MAPI

RESEARCH REPORT

Out-Innovate Your Competitors with Advanced Analytics

AUTHORS:

PEET VAN BILJON, FOUNDER, BMNP STRATEGIES LLC

JENNIFER CALLAWAY, VP RESEARCH, MAPI

VIDYADHAR RANADE, FOUNDER, DECODEXIS

ERIKA RUIZ, RESEARCH ANALYST, MAPI

PARTNERS

BMNP Strategies LLC

Decodexis

The Potential of Advanced Analytics in Innovation and Product Development Remains Untapped

Ask innovation and product development executives at U.S. manufacturers and they will agree – advanced analytics will change the face of innovation. Two-thirds of executives surveyed expect that analytics will improve their innovation performance in the near future. The trouble is that few companies are resourcing analytics well enough to use it to leapfrog their competition or maintain their market position in the future. Why? This story follows a familiar paradigm, like with many new technologies even the earliest adopters are just starting to see the benefits of their investments. Most companies like to wait until the value is more assured–for any new technology investment–and this remains true when it comes to investing in advanced analytics.

What's surprising isn't that the upshot of advanced analytics in innovation is just becoming clear now (that's expected), but instead it's which companies are the vanguards. They aren't all innovation leaders looking for a new way to maintain their edge, but companies from all across the spectrum of current innovation performance looking to get a leg up on their competition by doing analytics proofs of concept today. This means future market positions are up for grabs and the analytics race in innovation is still anyone's game to win. There is no substitute for getting a head start on your competition and harnessing the power of information as this will be the foundation innovation success tomorrow.

While the use of advanced analytics is rapidly expanding in functions such as marketing and sales, and more recently in operations, the potential of these techniques to improve innovation and product development is largely unexploited. To explore this issue, MAPI collaborated with Decodexis and BMNP Strategies to engage senior innovation and product development leaders of manufacturing companies, to assess the state of adoption of advanced analytics and, understand the opportunities and challenges on the analytics journey.

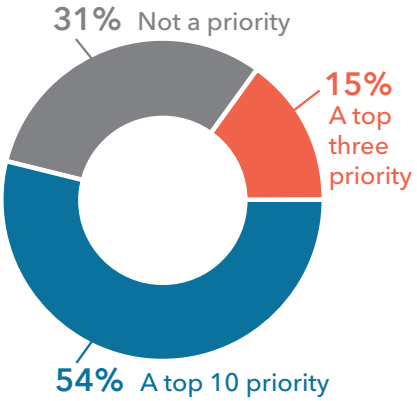
The State of Advanced Analytics in Innovation

The overwhelming majority of executives involved in innovation acknowledge the potential of advanced analytics to transform the innovation process across industries in the next few years. Nearly half (46%) believe that advanced analytics will drive major changes and 49% believe that it will drive some changes in how their industry innovates. For 15% of executives surveyed, advanced analytics in innovation is a top 3 priority and for two-thirds, it's a lesser but still important priority. One in ten executives predicts that, if it hasn't already, advanced analytics will become a top priority over the next 3-5 year horizon.

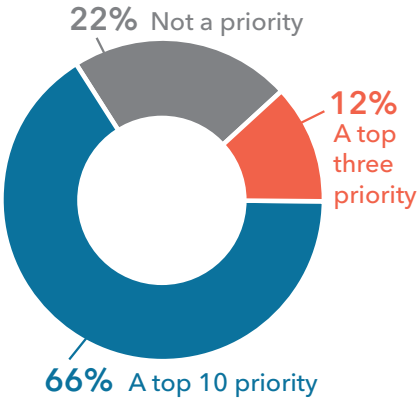
"ANALYTICS IS GOING TO TRANSFORM EQUIPMENT MANUFACTURERS TOTALLY. NO EQUIPMENT MANUFACTURER CAN HOLD ON GROUND UNLESS IT DEVELOPS A SOFTWARE OFFERING TO GO WITH THE EQUIPMENT."

