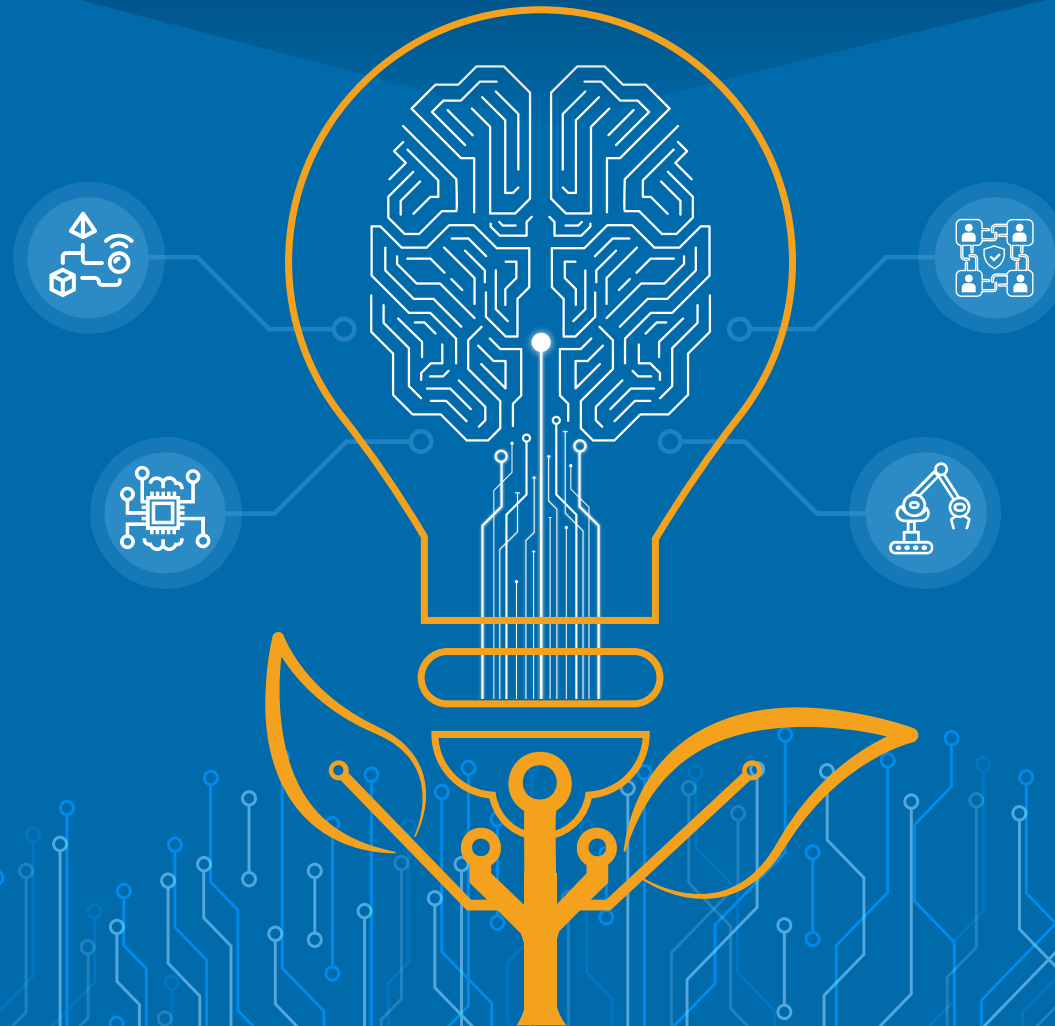
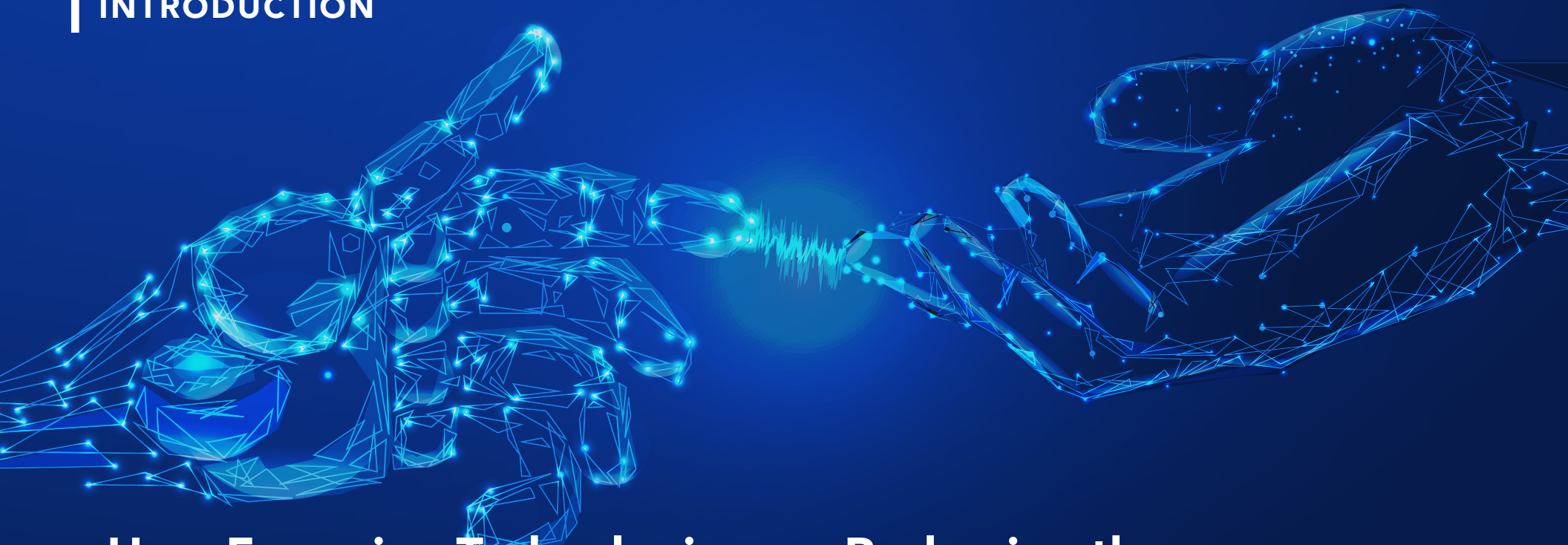


