The Industrial Internet of Things

Industry 4.0

Preparing For The Fourth Industrial Revolution

Challenge Advisory Digitisation and Automation

Insights & Solutions

London

Berkeley Square House,
Berkeley Square, London W1J 6BD
E-mail: ldn@challenge.org

Chicago

One South Dearborn , 2100,
Chicago, Illinois, 60603
E-mail: chi@challenge.org

Singapore

Centennial Tower, 3 Temasek Ave,
Singapore 039190
E-mail: sgp@challenge.org

Dehli

15th Floor, Eros Corporate Tower,
New Dehli 110019
E-mail: del@challenge.org

Nairobi

13th Floor, Tower 2, Delta Corner Towers,
Chiromo Road, Nairobi
E-mail: nbo@challenge.org

Curitiba

Rua Pasteur, 463-13° andar,
Batle, Curitiaba
E-mail: cwb@challenge.org

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Charles King
Head of Industry 4.0

❝ **PLANET EARTH STANDS ON THE CUSP OF A TECHNOLOGICAL REVOLUTION THAT CHANGES THE WAY WE RELATE TO ONE ANOTHER,** THE WAY WE WORK AND THE WAY WE LIVE. SUCH A REVOLUTION WILL BE UNPRECEDENTED IN SCALE, SCOPE, AS WELL AS COMPLEXITY. WE MAY NOT YET KNOW THE EXTENT OF THE CHANGES, BUT ONE THING IS FOR CERTAIN; IN ORDER FOR MANKIND TO FULLY COPE WITH THE DIGITISATION OF OUR WORLD, THE RESPONSE MUST BE COMPLETE, AND COHESIVE, INVOLVING ALL INDUSTRIES FROM ALL CORNERS OF THE GLOBE, FROM PUBLIC TO PRIVATE SECTORS, TO ACADEMIA, TO CIVIL SOCIETIES. TO THIS END, CHALLENGE ADVISORY HAVE COMPILED THIS DOCUMENT TO OUTLINE OUR CLIENT SERVICE AND TO CONSOLIDATE OUR EFFICACY WHEN IT COMES TO PROVIDING SUSTAINABLE SOLUTIONS TO PREPARE FOR TEN BILLION PEOPLE BY THE YEAR 2050. I HOPE THIS DOCUMENT WILL PROVE TO BE VALUABLE TO YOU. ❞

The Fourth Industrial Revolution

In 1784, the First Industrial Revolution followed the **introduction of manufacturing facilities powered by water or by steam**, like the steam train, the steam engine, and the first mechanical loom.

1870 saw the opening of the first production line, the Cincinnati slaughterhouses, and brought about the Second Industrial Revolution, **focused on electricity-powered mass production.**

The Third Industrial Revolution coincided with the advent of Information Technology, which resulted in further automation for the manufacturing industry. The first programmable logic controller was invented in 1969.

The Fourth Industrial Revolution is characterised by digitalisation. From the supplier all the way through to the consumer, **all aspects of business will be interconnected**, supported by digital infrastructure and advanced robotics.

This means new business models and precise, individualised customer service, as well as colossal improvements in efficiency, speed and quality. With an abundance of data, as well as new metrics to utilise this data, **size no longer matters when it comes to gaining a competitive advantage.**

Flexibility is vital; 40% of the current Fortune 500 companies are expected to no longer exist within 10 years, due to their inability to keep up with the changes brought about by Industry 4.0. **How will your business adapt?**

This document explains the key changes brought about by Industry 4.0, and describes how the Industrial Internet of Things will affect your businesses, your governments, as well as your lives. **It also introduces you to the solutions on offer at Challenge Advisory.**

