Viewpoints

Viewpoints on

Advanced Analytics in R&D

A Guide for CPG Manufacturers

KALYPSO

A ROCKWELL AUTOMATION COMPANY

After a difficult year, CPG companies are wondering what the future holds. As people start to change behaviors and settle into whatever "normal" is going to mean, how will behaviors and trends be different from our pre-pandemic lives? Will they continue to cook more at home? Will they return to offices and schools?

No matter what the future holds, the digital transformations that have accelerated since March of 2020 will continue to drive efficiency in a post-pandemic world. And no matter what happens, CPG companies will always seek ways to find new ways to discover, create, make and sell new product – better, faster and cheaper.

One important area to consider is the application of advanced analytics to the R&D process itself.

Top performing CPG brands are known for taking a data-driven approach to evolving their brands based on marketing and sales data. As functions and processes become more connected across the enterprise, the next big opportunity for data-driven insights is centered around R&D.

CPG companies are sitting on huge volumes of data about products, customers, consumers and operations. This data is housed in systems and spreadsheets across the enterprise, from sales and marketing to manufacturing and R&D.

By connecting all of this enterprise data, companies can transform product development with data-driven insights that both augment and automate R&D operations and decision making.

This eBook contains advice and opinions on leveraging analytics in consumer goods, as well as examples of real use cases to demonstrate the real value companies have achieved.

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CPG's New Business as Usual: Tactics to Prepare for the Future

By Colin Speakman

"The pessimist sees difficulty in every opportunity. The optimist sees the opportunity in every difficulty." – Sir Winston Churchill

There is difficulty everywhere. The stock market, the news, politics, even at the grocery store. These are unprecedented times, but as an optimist, I believe we will learn, adapt and thrive again.

For businesses to prosper, there are new approaches, new delivery methods and new business models waiting to be digested and incorporated into everyday life. The question is… how do we get there from here?

I am a classically trained CPG professional who grew up in one of the 'big CPG machines,' and I know how things are typically done to achieve lasting brand value and equity. There is a proven methodical approach that has usually created significant value for individuals and organizations alike. I have also been fortunate enough to work with several large global CPG organizations and I know that many also understand that what was good enough before is not good enough anymore.

As days go by and challenges mount, what actions will you take to adapt and survive in the near-term? Thinking ahead, how will your business look different? What can you do now to prepare for this future?

The Limitations of Our 'Absolutes'

We are creatures of habit that evolve in steps, taking what has worked in the past and modifying it… a little. The CPG industry – like many others – focuses on meeting new demands through creative solutions based on assumptions that have proven successful over the years. Here are a few key things I learned 'back in the day' that, until a month ago, were absolutes:

- **Interact directly with the consumer** – Leverage in-person ethnographies, monitor grocery store behaviors, run focus groups and perform observational research
- **Perform hands-on new product development** – Experiment and test ideas with consumers, employ trial-and-error development, perform physical testing of shelf stability, packaging and distribution requirements
- **Streamline operations based on financials** – Optimize procurement's power to find lowest costs providers, optimize manufacturing capabilities to minimize downtime and maximize throughput on equipment, work to drive down capital costs

Lots of interactions… lots of 'touches'… this is the way billion-dollar brands were built – and are still being built.

And while new techniques and technologies are coming onto the market with the promise of transforming businesses, they don't have the track record of how it affects the organization… OUR organization.

For new, small CPG companies, adopting new techniques is critical for success. But for the leaders in established global organizations – is the risk/reward equation worth the necessary time to communicate to the Street, to the C-Suite and to the boss? For many, risk causes hesitation.
A CPG leader once told me about risk: "I love the idea, and the revenue, volume and profitability all look appealing. I just don't think I'm willing to do things that differently or take on any risk during my watch."

Rethinking our Assumptions

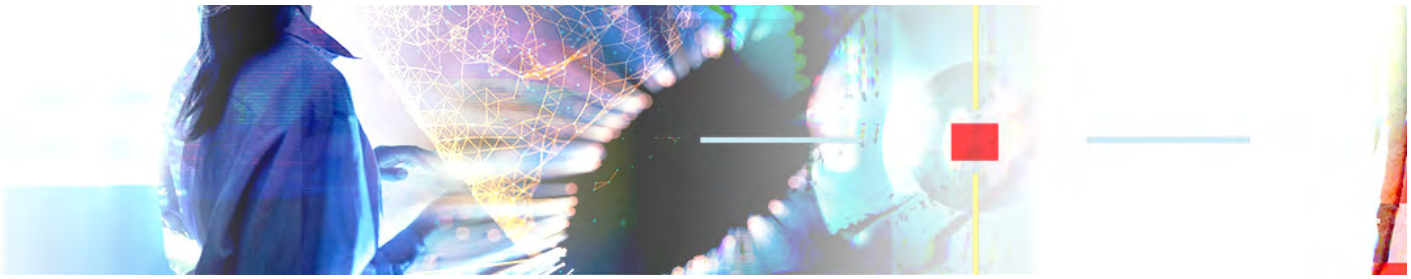
The last month has caused all of us to take a pause and reflect on our assumptions. Handshakes after every face-to-face meeting? Flying to our other offices to meet with our team? Constantly chasing cheaper manufacturing in Asia? Perhaps we need to rethink – and adjust – some other 'given' practices.

To thrive, organizations will need to adapt and evolve how they discover, create, make and sell their products. They will need to build upon data, analytics, modeling, smart connectivity and automation. What if we modify our thinking a bit, and focus on how we can leverage existing digital capabilities so we can:

- **Understand the consumer** – Identify rapidly evolving trends through advanced analytics, gain perspectives based on always-on active monitoring research, understand how shoppers engage, purchase and comment on products.
- **Perform virtual new product development** – Leverage digital twins and modeling/ simulation to predict new products that will match evolving consumer interests, use modeling and simulation to determine shelf stability, packaging and distribution requirements
- **Optimize operations based on financials** – Develop operational efficiency through automation that relies more on data and less on operator 'know-how,' optimize procurement's power to find low cost providers across a network of suppliers with redundancy built on connected specifications, optimize throughput through smart connected operations that dictate when preventative maintenance should happen while minimizing impact on operations

Lots of modeling… lots of 'scenarios'… this isn't the future, this is TODAY.
This is the way billion-dollar brands will excel in the future.