– MANUFACTURING EXECUTIVE

Prioritization of the Use of Analytics to Improve Innovation Performance



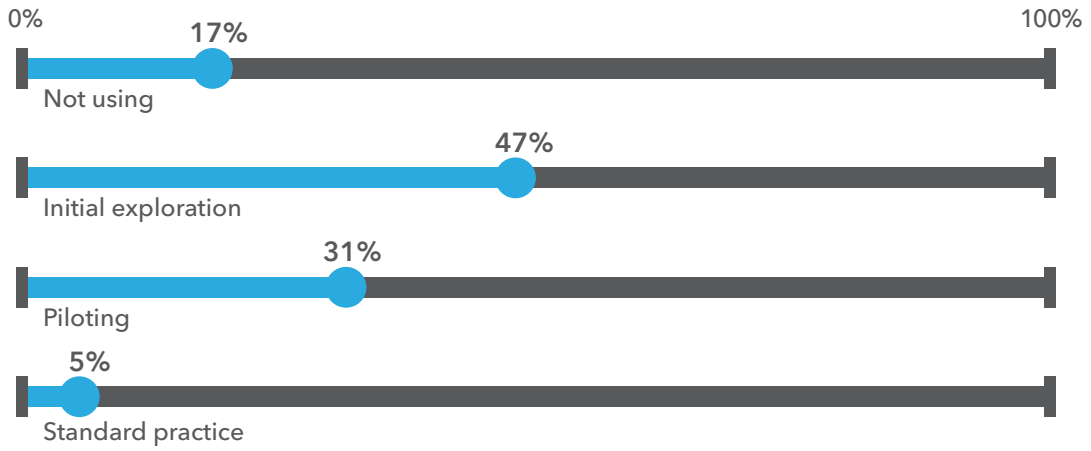
Next 1–2 Years



Next 3–5 Years

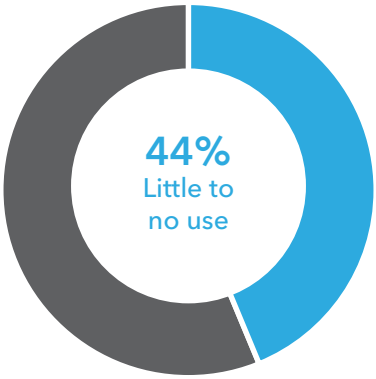
Despite being a priority, few executives report that advanced analytics are fully deployed in their innovation process. Investments are still in the early stages, and 95% of executives admit they have either not touched advanced analytics at all, are barely scratching the surface, or at best have done a couple of proofs of concept. However, as with other endeavors, priority translates into action. Executives who assign a high priority to advanced analytics are twice as likely to have done at least a few proofs of concept or have deployed analytics compared to those who do not assign high priority to analytics.

Status of Advanced Analytics Adoption – Percent of Companies at Each Stage

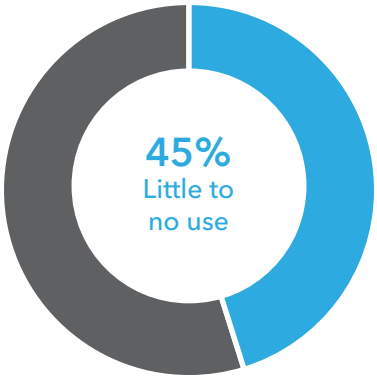


Advanced analytics is a new-enough discipline that there is practically no difference in its use between companies that are above-average or leading innovators versus those that are below-average or average innovators. The field of play is still wide open, and there a is first-mover or fast-follower advantage to be claimed: nearly two-thirds (60%) of both categories of innovators have yet to start, or have barely scratched the surface of exploiting analytics for innovation. It seems likely that the power of advanced analytics to harness big data and deliver insights will become a significant new performance differentiator in product development and innovation, if it hasn't already for some market-leading firms. Currently, lower-performing innovators, who crack the code on advanced analytics in innovation early, may be able to leapfrog their higher performing peers in short order.

