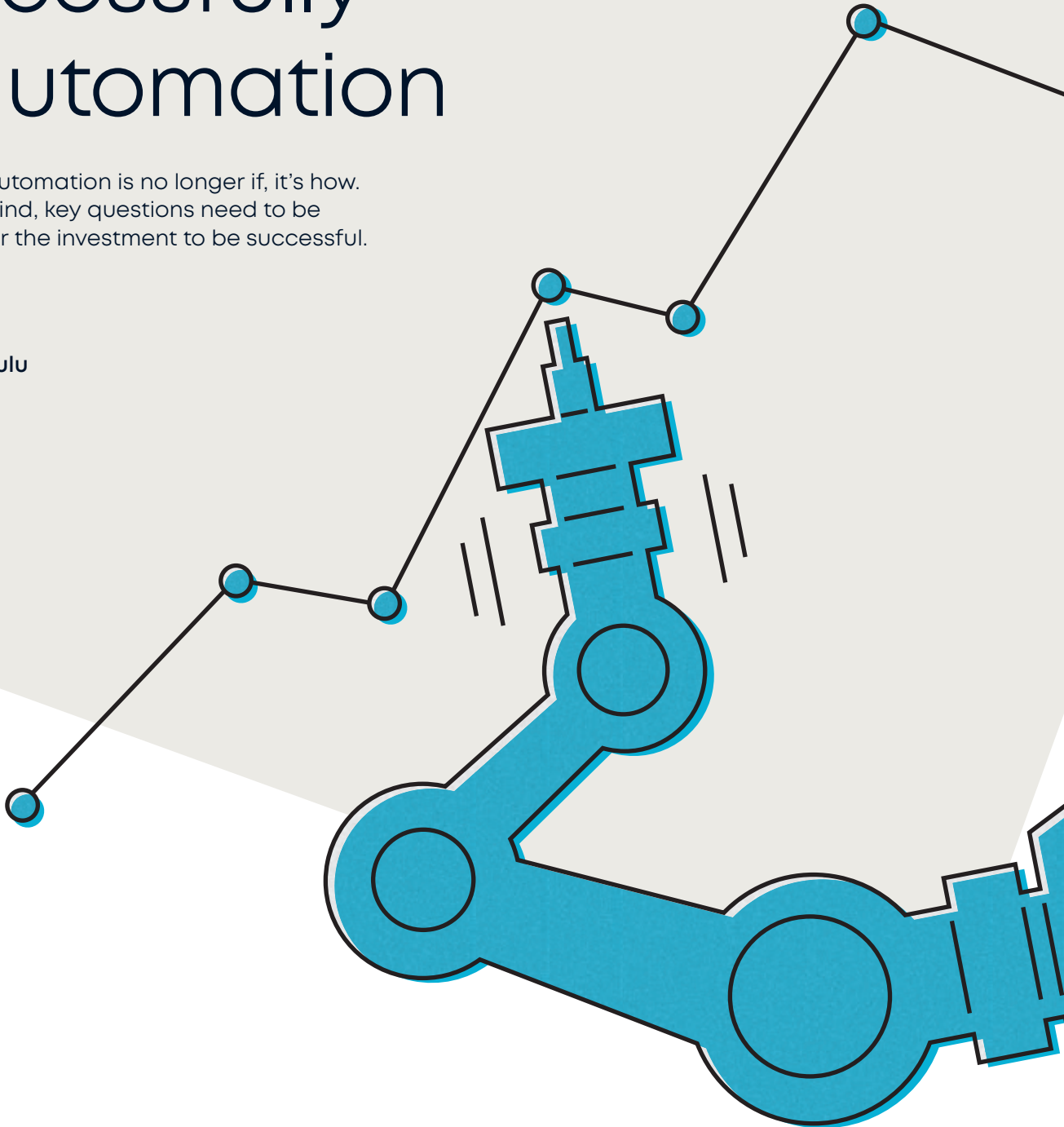**Innovation briefing**

How to invest successfully in automation

Investing in automation is no longer if, it's how. With this in mind, key questions need to be addressed for the investment to be successful.

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CC in three
The key questions to address

①   What kind of robotics and automation should I pursue?