This new environment focuses less on 'how it was done' and more on 'how we can do it,' leveraging data and technology to drive speed to decision making, speed to market, and most importantly, speed to delighting the consumer. Digital capabilities and digital transformations are here today and are being adopted by many organizations to enable this new reality.



Focus Areas to Prepare for the New Normal

At some point, consumer 'touches' will come back, but it likely will not be the same. Crises serve as a catalyst for change, ushering in new approaches, new models and new technologies. To thrive in the new reality, here are a few areas for focus:

- **Data** – CPG manufacturers have volumes of accumulated data about products, customers, consumers and operations. Drawing actionable insights from enterprise data remains a challenge due to incomplete, inaccurate and inconsistent data sets. Focus on what data is important, and focus on its quality, security, governance and how it combines with other data to generate valuable insights. Invest time in creating the right process and using the right systems to generate actionable data.
- **Analytics** – Analytics should be built on a solid data foundation. Fully leveraging analytics requires new talent, new organizational structures, and the ability to combine mathematical, technical and business capabilities. Explore data to create initial observations and simple trends. Explain observations and trends through the measurement of causal relationships and correlations between variables.
- **Modeling & Simulation** – Creating a digital representation of a product requires data and analytics to be successful. Leverage a digital twin (a digital representation of the physical product) to enable testing, analysis and performance improvements without entering a lab. Determine what data/attributes can articulate what a product is in digital form. Create models that test these attributes and observe what will happen if certain actions were to happen in the physical world. Adjust the digital twin and re-test, all before having to touch the physical product.
- **Smart Connectivity** – Bringing the data, analytics, modeling and simulation together make prescriptive recommendations and optimization a reality. Identify key indicators for quality outliers and how manufacturing nuances can play a part in controlling them. Initiate changes and maintenance based on performance parameters and take the guess work out of what and when they should happen.

Remarkably, many of these concepts and ideas probably seem like ideas 'for the future.' In reality, they are already in practice across other industries, with adoption only just starting within CPG.

Conclusion

In these unprecedented times, priorities have shifted, and companies need ways to reduce near-term risk and transform to deal with the impacts – both today and tomorrow. Despite rapidly changing external factors, you still need to run your business and take actions to adapt and survive.

Thinking ahead, when the crisis of today is behind us, our world (and our businesses) will look different. As companies, industries and economies recover, coping with that change and continuing to adapt for the future will become more important than ever.

How are you going to be an optimist and find an opportunity to drive your company forward in these challenging times?

Advanced Analytics in Consumer Goods: Three High-Value Use Cases

By Rein Singfield

Companies that manufacture consumer packaged goods are great candidates for driving real business value from advanced analytics. At this point, we all realize there's potential value, but there's still a lot of hype, and many of the technologies are complex.

Here are some real applications of machine learning and analytics for CPG manufacturers, along with some practical recommendations on how to get started.

A Little Background on Advanced Analytics and Machine Learning

Advanced Analytics is the examination of internal and/or external data sources using machine learning, natural language processing, and other sophisticated techniques to discover deeper insights, make predictions and/or generate recommendations. The capabilities of advanced analytics typically go beyond those of traditional business intelligence.

Machine Learning is an artificial intelligence (AI) technique that allows a computer program to learn without being explicitly programmed.

Machine learning algorithms are designed to learn new things in similar ways that humans learn – yet much faster, at a greater scale, and under more complex conditions. Unlike traditional computer algorithms, these grow and change when exposed to new data.

A great example is the 2016 machine learning breakthrough when an algorithm beat a Grandmaster at the game of Go. There are more possible positions on a Go board than there are atoms in the universe (10^{360}). Traditional computer algorithms could not handle such a challenge. At first, the algorithm was a blank slate. Then it was trained with historical real-life games. Then it was tested, and its learning was reinforced with game play. Finally, it picked a strategy to win based on statistics.

At the time, it took six weeks to train the algorithm to be a Grandmaster. Today, with the improvements in learning algorithms and computer processing, it would only take three days. For a simple game like Chess, it takes less than an afternoon to go from knowing nothing about the game to defeating a human grand champion.[1]

Consumer Goods Manufacturers can Leverage Advanced Analytics to:

- **Explore** current and historical performance
- **Explain** trends, root causes and correlations
- **Predict** future predictions and foresights
- **Prescribe** evidenced-based recommendations to improve future outcomes
- **Automate** actions based on learning rules, so simple tasks can be completed without human intervention

1 https://deepmind.com/blog/alphazero-shedding-new-light-grand-games-chess-shogi-and-go/

So What Does This Mean in a Business Context?

With advanced analytics, companies can drive actionable insights from data that comes from multiple sources and systems (both internal and external). And in the same way algorithms can be trained to make decisions to win a game of Chess, they can be trained to extract meaningful insights from product data, formulate predictions, recommend improvements, and even automate actions within systems and processes.

These predictions, prescriptions and automation can improve marketing effectiveness, increase sales team performance, improve forecasting, optimize the supply chain, and streamline manufacturing.

Three Valuable Use Cases for Consumer Goods Manufacturers

Here are three use cases we've seen drive real business value.

Product Lifecycle Intelligence

PLI is the application of advanced analytics across the product development lifecycle to improve results from innovation.

Most companies have collected product data for years, and it's largely untapped. Data in enterprise systems like product lifecycle management (PLM) describes the decisions made on products, and there's an opportunity to combine this with data from other sources like ERP, MES, and other systems. With PLI, companies can drive actionable insights from all of these sources to predict outcomes and prescribe actions to improve results. And it only takes minutes.

As an example, we worked with one company that was searching for ways to optimize R&D cycle time. With PLI, we helped them apply predictive and prescriptive techniques that not only optimized R&D, but also product development and quality processes, which drove substantial cycle time reduction. PLI can transform data management tools into an intelligent decision-making system that benefits the whole enterprise.

Here's a six minute overview of PLI. Check it out to learn about structured data, advanced analytics vs. machine learning, and more about how PLI leverages these technologies to maximize the value of PLM data.

KNOW: The Future of Product Data Analytics from Kalypso LP on Vimeo

Robotic Process Automation

RPA is an automation tool that completes rule-based tasks in a business process. The traditional goal of RPA is to take the robot out of the human—to complete repetitive and rule-based tasks without human intervention. With RPA, these tasks are completed faster and with more accuracy.