# EMERGING TECHNOLOGIES eGUIDE



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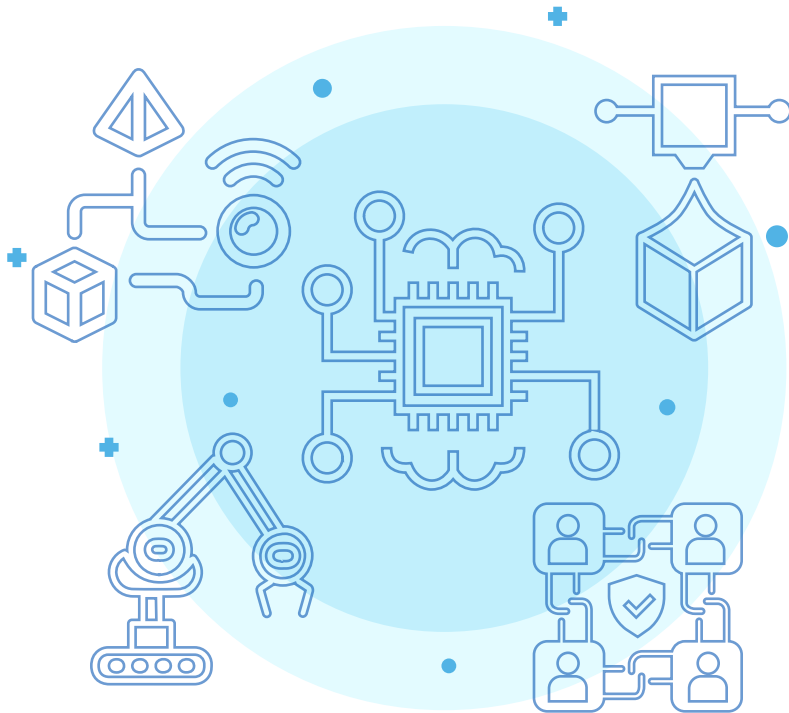
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# How Emerging Technologies are Reshaping the Procurement Function

Profound technology innovations are redefining the boundaries and expectations for procurement. We see it every day in the growing use of digital technologies to generate revenue, improve partnerships, and replace/evolve processes. Now, more than ever, purchasing and procurement are essential to helping companies refine their competitive edge and to thrive in this new digital age. By seizing the moment and leveraging the potential of digitalization, procurement stakeholders will exert a larger influence on corporate decision-makers and their investment plans.

## INTRODUCTION



The sheer volume of data being gathered, stored, analyzed and connected is changing the way that business decisions are made. Emerging technologies like **Artificial Intelligence (AI)**, **Robotic Process Automation**, **Blockchain**, **Internet of Things (IoT)**, and **3D Printing**, have the potential to act as powerful enablers in the hands of purchasing and procurement teams. As a result of these new technologies, suppliers, purchasers and end users will need to reinvent the way they work and interact. In this new technological age, those who learn to master the nuances of the new relationship between data, analysis, cost savings and profitability will be the winners. Success in this data-driven environment will require a new level of understanding of both the market forces and the skills that are necessary for procurement professionals to be successful.

