

SOURCING ROBOTICS

Adoption and Automation of
Best Practice Strategic Sourcing

ABSTRACT

In this white paper we chart the path to Automation of Sourcing that is:

- 1) founded upon tools for best practice
- 2) trained with data from best practice examples
- 3) supported via automation of best practice

This paper describes the conditions needed for full automation of sourcing, the progress to date and key milestones achieved as well as offering a look to the future to see what can be reasonably expected in the near term.

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SOURCING ROBOTICS

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SOURCING ROBOTICS

Automation of simple tasks drives savings and reliability but automation of complex tasks drives strategic benefits. Back-office functions such as invoice payments processing are usually the first tasks to be automated because they are easier to formalize into simpler rule-based systems. It would be a mistake to conflate operational efficiency with the strategic advantages that are possible when the more sophisticated aspects of executing large and complex sourcing projects are addressed by AI. Also, automation on its own is not sufficient. We need to automate best practice rather than accelerate poor practice.

In this white paper we chart the path to Automation of Sourcing that is 1) founded upon tools for best practice, 2) trained with data from best practice examples and finally 3) supported via automation of best practice. We refer to the stages in this evolution, collectively, as Sourcing Robotics because the AI is interacting with the real world in the form of decision making that is contingent upon responses from bidders. Various aspects of AI that include Machine Learning, Optimization and Robotics are relevant to different aspects of the sourcing lifecycle. This paper describes the conditions needed for full automation of sourcing, the progress to date and key milestones achieved as well as offering a look to the future to see what can be reasonably expected in the near term.

INTRODUCTION

Few organizations execute best practice techniques regularly and frequently. Sustaining best practice has proved elusive for even the top performing companies. High standards become tied to key individuals that have a strong grasp of how to match sourcing strategies to external market landscapes and internal corporate objectives. It's a difficult task so when high-performers move to other companies, the loss in institutional knowledge leads to procurement performance suffering.

So companies encounter twin challenges of educating sourcing professionals about best practice and retaining/sustaining high standards. When the sourcing events that rely on optimization and tailored mechanisms in the bidding protocol are in the order of 10's or 100's of millions of dollars in value, the losses from institutional knowledge and reduced sourcing standard are substantial.

The primary challenge for organizations is instilling and sustaining excellence in strategic sourcing. The new field of Sourcing Robotics offers the following potential benefits:

1. Faster execution of published events to instill increased competitive tension whilst retaining fine control over quality/cost trade-offs.
2. Automated, reliable excellence in strategic sourcing bid process design.
3. Automated invitations to suppliers with suggested inclusion of new suppliers that AI has determined would be competitive.
4. Automated and intelligent use of 3rd party data to inform performance and feedback for bidders in multi-round events.

Automation of Sourcing requires a multi-year plan involving a well-integrated product roadmap and IT architecture that is amenable to training of autonomous agents (or bots) using structured data. First we looked at the historical barriers to adoption of best practice and approaches to lower those barriers. We purposely built software that would support the key features of best practice eSourcing and in a manner that made it amenable to training and automation so all data collected is in structured form that acts as a corpus or knowledge base so that past experience can train future bots.

BARRIERS TO BEST PRACTICE

Many commentators have debated why best practice techniques in sourcing are not ubiquitous. Several hurdles to adoption of best practice have been prevalent for many years, namely:

1. First generation tools that supported optimization were designed by PhD's for PhD's. They lacked ease of use so most users were too intimidated to engage with them.
2. The commercial models were a barrier; requiring 6-figure initial investments and decision makers lacked confidence to make the necessary jump knowing that they could encounter user resistance to what were complex tools.
3. There was a lack of training among professional qualification bodies as to what constituted best practice strategic sourcing techniques. A relatively small percentage of sourcing professionals have ever been exposed to strategies that yield best results or fully comprehend what strategies are appropriate given the levels of competition, purchase volumes and risk tolerance. This is understandable given that the training bodies themselves did not have access to advanced sourcing tools.