We've seen companies apply RPA to automate and improve data migration to drive business value in the following situations:

- **Data Standardization and Validation:** With RPA, companies can quickly and easily improve data standards use across systems and validate them against publicly available data.
- **Data Confirmation:** An organization can leverage RPA to review and confirm information submitted to a central repository. This data can be from suppliers, consumers, customers, or an internal function.
- **System Modernization:** When sunsetting legacy systems or moving capabilities to the cloud, RPA helps create a better user experience on the front end while using different systems on the backend.
- **Mergers and Acquisitions:** RPA quickly migrates data to resolve overlapping systems and datasets, enabling platform consolidation and reducing licensing costs.

- **Data Duplication and Reporting** (for ongoing data migration):
  - Many legacy systems cannot support integration and require employees to enter data twice or use a manual migration format, like Excel or CSV. RPA eliminates that duplication.
  - Real-time data relevant to the CRM function can exist in multiple systems. With RPA, this data can be refreshed quickly by clicking a button that launches a bot to retrieve the data from multiple systems.

The RPA software robot (or bot) has a user ID just like a person. The bot typically has a single-business task governed by logic and structured inputs. Its rules do not deviate. It does not learn, but this technique has been successful in streamlining operations and freeing up staff spare time.

RPA can improve data migration by providing:

- **Ease of Use:** Most systems have a graphical user interface (GUI) and can be configured without advanced programming skills. Some systems are starting to apply machine learning, meaning the RPA can learn over time. [AK10]
- **Data Quality Checks:** Most RPA solutions quickly expose inconsistencies in data and can use external data to improve validation. Some even leverage machine learning to make data quality checks better.
- **Traceability:** Data traceability is a concern, so many RPA solutions can produce a log file with a configurable level of detail in various data output types to satisfy data traceability needs.

Always On Monitoring

This is an algorithm that monitors internal and external data sources, and then applies analytics and machine learning to provide insights around a specific business question.

Today, trends are more dynamic, consumer engagement models constantly evolve, channels are frequently disrupted, and regulatory shifts are common. With always on monitoring, consumer goods manufacturers can keep their finger on the pulse.

As an example, we have helped companies leverage always on monitoring to rapidly identify the difference between complaints and mentions that appear online. When they properly categorize complaints, they can feed the right insights back to product developers to improve future product revisions. So they get smarter insight without expanding headcount.

For one company, we helped to connect structured internal complaint monitoring with unstructured social media sentiment to analyze and assess the inputs received. The always on system continues to monitor activity, process new data, and refine the algorithm it uses to be more exact.

Getting Started with Advanced Analytics in Consumer Goods

Many companies believe in the value of machine learning and advanced analytics technologies but are intimidated by their perceived complexity and lack clarity on how to get started.

One of the most important pieces of advice we can give is to avoid black-box analytics services. There are many companies who will outsource data science if you provide the data, but the benefits of these services can be limited, and this approach prevents companies from building analytics capabilities in-house.

Here are some leading practices based on our experience helping our clients build and adopt advanced capabilities around predictive analytics, machine learning and artificial intelligence.

1. Don't be afraid to start with a minimally viable product (MVP)
2. You may need to prove to your leaders that investment can pay off
3. Start with a Business Problem
4. Identify business needs that can be tied to clear analytical goals
5. Quantify the Metrics Improvement for the Business Case

Learn more on getting started

Blockchain in Consumer Goods: The Impact, the Challenges, and the Way Forward

By David Laborde

Blockchain, Bitcoin, Etherium… these words that were once only used in technical circles have now become mainstream vernacular. Since Bitcoin traded at an all-time high of over $17,000 per coin in December 2017, blockchain technology has been all the buzz from trading companies to food and beverage manufactures. But how can this new technology really impact your business and how can you get started?

The Blockchain Potential

What is Blockchain?

A blockchain is a continuously growing list of records, called blocks, which are linked and secured using cryptography. Across the chain are nodes, which record a transaction. For a block of new information to be added to the chain it must be validated and confirmed by a consensus of nodes on the network.

For more background, read Three Ways Blockchain Technology Will Impact R&D Management (link in More Reading section below).

Blockchain could also improve supply chains by identifying where inefficiencies occur. Cash flow could increase by improving account receivables through smart contracts, by verifying transactions the moment they occur, and by executing payment immediately and electronically.The proposed benefits of blockchain technology are huge. The distributed ledger technology can be leveraged to increase trust within the supply chain, ensuring products are what they say they are. Using the chain, a company or consumer can trace a product in their hand all the way back to its source, by simply scanning a QR code or looking up a unique identifier online. In the event of a recall, blockchain technology can help identify affected products within seconds, saving companies millions of dollars while protecting consumer health and brand trust.

With all of these upsides, it is no wonder big names within the consumer goods industry have started to experiment with various blockchain technologies. Carrefour, one of the largest hypermarket retailer chains in the world with a market cap of over €70B, began experimenting with blockchain technology last year. Carrefour started small, partnering with IBM's Food Trust blockchain to trace their free-range poultry line[1]. Following that success, Carrefour has expanded the technology to select dairy and produce lines. They have also partnered with Nestle, another IBM Food Trust customer, to enable blockchain traceability for Nestle's Mousline potato products[2].

1 Carrefour Hatches Poultry Tracking Blockchain Program: https://www.thomasnet.com/insights/carrefour-hatches-poultry-tracking-blockchain-program/

2 Carrefour - Nestle Blockchain: Technology for food transparency with Mousline!: http://www.carrefour.com/current-news/carrefour-nestle-blockchain-technology-for-food-transparency-with-mousline

Three Blockchain Challenges

Innovative technology has always been sexy. Each new idea or advancement brings the science fiction we all imagined as children closer to reality. And the decision makers in boardrooms want to be a part of bringing that future to life.

We talk with C-Suite executives every day, and these conversations are happening more and more. In each of those discussions, what we hear boils down to: "What about blockchain? I've read about it and think this could transform how we do business, but where do we begin?"

First, let's discuss the current challenges blockchains face.

No Industry Standards

Each blockchain is independent and there is yet to be a consensus around how and what data should be captured. With no industry standards in place, chains cannot easily communicate with each other. If a grocery retailer is trying to use Nestle products on IBM's blockchain and Bumblebee Tuna's products on SAP's blockchain, that information cannot easily be integrated. Each may have different data types and formats and may even capture different information. The retailer will then need to create a translation key so it can absorb and translate each chain's information into their system.