Within procurement departments, process efficiency and timely decision-making are key influencers of revenue generation and cost containment. Some of these emerging technologies, whether they be deployed on-site or in the cloud, are beginning to reach the stage of practical application (as opposed to just theory).

## INTRODUCTION

A recent study performed by The Hackett Group, a strategic consulting and benchmarking firm, gathered research data from more than 180 large-company executives in the US and abroad, whose companies' annual revenues averaged \$1 billion or greater. Their findings determined that, although these procurement executives recognize the potential business benefits of digital transformation, few are confident they have the necessary strategy, talent and competencies in place to exploit those benefits.

Thus, a gap appears to exist between procurement's transformation agenda and enterprise-level digital transformation capabilities.

**The research showed that nearly 90% of all procurement organizations believe that digital transformation will fundamentally change the way they deliver services over the next three to five years. The use of cloud-based applications, advanced analytics, robotic process automation (RPA), mobile computing and big data are also expected to grow dramatically, the study found. Yet only 32% of procurement organizations currently have a formal digital strategy and only 25% have the resources and/or competencies in place today needed to execute on the digital vision.**

## INTRODUCTION

A mix of new technology enablement and a general uncertainty could help early adopters to gain competitive advantage. If their digitalization projects are properly executed, they can take the leap forward while their competition remains stagnant. The pot of gold at the end of the rainbow, as it pertains to procurement process digitalization, is improvement in business agility. The early-adopter procurement organizations have already unearthed significant opportunities for cost savings and efficiency gains, and many are now focusing on improving the experience of their stakeholders as a way to create additional value.

All organizations, whether large or small, will need to embrace new strategies for remaining relevant in the marketplace. A lack of confidence in the organization's ability to execute digital transformation presents a challenge, but it should not close the door to new marketplace opportunities that will present themselves.

By addressing processes, one at a time, and by remaining educated in how digitized solutions can improve business performance, procurement can transform as a function and strengthen its role as enterprise transformation enabler and advisor.

**This e-guide reviews how some of these disruptive changes, driven by five emerging technology trends, Artificial Intelligence (AI), Robotic Process Automation, Blockchain, Internet of Things (IoT), and 3D Printing will impact the future of supply chain and procurement.**



### **What the transition to procurement digitalization will look like**

Not all of the emerging technologies discussed in this e-guide will have immediate impact on how procurement influences the growth of the business. Some of these technologies are immature and could take a decade or more to fully develop. However, it is important for procurement professionals to consider their current technology base to judge how well they are positioned for digitalization in the near term and how they can utilize these trends in the future for a competitive advantage.

One certainty is that “big data”, the foundation for the transition to these emerging technologies, already has a firm foothold in many organizations. Data warehouses, whether they be centralized or distributed, the true potential to accelerate corporate growth, a significant part of which can be driven by digitized procurement practices. Modern, unified Source-to-Pay (S2P) platforms are also a perfect launching point for reaping the benefits that these new technologies have to offer. Why? A unified S2P platform enables linkages between sourcing and contract, contract and catalog, catalog and ordering, ordering and invoice. Automation is already built in at source and data is both created and collected across the various steps of the procurement process. This data engine can be leveraged by the new emerging technologies to accelerate efficiencies and thereby increase procurement’s value to the business.

## ARTIFICIAL INTELLIGENCE (AI): MORE ACCURATE DECISION-MAKING

The “Artificial Intelligence” (AI) term was first coined in 1957 and, at the time, scientists felt that its real influence would be felt within the next 20 years. That prediction was somewhat aggressive as the emergence of true AI may still be 10 years away. However, there are capabilities today that hint towards artificial intelligence. If you talk into a box of electronics in your home and say “Alexa, order me a pizza”, and a pizza arrives, that looks like artificial intelligence. It’s a statistical algorithm, but why does the hungry home occupant care? If the right pizza arrives, the “robot” within the unit has accomplished the requested task.



## ARTIFICIAL INTELLIGENCE (AI): MORE ACCURATE DECISION-MAKING

**The volume of AI-like machine learning activity has picked up significantly across key industries over the last 2-3 years, particularly in B-to-B procurement operations. AI combines a set of defined rules, intelligence and information. For example, when requisitions are coming from different sources, artificial intelligence can flag some as a procurement risk or as an opportunity for savings. These tools analyze the data on a continuous basis and come up with recommended decisions or actions based on the data.**

If a procurement manager is planning which commodities to source for the upcoming quarter, he wants to identify his biggest opportunity for savings. In the case of AI, a machine would answer that question (perhaps with a spoken human voice), by offering an “informed” decision based on data. The AI algorithm trawls through all of the spend data, looking for patterns of disconnected purchasing, patterns of price variance, and also market intelligence to see how

a particular commodity is changing over time, also factoring in successful sourcing data from other parts of the world.