DEVELOPING BEST PRACTICE: EASE-OF-USE

THE FOUNDATION FOR DATA GATHERING

The most important initial hurdle to overcome and the *raison d'être* for Keelvar, is to make optimization backed sourcing easy. With intuitive flows and design-led implementation of user interfaces, it is possible to have sourcing events published with sourcing managers almost oblivious to the fact they utilize optimization under the hood.

Optimization suffered from a perception that it was only suited advanced users. We've proven otherwise with examples of former bus drivers running passenger transport events among other examples of untrained professionals easily adapting to optimization when the flow was simple and intuitive (as in Figure 1). With some sourcing events having a purchase volume <£10k in spend optimization is used because it's the fastest and easiest way to collect data and evaluate the outcomes in seconds. Speed is a primary motivation for many users so ease of use accelerates uptake and performance.

The flow in events is linear, the sequence of necessary actions should be minimized based upon settings chosen beforehand. Furthermore, bulk actions need to be supported so that speed and efficiency of event construction is maximized. Examples of bulk actions may include upload of all Bill of Quantities data with automated detection of compliance with data types. Data cleansing and validation should aid this process and alert for problems or incomplete rows of data. Furthermore, invitations must support bulk actions, visibility on invite acceptances, reminder issuances, bid completeness status etc.

The evaluation stage is when the automated calculation presents the greatest time savings. By quickly applying business rules and re-evaluating, sourcing teams can navigate the trade-offs between qualitative objectives (e.g. limiting switching) and costs. This can be done in a pairwise fashion. But is also the step during which key strategic objectives are married to award outcomes. The actual implications of CSR goals, switching targets, supplier diversity constraints and other objectives can be measured and assessed. This is how companies can marry corporate objectives at a macro level to micro-level decisions. This is usually a failing in evaluations that can otherwise be reduced to line-by-line assessments that don't take due consideration of the wider picture.

Analysis and Reporting offers an array of options for how results and scenarios can be presented to interested stakeholders. Standard reports cover the most common requirements but tailored reports can offer more drilldown capabilities. There is a trade-off between usability and flexibility so Keelvar hides advanced reporting options because only power-users seeking specialized configurations need that access.

In the age of AI, best practice has increased value over and above delivering results for the immediate sourcing challenge. Once the event data, including all demand and market data as well as event configuration parameters, are collected in structured tables then the entire sourcing project can be used to train AI as to how it should be repeated in future. A corpus of knowledge is being developed so that bots can, when sufficiently well trained, automate best practice techniques in strategic sourcing. And thus it is doubly important to encourage wide adoption of best practice because it is an investment in the present but also an investment for the future.