However, chains are beginning to address this issue. Source Chain International from Australia and Hoan Vu from Vietnam, both food testing labs, are partnering to create a database using OriginTrail's blockchain and GS1 standards[3].

By using GS1 standards, which are common in the global food and beverage manufacturing industry, both companies collect the same data information. Now if a customer uses either lab, the blockchain data collected will be consistent and easier to integrate to their system.

In a recent report from GS1, Bridging Blockchains: Interoperability is essential to the future of data sharing[4], the authors request a call to action for leaders in industry to come together and create a standard, enhancing the sharing and flow of data as blockchain technology continues to develop.

Debating Public vs Private

The next challenge facing companies using blockchain technology is to determine if their chain should be public or private. Since the blockchain is a distributed ledger where each node is validated by its members, all information can be seen by those members. Therefore, if a chain is public, all information can be seen, and so can all the transactions. For larger corporations, the information shared – trading partners, goods, location or even frequency – could expose strategic advantages they do not want to share with the world or their competitors.

On the flip side, consumers increasingly want to know more about the products they purchase. In a new report from the Food Marketing Institute, 75% of shoppers are more likely to switch to a brand with more information on a label, up from 39% in 2016[5]. This means companies need to decide the balance between what blockchain information they decide to share with the public versus which business transactions to keep private.

3 Blockchain Technology to extend GS1 standards to food testing labs "for first time": https://www.foodnavigator-asia.com/Article/2018/03/12/Blockchain-technology-to-extend-GS1-standards-to-food-testing-labs-for-first-time

4 Bridging Blockchains: Interoperability is essential to the future of data sharing: https://www.gs1.org/sites/default/files/bridging_blockchains_-_interoperability_is_essential_to_the_future_of_da.pdf

4 Bridging Blockchains: Interoperability is essential to the future of data sharing: https://www.gs1.org/sites/default/files/bridging_blockchains_-_interoperability_is_essential_to_the_future_of_da.pdf

5 Quantifying the value of transparency: https://www.foodbusinessnews.net/articles/12532-quantifying-the-value-of-transparency

But what if a company wants both – public transparency while maintaining data privacy? Enter Hybrid Blockchain[6]. A hybrid blockchain consists of using both a public blockchain and a private network that restricts participation to only those invited. Leveraging this technology, companies have the flexibility to determine what data is shared and with whom. Governments and multinational organizations are gravitating towards hybrid blockchains to gain the benefits of distributed ledger technology without the associated risks.

Cost (and Who Pays for It)

Implementing a new technology brings added costs. And a large decision companies will need to make is who will pay for that added cost? To implement blockchain, each transaction's data must be exchanged and validated. Often, that exchange occurs instantly by using sensors. The sensors can range from RFID chips the size of a grain of sand inserted into expensive wine bottles, to chips placed on product labels or attached to cases of goods. In every situation, some sort of technology will need to be installed so that when a transaction occurs, that data can be read, transmitted, logged and verified by the blockchain. And each transaction along the chain – from the farmer to the consumer – will need to be recorded.

So, who will pay for this? For vertically integrated companies, it is a simpler decision. For companies that interact with many partners, the question becomes more complicated. Should the farmer pay for the sensor to be added to his farm? Or the processing manufacturer? Will the shipping company incur the cost of adding sensors to their containers? And if the company pays for the sensors, will they also pay for the software, installation and maintenance?

When new technologies enter the marketplace, governments often step in to aid in user adoption. In 2018, the UK's Government Food Standard Agency (FSA), successfully completed a food chain blockchain trial for beef in a cattle slaughterhouse[7].

While the trial was limited and initial data collected small, government programs like this are a strong start in spreading the costs across all participants in a food chain, as well as potentially subsidizing implementation costs.

Getting Started with Blockchain

So, with such clearly defined benefits as well as significant obstacles, what should a company executive consider when exploring blockchain?

First, gather a deeper understanding of your supply chain. In order to successfully implement a blockchain, you need to fully understand your entire supply chain, who the players are and what information is or can be shared between each transaction. By fully mapping out your entire supply chain in detail, you will fully understand how your products move from farmer to consumer and what data can and should be collected at each transaction.

When it comes to initiating conversations, take the example of the widespread adoption of Adobe Acrobat as a new technology. Adobe successfully tackled the large task of changing consumer behavior while increasing use of their software. By understanding and leveraging Metcalf's Law, a network's value equals the square of the number of users, Adobe launched Acrobat by aligning with power players in the industry, like Microsoft, AOL, and Google, and complimenting their services. Adobe then created incentives for all involved parties, like free downloads and open source code, increasing user adoption. These strategic moves changed consumer behavior and increased adoption, launching Acrobat as the preferred PDF reader across the globe.

After you understand all the players throughout your supply chain and each of their respective transactions, start initiating conversations. Who are your most trusted partners? Are they exploring blockchain as well? Could you both test a common product to share costs and knowledge, building a chain together? Or perhaps, could you start in another aspect of your business – like marketing or finance? By testing in other departments, you can experiment with blockchain, understand the limitations and benefits, and expose any technology weaknesses before investing in a larger chain.

6 Hybrid Blockchains: The best of both public and private: https://bravenewcoin.com/insights/hybrid-blockchains-the-best-of-both-public-and-private

7 UK Government Food Agency Trials Food Chain Blockchain, Beginning with Beef: https://bctechreport.com/uk-government-food-agency-trials-food-chain-blockchain-beginning-with-beef/

And if you're comfortable with it, begin having a discussion with other leaders in your industry. Can you begin to develop a common blockchain language, or set the standards for what kinds and types of data to collect, increasing blockchain use and adoption? As noted in the March 2004 HBR article, The New Rules for Bringing Innovations to Market, by Bhaskar Chakravorti[8], "when a new product's adoption by one player depends on its adoption by other participants, there has to be a systemwide switching of behaviors before change can take place."

After mapping your supply chain data and assessing blockchain throughout your industry, you can begin evaluating your blockchain ROI. Start by answering these questions: What is my company's cost versus benefit? Who will pay for the nodes and what is their incentive? What drives my company's need for blockchain and what is the expected benefit? Are my customers requesting more transparency in my product's supply chain? In the event of a product recall, is my exposure dependent upon my identification and response time? And most importantly, do the results of implementing blockchain align with my company's core values, culture, and strategic goals?