01
1784

02
1870

03
1969

04
TODAY
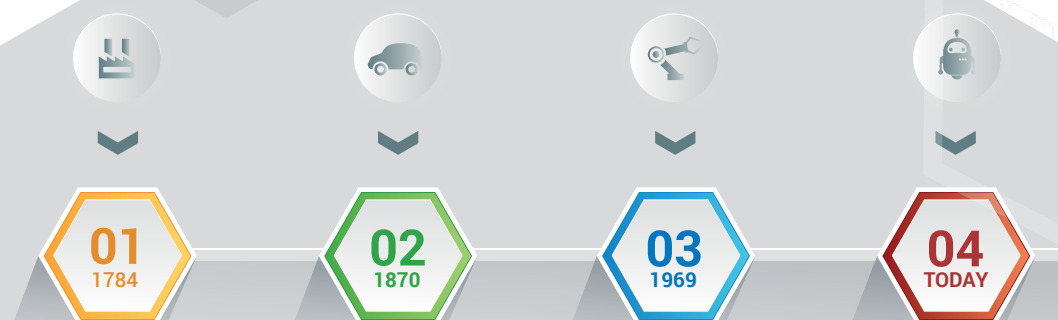
1. Industrial Revolution
The First Industrial Revolution consisted of manufacturing facilities powered by steam such as factories, trains or mechanical cotton looms.

2. Industrial Revolution
The Second Industrial Revolution in 1870 brought about a renewed focus on electricity-powered mass production lines, disrupting the car industry.

3. Industrial Revolution
The Third Industrial Revolution in 1969 coincided with the advent of IT, resulting in further automation for the manufacturing industry.

4. Industrial Revolution
Today, there are breakthroughs in neuroscience, 3D printing, mobile networking and computing. We will see system-wide innovations every few years.

Design Principles

The developments brought about by Industry 4.0 will change our lives in a number of ways. A dedicated research team chaired by Siegfried Dais and Henning Kagermann first introduced industry 4.0 in 2013 at the Hannover fair, with the concept based on six pillars of design:

Interoperability

In a workplace, this will lead to integrated systems where humans, machines, and factories will be interconnected via the *Internet of Things* (IoT), communicating with each other freely.

Virtualisation

Virtual models can be created from scratch with the help of advanced sensors, and can be linked to data in order to create deadly accurate simulations of industry processes.

Decentralisation

Machines in a factory could soon operate independently of one another, which leads to more precision and efficiency when it comes to smart factories, especially once artificial intelligence is introduced.

Real Time Capability

There will be increased capability to collect and analyse data and provide the derived insights immediately, meaning companies can collect, analyse and solve their problems in the blink of an eye.

Service Orientation

Industry 4.0 is expected to provide fresh impetus to customer service, using vertical integration to provide better services using company-wide IoT principles.

Modularity

Soon, Smart Factories will be able to change their production metrics in order to suit demands or issues, and with the proliferation of data, this becomes extremely accurate.

This will also change the way organisations operate.

Platforms

Companies are moving towards a platform based purchasing model, where products, sources and information can be exchanged via pre-defined streams.

Pay-By-Use/Subscription

More and more, companies will begin to move away from one-time payments for their products, which means cheaper prices and flexible timings for customers, and improves business by changing capital expenditure to operational expenditure.

Monetisation of Data

A new industry that's set to come to life is the data industry. Big data is already a huge part of how a business operates, but companies will begin to compile vital data that can help to comprehensively improve entire industries.

Licensing Intellectual Property

Some organisations, through experience, cultivate a deep wealth of knowledge, but not necessarily the avenues to exploit this wealth. Soon, they will be able to offer value for their knowledge by use of either additional consulting services, or by selling their data.

Impact of Industry 4.0

Impact on Business

The main area in which organisations will evolve thanks to digitisation relates to the supply-demand dynamic that drives consumerism. On the demand side, **organisations will be under pressure to adapt to rapidly changing industry practices.** Disruptive technologies dominate the supply side, with new access to Research & Development (R&D), sales, marketing and distribution. This means consumers will benefit from higher quality, speed and value. **Organisations will have to be more transparent, focusing on consumer engagement and behavior in order to gain the highest value.** With the new advancements, customers will have higher expectations of their products, driving quality, and leading to data integration and the enhancement of physical products. They may need a revamp of their structure as well as collaborative innovation with their target demographics.

Impact on Government

Government input is vital to solving one of the significant challenges to Industry 4.0 – they are responsible for the policy changes that will help companies to invest in the industrial revolution, with a **focus on financial incentives, improved data security laws and international standards.** There are added challenges, however, when it comes to improving transparency and efficiency in the public sector; the decentralisation of power as well as the proliferation of information means governments will have to be extra flexible in the future to remain ahead of the latest trends. The 4th Industrial Revolution will see an influx of "agile" governments, which adapt fluidly to public changes, which will be impossible without close collaboration with organisations and civil societies.

