Autonomous Procurement:

The technologies that are driving progress

JAGGAER

01 |

02 |

03 |

01 |

Autonomous Procurement:
A User's Perspective

—

Artificial intelligence and other associated technologies are revolutionizing every aspect of our lives. With more and more smart technology working its way into our homes, recreation and travel, we need to ask, "What about my work?" and specifically, "What's happening in procurement?"

This white paper explores the technologies involved and the consequences and opportunities of technological advances that change **the way humans and technology collaborate.** We will also highlight how this can boost performance and unlock new capabilities for companies, raising the profile of procurement as a function that adds value rather than just reducing costs. In the world of procurement, the application of these latest technologies has a name: **autonomous procurement.** But this is an evolution. We are a long way from fully autonomous procurement; in this document we also consider the limits: there are areas of activity where human beings – i.e. procurement professionals – will always be better than software and machines.

In a subsequent white paper we will explore the theme of collaboration between humans and machines made possible by embedding intelligence across the procurement value chain. Progress towards autonomous procurement is already taking place in many organizations. Therefore, a further vital question that we will address is, what should you be doing now to benefit from what autonomous procurement has to offer?

Let's start with a definition. What is autonomous procurement? In answering that question, we could describe the various technologies that make autonomous procurement possible and how they work; technologies such as machine learning and natural language processing. But we'll refer to these technologies later; first, it makes more sense to **define the term from the perspective of users and what it does for them.** We are often told, "I understand that digital transformation is coming, but what's in it for me?" In fact, there are huge potential benefits for procurement professionals. A more useful way to define the term in this respect is as follows:

Autonomous procurement relieves procurement professionals of the burden of monotonous and routine tasks through enhanced collaboration between humans and machines, enabling professionals to focus on the strategic relationships and activities that are fundamental to procurement and require human creativity and empathy.

02

A Step beyond Automation

To what extent is this digital transformation already happening? In today's procurement environment, many organizations are already automating or semi-automating certain tasks using assistive intelligence, which is usually a combination of rules-based processing and low-level robotic process automation (RPA, see below). But even in the most advanced sectors, such as automotive manufacturing, companies are moving forward at a pace that makes business sense, but no faster. In its 2019 study, The Future of the Automotive Value Chain: Driving the Future of Procurement, Deloitte characterized this as "business as usual with incremental improvements" stating that an "important priority for the entire procurement organization is to digitalize and automate procurement processes and tools as far as technologically possible".

More than two-thirds of management tasks will be automated

Gartner predicts:

- 69% of what a manager currently does will be automated by 2024, requiring a complete overhaul of the role of the manager
- Through 2023, computational resources used in AI will increase 5x from 2018, making AI the top category of workloads driving infrastructure decisions
- By 2025, 47% of learning and development budgets will be wasted as AI eliminates 67% of on-the-job, task-based learning opportunities
- By 2023, all personnel hired for AI development and training work will have to demonstrate expertise in responsible development of AI

"Rules based" generally means programming a system to take certain actions if certain criteria are met or thresholds reached. Basically, "if this, do that." Here are a few examples of how such rules-based logic could be used in procurement:

If spend with the supplier is under a certain threshold, then block supplier. If the quality of a supplier (ppm or on-time delivery performance) is under a certain threshold, then launch audit / corrective action plan / increase share of business allocated to other sources, etc.

If the deadline or expiration date of RFQ / contract has passed then trigger specific events (reminders, extensions, etc.) If some part of the spend has been left untouched for too long (e.g. no RFQ or negotiation in the last XXX years) then create an alert.

Alerts and recommendation for actions linked to raw material price trends Invoicing is one area that is ripe for such automation, for example by setting up the system to approve an invoice under $5,000 automatically when there is a PO match and the amounts match within 1% tolerance. So far, this is relatively easy: it is a rules-driven robotic process automation application.

The ability to identify that the last three invoices within 5% tolerance were approved and suggest that the tolerance be increased is a further step forward: it is assistive intelligence and true automation – the system itself helps you automate such processes, which normally would require human intelligence and judgment, as opposed to simply digitalizing them. However, this is still fairly low-level stuff; and we are still not at the stage of cognitive procurement, which enables the machine to learn from large volumes of data in such a way that it drives continuous improvement.