Finally, stop waiting and start experimenting. Companies are testing blockchain in all aspects of their business; not just in supply chain, but marketing and finance too. And many are experimenting with new and innovative technologies. A common trend is to run think tanks, competitions or idea accelerators that are targeted specifically at identifying and developing ideas and emerging technologies. These new technologies, like blockchain, often turn into commercial pilots, advancing both the company and the industry to the leading edge.

Carrefour's Blockchain Success

If we return to our Carrefour example as one of the emerging leaders in blockchain use, we can see how they followed these same steps.

Carrefour began testing blockchain with small product lines that the company vertically controlled; poultry and dairy. The company fully understood the entire supply chain for these products and was able to control both the implementation costs and the data that was shared with the end consumer.

After testing on smaller product lines, Carrefour expanded their blockchain reach by initiating conversations and partnering with others in their industry. They've since partnered with IBM and Nestle to add additional products to their blockchain. And while exploring blockchain, Carrefour has started experimenting with new technologies that could impact their business. In June 2018, they announced a partnership with Google[9] in which both will collaborate in developing new shopping experiences for each other's customers.

The Bottom Line on Blockchain

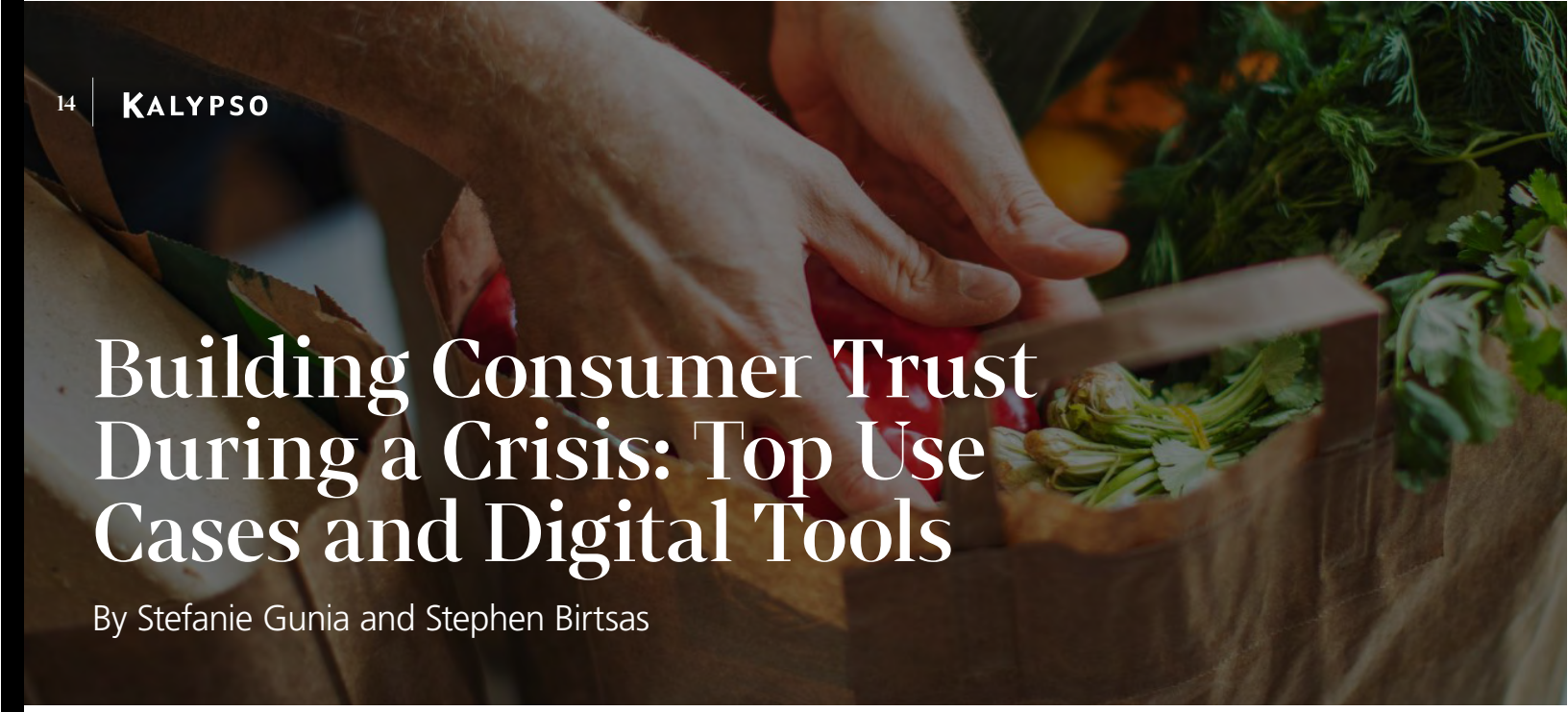
It's early, and blockchain may or may not be part of the future of business practices. But it does hold great potential for the food and beverage business. We've seen a lot of activity in the industry with companies deploying pilots and some even scaling their efforts to full production. However, there are still a lot of hurdles and ambiguities to overcome.

To get started, we recommend fully understanding and controlling your company data, discussing blockchain opportunities and standards with key vendors and industry comrades, and exploring additional new technologies.

Now is the time to take steps that put your company at the forefront, reaping the benefits as the future unfolds.

8 The New Rules for Bringing Innovations to Market: https://hbr.org/2004/03/the-new-rules-for-bringing-innovations-to-market

9 Carrefour and Google Sign Strategic Partnership: http://www.carrefour.com/current-news/carrefour-and-google-sign-strategic-partnership



Building Consumer Trust During a Crisis: Top Use Cases and Digital Tools

By Stefanie Gunia and Stephen Birtsas

As the world begins to move into the new normal after the Coronavirus pandemic, consumers will demand more transparency into product safety and authenticity.

Consumer brands need to re-evaluate their organization, process, data, and technology to ensure that their products are safe and that consumers trust their brand to be reliable, safe, and effective. Providing this consumer confidence will require building transparency and trust in the brand, products, ingredients, supply chain, manufacturing operations and distribution channels.

Here's a look at the three top use cases for building customer trust – traceability, transparency, and authentication – and an analysis on how to leverage technology like artificial intelligence (AI) and blockchain to navigate the new post-pandemic reality.

Use Case 1: Traceability

Supply Chain Traceability. A product can be traced from source to customer or shelf using blockchain or sensors. As an example, Walmart requires suppliers of leafy green vegetables to enter detailed supply chain information in a blockchain database. If there are any product issues, they can identify affected products within seconds, saving money and keeping consumers healthy.