②   How can automation make my business more resilient?

③   How do I make my business ready for automation and its successful scaling?

What this briefing reveals

This CC Innovation Briefing answers the key questions and more. We highlight the challenges you will face when bringing robotics and AI into your operations. We share best practices that can be systemized to make the automation journey less disruptive. And we flag the most direct route to increased operational efficiency and business success.

For us the key ingredient is this… understanding your business and operational uniqueness and coupling your strengths and weaknesses with the technology enablers that will help you transform your business while effectively managing risk.

It's crunch time for automation – and the technology is ready

Once upon a time robots knew their place. More often than not it was inside a cage performing repetitive tasks such as spot welding in an automotive plant. But now they are escaping their cages to help accelerate drug development in life sciences labs, to sort packages in warehouses, to fold t-shirts for fast fashion e-tailers or to install 10ft slabs of concrete on construction sites. The list goes on – and few if any business sectors are off limits.

Automation is becoming the essential component to survive, let alone thrive. We all know why this is happening… the high cost and scarcity of labor, the demand for ever-increasing industrial productivity, the modern mindset of consumers craving instant gratification, the reshoring of manufacturing, the dependence on fast paced launch cycles and the fact that the necessary technology (robotics, sensing, computing, AI) is becoming more cost effective. It's crunch time to press the button on automation.

"Robots are getting out of their cages!"

Automation challenges are different yet similar across industries

Every company has distinctive business models and operational processes – so every company's automation challenge is unique. Nevertheless, there are many lessons to be learnt that are transferable across industries. CC's experience of working with clients in many sectors gives us a privileged vantage point here. Once you dig into the challenges, it's actually quite surprising to discover that many difficulties to adoption are shared.

Let's take, for instance, a beverage company's warehouse, a large-scale crop grower in the Midwest and a life science organization's R&D process. Many of the core obstacles to adopting robots and intelligent automation are common. At the outset, a single thread that connects them all is the task of adopting automation successfully while still building a resilient business.

In our experience, the key challenges are the ones we outlined upfront (identifying the right technologies, the question of scaling, the need to manage new capabilities and organizational change). So, let's unpack them…

Key challenges:

The ability to scale

Identifying suitable tecnologies

Managing change and capabilities

Identifying the right technology for you

As robotics and automation enters non-manufacturing industries – warehousing, ports, farms, construction sites, hospitals and so on – it's necessary to match the available automation technologies with the particular business operations.

The danger is that a business spends so much time learning, trialing and building various automation approaches that it harms business growth and profitability. With that in mind, let's fast track to three key areas that businesses are wrestling with: the 'future problem'; bringing automation to existing brownfield sites; and the conundrum of buy, build or rent.

The 'future problem'

Large scale automation endeavors are capital, resource and time intensive for enterprises. As factors like consumer behavior, market demands, supply-chain dynamics, labor skills, costs and availability are constantly fluctuating, it is vital to understand the impact of these factors on current and future business.

Before complex automation programs are unleashed into the organization, it is crucial to understand what automation will deliver for today's business and future market demands.

Automating brownfield sites

The main goal of a distribution center manager or manufacturing unit leader is to ship products out of the door on time. The prospect of automating current operations and existing brownfield infrastructure is not just a significant undertaking, it's borderline disruptive.

Such sites have a large installed capacity of conventional machines and material handling systems and are primarily designed for labor-intensive operations. Interrupting this living infrastructure for automation installation will limit operational capacity and harm the business.

This dilemma of building future capacity while protecting current business can be addressed by a systems engineering approach that balances the level of disruption (temporary loss of capacity) with positive business impact of automation (improved productivity).

To buy, build or rent

Traditionally, adopters have taken the 'buy' route to enable them to retain focus on their business and operations. But with technology and skillsets increasingly accessible, the proposition to 'build' automation is more attractive than it was. Recently too, the pay-per-pick 'rent' model has gained traction with warehouse and logistics companies, and many are wondering whether it could be extended to the likes of farms, ports and airports.

Our advice? All have their merits, so it is necessary to engage with expert advice to weigh up pros and cons. It is crucial to examine each approach holistically to determine the most feasible option.