AI will be applicable to procurement when tracking down various independent information sources and organizing them together to come up with an action is required. Procurement professionals have, until recently, been dependent on data that is a year, a quarter, or, in a best-case scenario, a month old. With the help of AI, data can be analyzed in real time. This can augment savings when acquiring particular commodities by informing procurement managers what they should be paying today and in the very near future for commodities by factoring in projections of marginal demand. The end result is both tighter control and better compliance within specific commodity categories.

## ARTIFICIAL INTELLIGENCE (AI): MORE ACCURATE DECISION-MAKING

The more an AI algorithm is asked to process, the more it learns and the more accurate it becomes because of the way the algorithms are organized. Ordering a pizza is an example of a big data application. Machine learning allows for recognition of what is being asked for and translates that into what needs to be delivered.

When the “human” AI voice tells procurement “this is a sourcing opportunity, you will save 15 million if you do it”, the procurement manager can make the decision to do just that, right then, without any checking, without any validation, without any due process. But...what if that decision is wrong? What assures that the data being accessed by the AI engine is correct and that the patterns being analyzed represent the truth?

When human beings spend weeks working through spreadsheets trying to get to the “optimum sourcing” answer, there is a degree of built-in error correction in that process.

The procurement team can conclude “this data is a mess, we have to do a cleanup before we can get to an answer.” AI is getting there, but a very large piece of foundational work that needs to be performed first before the cognitive systems are allowed free reign to tell us what to do. If the proper preparation is executed and the proper framework is established, AI decisions can be made to be more precise and instead of being correct some of the time, it can be right a lot of the time.

Such capabilities are currently under development and, as the industry moves in the AI direction, investment in big data collection and analysis will need to grow. If not, users will not have confidence in the validity of machine-driven decisions and regress to traditional approaches for weighing all the variables.

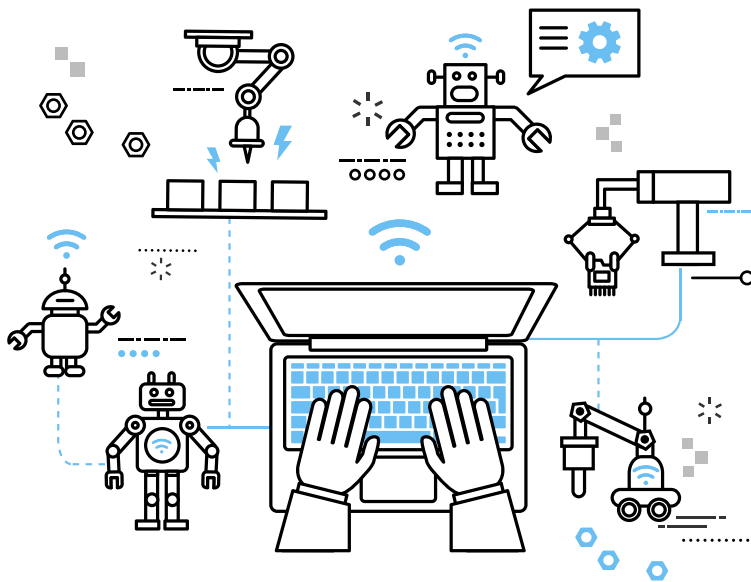
## ROBOTIC PROCESS AUTOMATION (RPA): A SIMPLIFIER OF REPETITIVE TASKS

The purpose of Robotic Process Automation (RPA) is to integrate or automate the execution of repetitive, rule-based tasks or activities, and to emulate tasks executed by human operators. In some cases, RPA can mirror human behavior and perform simple to moderately complex tasks.

## ROBOTIC PROCESS AUTOMATION (RPA): A SIMPLIFIER OF REPETITIVE TASKS

RPA is related to AI in that it can involve the use of artificial intelligence and machine learning capabilities in software to automate tasks that are highly predictable and don't require human insight or creative thinking.

Tasks that apply themselves well to RPA include activities requiring integration of multiple screens (the technology looks at the screens of different tools, extracts relevant information from them and then takes an action), as well as self-service inquiry applications.



RPA also offers significant cost and efficiency benefits when automating transactional procure-to-pay (P2P) processes and when executing simple bidding transactions by leveraging systemic controls and well-defined business rules. According to an Everest research study, RPA can reduce cost by 35% to 65% for onshore delivery operations and 10% to 30% for offshore delivery operations.

Organizations that deploy labor on a large scale for general knowledge process work, where people are performing high-volume, highly transactional process functions, can boost their capabilities and save money and time with robotic process automation software. In procurement environments, however, RPA will most likely not reduce the active human workforce but will instead free up human resources to focus more on strategic value delivery rather than on repetitive process execution.