Impact on People

With increased use of cloud technologies to store private documents, the largest change that we can expect to see with Industry 4.0 is the adjustment with respect to privacy and ownership. As biotechnology and robotics continue to improve, we could soon be presented with new moral and ethical boundaries as **human augmentation and artificial intelligence** will cause the line between human and robot to become blurry. The renewed focus on customer service and employee tasking means we can offer specialised care in the healthcare industry, as well as higher quality with precision surgery and improved disease detection techniques.
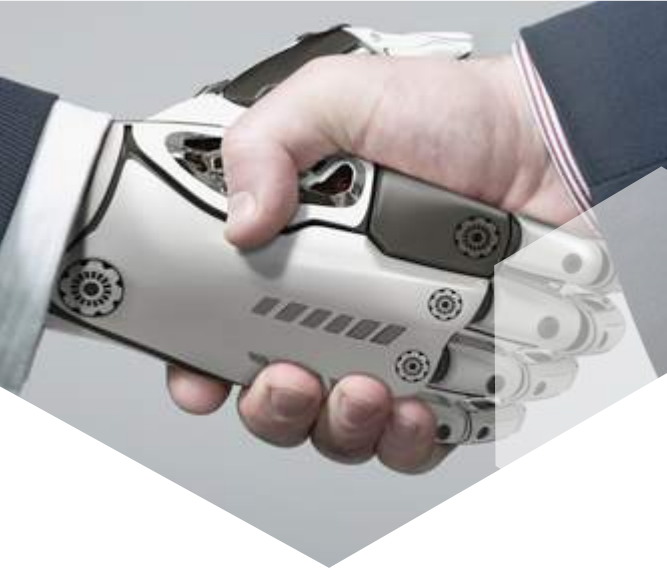
Challenges and Solutions

Challenges

We've talked at length now about the opportunities that will be available when the fourth industrial revolution rolls around. What about the drawbacks? Here, we discuss the challenges stopping industry 4.0 from really taking off, and what we can do to improve things.

Resolving Your Economic Problems

The Obstacle:

A huge issue for lots of companies who want to implement Industry 4.0 is a buying strategy that is less than clear for a lot of companies. As a result, there are often unclear economic incentives for implementation, and organisations find themselves having to spend over the odds to implement these new initiatives.

How We Solve This:

Challenge Advisory have put together a strategy to ensure every business that works with us on industry 4.0 has a clear plan as to why they're upgrading, plus a pick of the best tech companies at an affordable cost. We'll take a close look at your organisations to pinpoint the best places for you to adopt these new initiatives, meaning you have an idea of how much money you'll be saving,

plus what you'll be getting for your investment. Once this is done, we put you in contact with the brightest minds and most disruptive technology in your respective industry, and we'll go the extra mile to ensure that both parties can reach a profitable conclusion. Plus, we'll work to subsidise the costs, so you'll pay for world-class service at an affordable cost.

Repurposing Your Workforce

The Obstacle:

Bringing together manufacturing automation and Smart Factories will bring unprecedented levels of efficiency and speed to a business, but the downside of this is that many companies will see a workforce that will be unused to the new developments taking place, and ill-equipped to adapt to them.

How We Solve This:

A huge aspect of Industry 4.0 is a renewed emphasis on customer service. With the manpower available to expend, Challenge Advisory helps our clients to repurpose their workforce to suit the new demands of their business. Whether it's training them to work with these technological changes or readjusting a taskforce to work in an entirely different sector, Challenge Advisory has a number of programs and metrics designed to help your employees thrive in the face of an industrial revolution.
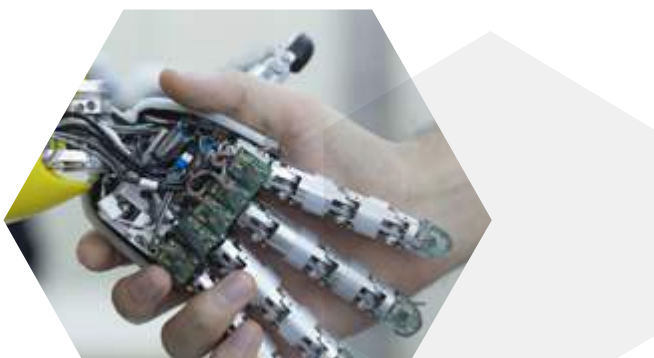
Standardisation

The Obstacle:

There is some confusion with organisations trying to innovate as to which standards will be adopted in the next five years. A huge challenge to overcome will be to derive a standardised system that works for all parties and allows for both horizontal and vertical integration, and results in maximum value for both present and future investments.