Procurement is by its very nature a data-rich activity and the generation of "big data" has major implications for anyone working in procurement. As an innovation engineer at IBM puts it:

Now with exponential technologies and data proliferation, the next iteration is upon us: cognitive procurement. This new environment transcends the mere automation of existing capabilities. Instead, cognitive procurement reinvents end-to-end workflows to fully realize the potential of humans and machines working together to complement each other ... procurement professionals have a leading role in building strategic relationships and innovating across the value chain. New platform capabilities and cognitive technologies provide real-time insights, competitor analysis, scenario planning and market information. The cognitive function will generate instant demand-sensing data and self-learning capability to drive continuous improvement. A high degree of segmentation will allow for automated tail spend operations managed by informed strategic category specialists.

— *Anders Quitzau, IBM Watson - May 2019*

Big data is a necessary but insufficient condition for progress. There must also be integration:

Digital supply networks are evolving, connecting all parts of the supply chain, and insight-driven organizations are applying advanced analytical capabilities to enhance performance. Digital transformation is inevitable and high performing organizations are leading the way on adoption.

— *Deloitte*

Organizations that can harness data across integrated processes and become world-class procurement organizations will reap huge benefits:

The Hackett Group
World Class Defined and Enabled

World-class procurement organizations remain highly focused on achieving optimal performance. The Hackett Group's 2018 analysis of its procurement benchmarking database quantified the performance advantage of these organizations, which include 21% lower labor costs and 29% fewer full-time equivalent staff than more typical organizations (i.e., the peer group). Technology has always played an important role in enabling world-class performance, but procurement is now at an inflection point: World-class organizations can continue to reduce costs by embracing digital technology, while the peer group can leverage the same technology to catch up faster at less cost.

— *Hackett Group 2018 Benchmarking Study*

03 |

What are the Technologies behind Autonomous Procurement?

Let us now review the technologies that are being applied to leverage data integration to transform procurement. There are a number of them, they are often used in conjunction with one another, and as they converge and develop further, we will move closer to autonomous procurement. These include but are not limited to, the following:

Machine Learning

Machine learning is the application of algorithms and statistical models to perform a specific task without using explicit instructions, relying on patterns and inference instead. Machine learning algorithms build a mathematical model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to perform the task. Machine learning algorithms are used in a wide variety of applications, such as email filtering and computer vision, where it is difficult or infeasible to develop a conventional algorithm for effectively performing the task.

Unreliable spend data remains the greatest challenge for many procurement organizations.

No matter how much time is spent cleaning up and classifying long-tail spend, the complexity of millions of line items of spend goes beyond the time and resources of even the most talented Procurement teams.

Machine learning spend classification is already advancing long tail spend management. Machines are better at handling dull and repetitive tasks and can achieve higher classification accuracy more efficiently than a team of humans. But even today's most advanced machine learning spend classification techniques require training and supervision from real domain experts.

If you have a recent iPhone, you probably experience this kind of machine learning every day. Apple's FaceID security system is built on a learning algorithm that regularly updates its facial models, improving results so that it can continue to recognize you when you get a haircut, grow a beard, or get new glasses.

Chatbots, NLP and guided buying

Natural language processing (NLP) represents a big step beyond the graphical user interfaces we currently use to interact with digital devices. Improvements in NLP open the door to new, more natural, and more intuitive interfaces that stimulate conversation with humans (chatbots, popularized by Siri, Cortana & co.)

Chatbots adoption in many industries is driving the market for global conversational AI platforms. According to Adroit Market Research, it is expected that the Conversational AI Platform Market will grow at a compound annual growth rate (CAGR) of 30% to hit US$17 billion by 2025.

And according to Markets&Markets the chatbot market size is expected to grow from US$2.6 billion in 2019 to US$9.4 billion by 2024, at a CAGR of 29.7%. The key growth factors for the market include advancement in technology coupled with rising customer demand for self-services and 24*7 customer assistance at lower operational costs, together with the adoption of social media and messaging apps.

Another market research company, Kenneth Research, expects that about 85% of all customer support communications and related services will be conducted without engaging with customer service representatives for the major task options.

Yet, despite the great promise and widespread adoption in personal uses, conversational AI technology is still in the early stages of development in business scenarios. A 2018 Gartner survey showed that while only 4% of

respondents had deployed conversational interfaces somewhere in the enterprise, 38% were planning to deploy or are already engaged in proofs of concept and they expected that by 2024, 25% of purchase orders will be created via voice or chat, thus increasing contract compliance and process adoption.

That said, the ease of use and the move towards a conversational platform is a major requirement for procurement vendors to remain competitive in this market.

Going forward, there are many uses for chatbots and digital assistants in procurement – too many to list here. However, the central issue is that procurement specialists are increasingly dealing with vast quantities of data, which means that a lot of their time is spent looking for information rather than using it. Chatbots will enable procurement specialists to converse with their AI-powered procurement software, which will do the heavy lifting involved in finding the relevant information and making intelligent suggestions as to what actions need to be taken in specific situations.

