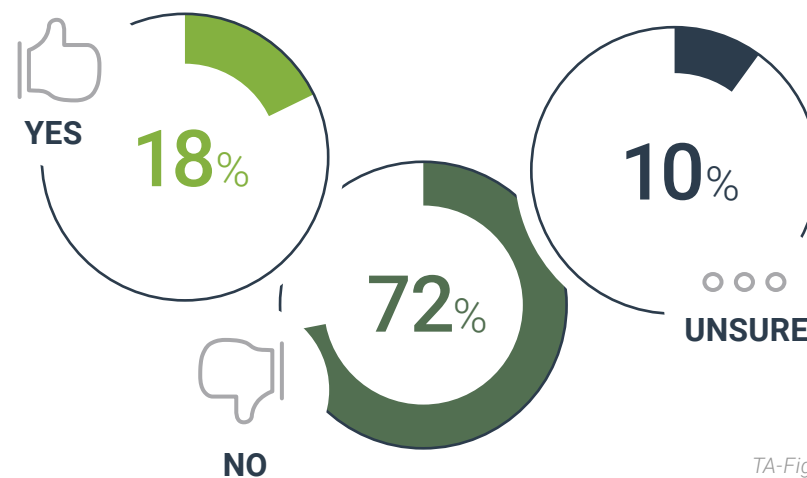
TA-Figure 1

An aggregator centralizes the organization's payment processes. This centralization is a source of several benefits, but one of the most important is the boost it gives to security. Pulling together the payment streams into a single, defensible environment narrows the front in the war on fraud, and the TA's high visibility, consistent process, and enforced controls bolster the defense of this single front. The simplicity reduces the confusion that could mask fraud and allows for more focused efforts to understand and protect payment processes. Controls are built in, and robust TAs employ encryption of data, secure user access methods, and SOC certified data centers, all adding up to a highly secure environment that can far more effectively protect payments and data than scattered processes could.

Compliance Burden

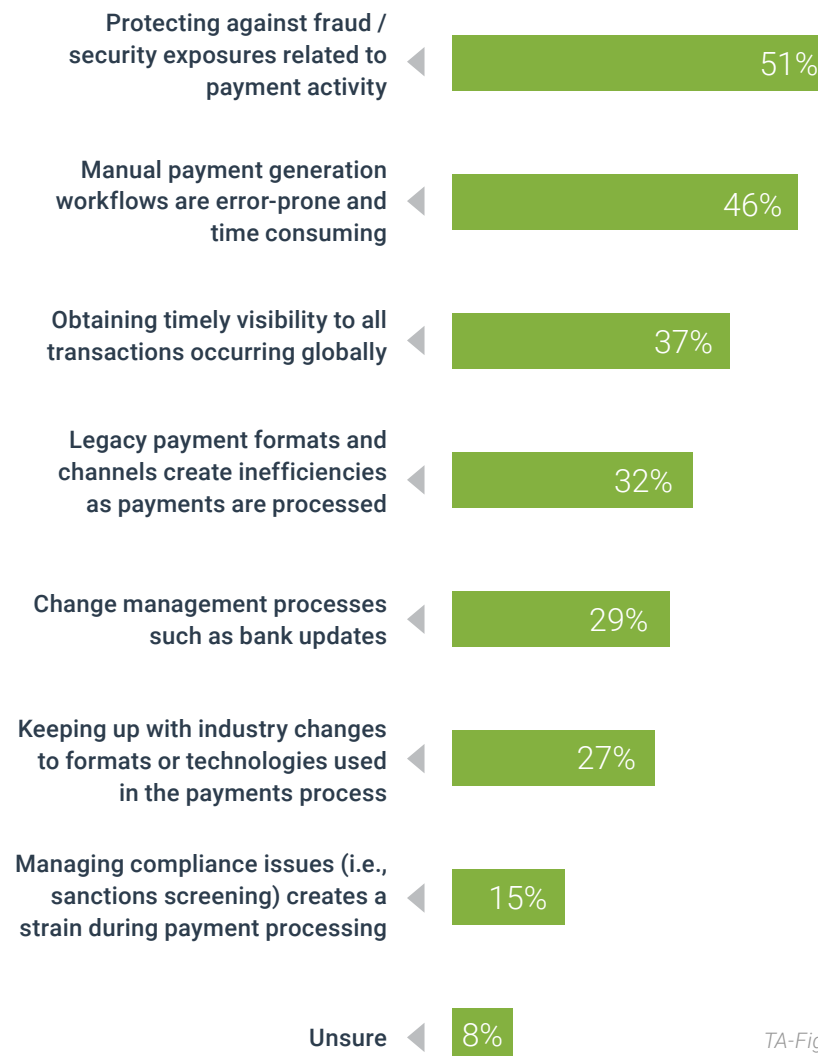As treasury practitioners agree that the regulatory burden is only growing heavier, with no reprieve in sight, tools that can offer some leverage in compliance are increasingly valuable. There is a fair amount of variation in the level of compliance support TAs offer, with some providing modules to help track signers and bank accounts for FBAR filing, while others offer more basic compliance options. In some cases, implementing a TA may help comply with regulations such as PCI-DSS and Nacha's requirements that require certain levels of technological sophistication to ensure your company is not risking sensitive customer information or endangering network security. Buyers should assess their own compliance needs and the specific functionality of the TAs under consideration to find a good match.

Sanctions screening is one notable area where a TA can lower the risks and headaches associated with compliance. Historically, most corporations have been comfortable leaving the burden of sanctions screening to their banks, but in recent years, OFAC and other regulatory bodies have begun holding individual corporations accountable for violations. Corporations have been fined up to $100mm in the past decade for negligence in sanctions screening.

Q. **Please select up to the top 3 challenges treasury experiences regarding their B2B payments:**
(Not all choices included)

Challenge	%
Protecting against fraud / security exposures related to payment activity	51%
Manual payment generation workflows are error-prone and time consuming	46%
Obtaining timely visibility to all transactions occurring globally	37%
Legacy payment formats and channels create inefficiencies as payments are processed	32%
Change management processes such as bank updates	29%
Keeping up with industry changes to formats or technologies used in the payments process	27%
Managing compliance issues (i.e., sanctions screening) creates a strain during payment processing	15%
Unsure	8%

TA-Figure 2

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While these fines are uncommon, they do pose a risk. Sanctions screening, however, is not easy to implement. The lists of sanctioned parties are multiplying, growing longer, and changing rapidly. In order to ensure they are not transacting with sanctioned parties, corporations must screen all transactions against up-to-date copies of all the lists that are relevant to them. Automating this process through a TA is one option for efficiently reducing the risk of a massive fine.

Global Expansion

Any type of expansion, global or not, typically results in the added banks and accounts that lead to heightened complexity. Global expansion, however, multiplies the complexity even more. Companies moving into new regions must deal not only with new banks and accounts, but also with new payment rails, new formats, and new currencies, regulations, and networks. Complexity grows almost exponentially as a result, while perhaps one new member is added to treasury's staff — if any. Treasury may well find leveraging technology a necessity at this point. Aggregators in particular are built for such scenarios, with robust functionality in translating across regions and bringing usable data to treasury. In many cases, a TA is able to build out connections to small banks with proprietary formats, which would otherwise prove a significant headache.

Cash Position and Visibility

As discussed, gathering complete bank data in a timely manner is vital to visibility and to treasury's daily operations, such as cash positioning. Beyond simply aggregating the data, however, TAs also transfer the data to wherever treasury and other groups need to use it. For groups that need the data in a TMS, ERP, or BI tool, the TA's connectivity specialization facilitates smooth data flow to these other tools as needed. If a treasury group does not have a TMS, TAs do typically have basic reporting functionality to allow treasury visibility and cash positioning.

Efficiency Needs

Whether your team is facing complexity for one of the reasons above or for any other reason, manual processes can quickly become overwhelming as the thinly staffed departments try to face various types of growth and increasing demands. Leveraging technology can improve efficiency and remove much of this weight, and automating certain processes can free staff to manage higher level tasks. Pulling bank data in and handling outbound payments are excellent candidates for automation, as these processes can be extremely time-consuming for staff, while technology can handle them with ease and accuracy.

Do You Need a TA?

01 »

02 »

03 »

04 »

05 »

PAYMENT COMPLIANCE ISSUES

If complying with sanctions and other payments-related regulations has become or is about to become a headache for your company, a TA might be in order. These regulations are liable to become heavier, not lighter, and trying to manage them without technological help can mean trying to decide between overwhelming staff or incurring a fine for failure to comply.

PAYMENT SECURITY

Many companies today are realizing the massive risk of fraud and the difficulty of defending on so many fronts due to disparate payment processes. Centralizing payment processes and increasing visibility through a secure TA make a significant difference in a company's ability to withstand fraud attempts.

EXPANSION OR ACQUISITION

Growth is to be welcomed, but acquisitions and expansions can rapidly and dramatically add to treasury's responsibilities. From integrating with new internal systems to dealing with regional banks, employing a TA can reduce the complexity and help treasury gracefully support organizational growth.

FORMAT ADOPTION ISSUES

Adopting new formats opens treasury up to the benefits of richer, more flexible messaging options, but it can also add yet another layer of complexity and become a pain point for some departments. With fluency in both old and new formats, TAs allow treasury to reap the benefits of various formats efficiently.

SOLVING PROBLEMS REPEATEDLY

Some changes, such as a back-end system implementation, can cause a chain reaction of adjustments throughout the organization. Especially when dealing with multiple decentralized payment channels, such back-end changes can result in needing to solve the same problems over and over in each payment channel. This time-consuming and inefficient issue can be mitigated by using a TA, where you only have to solve such problems once.

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Innovations Impacting TAs

As technology and its uses progress, solutions must change to continue fitting into the new technological landscape. The innovations and shifts discussed below all have some impact on TAs and may affect their future — whether by empowering them to do more or changing how they relate to other solutions.

Networks

Since TAs can be used to leverage certain networks, they benefit from those networks expanding or improving their reach and functionality. SWIFT, as a prominent example, is rolling out a new type of platform messaging that marks a fundamental change from the old linear type of messaging. The new method places the message on the platform as if on a bulletin board; all parties can see it throughout the process, and the message is not transferred from party to party, so the danger of information being lost in transfer is dramatically reduced, while visibility is increased. Innovations like these add to the functionality that treasury can leverage through their TA, making the solutions more powerful.

Faster, Better Payments

New payment rails and formats are, as we have discussed, drivers for TA adoption due to the complexity they add. However, like networks, they also add to the functionality available through TAs. From Same-Day ACH to RTP and other faster payment options, innovative payments offer companies the advantages of speed, rich data, and visibility. A TA allows organizations to leverage these benefits without overwhelming treasury staff.

APIs

APIs and TAs could be seen as rivals since both enable more extensive connectivity, but APIs cannot replace TAs. If companies attempted to rely solely on APIs for their connectivity, they would end up paying for data multiple times, making TAs a more cost-effective option with a robust set of needed functionality.

BI Tools

As companies begin to prioritize data strategy and making the best use of their data, BI tools are becoming a more and more important part of the tech stack. This, in turn, makes the use of solutions such as TAs, which can aggregate data and then seamlessly feed it to the BI tools, all the more important.

Expansion of Capabilities, Blurring of Lines

Sped by innovations such as microservices, cloud-native, PaaS, APIs, embedded technologies, and more, many portions of the tech stack are expanding their capabilities. As they expand, they begin to overlap one another. This will be covered in more depth in the section on ELM, but the blurring of lines between solution types is impacting TAs as well. TMSs are increasingly powering up their payment and bank data capabilities, and while some were already powerful enough in these areas to count as TAs, more are likely to follow. The TA is not going away, but distinguishing it very cleanly from other categories may become more difficult as functionality expands in all directions.

Implementing and Using a TA

TAs are, unsurprisingly, connectivity heavy, and setting these connections up and training staff well both require careful attention. The following are specific tips for implementing and using a TA (in addition to the advice found in the Overview, which also applies).

Onboarding Banks

Those who need a TA are often those with substantial bank connectivity needs. A TA will save significant amounts of time in this area in the long run, but plan plenty of time for setting these connections up initially. KYC requirements, finding the right contact at each bank, and various delays can plague this process. Plan in as much detail as you can regarding whom to contact, what steps needs to be accomplished before others, and so on, but also plan plenty of margin for the unknowns.

Integrating Internal Systems

TAs must also integrate smoothly with other internal systems. Depending on the organization, there may be quite a few of these connections to set up. Plan the following into your implementation to ensure that these connections are set up properly as painlessly as possible:

1. **Consult IT**
   Consult your IT team early and often regarding your TA, which other solutions in your organization's ecosystem it will need to connect with, and how those connections are going. They are the ones most familiar with the overall ecosystem the TA needs to fit into, so keep them current on the status of the project so they can properly assist and advise.