Innovation Performance by Advanced Analytics Adoption Stage



Below Industry Average

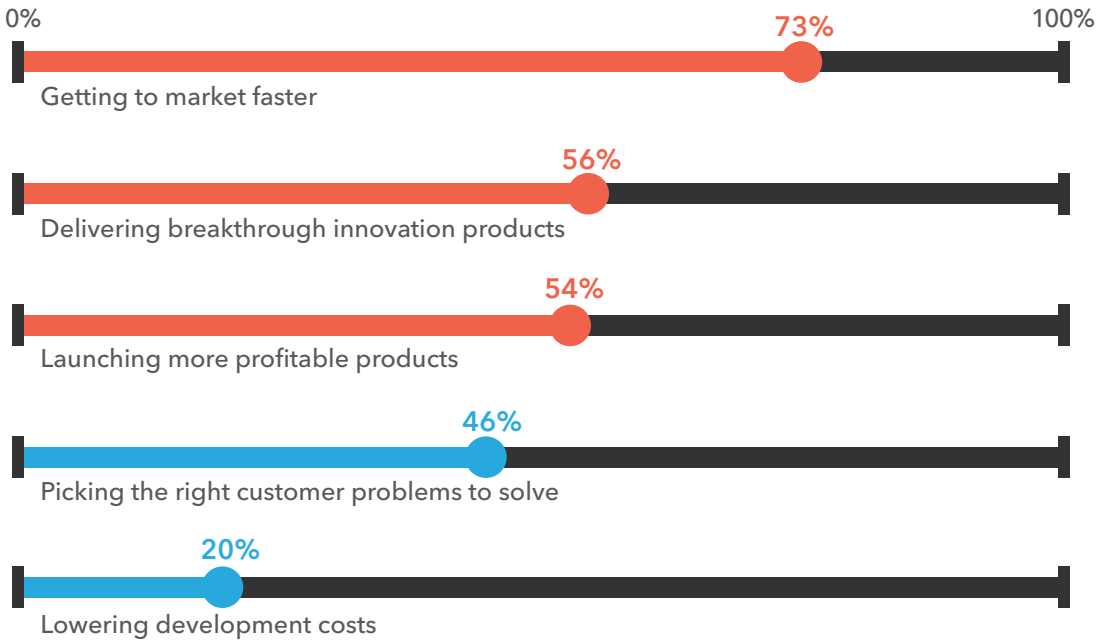


Leading the Industry

Opportunities and Early Successes

The use of advanced analytics in innovation, or anywhere else for that matter, is not an end in itself. It is a means to an end, a more effective and efficient innovation process. Therefore to explore its value, it needs to be assessed according to the to the major innovation challenges it can potentially solve. This study looked at a number of innovation challenges, the advanced analytics techniques being applied to each challenge, and whether or not there was a successful outcome from using advanced analytics. Unsurprisingly, the majority of companies are focused on the same challenge—speed to market. Launching more profitable products, delivering breakthrough innovations, and picking the right customers are important innovation challenges, but not nearly as ubiquitous as speed. Lowering development costs was, somewhat surprisingly, not a concern for most respondents, although it was more important to process manufacturers than for product manufacturers. Challenges varied little across all responding executives, irrespective of their company's innovation performance.

Top 3 Innovation Challenges

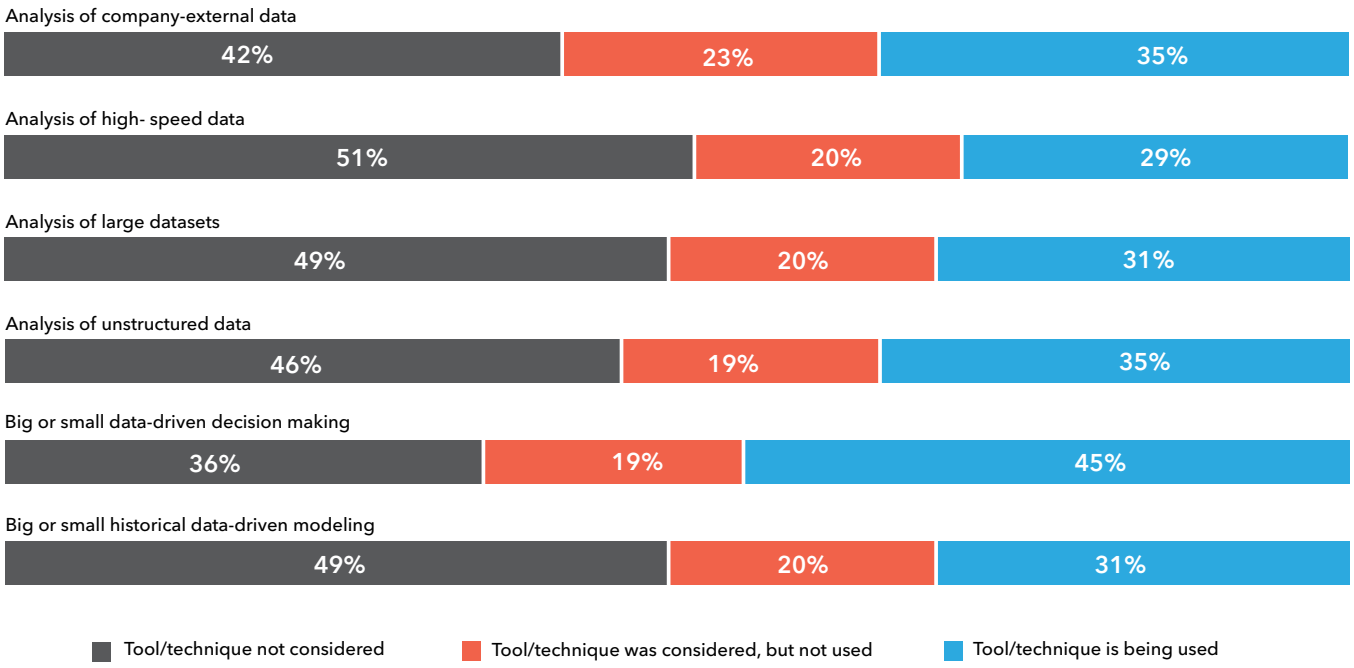


Advanced analytics is a relatively new and broad field with no united definition. To ensure a shared understanding of what constitutes advanced analytics, an explicit and exhaustive list of analytics techniques was defined and where possible, was used to get responses not just in the overall application of advanced analytics level but down to the application of the individual techniques constituting advanced analytics. A detailed list of analytics techniques included in this survey can be found at the end of the report.

