

Procurement's future is embedded platforms: Introduction to predictive procurement orchestration

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"The usual methods for boosting performance—process rationalization and automation—haven't yielded the dramatic improvements companies need. In particular, heavy investments in information technology have delivered disappointing results—largely because companies tend to use technology to mechanize old ways of doing business. They leave the existing processes intact and use computers simply to speed them up."

Reengineering Work: Don't Automate, Obliterate by Michael Hammer, Harvard Business Review (July-August 1990)

In 1990, HBR published an article titled "[Reengineering Work: Don't Automate, Obliterate](#)". It captures how organizations miss the potential of digital technologies. And, 32 years later, the article's observations are still valid for procurement technology.

In 32 years, digital technology has penetrated procurement and it is now ubiquitous. However, most technology remains powered by digits – literally by fingers – and thus, finger-based analysis and finger-based approval tasks have been re-located from the physical space (paper and fax machines) to virtual spaces (spreadsheets and email). While this transformation has dramatically increased executive visibility for procurement activities, the total workload for most procurement professionals has grown, not shrunk. For many companies, the workload has become a costly problem that is rapidly getting worse.

The problem stems from the widespread implementation of "self-service" procurement systems which put the tasks of filing Purchase Requests and approving Purchase Orders back onto the business units and departments themselves with the laudable goal of removing bottlenecks to productivity. Self-service procurement not only succeeded in this goal, but in doing so

dramatically increased spend under management and addressable spend. It also dramatically increased the number of people in an organization who touch a procurement process. Often, the people who are touching the process the most and are therefore responsible for capturing relevant data are the least motivated to align their activities with corporate spend management goals. To solve this challenge, businesses have implemented vast catalogs and eProcurement systems with pre-negotiated prices for commonly purchased items. Since many transactions require custom requirements, volumes, service levels, delivery times, and other hard-to-unify attributes, most corporate spend remains out of reach for catalogs and pre-negotiated conditions and requires attention from procurement teams.

The result is that, over the past ten years, many companies that have implemented digital solutions have seen the rise of low-intent purchasing behavior that is misaligned with corporate procurement intent as expressed in their policies, procedures and processes. The following three indicators can quantitatively identify low-intent purchasing behavior:

- **Supplier Per Dollar:** The number of suppliers goes up over time disproportionately to the amount of spend
- **PO Per Supplier:** The spend fragmentation (measured as the number of Purchase Orders per supplier) also goes up disproportionately
- **Variance Per Item:** The fidelity of spend taxonomy by transaction goes down, making for a noisier and less accurate real-time spend analysis

NUMBERS DON'T LIE: PROCUREMENT'S LONG TAIL IS GETTING FATTER

The problem we described is getting worse and is costing digitally mature enterprises 5%-10% of their total addressable non-catalog spend. In companies with "self-service" Source-to-Pay procurement systems, most of the data is entered by people who do not work in procurement and lack the motivation necessary to achieve a high-intent/high-quality supplier selection or negotiated price outcome. This has led to a well-documented increase of so-called "long-tail" spend filled with one-off transactions, fragmented across an increasingly complex supplier base.

To quantify the business case, it may be helpful to introduce one technical concept from statistical analysis: kurtosis, or "tail-fatness." Procurement teams dealing with low-intent purchasing behavior are seeing that their "long-tail" is becoming a "fat-tail" as the kurtosis of spend linked to non-catalog Purchase Requisitions increases over time. This "fat-tail" dynamic represents a massive business opportunity for any large enterprise with a procurement function. Critically, this spend is neither high volume nor low value, contradicting commonly held understandings of "tail spend." Instead, this spend is meaty, extremely addressable and filled with potential financial opportunities. However, there are simply too many transactions for procurement teams to act on them, and the transactions are often temporally clustered together (for example at the end of a fiscal year) for procurement to effectively benchmark or systematically improve their win rate.

Kurtosis:

In probability theory and statistics, kurtosis is a measure of the "tailedness" of the probability distribution of a variable. It tells whether data looks flatter (or less flat) compared to the normal distribution:

- A high value tells that you have fat-tails (a lot of data in your tails).
- A low value means that you have light-tails (little data in your tails).
- Normal distribution (bell-shaped curve a.k.a. Gauss curve) has a kurtosis of 3

That's why procurement leaders implementing self-service solutions – which have the obvious benefit of massively increasing visibility and spend under management– are now beginning to ask: Is there a better way to increase high-intent purchasing behavior without adding steps or cycle times to the user experience?