Food Safety Traceability. With the help of smart food safety technologies – such as wireless temperature sensors and the internet of things (IoT) – companies track food safety values like temperature and humidity in real time to meet regulations and ensure food safety and quality.

These technologies:

- Improve regulatory compliance and improve operational efficiency by reducing time consuming tracking activities and human error
- Allow earlier hazard detections that enable quicker corrective (and even preventative) actions
- Contribute to the reduction of the impact of disease outbreaks
- Enable quick response to risks along the food chain

Use Case 2: Transparency

Supply Chain Transparency. In a post-pandemic world, consumers will likely demand more visibility and transparency into the supply chain; they want to understand where ingredients were grown or made. Blockchain and sensors can be leveraged to provide transparency to the consumer about where a product comes from. Hershey's, for example, created a map that allows consumers to view sources for the ingredients in their Milk Chocolate with Almonds bars. They even provide videos for each location to show more about the farmers they work with and the manufacturing process.

Use Case 3: Authentication

Brand Authentication. According to the Global Brand Counterfeiting Report 2018, the value of counterfeited goods in 2017 amounted to $1.2 Trillion. Companies spend a lot of resources to protect brand authenticity. Companies that introduce blockchain, RFID or other digital technologies will find it easier to confirm authenticity throughout the supply chain.

Ethical Sourcing. Ethical sourcing can be documented using blockchain or RFID technologies. For example, they can document whether fish were caught legally and sustainably, as well as whether safe labor conditions were met. This allows consumers to differentiate fish caught ethically from those caught unethically.

Technology & Tools

Blockchain. Blockchain provides an end-to-end traceability from the raw materials to the end consumer. It has evolved into a transparency and trust enabler. It is a decentralized public ledger that contains a digital sequence of records that are very hard to counterfeit. The use of blockchain in retail is growing at a CAGR of 96.4%. But apart from the benefits, uncertainty with Blockchain still remains. The biggest downsides are lack of scalability and interoperability as there are no common standards yet.

Sensors. Sensor techonology is making science fiction science fact. There are examples with Near-Field Communication (NFC) sensors, like in Samsung Pay and Apple Pay, that detect and monitor bacteria, odors, temperature, specific chemistries or moisture levels in food packaging. This provides precise actionable data and direct engagement to consumers, customers, and government regulatory agencies. Even with traditional sensors, current processing power can allow real-time feedback.

Advanced Analytics and Machine Learning. With blockchain ledgers and sensor data, more insights can be gathered before a product makes it to the customer. Advanced analytics and machine learning can reveal patterns and anticipate problems. These technologies can be leveraged to review performance data to identify previously unspotted performance trends.

Robotic Process Automation (RPA). An RPA is a small application with a pointed task. Typically, companies use an RPA to automate a mundane task. It is capable of thousands of tasks, but for now think of it as a virtual data entry, data integration, and/or data migration clerk. RPA apps are quick to deploy, easy to change, and have a higher accuracy than a human clerk. As companies make the journey into an organization enabled by smart connected operations (SCO), RPAs can help avoid duplicate entry, costly integrations, and a lot of the pain associated with data migration. RPA can even help a company with a quick win - copying data from various sources to provide a transparency profile.

Getting Started: Key Concepts to Keep in Mind

Map Out a Full Strategy. The future has never been more uncertain, but now it the time to act. Take the time to re-evaluate the organization, processes, data, and technology to ensure that products are safe and that consumers trust the brand to be reliable, safe, and effective.

- Understand customer, consumer, and industry dynamics and be sure to surface both threats and opportunities
- Focus efforts around business objectives: there are many cool technologies in the digital space, but not all of them will drive business value equally across companies
- Prioritize opportunity areas and establish a clear vision of how to position your brand to address the next normal
- Identify the technologies, data and processes that deliver value for consumers
- Build metrics and scorecards to stay on track

- Establish a cross-functional governance team made up of leaders with the power and influence to steer the organization

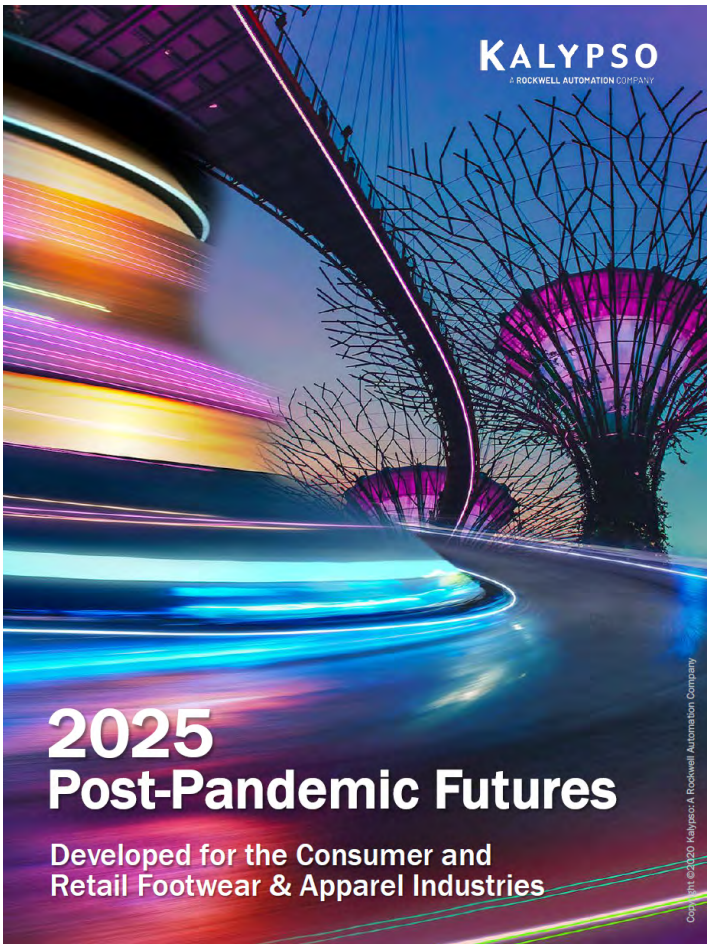
A technology-only approach is not enough to get full value from a transformation. Companies typically need to change processes, educate co-workers, and rescope current positions. Be sure to build organizational change management into your plans.