2. **Test Early and Thoroughly**
   The integrations you set up will need adjustments, and those adjustments are far easier to make earlier in the process. In order to avoid having significant rework to do at the end of your implementation, thoroughly test each connection as soon as it is set up and fix any issues immediately.

Training Employees

With all these internal and external connections to set up, a TA implementation can take a while. Often, treasury may be tempted to train staff on using the system either at the very beginning or very end of this implementation process, but both of these can prove problematic. Training at the beginning can mean that by the time they actually use the system, they no longer remember key elements of proper use. Training too late can mean attempting to correct habits of incorrect use that are already forming as staff have to begin using the system without proper training. Instead, try to train before employees will need to use the system, but not too long before.

Internal & External Connections

Banks

TREASURY AGGREGATOR

Internal Systems

TMS, ERP, BI tool, etc.

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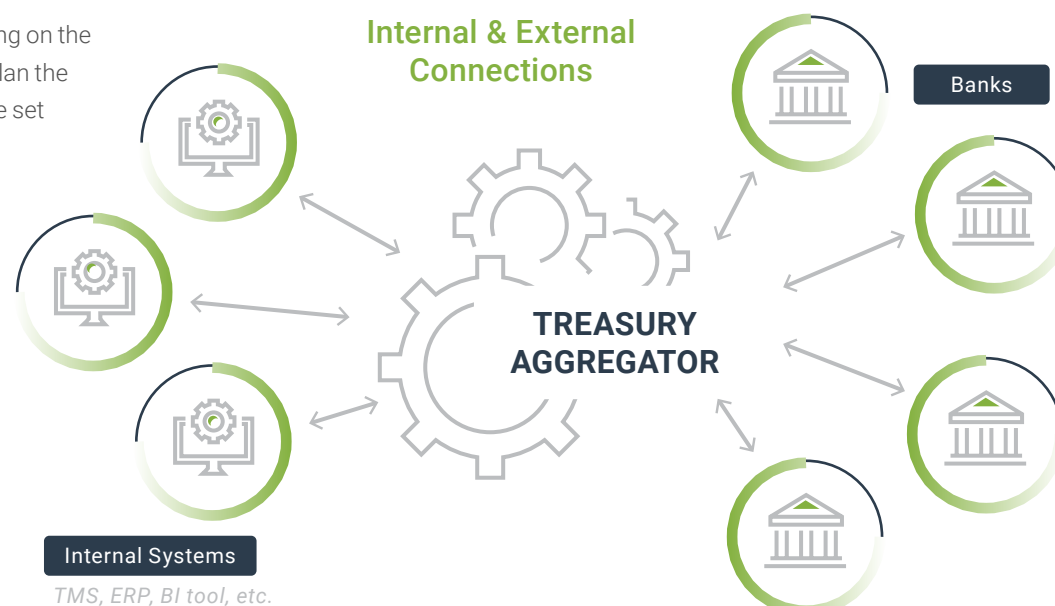
Supply Chain Finance and Cash Conversion Cycle Solutions

Treasury's interest in solutions is not confined to its own department. Any solution that can significantly impact liquidity and its management is of concern to treasury, and supply chain finance and cash conversion cycle solutions are prime examples. The solutions in this dual category are highly varied, but all of them impact the cash conversion cycle and, through it, working capital.

Defining the Terms and the Goals

For the sake of clarifying terms that are used differently across the organization, we will begin by defining "working capital," "the cash conversion cycle," and "supply chain finance." We will also briefly discuss the goals treasury should aim for in each area.

Working Capital

Accounting uses this term to assess the company's ability to meet its current obligations, while treasury uses the term to assess the cash available for the running of the business. This results in two different definitions, both of which can be expressed as formulas.

Traditional/accounting definition:
Working capital = current assets - current liabilities

Net adjusted working capital (NAWC):
Working capital = AR + inventory - AP

The traditional definition suits accounting's purposes well. It can be calculated quickly with nothing but a balance sheet, and it offers critical insight on the company's ability to make good on obligations. While treasury also takes a strong interest in the company's ability to meet obligations, when treasurers refer to "optimizing working capital," they are typically using the NAWC definition. For the remainder of this report, it may be assumed that "working capital" refers to the NAWC definition, but keep in mind that treasury may need to clarify the term when conversing with those from other parts of the organization.

Working capital makes up a significant part of liquidity for most companies, setting it firmly in the realm of assets that treasury must take ownership of. What, however, is treasury supposed to do with working capital? Too little strains the company's liquidity, while too much sparks a chain reaction that ultimately lowers organizational value. Neither minimizing nor maximizing, then, are proper goals. The goal with working capital is rather to optimize it.

Optimal working capital will look unique for each company due to differences in industry, organization, operational needs, and so on. The optimal level may also fluctuate over time as both external and internal factors shift. Each of the solutions discussed in this section addresses working capital management, often through increasing efficiency and offering the flexibility needed to adjust working capital to your company's specific needs and to continue calibrating working capital as your needs change.

Cash Conversion Cycle

The cash conversion cycle, often shortened to "CCC," is the measurement of time it takes to convert resources into cashflows. In other words, the CCC measures the length and efficiency of the lifecycle of cash invested in inventory. Once invested, this cash is converted to a receivable when the inventory sells, is converted to cash when the receivable is collected, and is then available to be converted back into a payable for more inventory. The length of time the cash spends in each part of this lifecycle impacts working capital, and a long CCC can signal various problems. The measurement is based on three lengths of time: 1) days payable outstanding (DPO), 2) days inventory outstanding (DIO), and 3) days sales outstanding (DSO).

As with working capital, the CCC must be optimized. Focusing narrowly on minimizing or maximizing it will only cause more problems. Increasing its efficiency lends flexibility to your organization's liquidity management, but remember that efficiency is not about doing things as rapidly as possible. Rather, it is about doing things well without wasting time and being able to decide when something should be done.

Supply Chain Finance

Supply chain finance has multiple definitions, some narrower and some broader. The definition we will be using is one of the broader ones, and it comes from the Euro Banking Association: "The use of financial instruments, practices, and technologies to optimize the management of the working capital and liquidity tied up in supply chain processes for collaborating business partners."

Cash Conversion Cycle Solutions

The CCC covers several departments and processes. Unless your company has already taken intentional steps to drive out inefficiencies, they are probably rampant in multiple portions of the cycle. Depending on the area, a lack of efficiency might mean missing discounts, damaging supplier relationships, or creating costly defects, but it will always mean limiting the company's liquidity options by extending the time it takes to convert resources to cash.

Cash Conversion Cycle: Automation Opportunities

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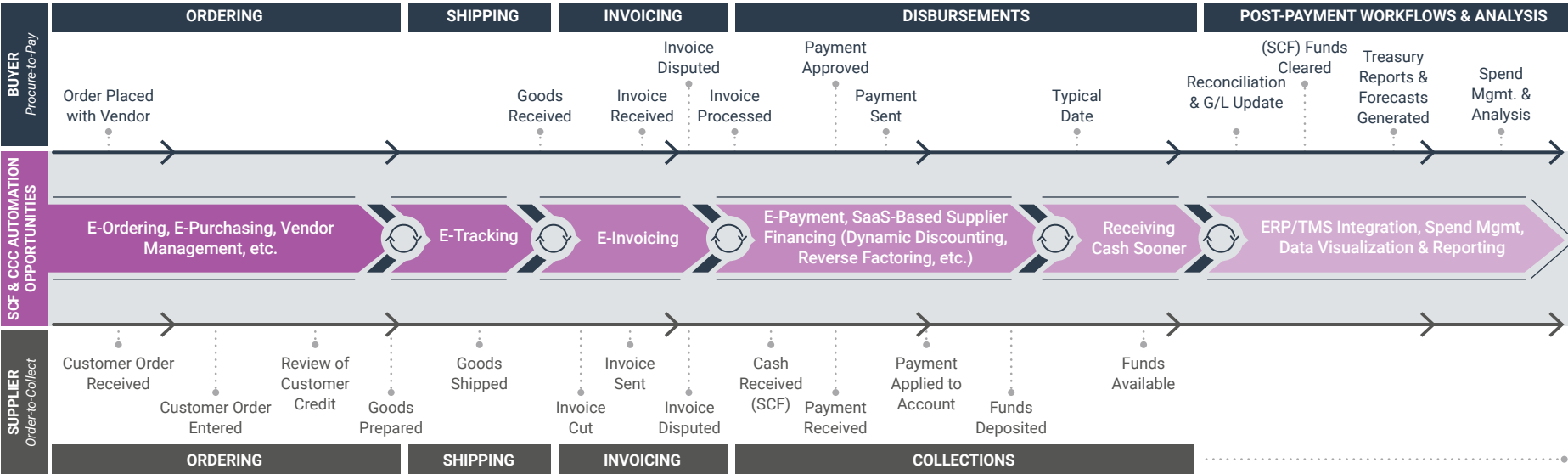
CCC solutions leverage technology and automation to increase the efficiency and accuracy of any department or process involved in the cycle. Some directly address a particular department's pain points, while others help with cross-departmental processes. When applied properly, solutions from this broad category can meaningfully impact liquidity management and working capital.

As a result, treasury may end up leading the initiative to obtain a CCC solution. When this is the case, the treasurer should keep in mind that each of these departments has its own perspectives, concerns, and goals. If, as is often the case, the technology project will require cooperation between areas, the treasurer should be ready to help them communicate and understand one another — which first requires that the treasurer understand them.

Challenges and Solutions Across the Cycle

The areas involved vary depending on each company's industry, size, etc. However, below are most of the common departments that may be involved in the CCC at your organization, along with a brief summary of some of the concerns and drivers that likely occupy their minds.

Procure-to-Pay
The procure-to-pay portion of the cycle covers the process of obtaining inventory, from initiating the purchase to paying the supplier:

» **Procurement:** The procurement department wants to keep a diversified but not too large pool of suppliers. It is concerned with balancing quality, strength, and stability against cost.

» **Accounts Payable (AP):** AP's concerns revolve around controls and hitting minimum DPO levels so that the company can hold onto cash for longer. However, they also want to balance this against taking advantage of early payment discounts when beneficial. Like treasury, AP is typically not a heavily staffed department.

Inventory
The inventory portion of the cycle is typically a single department that sits between AP and AR in the CCC but stands rather apart from them conceptually. Its concerns range from pricing to keeping enough materials on hand — a difficult task in many industries today. Inventory management and the shift away from the "just-in-time" trend due to the recent supply chain disruptions are important topics for organizations today, and this department's impact on liquidity and working capital are not to be underestimated. While SCF and most CCC solutions do not directly address inventory concerns, many of them indirectly impact and are impacted by this area. It should have a seat at the table when discussing working capital initiatives of any kind, including technological ones.

Order-to-Collect
This portion of the CCC encompasses several departments and processes, from receiving orders to applying payments.

Credit: Those responsible for issuing credit are typically quite wary of over-extending credit and are motivated to keep related losses to a minimum. This concern should be (but is not always) balanced against the potential loss of sales due to needless under-extension of credit.

Sales: The one clear goal for this department is maximizing sales or capacity to sell. However, if sales fails to balance this goal against several other concerns, including over-extension of credit, it will ultimately produce a negative impact on operations, revenue, and/or relationships.

Fulfillment: A fulfillment department has a fairly straightforward, although not necessarily easy, goal — delivering orders with quality and speed.

Invoicing or Billing: Quality and speed are goals for this area as well, but here the items to be delivered are invoices, not orders. Since defective and delayed invoices produce unnecessary costs for the organization, both accuracy and timeliness are vital, making this a popular area for automation.

Collection and Credit Application: This area focuses on keeping DSO in line with the terms promised and on relieving AR.

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Throughout these areas, inefficiency plagues departments. These inefficiencies create pain points within the departments, build tension with other departments and other parties, and ultimately reduce revenue and weaken the company's liquidity and working capital. Speed and accuracy are the main points of difficulty, and technology has proven effective at solving both for many of these groups.