How widespread is the use of advanced analytics techniques in innovation?
Companies use a patchwork pattern of advanced analytics techniques, with no technique being a silver bullet to solve all of the most pressing innovation challenges. Most of the techniques we tested were not considered by an average of 45% of respondents, considered but not used by another 20%, and used by just 35% of respondents.

There's only one outlier to this pattern: big or small data-driven decision-making. This technique is slightly more common, with 45% of respondents applying it to at least one innovation challenge. It is encouraging to see that manufacturers are using data where it can have an immediate impact-to drive better business decisions. But the fact that it is easier to practice data-driven decision-making, irrespective of whether true advanced analytics techniques are applied or not, is also likely to be a contributing factor to its relatively higher widespread usage.

Implementation of Analytics Tools



Does the usage of analytics techniques vary by company analytics maturity?
From the analysis, we can discern the emergence of basic maturity phases in the advanced analytics journey of innovation. There are clear differences in the application of analytics techniques between companies who have barely scratched the surface and those who have done several proofs of concept:

- Those at the beginning of the analytics journey focus on advanced analytics to support decision-making and using unstructured external data.
- Those applying advanced analytics in proofs of concept invest more heavily in core analytics techniques that use their historical data, large datasets, and high-speed data.

This pattern repeats itself when comparing the application of advanced analytics techniques in companies where analytics is a low priority versus a high priority. Again we see that priority setting leads to progress. Those who assign a high priority to analytics or are further along in their analytics journey, are actively addressing the challenging aspects of advanced analytics related to large volume and high-speed data. In contrast, those who have assigned a low priority to analytics are either focusing on small data or external data as it has become relatively easier to do so.

The challenges of using external and internal data are different. As interest in external data, particularly unstructured text has grown, numerous tools and vendors have come to market that collect, clean, and provide data or analysis to companies. A manufacturer is thus able to plug and play with external data if it uses these specialized tools and vendors. Working with internal data is a different story altogether. Manufacturers need to do the heavy lifting to improve data access and quality before off-the-shelf tools can be applied. This requires a much higher commitment and investment level. Only those manufacturers that assign the highest priority to analytics will make the necessary resources available to make their internal data useful.