It is okay to start small. If your company is not ready for a full transformation, start with one business problem to demonstrate value.

- Choose a business problem where the results are measurable—it is best if you can link it to in-market results
- Create a cross-functional team
- Take an agile approach
- Use early success to gain buy-in and secure funding for a larger roll-out

Done correctly, implementing digital technologies in support of smart connected operations can build consumer confidence and trust that your products are safe and effective.

More Reading



Kalypso created four alternative future scenarios for the CPG industry in 2025. Download our full Post-Pandemic Futures report to explore the implications these recovery scenarios have on what product creation leaders might make (in the form of artifacts from the future) and how products are made (in the form of value chain enablers).

CASE STUDY: RUN SMOOTHLY AND GAIN PRACTICAL INSIGHTS WITH AI-AUTOMATED SPEND CLASSIFICATION

How AI Automated Spend Classification at a Consumer Packaged Goods Company

By Jordan Reynolds and Chelsea Barnes

Kalypso was engaged by an existing client to develop a solution for classifying financial transactions automatically and accurately. Our client was already familiar with the quality benefits of AI in their product development process, but this time they needed to turn the digital lens inward.

In any organization, tracking spend against cost centers or cost codes is an essential task. But for a large organization like our client's, with more than 157k unclassified transactions, inconsistencies were high.

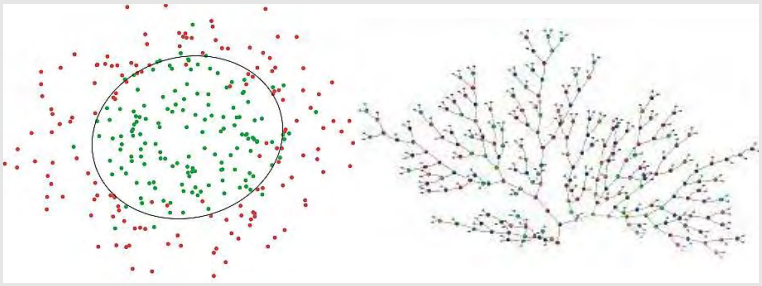
Our client found 74% of their purchase order transactions were missing an assigned cost code.

The burden of completing and re-classifying those transactions fell squarely on the shoulders of project managers.

By leveraging sophisticated use of natural language processing and an ensemble of machine learning models including random forests and text-based Naïve Bayes, we were able to first process and bulk categorize past financial transactions, then clean error-filled and inconsistent fields to finally label the data into consistent categories.

At 99% accuracy, this data cleansing and classification pipeline allowed project managers to bypass the data clean-up work that would previously cost them hours of tedious labor to go directly to the value-add work of analyzing expenditure patterns.

A quick primer on classification models



Naive Bayes is a classification technique with an assumption of independence among predictors. In simple terms, a Naive Bayes classifier assumes that the presence of a particular feature in a class is unrelated to the presence of any other feature.

Random forest is an ensemble classifier that uses multiple models for better prediction performance. It creates many classification trees and a sample technique is used to train each tree from the set of training data.

Our work optimized spend classification, saved countless hours of manual effort and increased data consistency.

The same techniques leveraged to classify unstructured transaction data have already proven to be valuable across other areas of R&D where the presence of unstructured data was previously limiting opportunities for analytics and robust insights.

We helped our client continue their AI journey, delivering immediate value while building the framework for continual improvement in the future.

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CASE STUDY: GETTING THE WORLD'S MOST RECOGNIZABLE BRANDS TO MARKET FASTER, WITH AI

How a Fortune 500 Consumer Packaged Goods Company Super-charged their Data Quality and Approval Cycle

By Jordan Reynolds and Chelsea Barnes

Kalypso was brought in by the client to help predict risk of specification rejection and increase approval cycle productivity with the help of AI.

We took a hybrid approach, leveraging a combination of several machine learning models along with business-defined conditional rules to develop a multi-faceted error detection mechanism. This combined approach allowed us to detect the simple "rules of thumb" that are common sources of error as well as more nuanced patterns of risk.

Our approach unlocked

- **30% reduction** in specification rejections
- **4% reduction** in rework resulting from weight and dimension errors

To solve for this complex problem, we developed a pattern recognition technique that compared new spec inputs with historical data to gauge the likelihood of an entry error.

For example, a shipping unit that is 2 feet tall is less likely to be 4 inches wide than it is to be 4 feet wide. If a user enters 4 inches, the advisor would detect that as an anomaly. By comparing the combination of the properties in a specification, the advisor is able to intelligently suggest where entries should be reviewed or modified.

A quick primer on why specification management is challenging and critical to get right

1. Specification management is critical to getting products from concept to store shelf. Multiple checklists or rules are used for data quality verification, which is often done manually.

2. Ever-accelerating innovation timelines means people are working with increasing volumes of high complexity specifications

3. When specification errors happen, for example in weight and dimension of a product, they commonly result in rework and loss of productivity. In severe cases they can trigger a cascade of financial losses through customer fines and freight costs, like overfilled or underfilled trucks, and late shipments, returns or order cancellations.

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A variety of techniques were used including:

A random forest model - a collection of decision trees - was trained on historical rejections, to identify patterns in the data that point to a high likelihood of rejection.

A clustering algorithm to identify anomalies present in the measured weight and dimensions of specifications. Outliers were identified based on the statistical distribution of groups of similar and comparable parts.

To maximize the utility of the AI analysis, we developed an interface that shows a heat scale to quickly communicate risk of rejection, a detailed ranking of the contributing factors to rejection and prescriptive suggestions that can be acted upon by the user.

Once the user takes action, immediate feedback is provided to signal successful risk reduction. Working through this process early in spec origination reduces the frequency of errors that result in costly downstream issues.

Our work created a feedback loop that builds on itself to create continuous improvement in spec quality, driving increased productivity by getting it right the first time.

CASE STUDY: MAKING FORMULA INFORMATION MORE USEFUL FOR HUMANS, WITH AI

How AI Helped Teams at a Consumer Packaged Goods Company Compare and Analyze Thousands of Formulas

By Jordan Reynolds, Stuart Gillen and Chelsea Barnes

Formulas govern the way ingredients come together to form an end product, like a cake for example. Packaged goods companies manage thousands of products, and their formulas.

Kalypso was asked to develop a different way to look at formula data, a more intuitive way to find formulas that were most alike. For our client, these similarities could be leveraged for learnings on safety testing, regulatory clearance, product performance and more.