Procure-to-Pay Solution Landscape

A broad variety of technology solutions address procure-to-pay. Some address a single department's pain points, while others help with interdepartmental processes. Some are industry specific, and others are more broadly applicable. Some integrate directly into an ERP or SCF solution, while others are standalone, and some are available via internally managed solutions, while others are outsourced. All, however, improve efficiency in the forms of speed and accuracy somewhere in this area, and as efficiency rises, costs decrease, and options for working capital optimization increase.
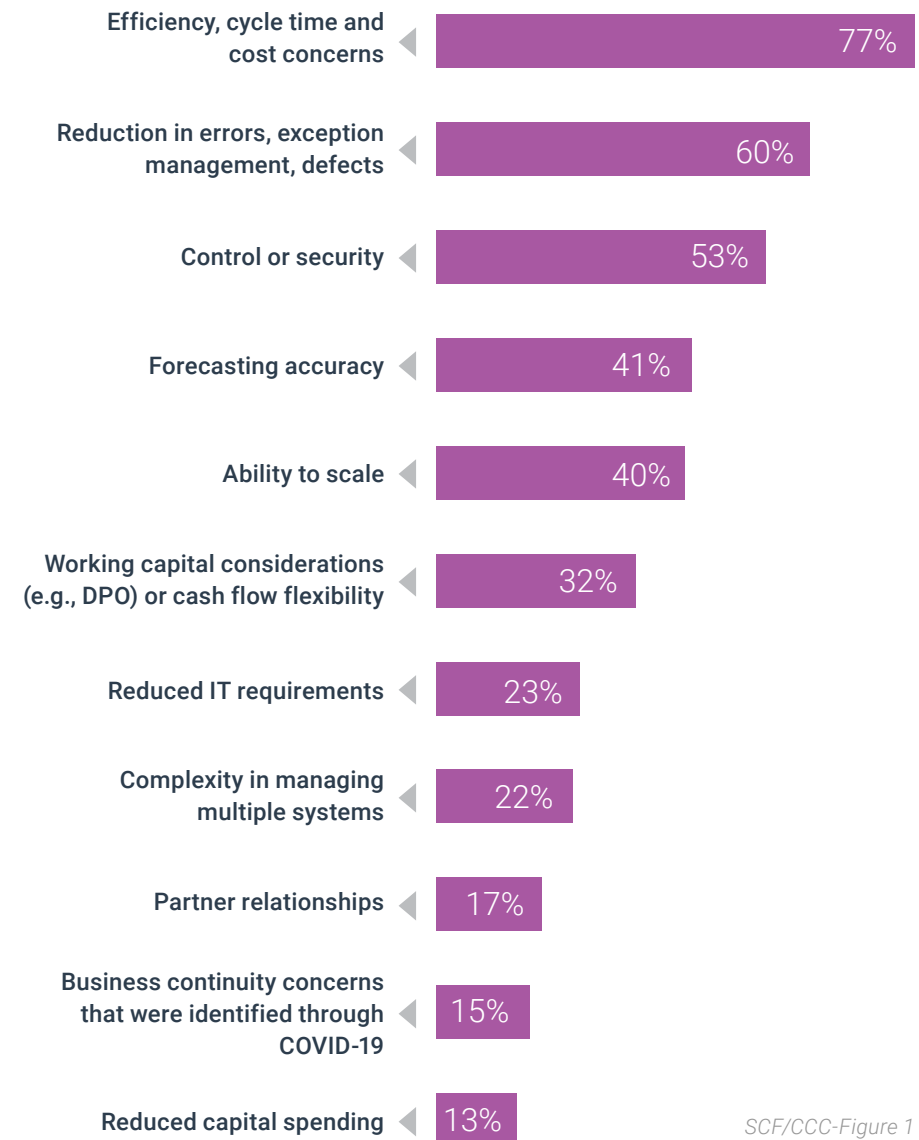
Some of the tools in this space include the following:

» Procurement platforms
» Vendor management
» Compliance management

» Receiving goods and services
» Receiving invoices
» Payment (AP)

AP automation solutions in particular have seen significant uptake since 2020's jump in remote work, with many companies today eager to reach fully electronic AP processes rather than manual or mixed processes. Many companies are finding that, in addition to being important for their smooth operations in the remote environment, AP solutions can dramatically speed the payment process, reduce errors, and bolster security in this high-risk environment.
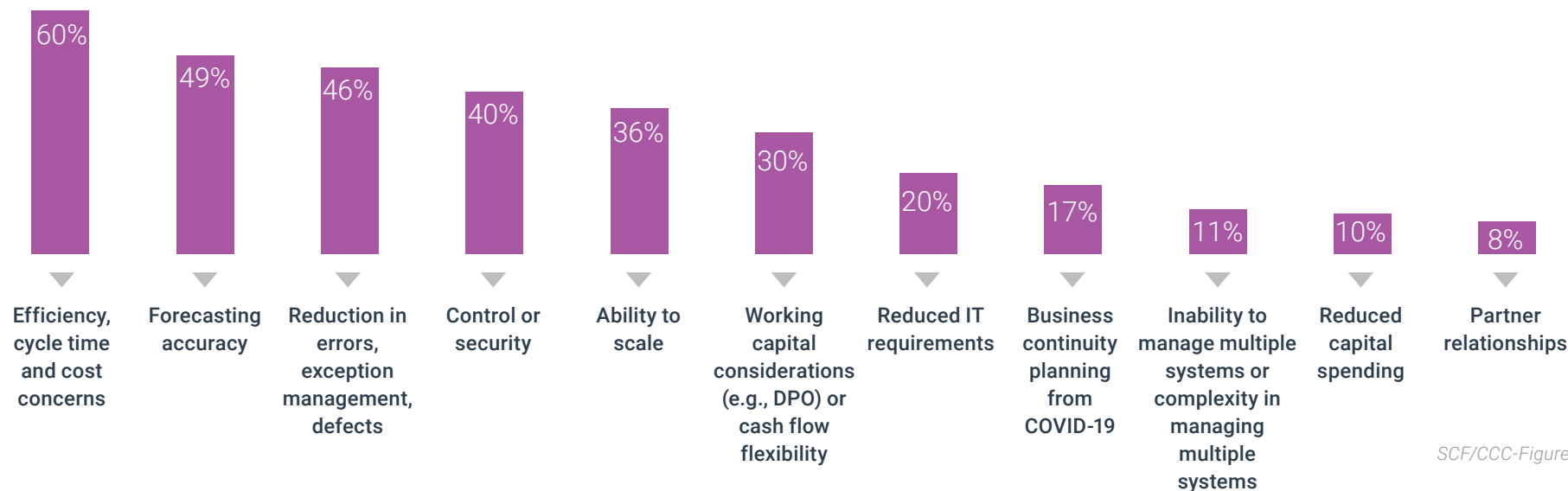
In terms of working capital, early payments are sometimes — although certainly not always — quite helpful. To be even more precise, the ability to pay early gives greater flexibility for calibrating working capital as needed. If elements such as the approval process, for example, take too long, they can preclude the possibility of early payment. They may even push payments late, deteriorating your company's relationship with its suppliers. Speeding these processes through a solution opens up options, reduces headaches, improves supplier relationships, and strengthens the supply chain.

Q. **What would drive you or drove you to more AP automation? (Select all that apply)**

Driver	%
Efficiency, cycle time and cost concerns	77%
Reduction in errors, exception management, defects	60%
Control or security	53%
Forecasting accuracy	41%
Ability to scale	40%
Working capital considerations (e.g., DPO) or cash flow flexibility	32%
Reduced IT requirements	23%
Complexity in managing multiple systems	22%
Partner relationships	17%
Business continuity concerns that were identified through COVID-19	15%
Reduced capital spending	13%

SCF/CCC-Figure 1

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Q. **What would drive you or drove you to more AR automation? (Select all that apply)**

Efficiency, cycle time and cost concerns	Forecasting accuracy	Reduction in errors, exception management, defects	Control or security	Ability to scale	Working capital considerations (e.g., DPO) or cash flow flexibility	Reduced IT requirements	Business continuity planning from COVID-19	Inability to manage multiple systems or complexity in managing multiple systems	Reduced capital spending	Partner relationships
60%	49%	46%	40%	36%	30%	20%	17%	11%	10%	8%

SCF/CCC-Figure 2

Order-to-Collect Solution Landscape

Market research in 2021 found that one in ten AR departments considered themselves highly automated, but that respondents in general wanted more automation, with many aiming at fully electronic processes. In AR and throughout the order-to-collect process, automation can speed the company's conversion of receivables to cash, decrease the costs associated with inefficiency, improve customer relationships, and again, open up possibilities for calibrating working capital.

Like procure-to-pay, the order-to-collect technology landscape is broad, with many options spanning the full process. Specific areas that technology streamlines include the following:

» Credit rating and scoring
» Shipping and fulfillment (tools addressing this area may automate or allow for easy invoicing)
» Cash application
» Collection

Inefficiencies across these areas can trap cash in the cycle, drive up costs, and frustrate partners and customers. For example, with an inefficient, manual invoicing process, a company may take quite a few days to get an invoice sent. The invoice is more likely to be defective with manual processes as well, so the customer may then have to return the invoice and request correction. This correction process is likely to take even longer, delaying payment and costing staff time.

Automating invoicing or any other part of the order-to-collect process typically improves both speed and accuracy, sometimes by a significant margin. This can reduce the time cash is trapped in the cycle and can create another area of flexibility where working capital can be adjusted as necessary.

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Accelerated Adoption Amidst Disruption

Well before the pandemic, most organizations were already making plans and setting goals for AP and AR automation. The crisis simply moved up the timeline, pushing many companies to adopt sooner than they had initially planned. While the worst of the pandemic appears to have passed, many industries continue to struggle with liquidity and supply chains, making the benefits of pertinent CCC solutions highly desirable. In addition, the recent surge in adoption shifted the industry standard toward automation. While companies should be cognizant of their own unique situations, needs, and goals, they should also be aware that if the industry passes them by in a certain area, they may find themselves falling behind in ways that meaningfully impact their success.

Innovations Impacting CCC Solutions

The benefits of CCC automation solutions are only increasing. Certain innovations, most notably AI/ML and networks, are lending power and increased functionality to the landscape.
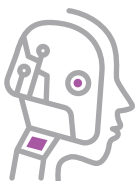
AI/ML

The application of artificial intelligence and machine learning to various portions of the cycle allows technology to take a broader range of tasks off the hands of busy staff, all while increasing accuracy and speed. Use cases within these areas include forecasting, cash application, collection, and payment security and fraud detection.

Networks

The networks accessible through payments solutions have proven to be helpful on several levels, especially as these networks grow in both size and functionality. They can streamline and bolster counterparty management, aid in compliance, track payments, find suppliers, and perhaps most importantly, prevent fraud through robust vendor management and validation of payee identity.
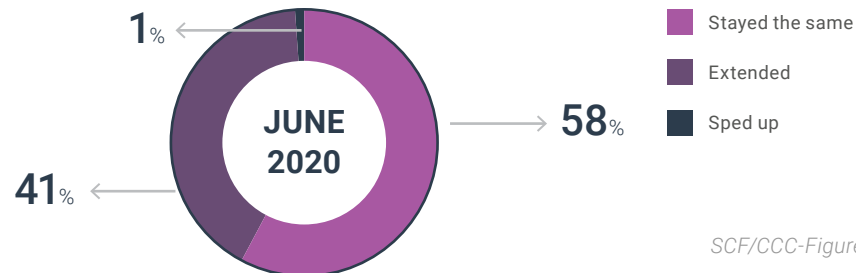
Supply Chain Finance Solutions

Supply Chain Problems and Limitations of Traditional Payment Terms

One need not be an economist to recognize that supply chains have been struggling in recent months and years. What began with the pandemic's lockdowns continued with liquidity challenges, business closures, and geopolitical unrest. While supply chain finance cannot solve international conflicts or viruses, it can help build some much-needed stability into supply chains, supporting key partners and helping both buyer and supplier stay afloat through difficult times.

Traditional payment terms work well enough when both parties are in a financially strong position. When one or the other is strained, however, each ends up tugging against their partner's liquidity. Sometimes, this is tolerable. At other times, however, one party pulls too hard, and their partner either fails or decides to cut off the relationship, placing even more strain on the first party.

At the beginning of COVID-19, many companies slowed their payments to suppliers to protect their own liquidity. Often, however, suppliers have smaller liquidity reserves and therefore less resilience. Buyers must conserve resources in the face of such a crisis, but in some cases, they may have contributed to the crumbling of their own supply chains.

Q. **Compared to typical times, our timing for paying vendors and suppliers has:**

- 1%
- 58%
- 41%

JUNE 2020

- Stayed the same
- Extended
- Sped up

SCF/CCC-Figure 3

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This is the problem that arises with traditional payment terms. The inflexible lockstep of the terms produces a win-lose scenario, and when liquidity tightens for both parties, a win-lose can quickly grow into a lose-lose.

Supply chain finance (SCF) solutions apply technology and innovative methods to turn this win-lose/lose-lose situation into a win-win. Whether by breaking the lockstep of payment terms or by smoothing out the discount proration and process, these solutions allow buyers and suppliers to continue supporting each other during times of stress.