*"Which kind of automation?
How will it fit my operations?"*
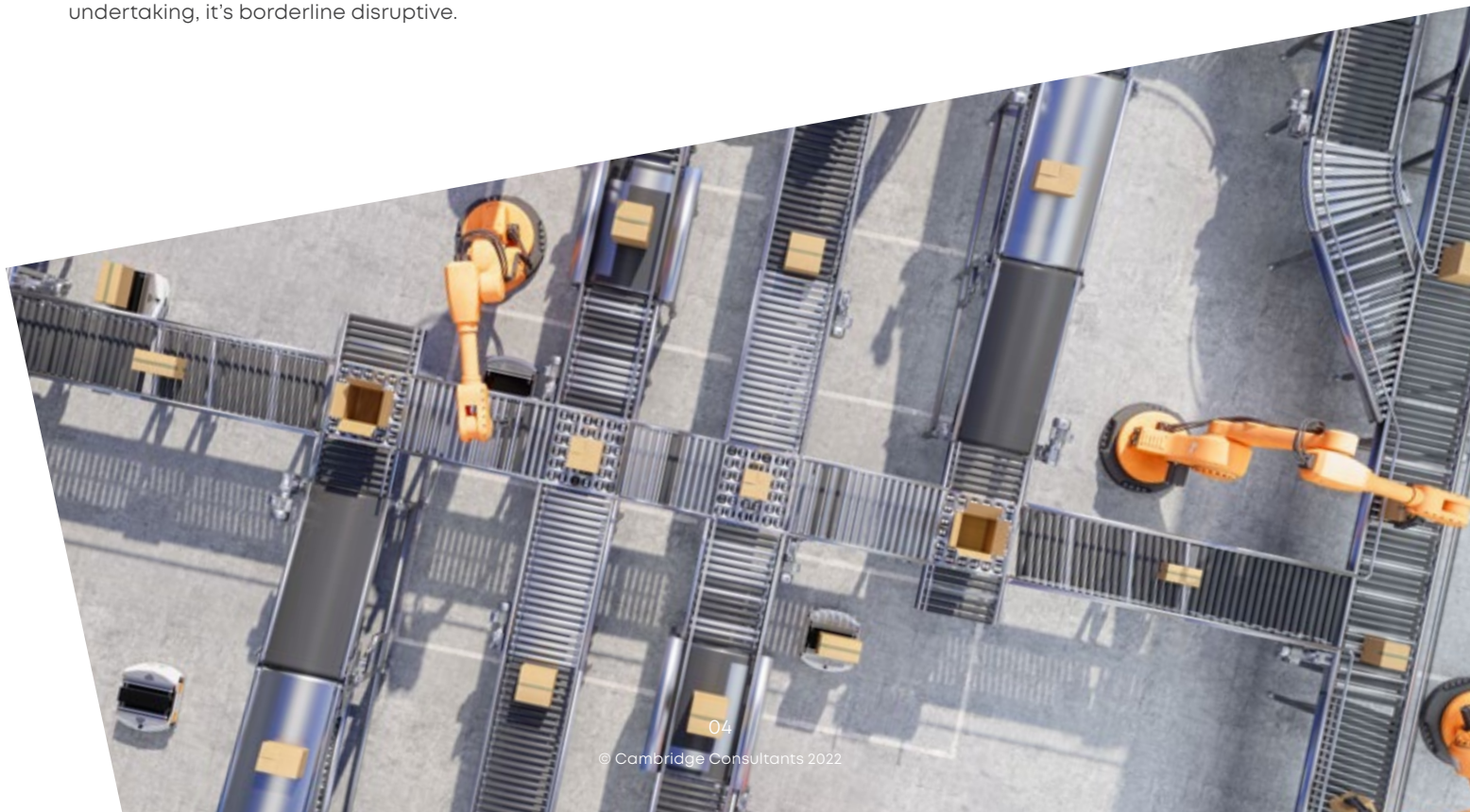
The truth about scalability

These days there is no shortage of 'cool' smart robotics technology spinning out of aspiring businesses. But neat tricks are not enough – businesses need automation systems that can scale across multiple sites and deliver operational efficiency as soon as possible. The ability to seamlessly scale automation systems operations are just as vital as a rapid return on investment. Here is our selection of scalability truisms…

Navigating the trade-offs

Automation systems must adapt to various operational environments, offer elasticity for the ebbs and flows of business and never cause breakdowns. Sounds like a walk in the park, right? Actually, a high degree of operational understanding and deployment rigor is required to navigate the trade-offs of functionality and reliability for scaling successfully.

