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Big data and the supply chain: Capturing the benefits (Part 2)

In the first part of this series, we described the many ways Big Data and Advanced Analytics can be used to improve supply chain performance. Now we look at an approach companies can use to make big supply chain analytics work for them.

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Big supply chain analytics describes the use of new data sources and analytical techniques to help companies design and run smarter, cheaper and more flexible supply chains. Despite the potential for improvement across every area of the supply chain, these techniques have not yet had the same impact on supply chain management (SCM) as they have in other areas, like retailing.

We believe that, with a few exceptions, companies are being held back because their SCM functions often lack the capabilities and the vision they need to identify and capture these new opportunities. In this article, we outline a structured process that can help companies bridge both those gaps[1].

Take a structured approach

Companies need a formal process to select, test and compare ideas to ensure resources are focused appropriately (Exhibit 1). Throughout, the company needs on a quarterly basis to systematically identify ideas, and rapidly prototype and test them. At the end of each cycle, ideas should either be de-prioritized, put forward for further testing, or implemented across the organization. Let's look at each of those steps in more detail.

A. Establish the Big Supply Chain Analytics organization

Big supply chain analytics requires skills and infrastructure that sit somewhere between most companies' supply chain and IT functions. That calls for a new, dedicated team. This Big Supply Chain Analytics organization will be responsible for the collection and generation of ideas from both within the wider organization and beyond it. And it will be responsible for testing and validating these ideas through rapid development of prototypes.

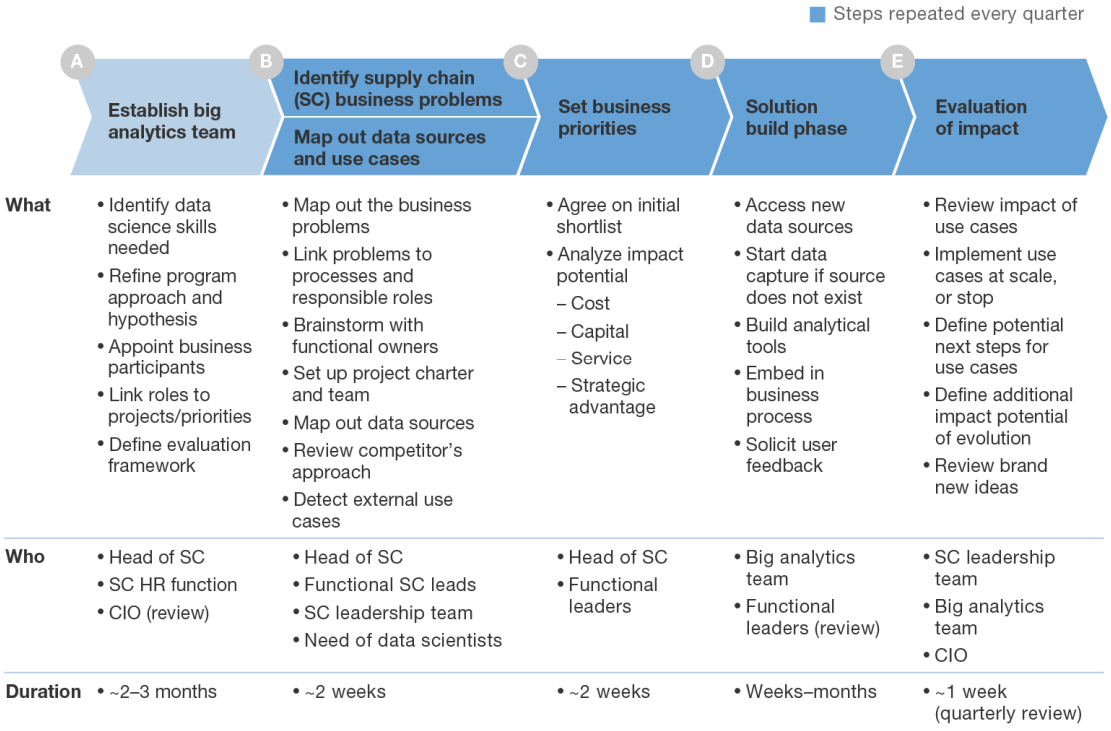
The staff of this new organization needs unusual skills: a combination of extremely deep analytical skills with the ability to deal with unstructured data, and a thorough understanding of the supply chain business. There is a need for business-oriented data scientists (see sidebar, "How to build the right team for Big Analytics in SCM"), but the required skills should also cover a number of core areas:

- The organization's current IT landscape (ERP/SCM)
- Solution development
- System integration
- Analytical, mathematical, and statistical capabilities

1 For part 1 of this article, which focuses on the overall supply chain data analytics landscape, see https://operations-extranet.mckinsey.com/content/function/Supply+Chain+Management/view/20160216_supply_chain_big_data_part_1

Exhibit 1

Process to capture supply chain big analytics potential



The Big Analytics team will drive the quarterly cycle and pick up the prioritized list agreed in Stage B. It will be part of the team's role to create a program plan for each idea to be tested, and to set up a joint group with business participants who will be involved in designing and building the prototype solution. To keep projects on track, the team will need to establish clear milestones and define success criteria.

The need for new capabilities also extends into the wider business, however. The new organization will need to train the existing supply chain function to become more data-savvy, and how to be comfortable communicating business problems to data scientists.

B. Identify business problems and potential data sources

To generate valuable ideas, the Big Supply Chain Analytics team must understand business priorities and current performance gaps. If the company has a good supply chain performance management system in place, it should already have an understanding of where it lags behind current practices and which supply chain improvements would pay the biggest dividend. Perhaps forecast accuracy is poor in certain regions, for example, or delivery performance is poor in certain markets, or there are too many stock-outs for a particular retailer. A review of current performance levels should produce a list of a dozen or so priority issues where Big Data could enable improvements. The Big Analytics team can then begin the search for possible solutions. Are there any published Big Data approaches that others have implemented? Perhaps

there are ideas from competitors, from software vendors or from professional organizations that can be re-used. The team also needs to ask internally for suggestions on how processes might be improved with Big Data. Examples of such ideas could include collecting competitive prices to update forecasting algorithms or testing active demand shaping by optimizing promotions based on dynamic constraints in the supply chain.

The initial search effort should result in long list of ideas that could contribute to improvements of the identified SC priorities. Now the organization must identify potential data sources that could be used to enable the idea. This data may already exist internally in ERP or SCM systems, for example, or it may need to be procured from external trading partners, government bodies, or data sources like Google or Facebook. Sometimes new data may need to be generated, something that is becoming cheaper and easier thanks to the availability of low-cost sensors, for example.

A structured review of potential data sources can be helpful in ensuring that useful sources are not missed. Exhibit 2 lists the most significant sources of data for SCM applications in most organizations. At this stage in the process, organizations must be willing to accept a certain element of risk: Some ideas may turn out to be too costly, complex or unreliable to implement. However, this is inherently difficult to predict before it has been tested.

Exhibit 2

Big data comes from six different sources and encompasses multiple types that can be leveraged for supply chain analytics.

	Source	Data type	Data size	Growth	Structure of data	Data quality	Ownership
1	ERP systems	Demand, sales, capacity, SC plans	Large	↗	Structured	Medium	Private
2	Barcode/ RFID scans	Location, time, ID	Large	↗	Structured	High	Private
3	Sensors/ cameras	Quality, humidity, temperature, images, status of parts	Large	↑	Structured and unstructured	High	Private
4	Archives	Financial statistics, price data, weather data	Medium	↗	Structured	Medium/high	Public and private
5	Internet	Hits, click streams, statistics, comments	Very large	↑	Unstructured	Low/medium	Public and private
6	Social networking	Preferences, text, developments	Very large	↑	Unstructured	Low	Public and private

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C. Set business priorities

To narrow and prioritize its initial list of problems and potential solutions, the company needs an estimate of how those solutions might be implemented, how much that will cost, and the potential value that might be gained. Usually, these first estimates involve a high-level draft of the way each solution might work. This should include how access to the relevant data will be achieved (for example by pulling data from an external source or integrating with existing ERP systems), how it will be analyzed, and how the results will be used. Such a draft will allow the

team to evaluate the technical feasibility of the idea and estimate the work involved. On the other side of the equation, estimates of the impact potential are usually made by expert opinion. Making very detailed predictions is by nature difficult given the exploitation of brand-new approaches where little or no prior experience exists.