SCF Models and Techniques

By the Euro Banking definition of SCF, there are quite a few different types. Some are led by the bank, some by the supplier, and others by the buyer. For our purposes in this report, we will be covering reverse factoring and dynamic discounting — two prominent buyer-led SCF types — as well as a hybrid approach.

"Buyer-led" means that the program is initiated and managed by the buyer and is AP centric. As will be seen, however, these programs still offer significant benefits and options to the suppliers.
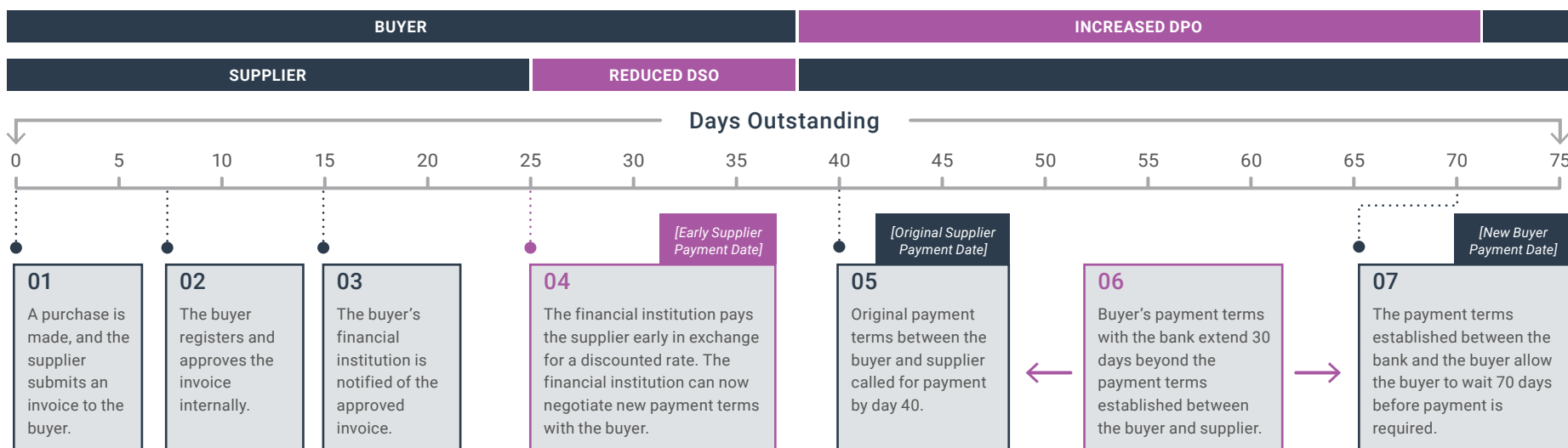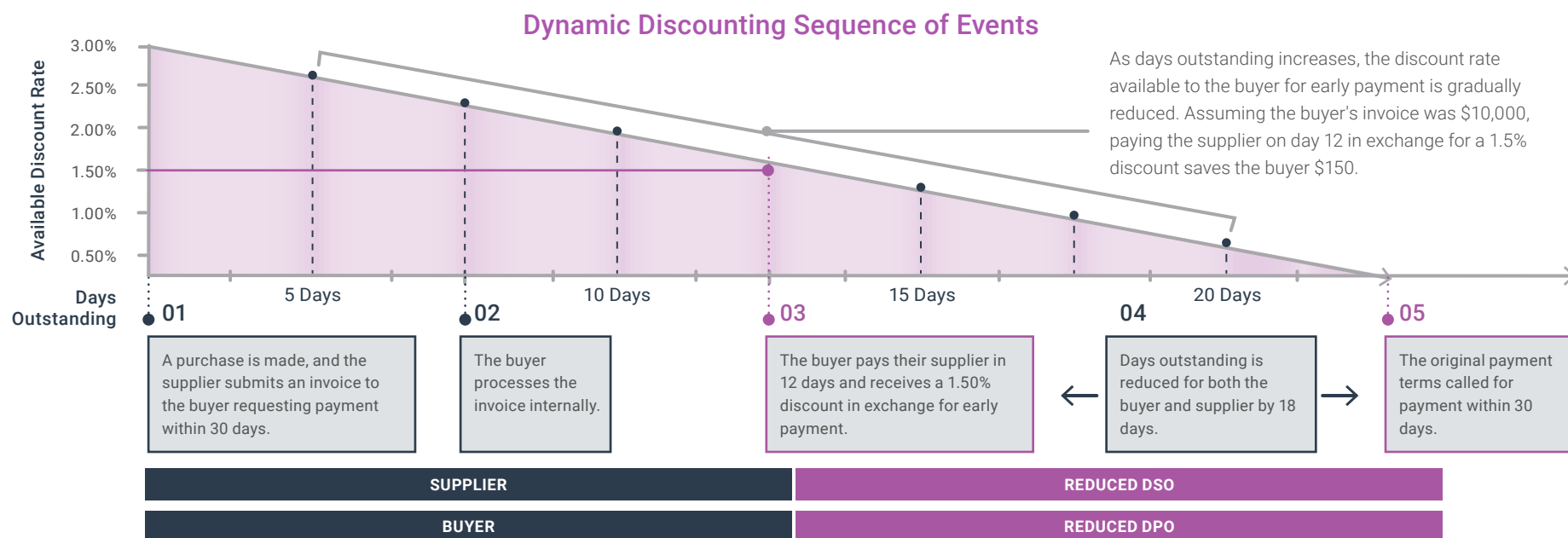
Reverse Factoring

Reverse factoring focuses on breaking the problematic lockstep of traditional payment terms. It accomplishes this by leveraging the buyer's credit to gain funding from a third party.

Suppliers typically have lower credit than their buyers, making it more difficult for them to obtain financing at good rates. In reverse factoring, the buyer uses its own more robust credit to obtain financing for suppliers in the form of early payment from a third party.

When the supplier submits an invoice, the buyer uses the reverse factoring program to notify the third party of the invoice once approved. The third party then pays the supplier early at a discounted rate, often prior to traditional payments terms and certainly earlier than the buyer would have paid them otherwise. The buyer then has a negotiated amount of time to repay the third party, meaning that they are able to hold onto their own liquidity for longer while giving their supplier access to early payment.

Reverse Factoring Sequence of Events

BUYER	INCREASED DPO

SUPPLIER	REDUCED DSO

Days Outstanding

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

01 A purchase is made, and the supplier submits an invoice to the buyer.

02 The buyer registers and approves the invoice internally.

03 The buyer's financial institution is notified of the approved invoice.

04 The financial institution pays the supplier early in exchange for a discounted rate. The financial institution can now negotiate new payment terms with the buyer.
[Early Supplier Payment Date]

05 Original payment terms between the buyer and supplier called for payment by day 40.
[Original Supplier Payment Date]

06 Buyer's payment terms with the bank extend 30 days beyond the payment terms established between the buyer and supplier.

07 The payment terms established between the bank and the buyer allow the buyer to wait 70 days before payment is required.
[New Buyer Payment Date]

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Dynamic Discounting Sequence of Events

As days outstanding increases, the discount rate available to the buyer for early payment is gradually reduced. Assuming the buyer's invoice was $10,000, paying the supplier on day 12 in exchange for a 1.5% discount saves the buyer $150.

01 A purchase is made, and the supplier submits an invoice to the buyer requesting payment within 30 days.

02 The buyer processes the invoice internally.

03 The buyer pays their supplier in 12 days and receives a 1.50% discount in exchange for early payment.

04 Days outstanding is reduced for both the buyer and supplier by 18 days.

05 The original payment terms called for payment within 30 days.

SUPPLIER	REDUCED DSO
BUYER	REDUCED DPO

Dynamic Discounting

In addition to having stronger credit, buyers often have stronger liquidity stores. Sometimes, they have an excess of capital and are looking for an efficient investment for it. Rather than leveraging the buyer's credit, dynamic discounting leverages this excess capital.

Traditional payment terms often include discount options, but these options are limited and do not always motivate the behaviors that would ultimately serve both parties best. Take, for example, the common payment terms 2/10 net 30. For the supplier, shortening their DSO on this invoice by 20 days is desirable enough to offer a 2% discount to try to create a win-win. However, the buyer is often unable or unwilling to pay at day 10, and once they pass that checkpoint, they have no further incentive to pay early at all. Even if they would be happy to pay at day 11 for a 1.9% discount, this is not one of the options given, so it is then in their best interests to hold onto their cash for the full 30 days. This represents a missed opportunity for both parties.

Dynamic discounting uses technology to power prorated discounts and to help buyer and supplier find the one scenario that suits them both the best. Through the buyer's

SCF platform, the suppliers can set a sliding scale of discounts, and the buyer can see the full range of options each supplier finds favorable and can choose the option that constitutes a win for them as well.

Unlike reverse factoring, no third party introduces funding into the equation, and the payment terms technically remain in lockstep. However, the platform allows for a more gracefully synchronized lockstep that benefits all involved.

Hybrid SCF

Dynamic discounting suits the needs of companies with excess capital, and reverse factoring suits those who wish to support their suppliers' capital but cannot use their own. While some companies consistently find themselves in one position or the other, almost 30% fluctuate between the two. This is where hybrid SCF solutions come into play. These solutions offer both options. Buyers can continually offer their suppliers favorable payment terms while toggling whether any early payments are funded from their own excess capital or — in times of more strained liquidity — from a third party.

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Who Needs SCF?

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LOW SUPPLIER CREDIT

If your supply chain is formed of many vital suppliers with low credit, and this is proving problematic, SCF is made for you. Whether you need a way to leverage your own excess capital to more effectively support suppliers or whether you need a way to keep your supply chain thriving while preserving your own liquidity, there is an SCF option that supports both your needs and your suppliers'.

WORKING CAPITAL OPTIMIZATION

If working capital has been a priority for your company for some time, but the steps taken thus far have been insufficient, it might be time to consider SCF. The flexibility the various SCF methods can infuse into your working capital could be the missing piece.

NET LIQUIDITY FLUCTUATION

For those among the almost one third of companies whose liquidity fluctuates between net positive and negative, a hybrid SCF solution offers the flexibility needed. In times of positive liquidity, excess capital can be used to gain discounts and pay suppliers early, while in times of negative liquidity, your organization's credit can be leveraged to continue supporting suppliers.

DIVERSIFYING CAPITAL ACCESS

If your organization is interested in diversifying its access to capital, SCF can offer another option beyond borrowing from your bank – all while increasing the flexibility and control you have over your liquidity.

ORGANIZATIONS FACING CHANGE

Our current environment is one of rapid change. Businesses expecting to face heightened challenges due to rising interest rates, an expansion, a more difficult sales or collections environment, and so on may want to consider SCF as a way of helping them manage working capital and supply chains in the face of change.

The Future of SCF

The usefulness of SCF solutions is impacted by various factors: economic conditions that drive buyer and supplier liquidity needs, technological innovations powering more functionality, difficulties that make potential SCF users eager or wary, and so on. Below are several of the factors that buyers should keep in mind today.

Interest Rate Hikes

After low interest rates throughout the pandemic, 2022 has seen rates rising again. Interest rates are not always predictable, and they vary from country to country and from year to year. No matter what the rates are, capital is always easier to obtain for large companies with high credit ratings than for small companies with lower credit.

This means that higher rates hit small companies hard, making it difficult for them to access capital when they find themselves struggling with their (likely small) liquidity reserves. When supply chains are as vulnerable as they have been in recent years, alternative financing options such as SCF become a way to strengthen the entire chain and keep all parties afloat in the face of rising or volatile interest rates.
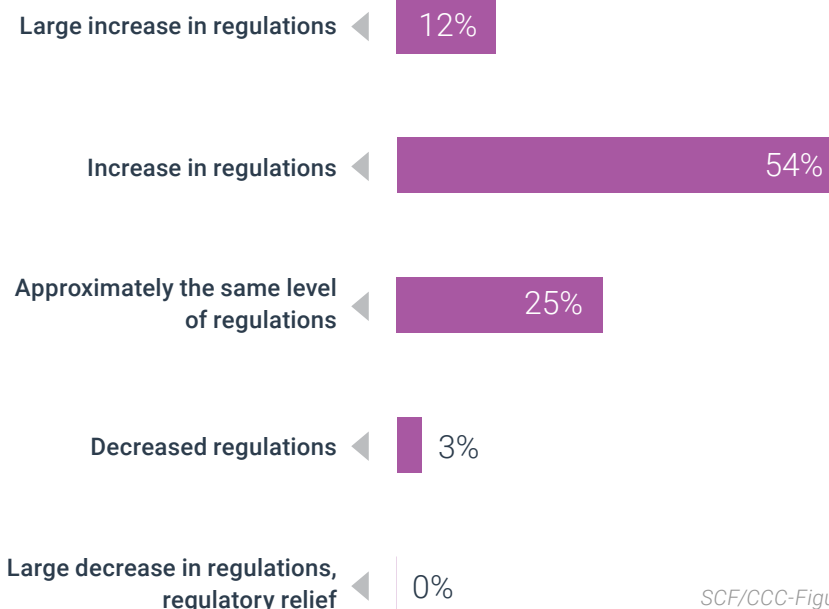
Compliance

KYC leads treasury's list of burdensome regulations by a wide margin, and banks directly offering SCF programs also list KYC as a significant challenge. Fintechs, while still subject to the regulation, are able to manage it with less overhead.