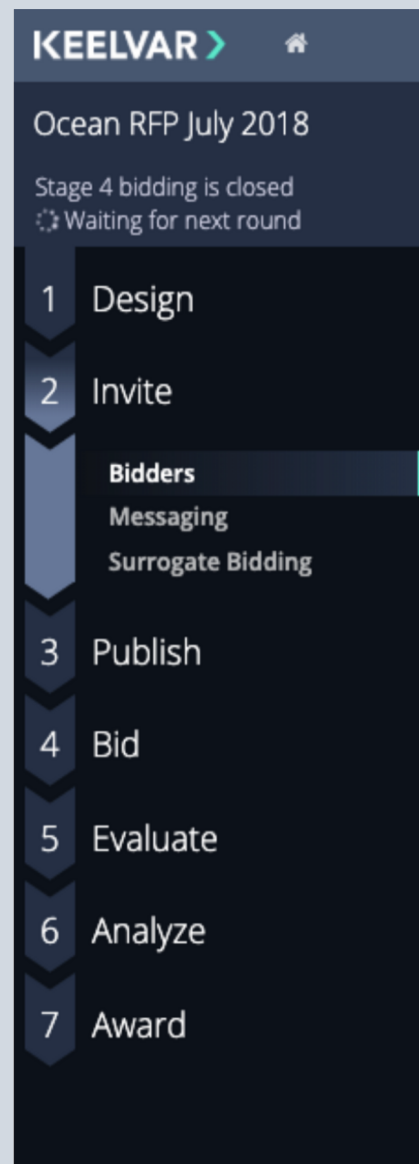


Figure 1: The Flow in Sourcing Event Execution

SUSTAINING CONSISTENT BEST PRACTICE – AFFORDABILITY & REGULARITY OF USE

AI LEARNS FROM EXPERIENCE SO SUCCESS BREEDS SUCCESS

Ease-of-use is necessary but on its own is not sufficient for wide adoption of best practice strategic sourcing. Another required condition is affordability and regular practice. Sourcing managers need to be accustomed to using tools and feel comfortable with their operation. So, it is important that there are low barriers to adoption for high, medium and low-value projects. The commercial fees for operating sourcing optimization on small projects need to be comparable with basic tools so that regular usage maintains familiarity and improves their understanding of the benefits associated with certain design choices. This has been a problem in the past because the software was too expensive for smaller projects.

Structured data sets across a wide variety of sourcing events are important for training AI systems about sourcing strategy design and execution so that we can ultimately automate the entire process. Therefore, it is desirable to encourage wider adoption across more categories and make onboarding for new companies and users as easy as possible, both financially and operationally.

ACHIEVING EXCELLENCE AND AUTOMATING BEST PRACTICE

LEVERAGING THE KNOWLEDGE BASE AND TRAINING AI

AI is trumping expert human performance in too many domains to list. For example, poker is a complex game and few people ever master it and those that do invariably require many years of practice. AI bots, however, have now mastered Poker and even the world champion cannot beat a bot that has learned how to master the game theoretic analysis and calculation of mixed strategy equilibria to optimize payoffs. Furthermore, AI is anti-fragile and thus will continuously improve whilst experts need continual practice to maintain standards. AI's continuous improvement is effortless as the training data is ever increasing so human experts will inevitably fall further and further behind.

As unromantic as this is, the sobering fact is that AI is defeating the best human experts in most tasks where the boundaries and constraints on decision making are well-defined closed systems. It would be a mistake to assume that AI won't be competitive in the task of strategic sourcing and then ultimately overtake humans in this role. Once the boundaries of decision making are communicated, then the game theoretic reasoning for optimizing the mechanism for sourcing goods and services becomes just another complex but tractable calculation for Artificial Intelligence.

Complexity should be viewed as an opportunity rather than a hindrance. Where there is complexity, there is an opening to achieve excellence and outperform others that lack the understanding and competency to master that complexity. Few experts in strategic sourcing comprehend Game Theory and Mechanism Design. In poker terms, most players are far from mastering the game. The same is true in procurement, most professionals only understand the basics and have never studied the science behind negotiations and tend to err on the side of adopting or slightly modifying existing practices at their organization.



Figure 2: The Mars Explorer Rover worked autonomously for long periods and out-performed all expectations in terms of performance and longevity

Radical improvements in the standards of strategic sourcing within organizations are possible but the outstanding AI challenges are highly non-trivial. The bar for AI to reach should not be under-estimated but, likewise, it should not be over-estimated. We won't need to wait for AI to master every category before it is deployed as an autonomous sourcing agent (or bot). Best practice techniques are most often witnessed in transportation and packaging so it is these categories that provide the most data for training AI. Consequently, it is these categories that will benefit from end to end Sourcing Robotics earliest.

AGILE DEVELOPMENT AND INCREMENTAL AUTOMATION

ITERATIVELY INCREASING AUTOMATION

The start point chosen by Keelvar for automation of strategic sourcing is the post-publish stage. This involves the roboticized process automation of the following tasks:

- Round Opening & Closing
- Evaluation of Predefined Scenarios
- Report Generation and Status Updates
- Assessment of the preference ordering of scenarios via a trained classifier and
- Evaluation of the termination criteria for when an equilibrium has been achieved.