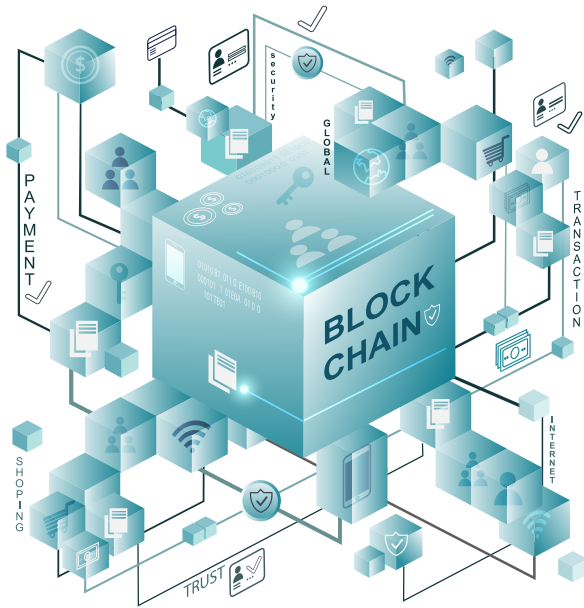


## BLOCKCHAIN: THE HOLY GRAIL OF SECURE TRANSACTIONS

A blockchain is an automated distributed public ledger that records transactions from multiple sources in a highly secure, trusted environment. Networks of computers use cryptography to allow each participant on the network to update the ledger in a secure manner, without a central authority – virtually eliminating the possibility of hacking. Blockchain technology can help reduce the time and costs associated with lengthy back and forth business processes and facilitate the tagging of items in the supply chain without revealing sensitive data. A potential blockchain application would be the creation of “smart” contracts that help to eliminate piracy (in the music and movie industries, for example).



## BLOCKCHAIN: THE HOLY GRAIL OF SECURE TRANSACTIONS



As blockchain enters into the mainstream, a new breed of suppliers will emerge providing solutions based on this technology. For instance, some small start-up companies are providing solutions that track the authenticity of goods along the value chain, thereby increasing transparency across the process. This concept can address some of procurement's key challenges such as tracking, sustainability, and the assurance of an ethical supply chain.

Blockchains are the technology behind the digital currency known as Bitcoin. It has the potential to improve trust and visibility along the supply chain with respect to flow of goods and money. Blockchain records all transactions, including impressions, clicks and audience segments that occur throughout the entire supply chain (for example, a full copy of Bitcoin's block chain contains every transaction ever executed in the currency). This tracking information is stored in the form of secure "blocks" via cryptography. The data recorded in the form of a blockchain can be used by various stakeholders, including manufacturers, suppliers, distributors, vendors, and corporate procurement personnel to audit every step of the entire supply chain.

A correlation exists between typical procurement functions and the encrypted distributed ledger concept that blockchain is built on. To this point, however, no procurement-specific application has yet to be built although a search is on for how to marry procurement to the blockchain concept.

## BLOCKCHAIN: THE HOLY GRAIL OF SECURE TRANSACTIONS

A benefit of the blockchain is that once an order is entered it cannot be altered. Specific goods, like cases of tomatoes, can be tracked from their origin on a farm, for example, to the vegetable aisle in a particular grocery store. The location of the items can be pinpointed in a matter of seconds rather than having to work through several stages and sources to track it down.

Blockchain ledgers may evolve to form the infrastructure for transactions of many types in the future. Under such a scenario, the infrastructure may become completely invisible to the user (much in the same way that public key infrastructures provide internet encryption and digital signature services today).

The idea that a procurement manager anywhere in the world can speak to a device and say, “OK, I wish to purchase this commodity from this supplier, make it happen,” is still a dream of the future, however. In order to enable such capabilities, what first needs to develop is a highly secure, immutable, error-free process that relies on the flow of the right information to the appropriate audience of supply chain participants. A blockchain architecture could be the answer.

## INTERNET OF THINGS: THE CONNECTIVITY AGENT

The Internet of Things (IoT) enables everyday devices that are now web-connected to communicate basic information such as location, state of being (e.g., hot, cold), age and other functional variables. These formerly “dumb” and now connected devices communicate back to data consolidation engines and that data is then analyzed to determine patterns, behaviors and conditions (which, in some cases allow for the analysts of that data to make accurate predictions). IoT represents a network of physical objects that contain embedded technology enabling communication of their internal states and nearby external environments.



## INTERNET OF THINGS: THE CONNECTIVITY AGENT

In a building, for example, sensors placed within the various components that make up the building's electrical and lighting system can accurately measure the energy consumption of each device. That means that the effectiveness of energy conservation initiatives can be measured and that analysts can determine whether the tactics used to conserve the energy have been successful. Such connectivity also helps to identify which elements within the electrical distribution system are the least efficient and may need to be upgraded.