While KYC is a challenge for SCF programs, other compliance issues function as drivers. Cross-border transactions are often plagued by disputes and confusion in the face of regional compliance issues, and these disputes are difficult to resolve due to poor documentation. Many SCF programs offer enhanced visibility, and some offer document management, allowing for clear proof of what happened when and where to help clear up any regulatory or dispute-related issues.

Q. In the near future (1-2 years), I expect the following to be true of the regulatory environment:
(Unsure responses are not shown)

Large increase in regulations	12%
Increase in regulations	54%
Approximately the same level of regulations	25%
Decreased regulations	3%
Large decrease in regulations, regulatory relief	0%

SCF/CCC-Figure 4

Networks

SCF solutions use network functionality to add value to the buyer. This includes networks of suppliers and networks of financiers. As vendors improve the power and reach of their networks, the power of SCF also grows.

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Emerging Technologies

Artificial Intelligence: AI analysis for optimizing payment strategies and discount terms has seen increasing use in SCF solutions. With AI, solutions can use information such as historical transaction data, current rates, and industry vertical averages for DPO and DSO to predict which suppliers are likely to accept which terms.

Blockchain / Distributed Ledger Technology: As in many areas that relate to treasury, blockchain sees limited use cases in SCF, but where it is useful, it does its job quite well. Resolving disputes in cross-border transactions, as discussed in the compliance section, generally proves quite problematic. Distributed ledgers increase transparency into the progress of these transactions and improve documentation, reducing confusion and allowing for faster resolution.

SCF Selection and Implementation: Specific Guidance

Due Diligence

In early 2021, a scandal involving the insolvency of an SCF-focused financial services company, Greensill Capital, drew attention to potential dangers in the industry. While SCF itself is not the problem, and the Greensill incident should not be taken as a cautionary tale against use of a supply chain finance solution, it should stand as a warning against partnering with any company you would be relying on for capital — SCF or other — that is not fully aboveboard in their practices and does not have sufficient diversification.

Due diligence requires understanding not only your potential partner's stated business models, but also the reality of the practices behind the words. Do not consider a statement of safety as enough, but perform thorough due diligence and refrain from taking a company on as a partner unless there is sufficient reason to believe them adequately diversified in their lending.
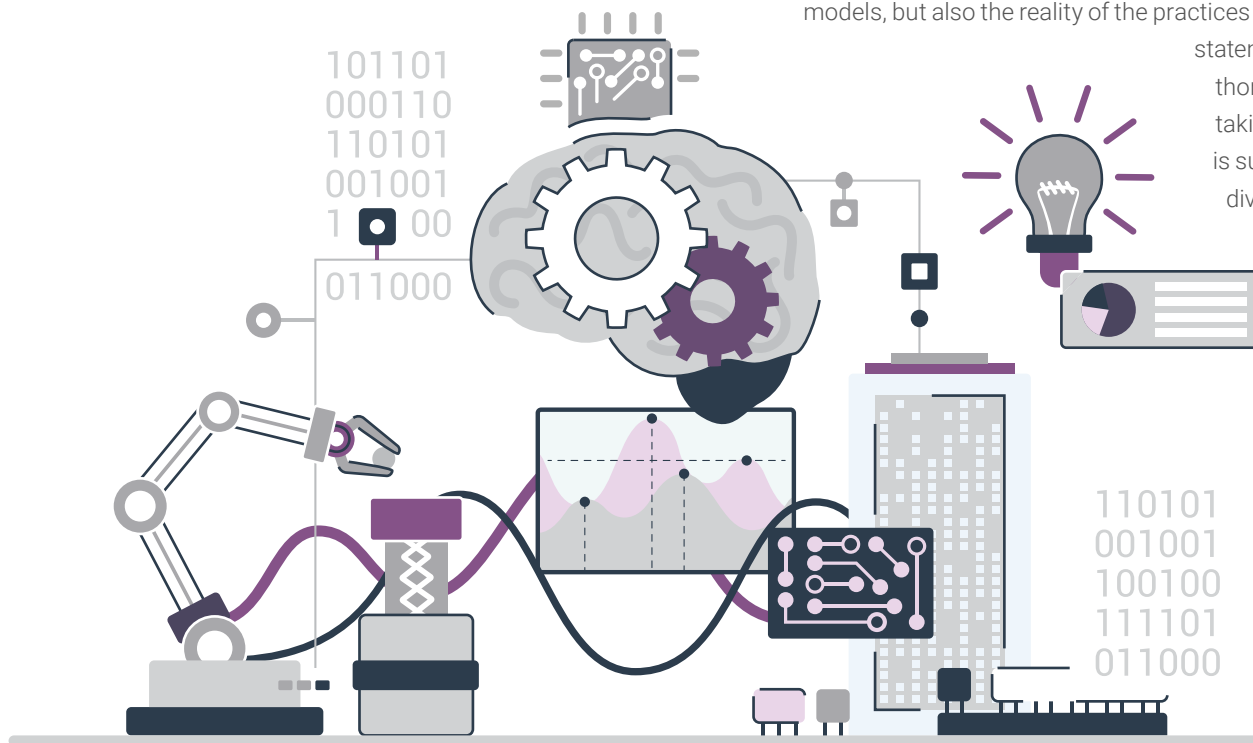
Maximizing Supplier Participation

Survey respondents have ranked supplier participation as the most impactful factor in SCF success. Supply chain finance programs, no matter how well built, are useless if the suppliers do not use them. Especially with buyer-led approaches such as reverse factoring and dynamic discounting, suppliers may be initially reluctant. It is worthwhile for the buyer to take the following steps to maximize supplier participation:

1. **Communication:**
   When a supplier hears that their buyer is starting a program and wants the suppliers to participate, they are likely to assume that this program is largely for the buyer's benefit, and not their own. They see something their buyer wants, and they see hoops they are being asked to jump through to make it happen. While the types of SCF discussed in this report are designed to meaningfully support supplier liquidity and resilience, the suppliers are unlikely to know this unless it is explained to them not only that it will benefit them, but how it will do so. This means that those who most frequently interact with suppliers — such as procurement and AP — need to know how the program works, exactly what benefits it holds for suppliers, how suppliers can take advantage of those benefits, and the importance of communicating this clearly.

2. **Minimizing Cost & Inconvenience: Onboarding & Use**
   Buyers should be mindful of the resources it will require for their smaller suppliers to onboard and use an SCF program. If the program charges suppliers fees for onboarding or use, asks them to push through red tap, or in any way proves difficult to use, this can dramatically impact participation. Consider these elements carefully as you select an SCF solution. Look for vendors with minimal fees and hassle, and prioritize those that offer extensive vendor training and support. Consider covering any onboarding, use, or training fees on behalf of suppliers. The resulting increase in participation is often worth it.

Corporate Suppliers: Top 4 Factors Impacting SCF Participation

Overall financial cost of using the solution

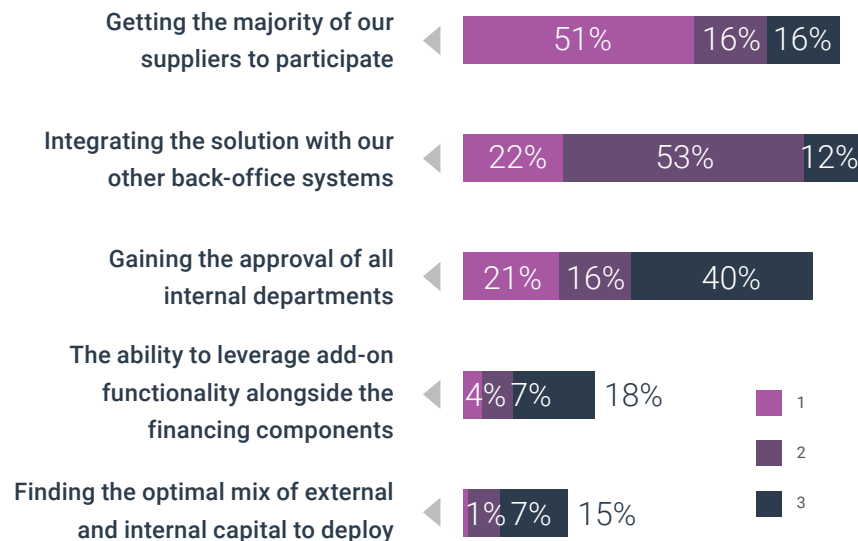Greater visibility into & predictability of payments / cash flows

Enhanced relationships with buyers / partners

Offering of functionality to automate and streamline the CCC

Q. **Corporate Buyers: Rank these factors from 1-5 according to how they impact the success of SCF.**
(Only the percentages of rankings 1-3 displayed)

Getting the majority of our suppliers to participate — 51% | 16% | 16%

Integrating the solution with our other back-office systems — 22% | 53% | 12%

Gaining the approval of all internal departments — 21% | 16% | 40%

The ability to leverage add-on functionality alongside the financing components — 4% | 7% | 18%

Finding the optimal mix of external and internal capital to deploy — 1% | 7% | 15%

Legend: 1, 2, 3

SCF/CCC-Figure 5

Working Capital Initiatives: Leading Practices

Since working capital initiatives cut across so many areas, it can be a challenge to implement them smoothly and calibrate them properly. A poorly operated working capital program can do fairly little good, while a well-orchestrated one can make a significant difference in the organization's liquidity and in various departments' efficiency. The following leading practices can help you lead your company to better working capital management efficiently and effectively.

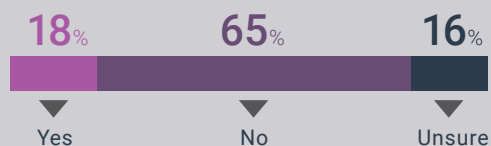## Build or Consult a Working Capital Council

In order to get all of the groups involved in working capital on the same page and gather their input, you need to get them all into the same room for the express purpose of discussing it. This means building a working capital council if you do not already have one.

These councils are typically led by treasury, with all the groups whose interests are bound up in working capital and its projects in attendance. This includes departments such as accounting, AR, AP, procurement, legal, tax, and often more. They typically meet monthly or quarterly, with agendas that include topics such as key metrics, strategies, and projects impacting working capital. The remaining leading practices are carried out by the council.

Forming a Working Capital Council

TREASURY: Leads the working capital council. Treasury is typically considered the owner of working capital internally and usually uses SCF as a tool for optimizing liquidity.

Q. **Corporates: Do you have a working capital council or committee?**

18%   **65**%   **16**%

Yes   No   Unsure

ACCOUNTING: Needs regular and timely reports of cash flow activity to update ledgers, perform reconciliations, and generate accurate financial statements.

Working Capital Council:

An internal committee typically overseen by treasury that meets monthly or quarterly to discuss working capital strategies and key metrics for all associated business units. The goal of the committee is to promote mutually beneficial working capital initiatives and eliminate competing KPIs across different departments.

AP/AR: Have direct responsibility over relations with suppliers and vendors and play a role in developing sales/credit promotions and payment terms.

PROCUREMENT: Involved in the purchase of inventory and company supplies and regularly interacts with suppliers.

LEGAL/TAX: Involved to ensure regulatory and compliance requirements are met. Can be involved in updating payment terms with suppliers.

SCF/CCC-Figure 6

Understand the Perspectives and Identify Competing KPIs

Every group involved in working capital has its own goals and concerns. In their efforts to meet their own objectives, they often unintentionally produce key performance indicators (KPIs) that conflict with the goals of the other areas. These are competing KPIs, and they wreak havoc on working capital, organizational efficiency, and interdepartmental relationships.

The first task of the working capital council is to weed out competing KPIs. In order to lead this process well, treasury must take several steps:

» Treasury must ensure that it listens and understands each member's concerns and goals. It should be clear to each group that they have been heard and that their concerns will be taken into consideration by the council. This may require treasury to help some members understand the perspectives of others whose goals are quite different from their own.

» Other groups who are not part of the council may still have perspectives that need to be taken into account. These groups may include external partners, such as suppliers and customers, and any other relevant voices. Treasury should make sure these groups' perspectives are heard.

» By impeding organizational goals and efficiency, competing KPIs harm the entire company, including the areas they were initially created to support. Each member of the council should understand that it is not just that these KPIs are problematic for others, but that they ultimately bring problems back on their own department as well. Treasury should be careful to communicate this and reiterate it as needed.