Sourcing Robotization naturally starts at this phase in the project for a few reasons:

1. There is an immediate tangible benefit for sourcing projects because the bid process is compressed and the most senior representatives on the supply side can be present and responsible for decisions.
2. This compression in bid time will facilitate increased competitive tension (if desired) and thus it is most beneficial for large global sourcing projects that have already enjoyed several years of optimization and need acceleration in order to improve results further.
3. Mature categories will have known strategy spaces and criteria in which the relevant scenarios are well understood and the preference ordering function is also known. Implementation and execution flows involve greater certainty and fewer unknowns so it is ready for automation.

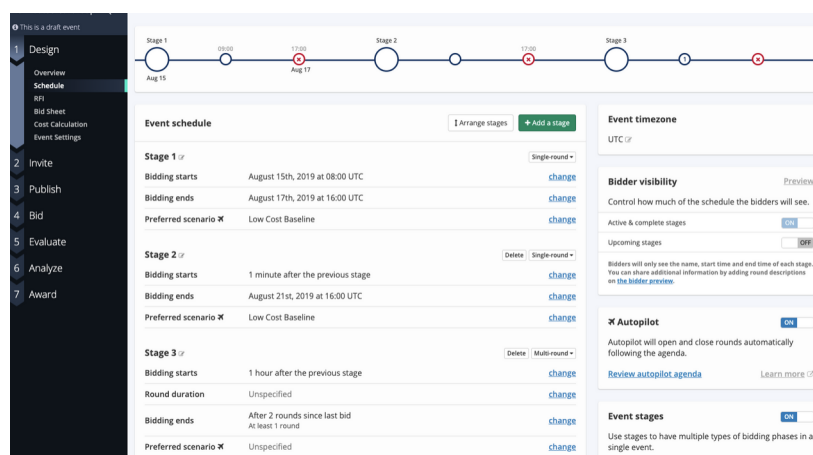


Figure 2: Autopiloting a multi-round event

It is natural to draw comparisons between the evolutionary stages in autonomous driving and sourcing. The next stage will involve automated tentative suggestions on Event Design and configuration so that best practice is encouraged rather than enforced. Over time, as confidence grows and the training set increases then more Opt-Out mechanisms may be adopted instead of Opt-In approaches. One reason why Autonomous Sourcing will likely precede Autonomous Driving is that there are no health and safety constraints to decelerate the march of Sourcing Robotics. We will report on specific details of Event Design automation when we release aspects of this functionality over future months. With a monthly release cycle and agile development methodology, we liaise with customers on this RoadMap and are free to evolve our strategy over time as we discover what works best and delivers most value for buyers and suppliers in win-win outcomes.

SUMMARY

Automation of strategic sourcing is an ambitious but achievable goal for procurement. It will take years of dedicated focus to fulfil its full ground-breaking potential but we are already making progress on that path. It is a challenge that can only credibly be tackled by software companies that are staffed by recruits from an AI research lab, understand best practice techniques in this field and offer an optimization backed solution to implement best practice. To use an automotive analogy, there is little point in having an autonomous bicycle because it cannot do the heavy lifting or attain the speed that cars can achieve.

Sourcing Robotics is a long-term initiative and Keelvar is the first vendor, that we know of, that is providing true automation of multi-round sourcing event execution. Keelvar is also unique in that all data is stored in structured databases for training AI systems to automate further stages in the strategic sourcing process. Such infrastructural investments ultimately will pay dividends for procurement teams because the future for Sourcing Robotics and AI in Procurement more generally is very bright.

ABOUT THE AUTHORS



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David is a computer scientist and came to Keelvar from the Cork Constraint Computation Centre. His research focused on Optimization and Machine Learning. He is a Principal Software Engineer with Keelvar and is based in Berlin, Germany.



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ABOUT KEELVAR

Founded in 2012, Keelvar is the leading provider of AI and Process Automation for Strategic Sourcing, offering an innovative and market leading Enterprise SaaS solution. Keelvar helps those sourcing goods and services to apply best practice to managing bid processes and auctions in categories that include transportation, materials, packaging, professional services and others.

Optimizing \$90bn+ in spend annually

40+ Fortune 250 customers

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