More universally recognized manifestations of IoT include wearable devices (like Fitbits), voice activation, smart tags (similar to bar codes, or QR codes), smart-connected homes, self-driving cars, smart lights, and an entire host of everyday objects that are now "connected".

IoT is another technology trend that will change how procurement workers will accomplish their everyday tasks (such as the way orders are placed in the information cycle) and will likely support blockchain (the smart devices will be interfacing with systems all up and down the supply chain).

In an IoT world, very inexpensive devices will allow for the tracking of commodities as they move across the supply chain. The smart devices are the feeders of the data that gets gathered as a product moves through the various stages of its development, purchase and delivery cycle.





## **INTERNET OF THINGS: THE CONNECTIVITY AGENT**

Asset management is also a hot area for IoT. Devices report back on their condition in real-time and steps like reactive maintenance (fixing a piece of equipment only once it fails, which is costly) and preventive maintenance (fixing equipment based on pre-established calendar dates, regardless of whether the equipment really needs fixing, which is inefficient) can be reduced or avoided. Instead, IoT enables predictive maintenance (fixing equipment just at the right time, before it breaks down), which dramatically changes the relationship with the supplier and within the supply chain.

Strategic sourcing teams will need to develop an IoT sourcing strategy for supplier innovation that helps calibrate their respective organizations for improved agility, transformation and outcome-based approaches.



**3D PRINTING:** NEAR LIGHT-SPEED COMPONENT DELIVERY TODAY.  
THE END OF SUPPLY CHAIN TOMORROW?

3D printing, also known as additive manufacturing, is a technology whereby a physical object is created from a three-dimensional digital model. The printer interprets the instructions from a design file and then lays down many thin layers of a material in succession until the object itself is built.

## **3D PRINTING: NEAR LIGHT-SPEED COMPONENT DELIVERY TODAY. THE END OF SUPPLY CHAIN TOMORROW?**

**Several varieties of 3D printing exist that have different applications. For instance, some 3D printers build objects out of chocolate; others build a laptop computer, while still others use human tissue cells to build organs. In 3D printing, the raw materials (such as plastics or metal droplets that feed the printer), along with the design (which is an electronic file of a configuration) are the key process drivers. 3D printing presents a potential for significant systemic disruption of the entire traditional procurement model.**

Consider an aerospace example of 3D printers being used to generate jet engine parts. A large 3D printer fires nanoscopic metal spheres onto a substrate. The impact of the spheres as they land on the substrate makes them melt and fuse very briefly into single whole and, with very precise controls they can build up hugely complex machine parts. Any metallic alloy can be used. Such a concept obliterates the traditional idea of 3D printing being only suitable for short lifetime temporary parts.

The significance is not only the ability to call up parts on demand, but to also call up unique parts on demand. In aircraft engine manufacture, for example, a part may only be used once per engine and thus cost millions of dollars as there are no economies of scale available from the mass-production of those parts. If those parts can be printed, to the same quality standards and tolerances as the original part, then the cost per part can be as little as the cost of the raw material.

In traditional procurement environments, buyers depend on suppliers to acquire the goods. In a 3D printing world, the buyer can go to the Internet to secure a design that will print out the needed component(s). Within a short period of time, the device can be in the buyer's hands. What specific products will lend themselves to these 3D printer environments will need to be seen. However, the fact that 3D printing technology will have a significant impact both on cost and business strategy is indisputable.

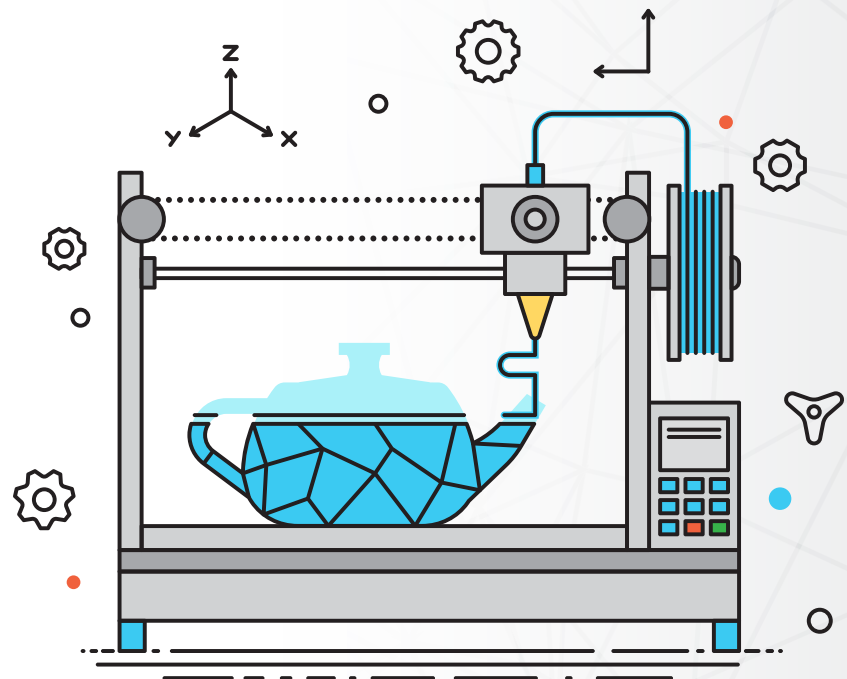
## 3D PRINTING: NEAR LIGHT-SPEED COMPONENT DELIVERY TODAY. THE END OF SUPPLY CHAIN TOMORROW?