Establish a Single Set of KPIs

Once each group's concerns are understood by the council, it should be fairly clear which KPIs are suboptimal. These can be eliminated, but leaving the council's members with no metrics to track would not be optimal either, so new KPIs must be established.

The council should work together to establish a single set of KPIs that support both departmental and organizational goals (including working capital) and that do not compete. These KPIs can be supplemented with specific, agreed-upon objectives for working capital and other projects.

Monitor and Refine the Approach

Working capital management is an ongoing project. As your company experiences shifting economic pressures, acquisitions, seasonal sale fluctuations, and any other internal and external changes, its working capital needs will need to be reassessed. Your working capital council should continue meeting on its monthly or quarterly schedule to discuss how things are going, what could be better, and how to recalibrate initiatives.

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Enterprise Liquidity Management

Introduction to ELM

Liquidity is not a siloed resource that treasury and finance exclusively control. Rather, it undergirds the entire company's operations and is affected by areas outside of treasury. Solutions such as SCF and CCC automation, for example, do not typically touch treasury operations directly, but they hold enough influence over liquidity that liquidity managers (treasurers) must take them into consideration.

Enterprise liquidity management (ELM) solutions are the result of two developments that have been happening concurrently that are finally meeting in a new solution category. The first development is that the role of the treasurer has been steadily expanding with time and with each economic crisis. Treasury is now expected to be able to know more about what is going on with the company's liquidity with less delay and more accuracy. The company wants strategic advice from the treasurer, and they want it fast. Treasury must take ownership of cash, working capital, and payment security and must see to improving efficiency across the organization.

At the same time as the demands on treasury are increasing, treasury technology providers are finding new ways of leveraging innovations, of building open, integrative solutions, and of improving functionality. In the past couple of years, the innovations seem to have finally met treasury's growing responsibilities in the form of ELM solutions, which provide a comprehensive view of liquidity coupled with the robust functionality the modern treasury team needs to fulfill its growing role.
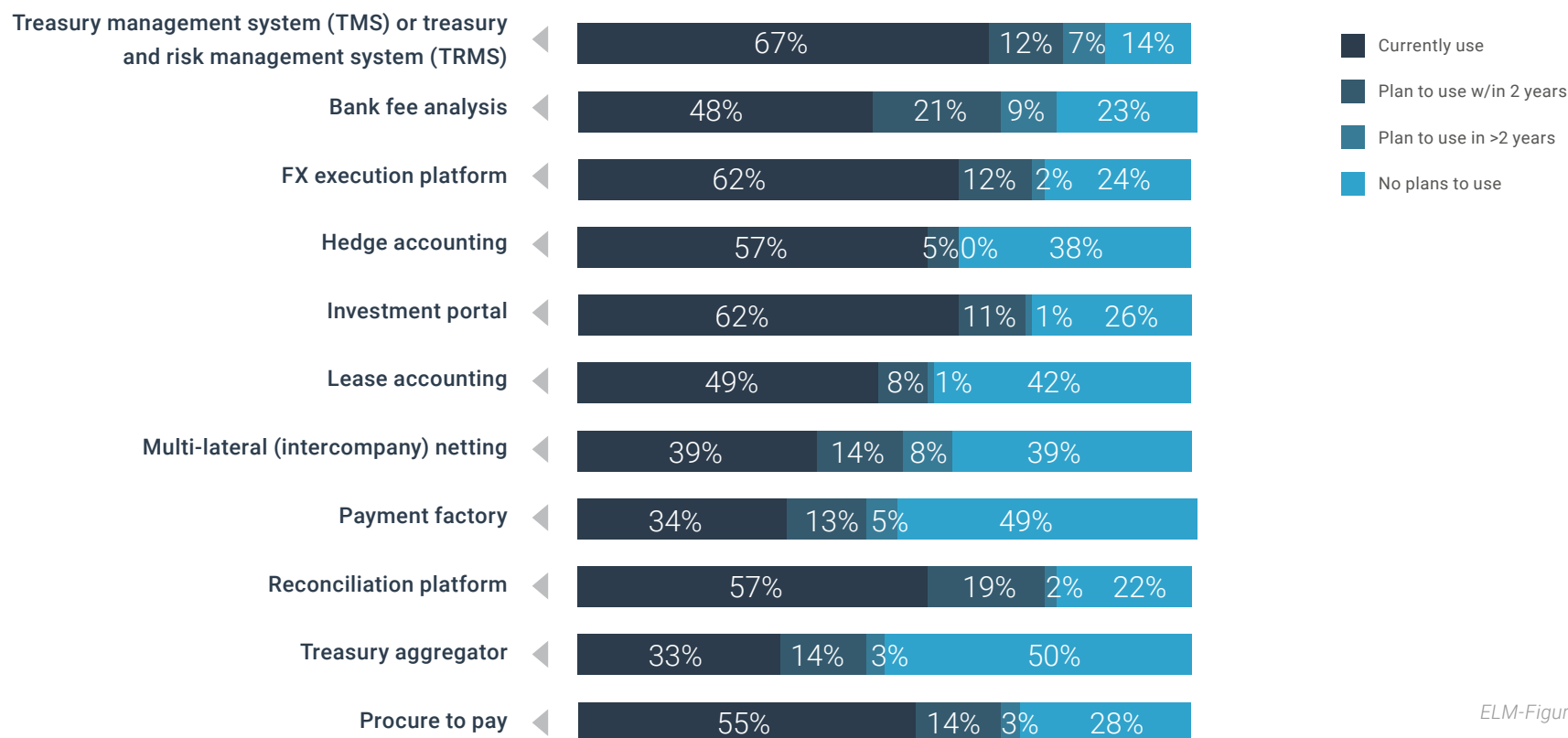
In a 2021 survey, there were 11 different solution types that at least half of treasury and finance respondents from large companies used or planned to use. Each of these solutions manages something that impacts liquidity. There is a need for visibility and functionality across many areas, and trying to manage each in siloed or poorly integrated systems becomes unfeasible at some point.

Integrative, seamless functionality providing all-encompassing visibility into liquidity factors is necessary after a certain level of complexity is reached. This may be achieved through open architecture and smooth integration between separate players, or it may be achieved through a single ELM player building expansive functionality that covers many if not all of those 11 solution types — but can still integrate with other sources as needed.

Our readers from previous years may recognize that, while we discussed the rise of ELM in the emerging technology section of the 2021 Analyst Report, this is the first year in which the solution has its own section. As a new category, ELM may have much room to develop and change, so the presentation here is somewhat broad to allow for the newness and potential of the solution type. In addition, ELM is largely built through expansion and combination of various principles and functionalities we have discussed in previous sections of this report, so these will be covered somewhat briefly to avoid redundancy.

Q. We currently use or plan to use the following:
(Unsure responses are not shown)

Solution	Currently use	Plan to use w/in 2 years	Plan to use in >2 years	No plans to use
Treasury management system (TMS) or treasury and risk management system (TRMS)	67%	12%	7%	14%
Bank fee analysis	48%	21%	9%	23%
FX execution platform	62%	12%	2%	24%
Hedge accounting	57%	5%	0%	38%
Investment portal	62%	11%	1%	26%
Lease accounting	49%	8%	1%	42%
Multi-lateral (intercompany) netting	39%	14%	8%	39%
Payment factory	34%	13%	5%	49%
Reconciliation platform	57%	19%	2%	22%
Treasury aggregator	33%	14%	3%	50%
Procure to pay	55%	14%	3%	28%

ELM-Figure 1

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Defining ELM

Enterprise Solutions

The problem of needing access to information that is distributed through many parts of an organization is not a new one, and ELM is not the first solution addressing this issue on some level. Instead, it follows in the tradition of multiple other "enterprise" solutions, some used broadly and some more niche. Each type helps manage a certain layer of data or resources across the company.

Enterprise Resource Planning (ERP)

For most treasurers, the ERP is a familiar solution type. These powerful systems address the need to manage business activities and resources — from cash to payroll to raw materials — across accounting, HR, procurement, supply chains, materials and productions, and more. Treasury is often among those using the ERP or needing to integrate their own solutions with it. While the resources it helps manage are often related to liquidity (so there may be some overlap between the ELM and the ERP), the ERP is not focused on managing liquidity itself and does not typically have the banking, risk, and cash positioning and forecasting functionality that treasury needs.

Enterprise Commodity Risk Management (ECRM)

The ECRM is less common than the ERP, as it focuses narrowly and deeply on the commodities niche. These solutions manage elements impacting commodity risk for organizations that are particularly commodity intensive and need an enterprise-wide view and management dashboard for relevant factors.

Enterprise Trading Solutions (ETS)

Similarly, the ETS is a more niche solution. It serves the needs of companies with intensity in the area of trading. These systems support the entire trade process, from a trade blotter through execution, confirmation, and reporting. They facilitate the activity, management, and reporting of trade transactions throughout the lifecycle and beyond.

Enterprise Liquidity Management (ELM)

ELM systems are built for viewing and managing factors impacting liquidity on an enterprise-wide level. Unlike the ECRM and ETS, ELM is not a niche offering serving specific industry verticals or those with particularly intensive needs in just one area. Every organization has liquidity to manage. The need for ELM is less defined by industry and more by high levels of complexity.

At moderate levels of complexity, a regular TMS may adequately provide the information needed and help treasury act on it appropriately. However, as treasurers at highly complex companies help strategize and guide the company through tumultuous times, they need something to solve for this complexity and provide current, comprehensive information on liquidity factors, whether it be a single ELM system or multiple open systems integrating together. The ELM will also support users from other areas, including receivables, payables, and other employees within the CFO's organization.
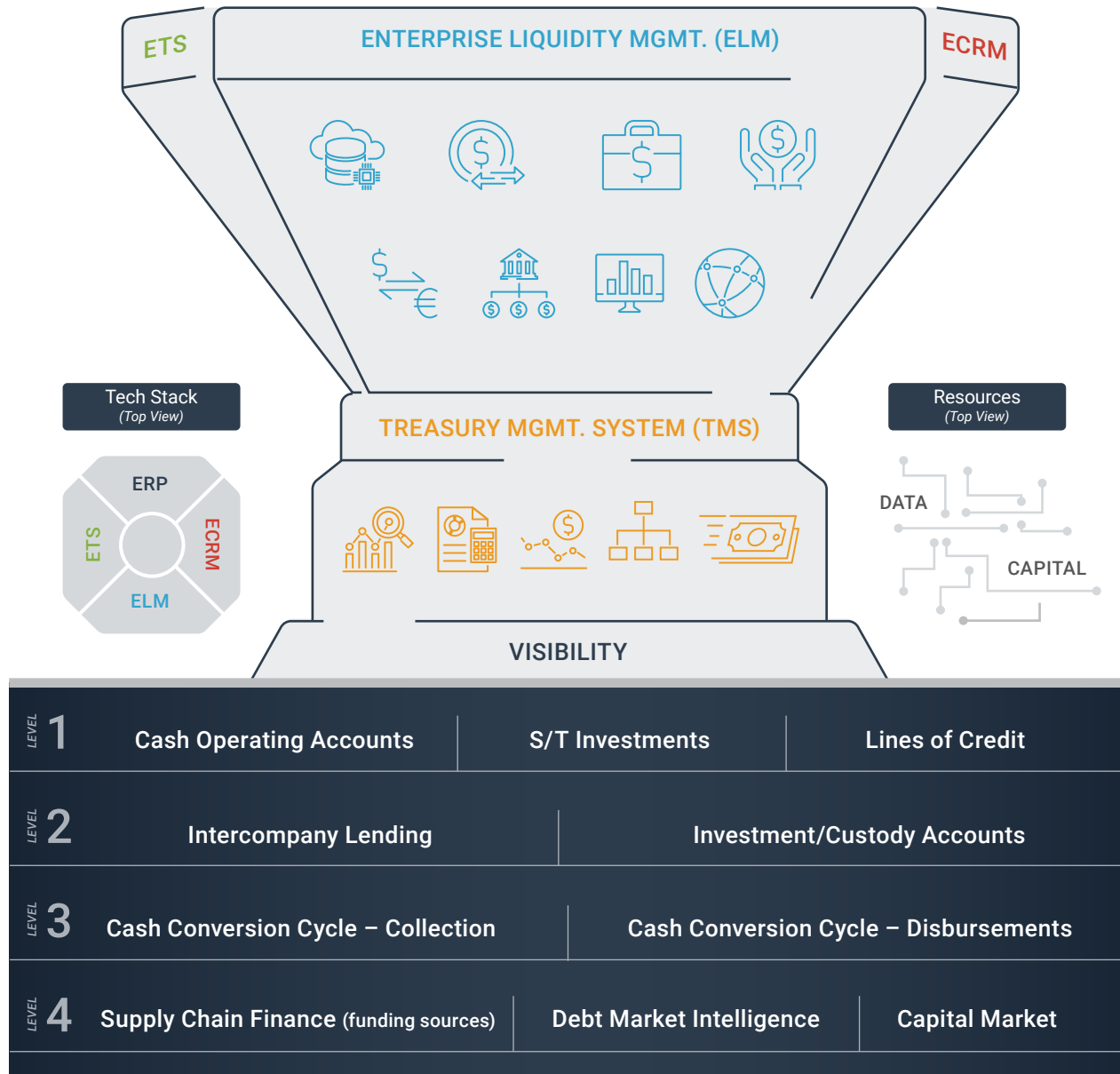
ELM Functionality