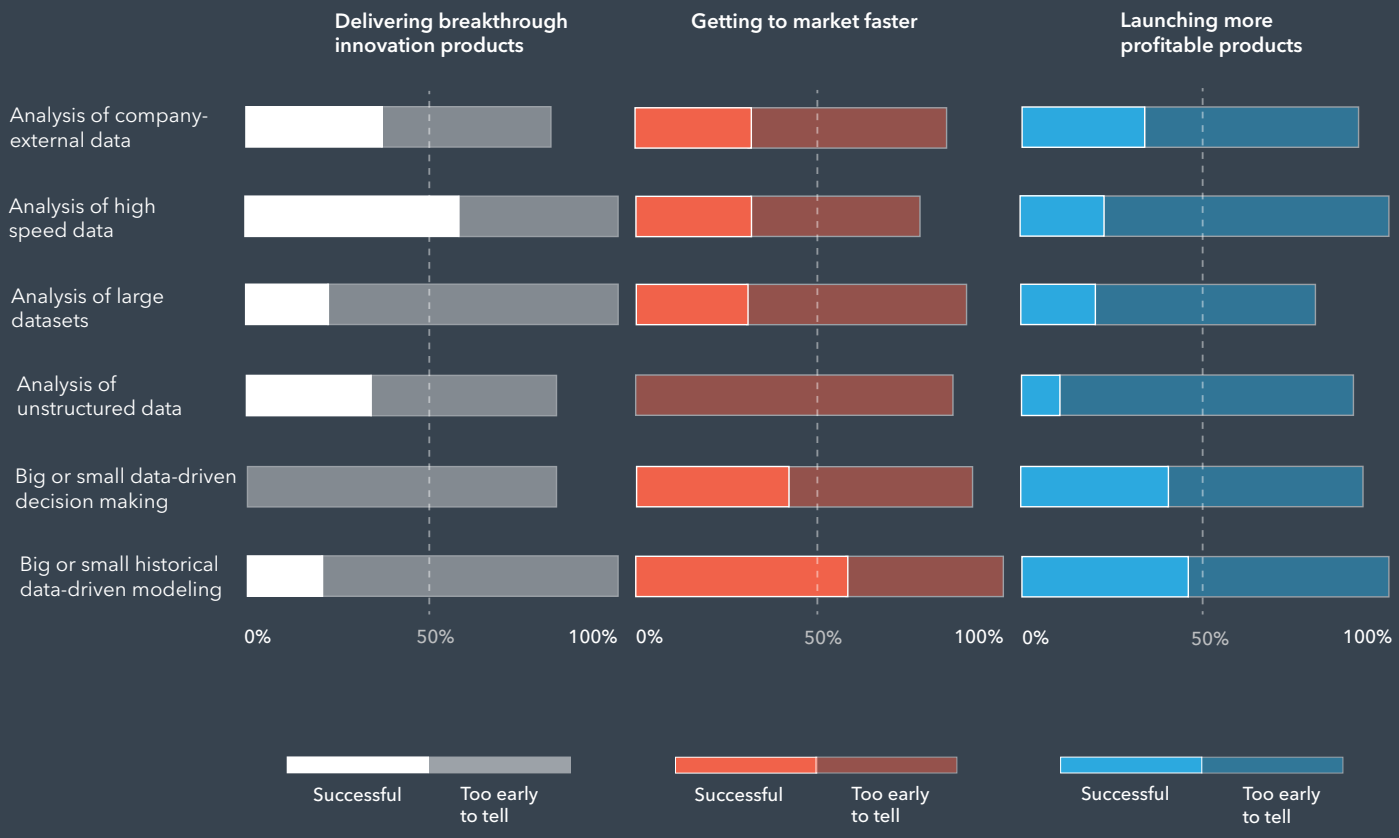
Which analytics techniques are successful and on what innovation challenges? Innovation teams are trying different techniques across these three major innovation challenges at roughly the same rate and thus far rarely see success more than 1 in every 3 times. With only 5% of executives reporting their company is routinely using advanced analytics in innovation, this success rate of mainly proofs of concept implies it's too early to declare failure or success in the application of analytics techniques to fuel innovation success. The field is wide open for anyone to become the pacesetter applying advanced analytics successfully in innovation.

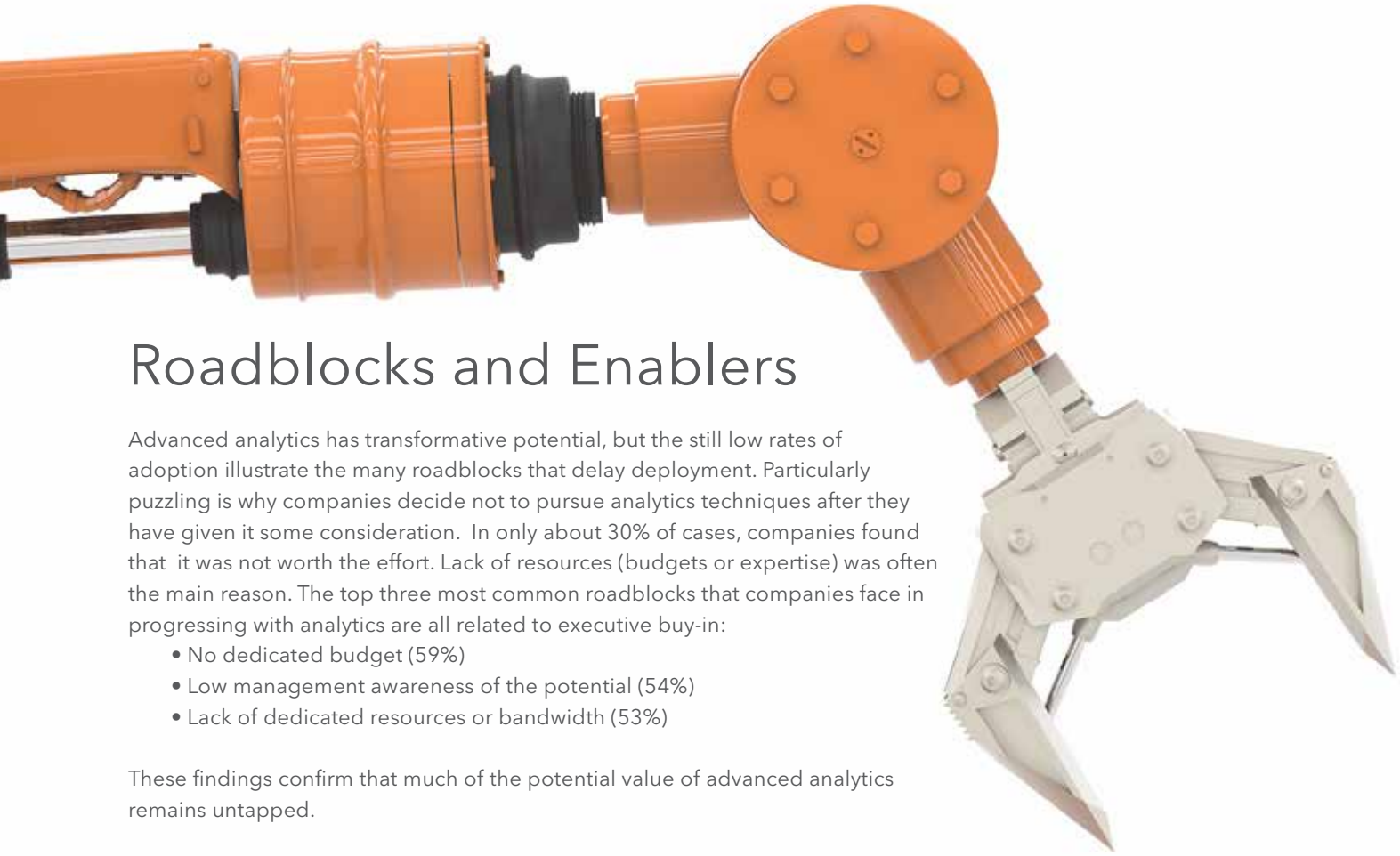
It's unlikely there is one catch-all advanced analytics technique that will broadly solve the most pressing innovation challenges, so it is important to evaluate the successful application of analytics techniques in the context of a single innovation challenge. Proofs of concept across all innovation challenges with certain advanced analytics techniques are showing better than average success rates in some areas including:

- The analysis of high speed data to break through innovation products.
- Big or small historical data-driven modeling to get products to market faster and launch more profitable products.
- Big or small data-driven decision making to get products to market faster and launch more profitable products.

Proceed cautiously. At this point we only have the results of limited experimentation with each advanced analytics technique. Different success patterns may emerge as more companies enter the proofs-of-concept stage and start to use advanced analytics more routinely in innovation.

The Successful Use of Advanced Analytics Tools in Innovation





Roadblocks and Enablers

Advanced analytics has transformative potential, but the still low rates of adoption illustrate the many roadblocks that delay deployment. Particularly puzzling is why companies decide not to pursue analytics techniques after they have given it some consideration. In only about 30% of cases, companies found that it was not worth the effort. Lack of resources (budgets or expertise) was often the main reason. The top three most common roadblocks that companies face in progressing with analytics are all related to executive buy-in:

- No dedicated budget (59%)
- Low management awareness of the potential (54%)
- Lack of dedicated resources or bandwidth (53%)

These findings confirm that much of the potential value of advanced analytics remains untapped.

Across all respondents, the particular roadblocks encountered depend somewhat on the advanced analytics maturity of the company. Those earlier in their advanced analytics journey are still skeptical of the potential benefits, while those, further along, are more likely to be struggling with implementation issues. In practice, this means that those who have barely started still struggle to put a clear business case together and find themselves in a familiar catch-22 paradox: without awareness of the potential power of advanced analytics in innovation, the budget and investment in expertise are not forthcoming and vice-versa. Those further along find themselves faced with challenges related to the lack of digitized data and appropriate tools.

Manufacturers who experience similar challenges, pursue similar solutions to make further investments in advanced analytics. Key tactics include trying to influence the corporate culture to adopt a data-driven problem solving process, defining a strategy to apply new analytical techniques to innovation challenges, and establishing performance measures to track their results. Addressing the catch-22 head on, educating others, and evangelizing the power of advanced analytics is a common secondary tactic. Regardless of their advanced analytics maturity today, companies apply similar tactics to persuade business leaders to invest more in advanced analytics capabilities. The only difference is that those who are already applying advanced analytics techniques are working on more enablers and therefore trying harder than those who have barely started.

We looked deeper into the subset of our respondents who assigned a high priority to analytics today. Within this subset, we compared roadblocks and steps taken to remove them between those (45%) in the subset with higher analytics maturity and with those having lower analytics maturity. With this comparison, we can detect differences between those who believe analytics is important and have made some progress with it (as in doing proofs of concept) and those who believe that analytics is important but have not made progress. The key differences are:

- Companies who are just beginning their analytics journey find it hard to get started. With low management awareness of the power of analytics, they have little money, time, or staff to dedicate to these types of activities.

- Companies who have done proofs of concept have gained crucial management awareness as well as experience translating their issues into analytics problems. Resourcing, mastering data tools, and dealing with fragmented data remain issues, but they have overcome common start-up challenges such as building a business case to secure budget and resources. Primary enablers in overcoming those roadblocks appear to be successful in creating a more data-driven culture and promoting the benefits of advanced analytics.