3D printing could serve as a catalyst that launches a second industrial revolution where the supply chain is no longer about finished goods or components, but more about raw materials and intellectual property. The raw materials in question will most likely also include new materials developed by industries that are specifically intended for use as additive manufacturing bases. Thus, the development and distribution of alloys, polymers, flexible conductors and other materials will represent a significant area of new growth for some businesses. The “commodity” bought by procurement in the future might only consist of the designs for the items that are requested or needed, or more likely, a limited license to print a certain quantity of those parts.

Some pioneers are applying 3D printing concept to maintenance, repair and operations (MRO) components.

These “widget on demand” systems allow for commodities such as bolts, screws and washers to be built (“printed”) on site instead of having to secure them from a distant warehouse.

The science of 3D printing is not the limiting factor to broad distribution and acceptance. Instead, the challenge in making it all happen depends more upon the proper engineering and systems integration.



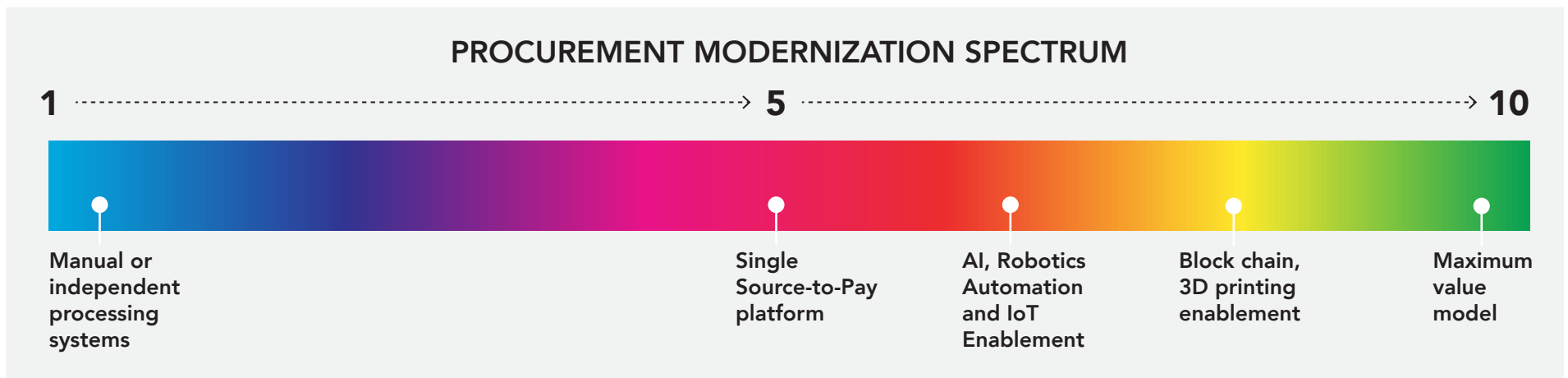
## **3D PRINTING:** NEAR LIGHT-SPEED COMPONENT DELIVERY TODAY. THE END OF SUPPLY CHAIN TOMORROW?

A 3D printing environment implies decreased levels of material waste and inventory. This is exemplified by a 3D printer, which utilizes only the necessary steel dust to fabricate a metal component as opposed to carving down an entire steel billet. Suddenly processes in which a large portion of the purchased material ended up as waste are now 100% waste-free. As material requirements continue to evolve, procurement will face new challenges in the quest to identify and develop capable suppliers.

In some instances, the reduction in lead times and transportation costs will create a compelling case for corporations to move down the supply chain. A detailed cost-benefit analysis of items that could be produced internally will need to take into account factors such as the proprietary nature of certain designs and unique supply chain circumstances such as geography, regulations and cost of material.

## ASSESSMENT: HOW WELL IS YOUR ORGANIZATION POSITIONED?

Given the existence of these emerging technologies, what actions should procurement professionals take to modernize their operations? First, procurement stakeholders need to determine where they are on the procurement modernization spectrum (see figure below).