This underlying double bind is the fundamental pain point that Predictive Procurement Orchestration (PPO) is designed to tackle. By deriving the attributes of high-intent purchasing decisions using large datasets, PPO can scale benefits of those decisions across more spend by pre-embedding preferred outcomes in any system or process.

For example, let's say a stakeholder wanted to request approval to purchase video editing services. If it were possible to rank all the transactions for such services, you would see that certain Purchase Orders performed better than others: paid to more preferred suppliers at better prices. In fact, one could ordinally rank specific POs as (#1) preferred, which would be optimal whereas others are sub-optimal (#2, #3, #4, etc.).

This demonstrates that procurement excellence is already present in most companies – it's just rare, unevenly distributed and frequently quite expensive from a procurement time and labor perspective.

But what if there were a way to identify these high output purchasing decisions in historical data and then scale their insights to orchestrate optimal procurement outcomes as the default outcome for future processes?

What if a technology could constantly monitor procurement activities, identifying and reinforcing the best purchases and making these optimal decisions the default everywhere, without users having to take any triggering action?

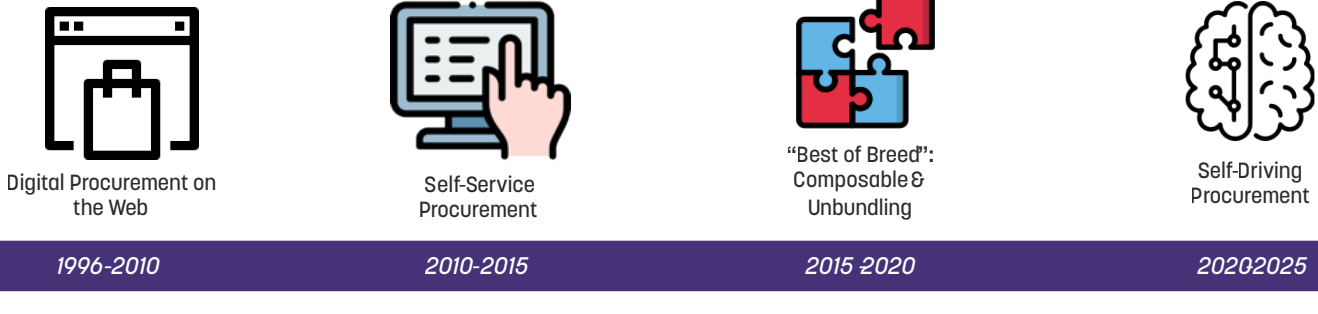
What if this technology drove either dramatic or incremental improvements in every category of addressable spend, from indirect services to direct materials to logistics to CapEx?

What if this technology could be implemented via a DocuSign-like user experience so seamlessly integrated into existing systems and processes that most users never need to login?

That is the potential of predictive procurement orchestration.

DEFINING PREDICTIVE PROCUREMENT ORCHESTRATION

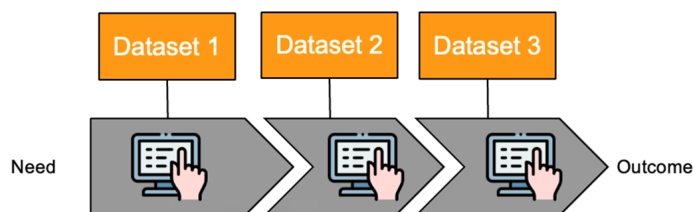
PPO is the latest evolution of digital procurement; it follows the digitization and digitalization eras and represents the true digital transformation of procurement as it leverages technology to do things that were previously impossible.



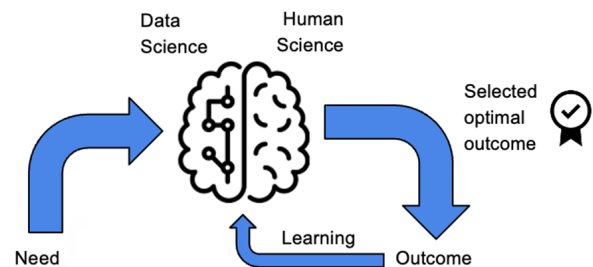
To qualify as Predictive Procurement Orchestration, a technology solution must meet the following three criteria:

- **No login, seamless user experience across multiple systems:** Data is delivered to users via an embedded agent that orchestrates across multiple existing systems. No end user needs to log in to an application interface for a system to run.
- **Pre-embedded and always-on analysis and data:** An embedded agent predicts any process's optimal attributes and data inputs before it begins. It does so by using live data, including in email-only or text-only workflows. "Live data" is updated automatically, checked for accuracy, recency, relevance, and does not go stale or out of date.
- **Alerts, notifications and delegated actions-by-default:** Embedded agent alerts administrators regarding updates and outcomes to self-triggering processes in motion and recommends pre-selected actions without any human guidance. The default action will be an approval for certain triggers, rather than the default being non-approval. This final fundamental transformation of processes will be critical as companies move towards increasing the percentage of fully touchless processes.