Some of the companies who are just getting started find it hard to establish the ROI of advanced analytics and identify the tools to transform data. Additionally, they often find themselves running up against governance hurdles about data ownership. Only a small number of companies have made investments in an analytics unit or center of excellence (CoE), although those further along in their journey often engage support from consultants to supplement their internal expertise. Even companies who have invested in proofs of concept still struggle to find the right digital talent to bring onto the team to support their analytics programs. Without adequate in-house analytics expertise, demonstrating the ROI of advanced analytics and establishing a set of KPIs to measure the performance of analytics programs remains elusive for some innovation teams—both are critical enablers for companies who are just getting started. Lastly, some companies are operating with out-of-date IT systems and data infrastructure. More investments need to be made to ensure that innovation teams have timely and reliable access to both internal and external data to support decision-making.

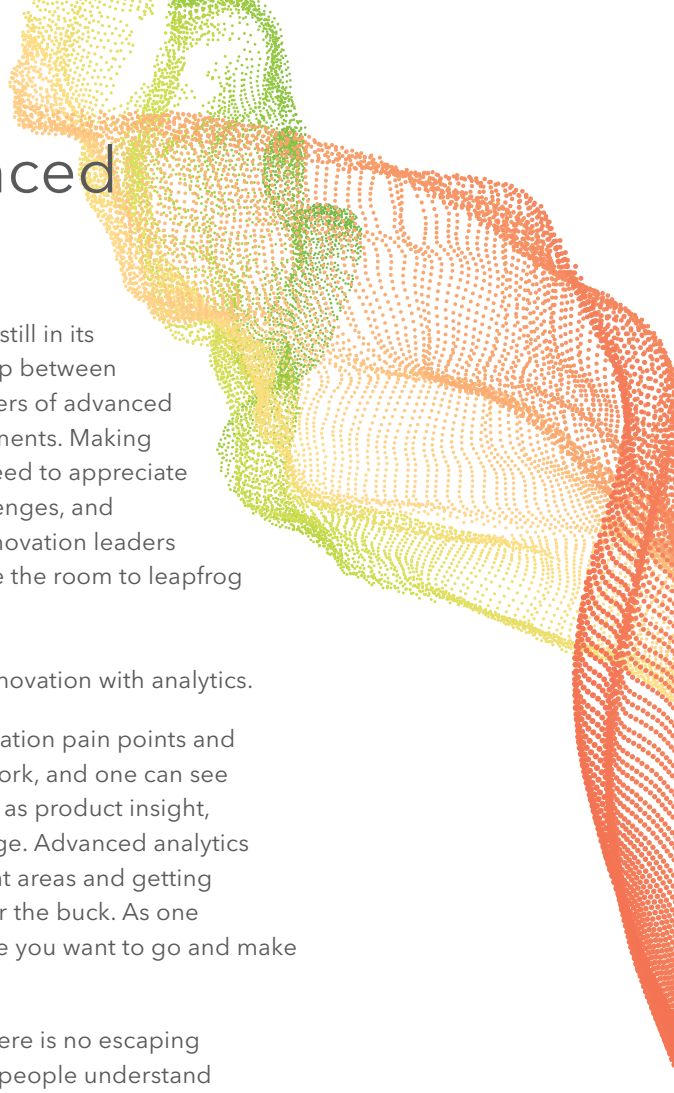
Main Roadblocks of Advanced Analytics Adoption

Roadblock	Companies with Proofs of Concept or Routinely Using Advanced Analytics	Companies with Little to No Use of Advanced Analytics
No budget	✘	✘
Data is siloed	✘	✘
No resources or bandwidth	✘	✘
No adequate data tools	✘	
Data is not digitized	✘	
Low management awareness		✘
Struggle to translate issues into analytics problems		✘

Main Enablers of Advanced Analytics Adoption

Enabler	Companies with Proofs of Concept or Routinely Using Advanced Analytics	Companies with Little to No Use of Advanced Analytics
Define a plan and strategy	✔	✔
Encourage data-driven decision-making culture	✔	✔
Educate and evangelize analytics	✔	
Invest in tools to do analytics	✔	
Engage external consultants	✔	
Define metrics, milestones, and KPIs		✔
Demonstrate ROI		✔
Hire the right skills and capabilities		✔

The Way Forward for Advanced Analytics in Innovation



The use of advanced analytics in innovation and product development is still in its infancy, yet some companies have managed to pull slightly ahead.The gap between leaders and laggards will grow in the coming years unless lagging adopters of advanced analytics can effectively overcome internal hurdles hindering their investments. Making advanced analytics a priority in innovation isn't enough; senior leaders need to appreciate the power of advanced analytics in addressing common innovation challenges, and companies need to work on resolving data-related roadblocks. Not all innovation leaders are leaders in using advanced analytics. Thus innovation challengers have the room to leapfrog innovation leaders using analytics.