The procurement modernization spectrum is quite wide, and the cost/benefit scenarios are different. The figure above depicts the various stages of progress with "1" representing the most basic, manual approach and step "10" representing a procurement model that leverages all of the emerging technologies discussed in this e-guide. Reaching "10" could take five to 15 years depending on how fast the emerging technologies achieve global acceptance.



## ASSESSMENT: HOW WELL IS YOUR ORGANIZATION POSITIONED?

Today, organizations that have deployed the most advanced procurement tools available (such as unified Source-to-Pay platforms) find themselves at a “5” on the spectrum. These are organizations equipped with the capabilities of master supply, and master taxonomy across the platform with linked requisition and invoicing. Many global Fortune 2000 companies are currently migrating to a single S2P platform. Some of the more advanced S2P platforms are now integrating some AI and IoT capabilities (which would place procurement somewhere between 6.5 and 7 on the modernization spectrum scale). No solution today yet incorporates blockchain and 3D printing as part of the integration.

Companies with a strong technology base (those further along the procurement modernization spectrum) won’t need high levels of investment to leverage the emerging technologies. Vendors can help companies to achieve their goal of accruing new technology benefits. This means they won’t have to build the technology themselves, as most of what they need can be obtained via the cloud.

Vendors should be looking to help procurement teams lay out a 5 to 10-year strategy, one where cloud / IoT and AI come first, with less evolved technologies (like blockchain and 3D printing) getting implemented later. A key critical success factor is implementation of a platform where more “big data” can be collected and available for analysis.

When evolving these key S2P platforms, simplicity of use becomes a key driver. As Baby Boomers retire and Millennials replace them it is essential that the day to day procurement tasks can be managed from a simple browser or app on a mobile device. These new employees who will be in full deployment of AI, RPA, IoT, blockchain and 3D printing will look for a single point to access key resources and key data. The new generation of workers coming in will demand this. They have been brought up on the simplicity of Apple, and this ease of use is what end users will demand of their procurement information systems.

## STEPS FOR MAINTAINING COMPETITIVENESS

### Short Term Adjustments

Before achieving the new emerging technology benefits, procurement teams first need access to more data and their organizations need to invest in the capture, centralization and analysis of that data. Their first step is to make sure that existing data in various places is secure, normalized and accurate. Extracting benefits from existing and expanding data warehouses is a multi-stage process. Accessing data for the purpose of applying it to machine learning is an important first step. A second step would be to bring in vendors that have already created artificial intelligence algorithms. Those algorithms can then be refined once the basic insight to the data is shared. Then key use cases would need to be identified and then piloted.

The data acts as a teacher that feeds the AI. Major procurement vendors are in a strong position to act as trainers because they work across many customers who perform similar functions and can provide many more data points.

The entire process is similar to how an infant learns from its surrounding environment. A baby with many more points of stimulation will learn more than a baby who is exposed to very little. The familiar and the unusual is easier to detect for the baby with lots of stimulation over time. Vendors that work with millions of transactions are able to gather data points on a continual basis. The infusion of data provides an increasingly accurate picture of which decision is likely to be right and which is wrong.

The emergence of these new technologies also changes the way stakeholders and influences think about data security. At first, the notion of how data is being shared across companies may make the individual contributors of that data uncomfortable. But that data is not shared in a traditional sense (e.g., “here’s a file with all of my supplier names on it”). Instead, the “big data” is used to feed machine learning which, in turn, improves the AI software’s ability to recognize patterns.

## STEPS FOR MAINTAINING COMPETITIVENESS

Therefore, if we harken back to the idea of a voice-activated Alexa device ordering us a pizza, Alexa knows what “order me a pizza” means because of everyone else’s data in aggregate. However, no one else knows what particular pizza you as an individual ordered (except for the person on the other end who fulfills your Alexa order).

### Long Term Vision

To some, the multitude of new technologies presented in this e-guide may appear overwhelming and may also raise the question of whether procurement has a strategic place in this new digital world. Although transformations will have to occur (such as transitioning from repetitive procurement tasks to decision-support tasks where knowledge workers and data analysis skills are emphasized), it will be important for procurement and suppliers to interpret how these technologies can drive more value to the core business and supply chain. Regardless of how

many new technologies are introduced into the process, nothing will eclipse the importance of procurement experts equipped with the skills (and data) to negotiate and cost-effectively spend funds in order to grow corporate revenues. Supplier Relationship Management is the key not only to procurement employment sustainability, but also to leveraging many of these emerging technologies. Arguably, the ability to manage supplier personal relationships should never be left to an algorithm.

Ultimately, the rate of adoption of these emerging technologies will be driven by the procurement system users. They interface on a continual basis with both their internal and external digital domains. As the new generations of workers enter all industries, their “iPhone” expectation of business software is not just a passing fad. Simplicity is the real driver for the acceptability of procurement systems for organizations. The usage of that software is what will drive the business results.



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