Through machine learning the chatbot will be able learn about your preferences and your organization's policies and procedures. A good example is guided buying (discussed below).

Blockchain

Blockchain has been one of the hottest technologies under discussion in recent years, though it is yet to make a significant impact in procurement. Blockchain technologies involve distributed databases that hold tamper-proof records of digital transactions. Blockchain and its associated applications could usher in a new era of supply chain and source-to-pay process efficiency, with a wide array of applications possible for procurement and supply chain management, though Gartner sees an extended time horizon for it to reach what it calls the "plateau of productivity". In other areas, such as smart contracts, things should move faster.

Smart contracts are basically pieces of code that sit within an individual block on a blockchain and automate actions where predetermined conditions are met. The procurement officer can thus define rules around a transaction so that conditions and obligations are enforced. Each step of the supply chain that produces a new line of data can be automated to ensure full traceability throughout the supply chain. Practical applications include fraud detection and transparency in the sourcing of materials in categories where there is a high incidence of corruption (e.g. in the extractive industries) or to identify the source of any contamination in food supply chains.

Gartner predicts:

By 2023, up to 30% of world news and video content will be authenticated as real by blockchain technologies

By 2025, 50% of people that own a smartphone, but do not have access to a traditional bank account, will use a mobile-accessible cryptocurrency account

In 2023, multiple blockchain technical standards will enable mainstream decentralized application and smart contract development and deployment

By 2023, costs will exceed returns for 30% of smart contracts

Through 2022, major cryptocurrency exchanges using multiparty computation (MPC) for signoff and private key protection will rise from 1% to 50%

Augmented Analytics

Analytics is a broad term, but there are essentially three types: descriptive, predictive and prescriptive. Descriptive analytics integrates big data to describe what happened in the past, typically using traditional statistical methods such as regression analysis. We talk about "augmented analytics" to refer to analytics capabilities that are augmented by artificial intelligence. Predictive and prescriptive analytics are driven by AI. Predictive analytics use algorithms and advanced techniques such as neural networks to tell you what is likely to happen in the future. With prescriptive analytics things get really interesting, as it uses a further level of intelligence in order to tell you what you should do, i.e. the best course of action.

In procurement, predictive analytics can be used to look at all the possible situations within demand planning, costs, profits, inventory optimization, logistics and transportation (and much more, too much to mention in full here). It enables organizations to anticipate anomalies through their supply chain network better and respond appropriately, given past conditions. Businesses can determine shipments, consolidate underutilized capacity, and assess potential future situations, ranking them by probability. Organizations are unlikely to have all of the information needed to enable reliable predictive analytics, so external data streams (e.g. for transport route optimization) are required.

Figure 1: Progressive levels of sophistication in analytics
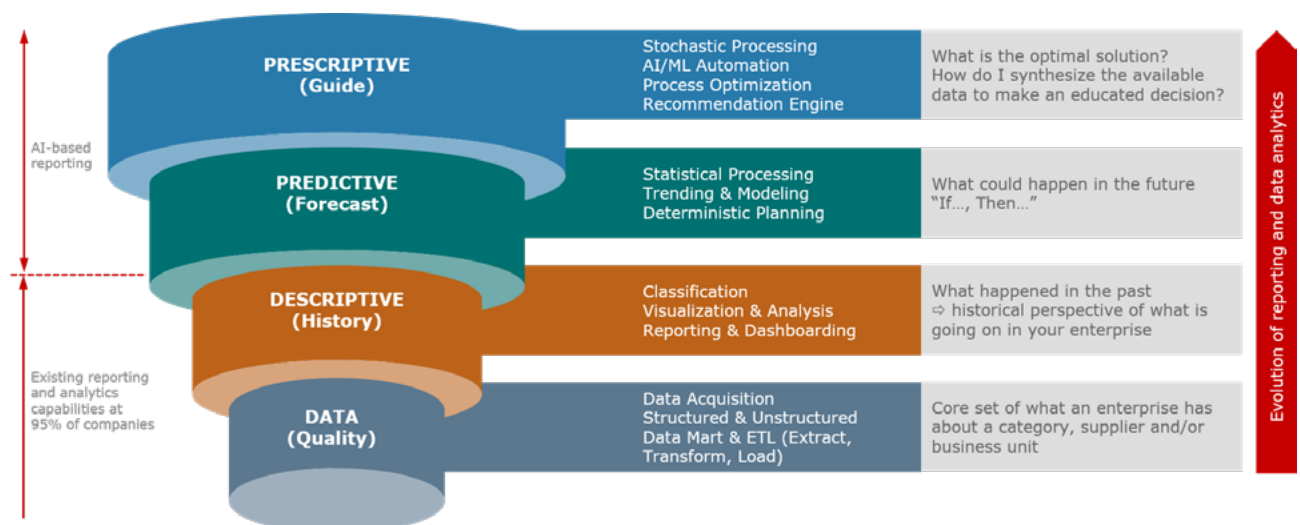
Prescriptive analytics offers the best possible action plans to reach a desired outcome while keeping the overall objectives in sight. There are two approaches to prescriptive analytics: optimization (linear programming) and heuristics (using set rules to reach ideal decisions). Futuristic stuff, but analysts such as Gartner believe that this percentage will increase more than three-fold over the next four years.