Here are four steps innovation executives should follow to propel their innovation with analytics.

1. **Be specific in the application of advanced analytics.** Identify innovation pain points and apply analytics in those areas. Take any existing innovation framework, and one can see that leading innovators typically excel in one or more aspects such as product insight, project execution, portfolio management, and talent and knowledge. Advanced analytics can improve each of these. But prioritizing innovation improvement areas and getting your colleagues behind the initiative may give the biggest bang for the buck. As one manufacturing executive told us, "Make sure you understand where you want to go and make sure you are aligned with your colleagues on that."

2. **Start laying the foundation for success.** This study suggests that there is no escaping the groundwork needed for advanced analytics to flourish. Unless people understand the benefits of advanced analytics and there is a culture of data-driven decision-making, progress will be slow and often painful. Our interviews revealed that the new mindset needs to start at the top, even as far up as at the CEO level.

3. **Pluck the low-hanging fruit.** Early success is important, just as with any other type of change management. Innovation leaders should pick their top innovation challenge, match it with an advanced analytics technique most likely to address it, and then run a proof of concept. Data and cultural conditions are never going to be perfect while getting advanced analytics programs off the ground, but demonstrating that initial benefit is critical to get the buy-in and create enthusiasm for analytics. Our interviews revealed that to plug the advanced analytics skills gap and get a quick start. Many companies relied on external tools and resources to fill the gap.

4. **Acquire further advanced analytics capabilities and build a comprehensive infrastructure.** Finally one needs to transition from ad-hoc proofs of concept to a more systematic use of data. This is only feasible after making adequate investments in the data infrastructure, quality, access, and skills and tools needed to do the analytics.

Demographics and Study Methodology

MAPI, Decodexis, and BMNP Strategies research about the use of advanced analytics in innovation was conducted through an online survey as well as phone interviews with innovation executives. The survey participants included manufacturing executives in engineering, R&D, innovation, and business leadership roles including both U.S.-based MAPI members (93% of total executives) and some non-MAPI members based in Europe (7% of total executives). Targeted interviews were conducted with select number of survey respondents to enrich the survey findings. Respondents represent a variety of manufacturing industries, with nearly three-quarters being product manufacturers and the other quarter being process manufacturers. The results were consistent across product and process manufacturers.

One of the reasons it is difficult to get consistent information on the use of advanced analytics is that there is no standard definition of advanced analytics. For this research, and to get to a shared and a more detailed definition of advanced analytics, this study defined a discrete set of techniques under the broad advanced-analytics umbrella encompassing the following:

- Analysis of large datasets: business intelligence, data mining, distributed computing (e.g., on Hadoop, Spark, etc.)
- Analysis of high speed data: analysis of sensor or machine data, real time data processing and visualization
- Analysis of unstructured data: analysis of documents and reports, image or audio or video data mining
- Analysis of company-external data: social media, websites, etc. – either standalone or in combination with internal data
- Big or small historical data-driven modeling: machine learning, statistical modeling, predictive modeling
- Big or small data-driven decision making, for example, on portfolio, projects, risk, resources, and investments
- Others – simulations, virtual testing, etc.

Learn More About Our Partners

For this research, MAPI collaborated with BMNP Strategies, an advisory company, and Decodexis, an advanced analytics company.

BMNP Strategies LLC

BMNP Strategies LLC is an advisory company based in McLean, Virginia. It serves clients on strategy, innovation and tech ethics challenges, and assists industrial companies with Industry 4.0 transitions. Its ethics work is centered on mitigating the risks and liabilities of artificial intelligence and robotics, and Ethics-driven Innovation®, a proprietary innovation process to help clients design successful new business models that meet the highest ethical standards.

Decodexis

Decodexis is a company based in the Netherlands. Decodexis provides bespoke advanced analytics services to its clients primarily in manufacturing sectors. Decodexis serves clients end-to-end on advanced analytics and digital transformation topics, ranging from identifying analytics opportunities, to doing proofs of concept and helping clients embed analytics in their organizations.

MAPI

Founded in 1933, the Manufacturers Alliance for Productivity and Innovation is a nonprofit organization that connects manufacturing leaders with the ideas they need to make smarter decisions. As the Manufacturing Leadership Network, its mission is to build strong leadership within manufacturing to drive the growth, profitability, and stature of global manufacturers. For more information, visit mapi.net.