Traditional process-focused method: the process and supporting data steer towards an outcome. A user input/action is required at every step, multiple stakeholders are involved, often with low motivation/understanding of the bigger picture (from an outcome and data/insights perspective). Very limited learning.



PPO is "optimal by design": Data is the process, outcome defined based on all available data, all past interactions, and on behavioral considerations.



FROM "BEST OF BREED" TO "SELF-DRIVING:" THE NEW ERA OF PROCUREMENT DRIVEN BY BEHAVIORAL SCIENCE, AI/ML AND GAME THEORY

Digital technologies are a booster of efficiency and effectiveness. But expanding the stakeholder pool has had the unintended consequence of negatively impacting data quality in procurement. As "data-driven" becomes the next imperative for business decisions, this design flaw creates massive barriers to digital success.

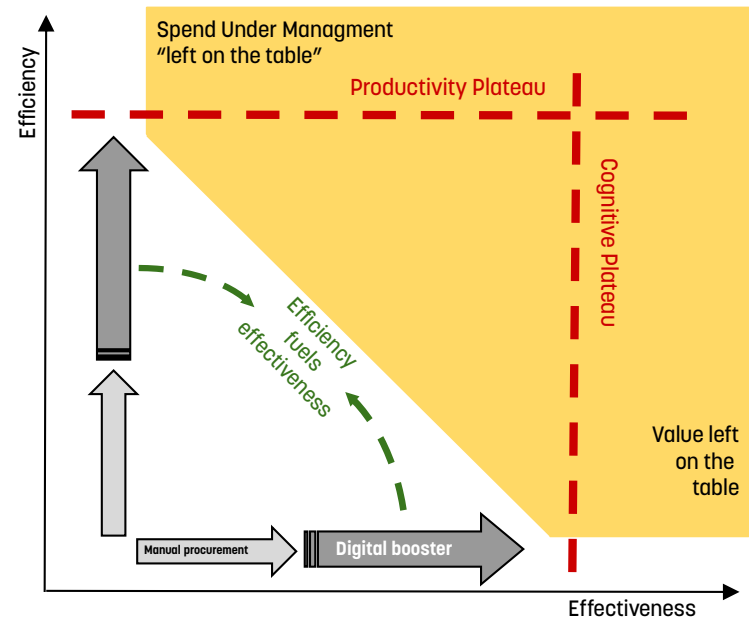
The overarching design concept behind self-driving autonomous systems is what we call Predictive Procurement Orchestration, where filters derived from high-intent purchases can be used to amplify the impact of procurement's influence on future purchases, sourcing events, renewal cycles and even supplier and spend reporting activities. By pre-embedding preferred outcomes in any process or system, PPO enables companies to put their data to work, creating value on autopilot, without extra effort.

Predictive Procurement Orchestration = (data science + human science) x predictive machine learning

Data science

PPO addresses data wherever it lives. It synchronizes across different systems to overcome silos, and it delivers the proper process to the right person in the desired medium through:

- Data clustering and iterative variance analysis (to understand context and similarities and to bucketize comparable transactions and synthesize predictions for future transactions)
 1. Is it statistically normal or an outlier?
 - What is the best?
 - What is the worst?
 - What is the most frequent?
 - What are the parameters?
 - What outcome is the most likely?
 - What outcome maximizes value?
 - What is the confidence interval of the prediction?
 2. Is there a cluster of transactions that says that this is normal?

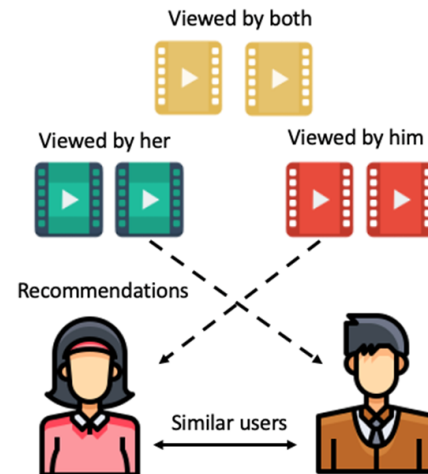
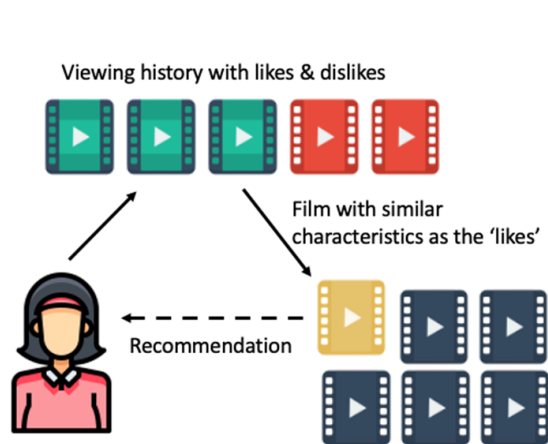