The measuring of a mathematical distance between formulas already existed at the client when we began work, however the absence of the context needed by different business functions reduced the utility of the metric. To improve this utility we had to find a better answer to what it means for two formulas to be 'similar'.

To provide a digestible and useful metric, we needed to develop a robust and quantitative comparison method and evaluate the outputs through a human lens.

We wanted a method that would allow us to navigate a vast repository of formula data and measure similarity between complex formula structures while accounting for the varying perspectives under which similarity is evaluated.

Our analysis found the best fit to be not one metric, but instead an ensemble of metrics that apply different conceptions of distance and likeness for a balanced result.

A quick primer on why comparing formulas is important but complicated.

In the realm of safety assessment, regulatory approvals, and product evaluations, there is a concept called "read-across", where two formulas are so alike that the testing, evaluations, and approvals done for one can be transferred to another.

In other words, several rounds of costly and time-consuming lab testing can be skipped when a nearly identical formulation has already been evaluated and approved.

The challenge is with properly identifying how "similar" those things are. Not only are formulas complex, multi-level structures, but "similar" means different things to different functions.

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An example would be a cake mix. An allergist would want to know what possible allergens go in, while a baker would be interested in how those ingredients create the end product, like knowing which fats might develop an off-flavor in the cooking process.

A baker would consider a chocolate cake mix to be very different from a vanilla one, while the allergist would be focused on the fact that they both contain common allergens such as dairy, wheat, eggs, and soy and to her, the two mixes may be more "similar."

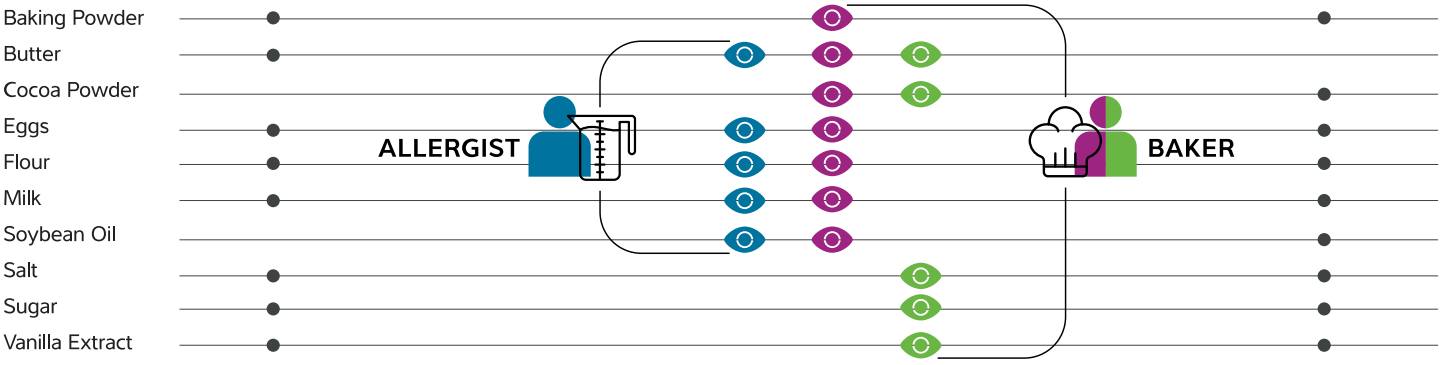
How similar is the rise and consistency? 95% Similarity

What allergens are shared? 70% Similarity

How similar is the flavor? 22% Similarity

VANILLA

CHOCOLATE



To answer for the question of context and therefore make that metric meaningful to a user, we compiled training data that was function-specific. The function-specific training data – from safety testing, regulatory, product performance, etc. – was then used to weight, or tune, the measures of distance to be specific to how that function views similarity. In the end, rather than providing an abstract measure of distance, we provided a direct answer to the question of similarity,

"For my purpose of evaluation, this new part, x, is 95% similar to previously released part, y.

...and therefore

The safety evaluation done on part y is transferrable to part x."

With different functional contexts applied, we can answer a multitude of actionable questions:

1. Is this new formula so similar to existing formulas that there is no need to repeat already conducted safety tests?
2. Can regulatory clearance be expedited (because we've already done it with essentially the same formula)?
3. Can claims statements be repurposed?
4. Do prior performance tests apply? ...and so on.

The model is built to learn and fine-tune those contexts over time so the answers to those questions continue to remain relevant as business practices and policies evolve.

Our work delivered a result that was not only analytically robust, but also user friendly – answering a highly subjective question with a simple objective measure.

We helped the client look at their data differently, and created a foundational model that is highly extensible to future opportunities related to the manipulation, analysis, and optimization of formulated products.

Transform Product Development by Connecting Enterprise Data with Advanced Analytics & AI

How We Help Clients Implement and Scale R&D Analytics

Many companies have completed proofs-of-concept but struggle to get out of "proof-of-concept purgatory." Our human-centered approach to data science and analytics focuses on aligning efforts with user and business needs while delivering value in quick iterative cycles.

We work with our clients to present insights to users in accessible and actionable ways, define a strategic roadmap to continually add incremental value while ensuring broader business objectives are met, and build the organization and skills needed to sustain the program.

Our Value-Driven Approach

Identify Business Needs

Leverage deep industry expertise to home in on opportunity areas

Apply a user-centered, value-focused approach to identifying tailored use cases

Implement a Proven Minimum Viable Product (MVP) Approach

Start small with quick, iterative cycles to demonstrate and deliver value early and often

Build a full stack of capabilities to solve a significant business challenge

Create a Strategic Roadmap to Scale

Define longer-term strategy to advance functionality and expand impact, unlocking opportunities at scale

Develop a broad case for change aligned with business goals

Build a Sustaining Organization

Grow in-house capabilities to propel initiatives forward

Empower teams to continue to unlock opportunities across the organization

KALYPSO
A ROCKWELL AUTOMATION COMPANY

At Kalypso, we help companies connect enterprise data with scalable advanced analytics and data science-based capabilities. Data-driven insights augment the workforce with predictive and prescriptive insights for the product development process.

With a data-driven approach to R&D, CPG companies can drive significant benefits, including:

- Faster speed to market
- Improved product quality
- Increased productivity
- Optimized regulatory compliance

Let's Get Started

We know CPG. We know product development. And we know data science and AI. Let us help you turn your enterprise data into actionable insights to deliver business value across R&D.

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