ELM functionality can, for the purposes of understanding its place in the broader ecosystem of solutions, be divided into two sets. First, it takes common TMS functionality as a foundation, and then it builds broader, more advanced functionality on top of this foundation. The latter set is what distinguishes the ELM from a TMS, but both are part of ELM:

Foundational functionality (common to ELM systems and many TMSs):
» Cash positioning and forecasting
» Accounting
» Debt and S/T investments
» Bank account management
» Treasury payments

Treasury Technology Stack

ETS

ENTERPRISE LIQUIDITY MGMT. (ELM)

ECRM

Tech Stack *(Top View)*

TREASURY MGMT. SYSTEM (TMS)

Resources *(Top View)*

ERP

ETS

ECRM

ELM

DATA

CAPITAL

VISIBILITY

LEVEL **1**	Cash Operating Accounts	S/T Investments	Lines of Credit
LEVEL **2**	Intercompany Lending	Investment/Custody Accounts	
LEVEL **3**	Cash Conversion Cycle – Collection	Cash Conversion Cycle – Disbursements	
LEVEL **4**	Supply Chain Finance (funding sources)	Debt Market Intelligence	Capital Market

Enterprise Liquidity Management (ELM)

- Technology Use
- Forecasting: Advanced
- Capital Access & Working Capital Mgmt.
- Visibility & Payment Support (Treasury Aggregator)
- Foreign Exchange (FX)
- Banking Structure, Investment Execution
- Advanced Accounting
- Global Support & Network Effect

Treasury Management System (TMS)

- Cash Positioning/Forecasting
- Accounting
- Debt & S/T Investment
- Bank Account Mgmt.
- Treasury Payments

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Advanced functionality (the capabilities that distinguish ELM from a TMS):

▸ **Advanced forecasting:** Forecasting is a pain point for most treasury departments. Organizational complexity and economic volatility only sharpen the pain, making it more difficult to create accurate, timely forecasts. Advanced forecasting functionality helps treasury plan liquidity even when times are chaotic and when large amounts of complex data need to be processed to create an accurate forecast. This frees treasury for more strategic endeavors.

▸ **Capital access and working capital management:** As seen in the SCF and CCC solutions section of this report, the operations of every area within the CCC can impact working capital and, therefore, liquidity. While AR, AP, and supply chain management are not directly part of treasury's function, it is treasury's duty to lead efforts to optimize working capital. This may involve SCF through reverse factoring, dynamic discounting, or a hybrid model, or it may involve CCC automation to improve efficiency. The capital access and working capital capabilities of an ELM system provide the functionality needed by departments such as AR and AP while working seamlessly with the functionality treasury needs. Treasury knows what is going on with SCF and other capital efforts and can easily incorporate that data into the overall picture of corporate liquidity.

▸ **Visibility and payment support (treasury aggregator):** As seen in the TA section, complex banking structures and payment processes lead to the need for aggregation and payment hub functionality. An ELM system allows treasury to automatically pull in banking data with proper formatting, to see that payment processes are securely and efficiently centralized, and to have full, real-time visibility into both banking and payments.

▸ **Foreign exchange (FX):** FX can have complex impacts on liquidity, and having a solution that can infuse both visibility and operational efficiency into this area allows for better data and more time to strategize.

▸ **Banking structure, investment execution:** While some TMSs include basic bank account management modules and short-term debt and investments, the functionality in ELM covers more sophisticated banking structure and execution of investments.

▸ **Advanced accounting:** Accounting is a core piece of TMS functionality. However, an ELM's advanced capabilities are able to handle more complex accounting needs.

Other Features:

» **Global support and network effect:** Vendors offer global, follow-the-sun support, and growing community networks and ecosystems help users get the most out of their ELM systems. Many of the vendors pioneering ELM-type offerings are also invested in creating robust network strategies to grow their communities and ecosystems, making them more functional and more extensive.

» **Technology use:** As a new category, ELM offerings are built on newer technological models. They are SaaS-based and potentially PaaS or cloud-native. With the advanced functionality and comprehensive view we describe in ELM, one might expect simply monolithic products offered by large players, but key elements of the ELM space are increasing openness, interoperability, and faster development, and different vendors are bringing unique approaches and leveraging innovative technology to bring this expansive functionality to treasury.

Areas of Commonality and Distinction:

The foundational functionality of an ELM system handles the core treasury needs that many TMS offerings also serve. The advanced functionality unique to ELM, however, expands the scope to cover enterprise-wide liquidity factors such as FX and working capital management, as well as adding advanced functionality in core areas such as forecasting, accounting, and banking and investments. ELM systems offer visibility into each of these areas, allowing users to track liquidity comprehensively — often in real time. In addition to visibility, these solutions have tools built in to help analyze and manage various factors as needed.

With some of its functionality overlapping that of a TMS, and many other capabilities overlapping other tools and solutions, it is important to clarify where ELM has commonality with other solutions, and what distinguishes it as a unique category itself. This is especially necessary to avoid confusion since, in addition to sharing the foundational capabilities, some TMSs specialize in particular areas of functionality and have, for example, advanced forecasting or FX tools.

Despite having one area of advanced functionality, these TMS offerings would count as specialized or advanced TMSs, not ELM systems. However, in recent years, some solutions have outgrown the TMS category by adding multiple areas of expanded, advanced functionality aimed at allowing for comprehensive liquidity management. The ELM category has been added in recognition that once a solution reaches this point, it is something distinct from a TMS.
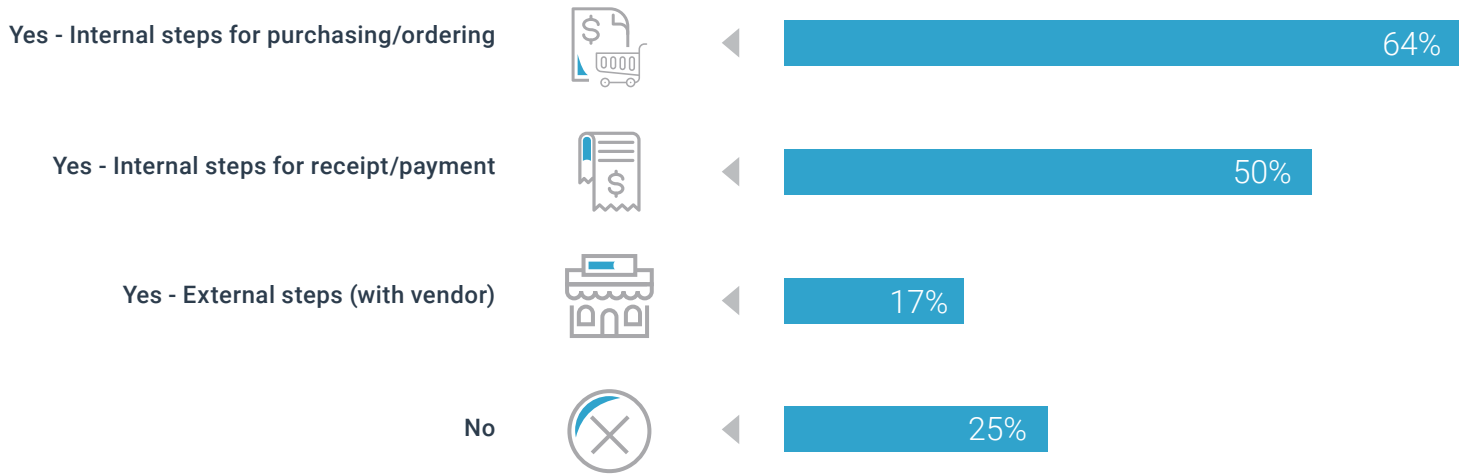
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Open Treasury — ELM and the Future of Treasury Technology

The TMS is far from the only solution type ELM overlaps. As seen above, these systems may include CCC automation, SCF functionality, aggregation, and more items that have traditionally been standalone offerings. Modern innovations, especially SaaS and the move to the cloud, have opened the door for open treasury, bringing increasing overlap and expansion coupled with decreasing clearcut distinctions in solution types.

This intersects treasury's growing need for seamless functionality that cuts further across liquidity factors. A growing number of treasury departments need FX data, SCF data, automatically aggregated bank data, company-wide payments data, and more all integrated into their dashboards in order to properly understand and manage organizational liquidity.

Many companies have been looking to gain "end-to-end" views of their processes, efficiency, and capital and liquidity. They are moving away from a pure silo mentality and looking more broadly — and now, this is growing into "end-to-end to end-to-end" or "end-to-end[2]," with companies recognizing a need to look at processes not only comprehensively across the organization, but even stretching out to counterparties. Whether an ELM system includes or integrates with, for example, an SCF solution, it is helping to achieve this broader end-to-end view.

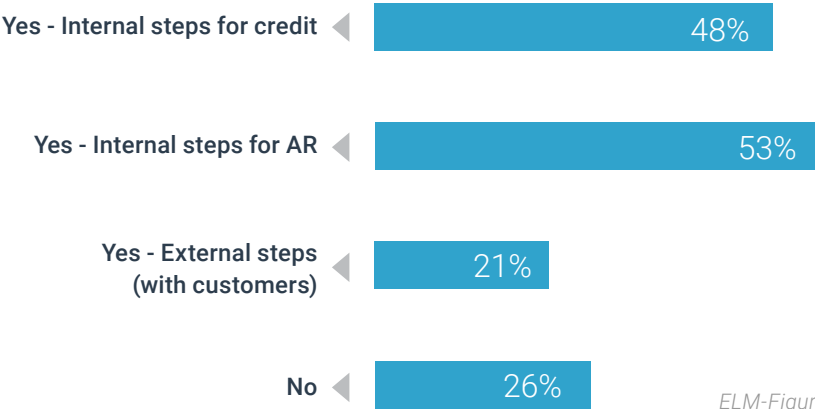Q. **Do you have an end-to-end view of your ACCOUNTS PAYABLE processes? (Select all that apply)**

Yes - Internal steps for purchasing/ordering	64%
Yes - Internal steps for receipt/payment	50%
Yes - External steps (with vendor)	17%
No	25%

ELM-Figure 2

The buyer's need for openness and comprehensive visibility and the vendor's expansion of functionality into adjacent and complementary spaces — blurring the lines between solutions — are occurring everywhere. Different vendors are pursuing different models, but all treasury technology vendors must find some way of pursuing open treasury in order to remain viable. They may harness microservices to achieve scalability and flexibility. They may lean heavily on API integrations and embedded functionality. Ultimately, any way a vendor finds to effectively offer comprehensive liquidity management counts as ELM.

Vendors are not the only ones who need to understand this shift, however. Treasury departments must be aware of where the technology stack is heading and how the tools they use are evolving. With ELM, this is something to watch more than something to be fully understood currently. While the shifts discussed above are happening everywhere, ELM is emerging from the midst of the shift itself. Treasurers should remain aware of how this solution type may grow and evolve, leveraging innovative technology to meet the growing challenges of today's treasury teams.

Q. **Do you have an end-to-end view of your ACCOUNTS RECEIVABLE processes? (Select all that apply)**

Yes - Internal steps for credit ◀ 48%

Yes - Internal steps for AR ◀ 53%

Yes - External steps (with customers) ◀ 21%

No ◀ 26%

ELM-Figure 3

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kyriba®

kyriba.com

Company Overview

Mission

Kyriba enables our customers to transform liquidity to build resilience, generate value and unlock growth.

Kyriba empowers forward-thinking finance teams to optimize treasury, risk management, payments and working capital automation and intelligence to maximize growth and protect against loss from fraud and financial risk, while improving productivity and business continuity through advanced automation.

With over 2,500 clients worldwide, including 20 percent of Fortune 500 companies, Kyriba delivers a secure and scalable Enterprise Liquidity platform to transform financial processes, unify data, and connect to one of the largest global networks of banks, ERPs, trading platforms and apps.