The necessity of customization

Although AI, Sensing, navigation and computing technologies are progressing well, there are limited off-the-shelf products available to solve specific challenges in unstructured environments. Customization is not a luxury; it is a necessity.

Let's take localization as an example. Put simply, robot localization is its ability to identify its own position in the environment in which it is operating. In absence of a global positioning system (GPS), robots rely on building maps of their environment using LiDAR, cameras and radar. On-board sensor readings then estimate their own position on the map. Simple enough ? Not really..

Working environments tend to be dynamic (shipping port, warehouse etc) and isn't always organized. People, trolley's, fork-lifts always move in and out of Robot's field of view. At CC, we understood this challenge and built a navigation technology that avoid dynamic obstacles using a combination of sensors and AI. Many end-use situations call for novel technology development and challenge is not all end-user organizations are familiar with developing new technologies and mostly get "out of the box" experience from off-the-shelf solutions.

A working demo doesn't equate to production readiness

Open-source robotics and software stacks have made robotics development easier and more accessible. Buoyed by early trials and results, it is unfortunately common for robotics start-ups to rely on demo setups and extrapolate their development timelines into production readiness. That is always a mistake.

"A working demo doesn't equate to production readiness. Addressing scalability challenges early enables resilient automation deployment."

Managing change and capabilities

Legendary business leader Jack Welch put it this way. "Anytime there is change, there is an opportunity. So, it is paramount that an organization gets energized rather than paralyzed." He's right of course, a new paradigm of operations will always provoke fear of the unknown. For us, the biggest challenges are:

■ Encouraging the team to embrace uncertainty in the face of risk. Not all automation projects see the light of day – very often because of scalability issues and the level of novelty required. Nevertheless, every failed project provides unmatched experience and learnings

■ Helping the team acquire the capabilities to evaluate, implement and sustain new technologies. The key here is to adopt visioning and strategic backcasting. Automation and robotics programs are multi-disciplinary and require a broad range of skillsets that is often hard to find within an organization. So, how to assemble the right talent for your initiatives? This is an important strategic question that needs to be examined through short and long-term lenses to build the right guidance roadmap

If these challenges resonate with you, rest assured that you are not alone. C-Suite executives across the world are wrestling with similar uncertainties.

Envisioning future business, operations and technology

To get ahead and stay ahead through robotics and automation deployment, it is crucial that you establish a thorough understanding of the following:

- Strategic market opportunities and threats (present and future)

- The operational structure (cost, functions, scale) to address the opportunities

- How automation technology can enable you to design resilient operations that create a thriving and innovative business

Once established, these insights should be used as the rudder to guide your implementation strategy.

"Let your business and operational priorities drive your automation aspirations."

Leveraging business insights to drive technology

Business

Identify unique business strengths

React to "HERE & NOW" while "architecting" your future

Identify changes and disruptions in markets

Operations

Create core operations metrics

Establish operational structure

Visualize operations by "backcasting"

Technology

Prioritize automation for core operations metrics

"Crawl, walk and run" your automation projects

Explore technologies: readiness, maturity, economics

What does success look like?

When a Consumer Packaged Goods (CPG) company is considering whether to invest in automation for their distribution center (DC) operations, it's imperative to generate insight about their future business and operations. This will allow them to determine what kind of automation technology they need and the best way to roll it out.

Envisioning consumer behavior – for example the amount of merchandise sold in-store versus online or direct-to-consumer – helps in establishing the required capability of the automation system. For instance, it could identify whether to fulfill and handle pallets for store replenishments rather than mixed cases for vending machines or 'eaches' for direct-to-consumer fulfillment.

This early determination of what success would look like goes a long way in deciding the kind of automation technology – and framing the right KPIs for successful roll out.