As part of selecting the ideas to prototype, clear success criteria should also be defined. This implies being clear on how much improvement in service, cost and capital is required to warrant the effort. Being clear on those objectives also illuminates the evaluation and decisions on what to continue developing and what to cut.

By weighing the cost, difficulty, impact potential, and strategic importance of each idea, the organization can create a prioritized task list for analytics team to develop during the next quarter. The increasing availability of cloud-based solutions can dramatically simplify the implementation of some solutions, helping companies to rapidly test or scale up ideas.

Sidebar: How to build the right team for Big Analytics in SCM

Harvard Business Review has described the role of data scientist as "The Sexiest Job of the 21st Century,"[1] suggesting that demand for these skills is likely to exceed supply.

There is no clear-cut definition of what exactly a data scientist is, but a few traits are important in a Big Supply Chain Analytics team. First, the team needs people who can write code quickly. There are no off-the-shelf Big-Data systems, so the team needs the tools and capabilities to develop its own code. Second, it needs people with the ability to communicate the stories behind the data. Great ideas will die unless they are sold in a compelling way in the organization. Third, teams need a good understanding of fundamental supply chain concepts and issues. Here, a close integration between SC experts and data scientists is crucial. We have seen too many organizations where data scientists lack an understanding of the firm's supply chain, while supply chain experts struggle to accurately communicate their requirements and drive the ideation process. The value of mutual understanding between data scientists and traditional supply chain experts cannot be underestimated.

To get and keep people with the capabilities it needs, the supply chain organization must be able to give people skilled in data science clear reasons to want to work for it. Pay clearly plays a part here, but more fundamentally it should offer the freedom to explore, build, and do things that have never been done before. The opportunity to break new ground is a powerful incentive for most high-caliber employees.

[1] https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century/

D. Build the prototype solution

During the solution build stage, the ideas are prototyped, and new data sources are established (if needed) and integrated into existing systems. Throughout the cycle, it is key to limit risk by using rapid prototyping. End-user involvement and regular feedback sessions with supply chain leadership can help make sure the solutions truly address underlying business problems and that performance targets are met. Some companies may even use “hackathon” events to develop initial prototypes for testing in a matter of hours. Regular feedback and iterations will help fine-tune and improve the solutions, or “pivot” them in a new direction if an idea needs further re-shaping.

The availability of cloud-based platform and instant storage and computing capacity also implies that deployment of prototypes can be more or less instantaneous.

E. Evaluate the impact

At the end of the cycle, the objective is to evaluate the ideas being tested and understand their impact. The evaluation should be performed against the targets established when the idea was launched. Evaluation criteria should be tied to both business impact (service, cost, and capital) and successfully tested hypotheses. Based on the results, stakeholders need to agree on next steps. Perhaps the idea needs to be expanded to go after even more impact, or maybe it is ready for full implementation and roll-out, meaning a handover to the IT organization. Some ideas may take more time to evaluate, requiring a second iteration. There will also likely be cases where the idea is sound, but there needs to be a pivot, as described above. For example, maybe an attempt at improving forecast accuracy failed due to difficulties finding competitive pricing in real-time, but the team identified other proxy data that could achieve the same thing, like tracking increased logistics activities outside competitors’ plants.

Finally, based on what it has learned during the prototyping process, and how the external environment has changed, a re-calibration of supply chain business priorities will feed into the next cycle of development.

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Big Data and Advanced Analytics techniques have the potential to transform many aspects of supply chain performance. A key challenge for companies lies in exploring this exciting new landscape effectively to find the opportunities that hold the most potential for them. Our proposed framework can help them do this systematically. The process might just reveal brand new sources of supply chain competitive advantage.■

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