Kyriba is headquartered in San Diego, with offices in major locations around the world. For more information, visit *www.kyriba.com.*

» Kyriba's implementation process typically reduces ERP connectivity projects from months to weeks

» SAP and Oracle certified partner

» Pre-built connectors to 1,000 global banks

» Pre-developed format library for 50,000 payment scenarios

» Fully managed cloud platform with monthly updates

» Strong security and controls through ISO27001 and SOC2 certified platform

» Open API Platform and Developer Portal with real-time integration to external apps and internal platforms

Founded:
2000

Headquartered:
San Diego, CA

Founder/CEO:
Jean-Luc Robert

Ownership:
Privately Held

All content was produced by Kyriba and edited by Strategic Treasurer.

SOLUTIONS & SERVICES

Kyriba Enterprise Liquidity Management

» Treasury

» Risk Management

» Payments

» Working Capital

» Bank & ERP Connectivity

TOP STATISTICS

» **2,500+** Kyriba customers.

» **80,000+** users in **100+** countries.

» Kyriba clients connect to over **1,000 banks** and manage **1.2 million** bank accounts.

» **20 million** payments per month with a total annualized value of **$15 trillion**.

MARKET POSITION

» Kyriba has been named a market leader for treasury and risk management by technology analyst firms such as IDC and Aite Group.

» Kyriba has 900+ employees globally with 24/7 support operations in North America, Europe and Asia.

» Kyriba invests over 20% of revenues in organic product development to continually deliver new business and technology innovations, such as APIs and artificial intelligence.

NEWS & HAPPENINGS

The Open API Platform

APIs are transforming the way Treasury and IT access, deliver and process information for improved strategic decision-making, automated processing and financial results. The Kyriba Open API Platform radically unlocks greater value and innovation for enterprise CFOs, Treasurers, and CIOs.

Real-Time Treasury

The next generation of treasury is instant and operating in real-time. Supported by rapid bank connectors and an open API platform, treasury teams can initiate instant payments domestically and globally, support digital currencies, and access new developer apps for current payment compliance.

KYRIBA CLIENTS

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Product Overview

Enterprise Liquidity Management (ELM): Kyriba's Enterprise Liquidity Management platform offers Treasury, Risk Management, Payments and Working Capital applications, all connected in real-time with APIs.

Kyriba unifies real-time data and workflows, empowering CFOs with insight and analytics to make strategic liquidity decisions to protect against volatility and drive growth.

With Kyriba, finance leaders now have technology that delivers:
1. A comprehensive real-time view of cash and liquidity,
2. AI-powered data-driven decisioning with predictive analytics and
3. Seamless engagement through a fully integrated liquidity network of workflow and apps.

Treasury & Risk Management:

Cash Management. Complete cash visibility with flexible cash position dashboards and full reconciliation capabilities makes it easy to view prior-day and intraday postings.

Cash Forecasting. Kyriba offers extensive rules-based and artificial intelligence options for modeling and measuring the effectiveness of forecasts, so clients can extend the accuracy and horizon of their cash forecasting.

Bank Relationship Management. Bank account management (BAM), signatory tracking, FBAR reporting, and bank fee analysis provide improved control of bank accounts and more transparency into bank fees.

In-house Banking & Netting. Clients can manage notional and physical cash pools, intercompany positions, interest calculations and automate reporting. Multilateral netting calculates net

payables and receivables positions by participant, optimizing exposure management and in-house bank integration.

Financial Transactions. Fully track financial transactions for your investments, debt, currency and commodity instruments with complete integration to the payments, accounting and cash forecasting modules.

Accounting & Compliance. Journal entries can be generated for all cash and liquidity models. With automated ERP integration with the general ledger, Kyriba also delivers bank-to-book reconciliation for monthly matching of bank actuals with uploaded accounting balances.

Risk Management: Kyriba's financial risk management platform includes risk management capabilities across interest rate, foreign exchange, and commodities risk.

Foreign Exchange. Kyriba's integrated end-to-end FX Risk platform helps treasurers reduce vulnerability to currency headwinds by extracting and normalizing balance sheet and cash flow exposures, improving the effectiveness of hedging programs, reducing FX transaction costs and delivering hedge accounting automation.

Interest Rates. Kyriba manages investment, debt and hedging transactions to help reduce the vulnerability of balance sheets to rising interest rates through end-to-end position keeping, valuations, and hedge accounting.

Commodities. Kyriba's Commodities Risk Management solution gives finance organizations the ability to track, value and generate accounting entries for commodities exposures and transactions, alongside FX and interest rate positions already supported in the platform.

Payments: Kyriba maintains one of the world's largest bank connectivity networks, processing $15 trillion annually in treasury,

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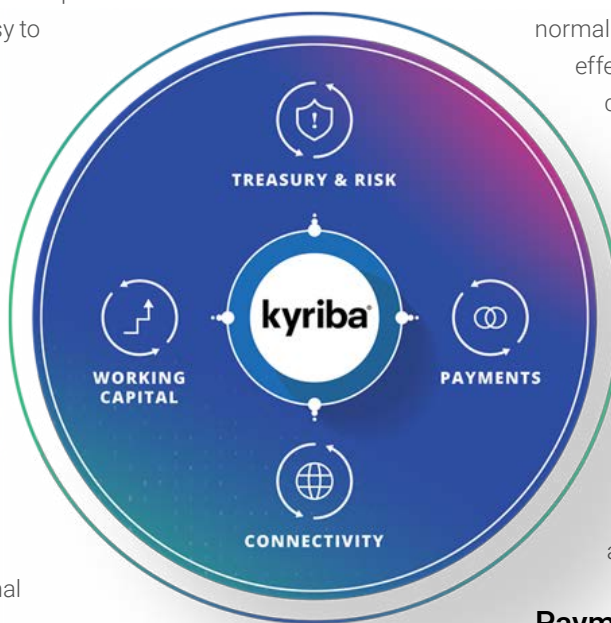
AP, claims and trade payments — improving automation, controls and governance while reducing the risk of payments fraud and cybercrime.

By centralizing payment controls and connectivity in a single platform, our clients often reduce payment processing time by 50% and operational efficiency by 60% or more. Built on APIs and enhanced with artificial intelligence, Kyriba modernizes your payments strategy.
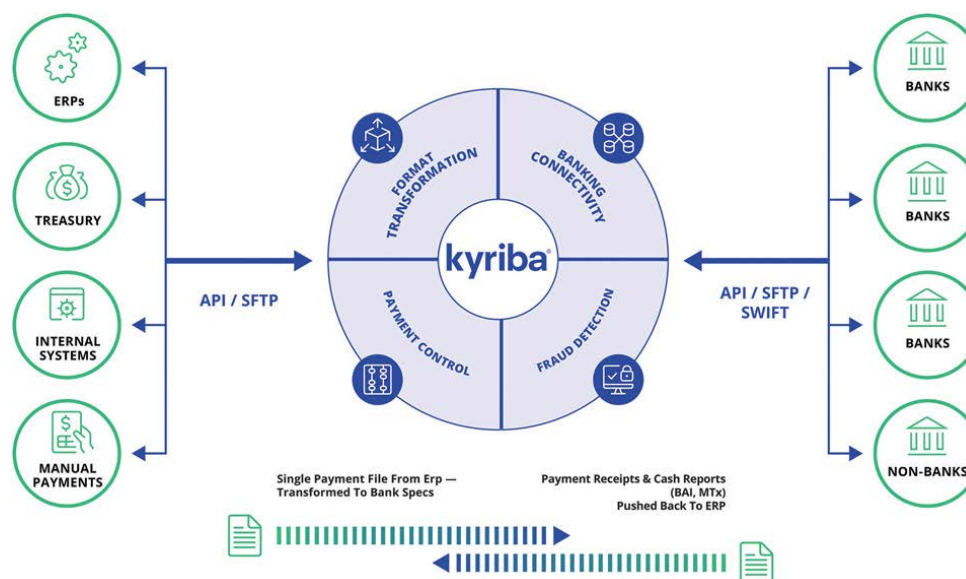

Working Capital: Optimize payables and receivables management to improve cash conversion and drive free cash flow.

Kyriba supports Supply Chain Finance, Reverse Factoring, Dynamic Discounting and Receivables Finance, giving CFOs and their teams program flexibility to inject liquidity into supply chains, optimize terms, and accelerate cash flow. As inflation remains high and interest rates rise, finance teams are turning to early payment and receivables programs to optimize liquidity.

Key features include:
- » **Payments Factory**
- » **Screening & Compliance –** including sanctions lists and bank account verification
- » **Fraud Detection –** real-time processing using rules-based automation and machine learning
- » **Real-Time Payments –** connecting to 50% of the world's B2B instant payment networks

Connectivity: Kyriba's Real-time API Cloud Connectivity network integrates banks, ERPs, trading portals, data services and special-purpose apps using pre-built connectors to improve business continuity and minimize IT time and cost.

Kyriba connects to over 1,000 banks, delivering one of the largest global banking networks for ERP-to-bank connectivity, omni-channel payments and real-time integration. APIs, machine learning, and artificial intelligence unify enterprise data for advanced decision making.

Key features include:
- » Pre-Built Bank Connectors
- » ERP-to-Bank Connectivity
- » Pre-Developed Bank Formats
- » API Network for Banks, ERP, and Apps

Key features include:
- » **Supply Chain Finance.** Provides suppliers with a complete reverse factoring solution to extend DPO with full integration between the buyer, the supplier and the financing partner. Kyriba's supply chain finance platform is ideal for organizations looking for term extensions on their payables to improve cash flow performance.
- » **Dynamic Discounting.** Dynamic discounting programs are best suited for organizations that have excess cash and liquidity, and are looking for an alternative to low-yield, short-term investments to earn risk-free returns on cash. With Kyriba, buyers can structure early payment programs in return for dynamically calculated discounts.
- » **Receivables Finance.** Kyriba's Receivables Finance accelerates payment on your receivables to get cash into the business quickly, where needed, giving CFOs a new tool to optimize working capital and strengthen balance sheets.
- » **Hybrid Programs.** Kyriba can simultaneously support balance sheet (Dynamic Discounting) and third-party funding (Supply Chain Finance) options to give FOs flexibility to meet their changing working capital targets.

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Works Cited

⟩ Overview

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» Figure 3, Page 5: *2021 Strategic Treasurer & TD Bank - Treasury Perspectives Survey.*

» Figure 4, Page 6: *2021 Strategic Treasurer & GTreasury - Cash Forecasting & Visibility Survey.*

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» SCF/CCC-Figure 1, Page 39: *2022 Strategic Treasurer & Deluxe - Modernizing AP/AR Processing Survey.*

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» ELM-Figure 1, Page 51: *2021 Strategic Treasurer & GTreasury - Treasury Technology Survey.*

» ELM-Figure 2, Page 56: *2022 Strategic Treasurer & Deluxe - Modernizing AP/AR Processing Survey.*

» ELM-Figure 3, Page 57: *2022 Strategic Treasurer & Deluxe - Modernizing AP/AR Processing Survey.*

Strategic Treasurer Market Research

As part of our ongoing market research, Strategic Treasurer conducts 12+ industry surveys every year on a variety of topics ranging from cash management and payments to fraud and compliance. These surveys are collectively completed by several thousand corporate, banking, non-profit, government, and higher education respondents annually. Below is a sampling of our current research initiatives.
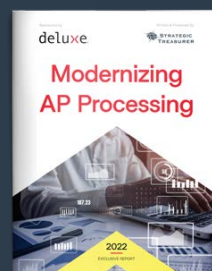
B2B Payments

Treasury Fraud and Controls

Treasury Perspectives

Modernizing AP / AR Processing

Virtual Card Solutions

CORPORATE BANKING
Probes the perspectives and plans of bankers, with questions ranging from essential lines of business to expected growth, innovation challenges, fintech partnerships, and plans to build, buy, and use technology.

LIQUIDITY RISK
Analyzes organizations' short-term investment and risk management strategies to uncover trends related to how firms are optimizing their liquid assets and identifying and mitigating associated risks.

CASH FORECASTING & VISIBILITY
Studies the operational and technological components deployed by organizations for maintaining visibility to cash positions and forecasting cash flows.

TREASURY COMPLIANCE
Captures the macro and micro elements of the compliance landscape that are impacting treasury, identifies how new regulatory developments are being accounted for, and gains insight into the various technologies and strategies leveraged by organizations for managing compliance on an ongoing basis.

SUPPLY CHAIN FINANCE
Evaluates the use of SCF technology within the corporate environment, as well as the strategies and technologies put in place by firms to manage vendor relationships, streamline cash conversion cycles, and optimize working capital.

GLOBAL PAYMENTS
Studies the various payment technologies, tools, and services used by organizations for facilitating global payments activity and analyzes the key areas of complexity currently impacting the payments landscape.

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