Simulation that accelerates automation and tackles uncertainty

The chief challenge of automating a huge brownfield site is determining if the proposed solutions will deliver the promised productivity and throughputs in existing constrained environments. Building Proof of Concepts (PoCs) and mini pilots to test viability is one way of mitigating the risks of taking the wrong direction.

But as we know from our experience, PoCs and pilots are time and resource heavy and often leave unanswered questions about scalability. Simulation has been used extensively in the automotive and aerospace industries to de-risk product development processes and reduce the uncertainties of commercializing complex products.

So, let's look at how simulation can be leveraged for deploying robotics and automation systems in a warehouse or a shipping port. Specifically, how it can accelerate deployment and help de-risk high-stakes CapEx investments.

1. Benchmarking automation

In the warehousing example, simulation can be used for modeling a material handling process including pallet or box conveyors, package characteristics (the actual material being moved) and physical space. It provides a virtual environment for evaluating different automation systems under consideration.

CC has developed a modular simulation environment that can rapidly evaluate the performance of an automation or autonomous system before embarking on prototyping exercises. This provides an objective framework for stakeholders to make informed decisions on the best system to deploy.

2. Training intelligent automation systems

These days systems rely heavily on AI and machine learning to tackle tough challenges. Developing such systems requires huge amounts of real-world data to train the algorithms. The trouble is that generating real-world data is time-consuming, expensive and sometimes not even feasible. Augmenting available real-world data with Synthetic data and leveraging simulation to train AI-based intelligent systems radically accelerates the development and deployment of automation systems. Potential cost savings are vast.

3. Optimizing automation performance

Robotic and automation systems are never a one and done affair. As the dynamics of real-world operations evolve, automation systems need to adapt. Think, for example, of a warehouse operation during the Black Friday period, a farm during a busy harvest season or an autonomous mobile robot (AMR) operating with lots of moving parts in tight spaces.

A simulation environment can provide a platform to evaluate how dynamic changes are impacting a system. It can then identify the updates and modifications that are needed to ensure the system thrives in the revised environment.

We've already discussed the importance of simulation as a de-risking strategy for brownfield operations. But it is equally impactful for greenfield sites. Increasingly, robots will be expected to flourish in unstructured and unconstrained environments. Leveraging AI, simulation and simulated environments is an effective way to build and deploy automation systems that will meet these demands.

Your ambition can drive ownership models

As well as representing a positive response to a changing world, robotics and automation can also serve as a differentiator for businesses. Think Amazon's acquisition of KIVA Robotics and Canvas Technology. Or FedEx's partnership with Nuro to advance last-mile logistics. Neither are typical 'buy automation equipment' decisions.

These logistics behemoths are betting on technology to disrupt markets and create new-to-the-world business opportunities. In areas where robotics and automation has never been attempted before, where there are no off-the-self products, end-users are increasingly investing in non-recurring engineering projects – either internally or with partners – to achieve first mover advantage and leave competitors in their wake.

'Pay per pick' models aren't just used for reducing CapEx costs. Rental models are a great de-risking lever for companies looking to evaluate how automation will benefit their operations, affect their workflows and necessitate change within their organization. All this before they make a high-stakes CapEx investment.

It's all about scalability

As we've already established, scalability can be a significant obstacle to adoption. Successful scaling examples include DHL rolling out thousands of Locus Robotics AMRs for warehouse order picking operations. But deploying scalable automation in highly unstructured and unconstrained environments is not straightforward. Automating areas such as garment packing at an apparel manufacturer, picking fresh produce on a farm or loading and unloading trucks for a shipping company are good examples of such challenging environments.

Getting the product development process right

Many end-users expect an immediate out-of-the-box experience. But the reality of off-the-shelf robot readiness for unstructured challenges currently falls short of such expectations – and will provoke scaling challenges later on.

It's no longer sufficient to write RFPs, award contracts and manage existing vendors. As automation is necessary for survival, the stakes have been raised for end-users of automation. Depending on the organization, end-users should establish advanced technology groups (tasked to bring in robotics and AI technologies), operations and facilities teams (to manage equipment), and user teams (those who will use the systems on a day-to-day basis.

A multi-party collaborative product development approach is required between robotics companies, system integrators and end-users for the successful scaling of automation systems in novel areas where there are no proven products or solutions. Hence it is imperative that end-users play an active role in the product development process throughout the definition of system requirements, early-stage demos, proof-of-concepts, pilots and scaling.