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- Recommendation system (to simulate and select the most favorable scenario)
 1. Recommend best supplier per item: which supplier is most likely to provide the best price for that cluster of similar transactions?
 2. Recommend price per item: What optimal savings-producing price is the supplier most likely to accept in exchange for greater predictability in sales cycle?

Recommendation systems or recommenders are powerful information filtering tools that can facilitate personalized content and/or services and provide tailored experience to individual users. Such systems play a central role in leveraging large amounts of data to make choices manageable. They make recommendations based on:

- A user's own past activity (content-based filtering) and relationships between item characteristics: you watched movie 'A,' the system recommends movie 'B' because items 'A' and 'B' share similarities)
- Activity of similar users (collaborative filtering): person 'A' has matched a specific movie, that movie is recommended to person 'B' because persons 'A' and 'B' share similarities



Recommenders learn from new data (loaded into the system or generated by each interaction with the system) and become more accurate. Amazon, Netflix and YouTube are examples of companies that have recommenders at the heart of their business models. PPO is the application of recommender systems driven by machine learning to procurement.

BEHAVIORAL SCIENCE

Business-to-business (B2B) and business-to-consumer (B2C) are, in fact human-to-human (H2H). Humans are making decisions. Therefore there is tremendous value in integrating human science, especially behavioral economics, into every procurement activity (other than face-to-face negotiations where it is more traditionally acknowledged and applied). It is why behavioral science and game theory are the other pillars of PPO, and these factors influence more than what we have covered above.

It is because confidence around the range of possible future prices enables precision transaction routing to a list of ranked suppliers, creating Fear of Missing Out (FOMO).

Once the orchestrator has been able to propose an outcome (a supplier and a price for an item in a purchase request) without requiring any manual intervention, it can move forward and send a proposal to suppliers.

In addition, concepts like the Nash equilibrium and the prisoner's dilemma are used to foster optimal pricing and post-award compliance.

FOMO:

The term finds its origin in a research paper by Dr. Dan Herman, a marketing strategist, who coined the term "fear of missing out."

It is often used in the context of social media, but it is applicable to far more.

It is, in a nutshell, a fear of regret when someone might miss an opportunity.

Nash equilibrium:

In a strategic interaction, the outcome for each decision-maker depends on the decisions of the others as well as their own. One cannot predict the choices of multiple decision makers if one analyzes those decisions in isolation. Instead, one must ask what each player would do considering what she/he expects the others to do.

The prisoner's dilemma:

It is an application of Nash equilibrium, and a type of non-zero-sum game in which two players can "cooperate" with or "defect" the other player. At the very heart of this game theory concept is self-interest which drives actions that appear rational to the individual in a specific situation at that time. However, should both parties put self-interest first then they will end up both being worse off. A key element is the fact that each participant does not know what the others will do although what they will do will impact each participant.

WHAT ARE THE USE CASES AND SUCCESS STORIES?

As we just demonstrated, with Predictive Procurement Orchestration, it is possible to trigger a quote request without a human being involved. Such a use case, which is possible under certain conditions, is one of the many applications of PPO.

Predictive Purchasing

Dover Chemical Corporation provides specialty chemicals, specifically chemical additives, around the world. MRO is a critical spend category for them, and they had a massive data challenge that impacted their capability to deliver savings. Buyers had difficulties accessing the data they needed to issue bids and negotiate. And, to make things worse, each cycle was a reset and implied a new lengthy data-collection and analysis process.

After implementing Arkestro and loading historical data, a one-time effort, they can now count on the solution to reuse data to send more bids more frequently. It ensures that they can benefit from positive market trends and be opportunistic and agile. The move also enhanced relationships with suppliers by improving supplier communications and collaboration, which historically were done via hand-typed email.

Predictive Sourcing

To keep the different corners of its business optimized, Bel Brands, a manufacturer of processed and semi-processed cheeses including The Laughing Cow, Babybel, Kiri, Leerdammer, and Boursin, routinely challenges its existing supplier base. Every couple of years, different suppliers are invited into a bidding event, which is then followed by a consensus selection by the various stakeholders to determine the best partner for the specific service or product in question.