A typical scenario where prescriptive analytics would benefit the procurement function would be to address disruptions to the supply chain. For example, what is the best course of action if your usual suppliers are unable to meet your demand due to a natural disaster? Another example is inventory optimization. With prescriptive analytics, store-level supply chain plans can recommend which items to reorder and when, not just now but in a range of "what if?" scenarios. This might involve a number of inputs including analyses of fluctuating (e.g. seasonal) customer demand, weather forecasts, which end-products will sell fastest or slowest in a given scenario (such as during a major sports tournament) etc. For example, a brewery or soft drinks factory will be able to optimize inventory based on weather forecasts, changing consumer preferences etc.

Cognitive Automation

Cognitive automation is the combination of an established technology, robotic process automation (RPA) and artificial intelligence. This development has the potential to save the procurement function literally years and years of manual effort. RPA technology is actually quite simple in principle and has nothing to do with robots: RPA is software rather than physical machinery. It imitates the activity of a human carrying out a repetitive task within a process and then replicates those actions for future repetitions. Or to put it even more simply, RPA records a user's clicks and drag-and-drops or keyboard strokes and then repeats those actions as directed, but does so intelligently (for example by entering the correct supplier name). Software robots can complete tasks such as opening emails and completing forms.

When RPA is used in conjunction with artificial intelligence/machine learning, it ceases to be a technology that, once implemented, stays the same, at least until the task or workflow changes. Cognitive automation improves as it learns. Vendor selection is easily one of the most time-consuming responsibilities in supply chain management. Cognitive automation can be deployed to carry out tasks such as the assessment of supplier creditworthiness, look through credentials and even finalize your selection based on predefined criteria. It can also be deployed to handle the bulk of your supply chain communication strategy. Thus deployed, it can be used to gather market intelligence, collect and organize data from vendors, sales and internal teams, create formal reports and communicate to all involved.

Internet of things (IoT)

The internet of things (IoT) is the extension of internet connectivity into physical devices and everyday objects; it has already become familiar in many consumer applications such a smart refrigerators and smart cars. And on a much bigger scale, we are witnessing amazing things with the advent of highly energy-efficient smart cities. IDC has forecasted that spend on IoT will surpass the $1 trillion mark in 2022. According to Statista, by 2030 there will be nearly 50 billion devices connected in the internet of things by 2050 (up from 22 billion in 2018).