Based on our experience in supporting clients to adopt automation, here are the key areas that end-users of systems must own, while collaborating with product partners and system integrators:

1

Prioritize system requirements rather than capabilities of products or vendors

A holistic approach here is crucial. There might not be existing products or technology that call deliver all the system requirements. But a thorough understanding of operational and user requirements will allow for intelligent technology and commercial trade-offs. It will also help establish realistic expectations and KPIs

2

The journey needs milestones at every stage of rollout

All system functions, capabilities, constraints and risks evolve during the implementation. So, the system's KPI goals, verification and validation plans, acceptance criteria, risk register and so on should be defined at the reach stage. That is through demos, POCs, pilots implementation on site and during scale up

3

Safety is a priority

As automation and autonomous systems are increasingly driven by AI and algorithms, establishing safety requirements early in the development of systems is critical to deployment.

4

Securing the system

Automation systems are data highways that interoperate with a multitude of systems within your operations and interface with third party systems. Protecting your business and operations by securing your cyber-physical systems is vital. Your strategy must be based on your unique operations and infrastructure, and must be deliberate, well-conceived and built-in early during the development phase

Robotics and AI alone are not enough

Deploying smart AI-powered robots is only part of the battle for success in automation. The new ways of running your factory or warehouse operations will affect the status quo of your organization in profound ways.

Leading change management and innovation

Innovation disrupts. It changes existing processes and arcane systems and demands new capabilities. Brand new ways of envisioning and executing changes at many levels of the organization must be found. Such situations are always fraught with uncertainties, risks and fears, but it falls on the leadership to acknowledge the magnitude of what's happening and institute a thoughtful change management strategy which addresses the following areas:

- Creating a compelling vision for the organization to pursue. Establishing urgency is important to inspire the organization that would place bold bets to bring profound and positive impact to business and operations

- Developing a culture of innovation. It's vital to help the team embrace the notion of 'fail fast, learn faster'. To enable this shift, the organization structure and performance management system should encourage colleagues to run towards risk and uncertainty

- Creating a guiding coalition force. This should include stakeholders across various parts of organization that would support and instigate change as co-sponsors and champions

- Successfully realizing innovation. The secret here is developing an 'innovation architect' mindset and managing risks proactively for the successful deployment of novel solutions and processes

Multi-modal innovation

Until recently, automation equipment just needed motors, drives, controls, mechanical systems and software. The current generation of systems has all the above but is equipped with intelligence to make human-like decisions in real time and collaborate with people as an extension to the team.

The complexity of systems has increased by orders of magnitude, so if follows that the process required to deploy these solutions is also much more sophisticated. End-users and operational leaders are acknowledging this and arming themselves with multidisciplinary capabilities and product development expertise to take on the challenge.

It's hard for any one organization to nurture and grow capabilities in diverse areas like AI, robotics, RF design, sensing and control all under one roof. But there are firms like CC that can provide vendor-agnostic, independent and unbiased technology support that focuses entirely on the interests of the end user organization. A partnering approach is a truly viable alternative if you want to deploy automation rapidly while garnering experience and acquiring skillsets.

As automation is transforming industries profoundly, we believe in the strengths of multi-modal innovation to bring in state-of-the-art automation and autonomous solutions that transform business.

Why CC?

Bill Gates said, "We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten." No matter where you fall on the spectrum of automation acceptance, it is here to stay. Leaders who invest in successful change management will be best placed to reap the long-term gains.

Thanks to our 60 years of experience at the intersection of industry and breakthrough technology, we have supported many companies to successfully navigate such seismic shifts. In this case, our advice is based on three firm pillars. One, maintain a resilient business by reacting to disruption while shaping a careful, strategic and sustainable approach to the future. Two, achieve scalable impact with an 'innovation architect' mindset that cuts through the complexities and brings success. And three, put people and culture before projects. An inclusive, collaborative approach embracing all stakeholders will be the catalyst for successful change.

Let's continue the conversation

We hope you've found value in this CC Innovation Briefing on how to invest successfully in automation. Please get in touch to discuss your ambitions.

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