The biggest challenges that Bel faced with its traditional approach to the RFP process (which took up to 90 days) were related to the efforts to get a single view of all the

information across multiple suppliers and collaborate with bidders and internal stakeholders.

Once the Bel Brands team started using Arkestro for their sourcing processes, everyone noticed a change in the velocity of projects. Because the data in the sourcing cycle is pre-embedded by a predictive orchestration agent, buyers are saving a lot of time. Arkestro's approach to PPO enabled Bel to capture new savings (10% cost savings delivered on the final award) and increase throughput (20%-25% increase in sourcing velocity).

Predictive Supplier Management

Box is one of the most widely used enterprise technologies around the world for secure content management, workflow and collaboration. Box has always been a socially responsible company and diversity is ingrained throughout the company's DNA. Within the procurement organization, Linda Chuan, Box's CPO, has established herself as an industry leader in addressing racial injustice through supplier diversity, equity and inclusion (DEI) to promote an inclusive approach to procurement.

Procurement had a granularity and scaling issue: the people managing relationships with the suppliers had limited insights into diversity indicators. They lacked detailed information about workforce makeup, how socially responsible they are, etc. Also, when they had data, pulling reports was a highly manual task, and the efforts hindered Box's decision-making process.

To help establish an automated system that leverages machine learning to help streamline the efforts, Linda brought in Arkestro to serve as the underlying procurement and sourcing operations platform. The Box team was able to embed diversity as a critical attribute into their processes (supplier base management, spend analysis, etc.) to get actionable insights to perform benchmarking and ESG (environmental, sustainability and governance) reporting.

Value Beyond Savings And The Rise Of Omni-dimensional Active Spend Monitoring

We already pointed out that the “old way” had not solved the problems it was supposed to fix and created unintended consequences. On the opposite, Predictive Procurement Orchestration creates a virtuous cycle of high-intent procurement activities:

- Companies capture new incremental savings and see results in less than 30 days
- Supplier and spend fragmentation slows down and even begins to decrease
- Price variance decreases due to iteratively routing more spend to preferred suppliers

But there are several other benefits beyond continuously delivering financial performance through improved pricing on purchases and contracts. All operational cycles have costs – financial, social, environmental and hidden costs in the form of risk. A dollar spent with a risky supplier is more expensive to a company than a dollar spent with a stable supplier, even if that cost cannot be represented on a balance sheet. The triple bottom line (3BL), double materiality and social value are accounting methodologies and concepts that more and more companies use to value such elements. And, procurement can have a massive impact on those.

The first one we want to mention pertains to ESG. PPO is flexible enough to consider many attributes and data elements beyond price. It can incorporate the direct and indirect impacts (externalities) on the people and planet to provide ESG-conscious recommendations. The success stories we used illustrate that.

The second benefit has to do with speed and agility. Organizations applying PPO can buy and react faster, which is an essential competitive advantage in terms of:

- Meeting evolving customer needs and demands in a timely manner (NPI/NPD and time-to-market)
- Business continuity and supply insurance (resilience and antifragility)

Resilience is high on the agenda of many procurement organizations that have suffered and continue to suffer from supply (chain) disruptions. The strategies they apply focus on flexibility and redundancies because they create a certain elasticity that enables organizations to resist shocks.

CONCLUSION

Procurement excellence is already here – it’s just expensive to scale high-intent procurement decisions to new sourcing, purchasing and approval cycles.

The combination of the evolutions in predictive models, behavioral science and game theory can change. There is a massive opportunity to obliterate and not just simply automate how things are done.

The application of self-driving autonomous systems to procurement, what we call Predictive Procurement Orchestration can identify the great things that teams are already doing and scale those insights to more spend faster than hiring and training new people. It does so by simulating a procurement process before it begins, predicting a range of outcomes and ranking and filtering them to exclude anomalies and exceptions to, ultimately, execute the optimal actions.

The result is fewer steps, fewer decisions, less typing, a better user experience and all the business benefits of high-intent procurement that include price reductions, supplier performance, and omni-dimensional cost savings aligned with ESG, risk management and diversity goals.

Procurement has long been criticized for being short-sighted in optimizing for short-term cost savings – because that is how many organizations measure procurement’s success. By optimizing for high-intent and high-impact decision making, financial cost savings are the effect of a great process running on a self-driving system rather than trading off with other corporate targets or the end user’s experience, sense of urgency and (often low) motivation.