But what can it do for procurement? One major example is traceability. IoT will increase the traceability of products and materials across the entire supply chain. In many situations, the ability to understand where products or materials are at any stage throughout the supply chain will
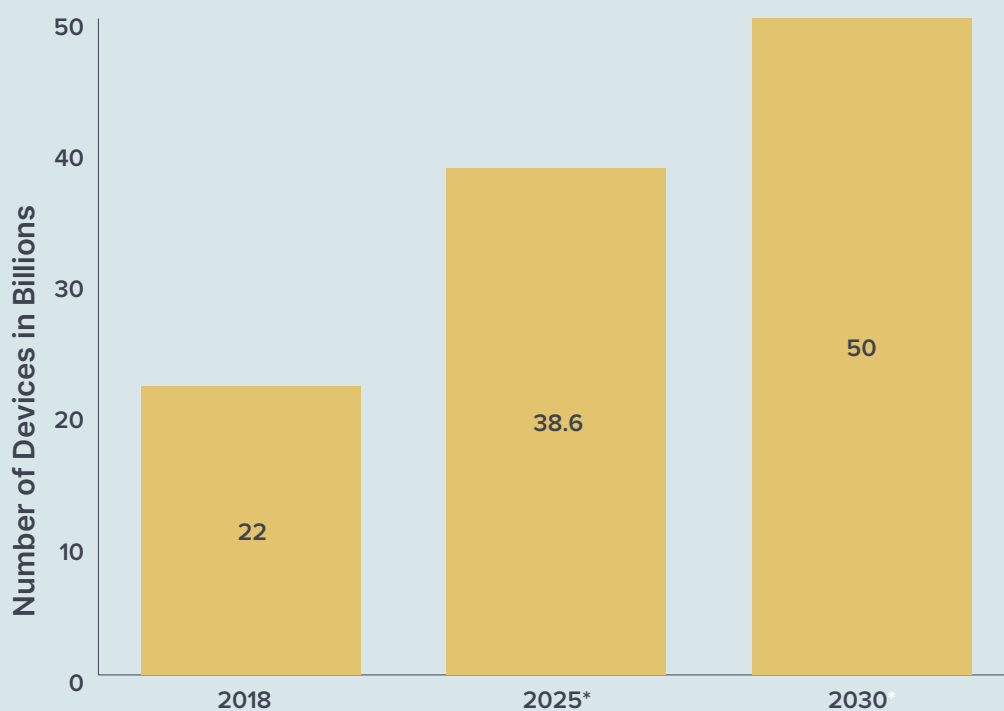

Figure 2: Projected growth of the internet of things. Source: Statista

be critical to business success. And in industries such as pharmaceuticals and food processing, the ability to track the materials and ingredients that make up a finished product is likely to become compulsory to meet regulatory requirements.

Combined with the opportunities presented blockchain, discussed above, this would be very powerful. The internet of things is largely based on data collected by sensors and sent to a central location, where it can be analyzed for various purposes.
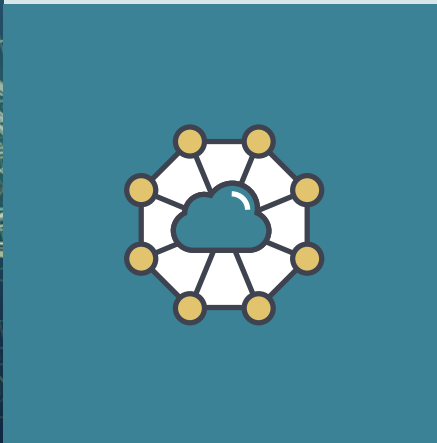
An example is the optimization of transport and logistics: sensors in delivery trucks can provide real-time information about the movement of goods but can also be used for applications such as condition monitoring; working with maintenance officers, procurement can then predict breakdowns and intervene before they actually happen.

Perhaps most importantly, the IoT will empower companies to gain visibility into their spend analysis by keeping a close eye on consumption patterns. The data that is generated is monitored continuously and analyzed for behavioral sets to optimize supply networks, as companies gain much greater insight into the needs and usage pattern of their consumers. This in turn empowers them to negotiate with suppliers in a more informed manner as they can estimate in advance what material and what quality and quantity is required. All these factors combined will contribute to cost savings and bring value for the procurement function.

A further important consideration is that the IoT collects data in real time. This means that spend data can be analyzed in real time and enriched with other data sources to provide more context, which may reveal unsuspected trends or correlations. This provides the best insights into spending, which, among other things, increases agility and speeds up the decision-making process.

5G Networks

By 2025, volumes of mobile data traffic are expected to increase by a factor of 4, and 45% of that traffic will be carried by 5G networks. The 3rd Generation Partnership Project (3GPP) unites telecommunications standard development organizations worldwide and develops protocols for mobile telephony. Its first standard relating to 5G was Release 15 and focuses on the 5G expansion without relying on the existing 4G network, laying the foundation for the first 5G networks. Release 16 will be completed by the end of 2020 with further enhancements and additions to future 5G networks and the existing LTE (long term evolution) network.

In the 2021 to 2025 timeframe, R16 and R17 features will start to roll out, and the enterprise device market will have matured, as will operators' commercial offerings and partnerships. 5G coverage will also have improved as operators build out their networks. This fifth-generation mobile technology will enable people, industries and things to connect on an unprecedented scale, and will present fantastic opportunities for innovation. For procurement professionals too, this will be transformative of the way we work, with the enhanced ability to work anywhere from any device.

In a subsequent white paper, entitled "Autonomous Procurement: Practical Steps to Embrace the Future", we will consider what procurement professionals can and should be doing now to embrace these new technologies, and how this will enhance the visibility of procurement's role as a driver of value in their organizations.

JAGGAER

JAGGAER.COM