How We Solve This:

We may not be the rule-makers…but we do know who to call to make the rules. Challenge Advisory's wide range of contacts in various industries means that we have a significant say in how the world will develop over the years to come. In order to fix this problem, we've decided to facilitate these law changes and bring everybody together in one room to thrash out the details. We think it will bring about the best chance of coming up with standardised practices for the fourth industrial revolution.

Data Security

The Obstacle:

Small and medium-sized organisations are primed to benefit the most from Industry 4.0, but this represents a problem. It requires them to publicise their data, whereas before they could use their own in-house data. This puts them at risk of having their intellectual property stolen by larger organisations, and might hold smaller organisations back from making a decision that will definitely benefit them in the long term.

How We Solve This:

As always, legislation is going to be a huge part of how soon Industry 4.0 takes off, so for our clients worried about IT and data security, we take the time to fully listen to your issues and concerns. Once we have an idea of the challenge that you are facing, we help to come up with a solution; we engage with government officials in order to kick-start the policy changes that will be required in order for everybody to be on a level playing field when it comes to intellectual property. Some laws will have to be rewritten, but Challenge Advisory will make sure that everybody benefits equally from these changes.

Product Lifecycle Cycle Management(PLM)

A Product Lifecycle Management (PLM) system is an information management system that **integrates data, organisations, and people in an extended, cohesive enterprise.** Successful PLM software lets clients manage gigabytes of data at any point in the product lifecycle - from the concept through to the creation through to the customer.

For Challenge Advisory, PLM is vital for building a coherent data structure by consolidating systems, making it ideal for an information strategy for your organisation. It also lets our clients introduce company-wide collaboration to design, produce and support products, allowing for the best practices to be included in future strategies, and for lessons to be learned along the way. **Challenge Advisory's Product Lifecycle Management empowers businesses to make unified, information-driven decisions all throughout the product lifecycle.**

An established PLM strategy allows organisations to construct a digital environment that is designed to create, develop, manufacture and manage innovation comprehensively. It creates digital business value and growth through digitalisation. By optimising your products services and consumer channels, PLM can help organisations with asset utilisation, business agility, process efficiency and new cost models, and leads to shorter times to market, higher productivity and product quality as well as driving innovation, accelerating revenue growth and reducing the risk of compliance.

With a lot of the disruptive technology involved in innovating still in infancy, Challenge Advisory help you to refine your Product Lifecycle Management in order to **prepare your business for the initiatives brought about by the 4th Industrial Revolution**, helping to bring together, data, processes and people in your business for perfect vertical integration, maximising your product portfolio. PLM with Challenge Advisory usually is split up into three disciplines:

Engineering and Product Development
- Innovation and Product Design
- Transforming Your PLM
- Implementation, Service Configuration
- Embedded software development
- Enhanced Capabilities

Products-to-Solutions
- Parts & Service Optimisation
- Service Lifecycle Management
- Warranty Services
- Connected Product Service: Monitoring & Predictive Maintenance
- New Product Digital Services

Manufacturing and Digital Operations
- Maintenance, Repair, Operations (MRO) Optimisation
- Enterprise Asset Maintenance
- MRO Sourcing Services and Strategies
- Manufacturing Technology Services
- Industrial Software
- Digital Manufacturing Operations (DMO)

More Solutions

Automation

Challenge Advisory helps our clients to introduce automation, improving flexibility and efficiency of business solutions, improving to-market times as well as customer satisfaction. We have a range of technology companies that are partnered with us specialising in automation. Our clients in every industry will be satisfied, including logistics, building, locomotive, life sciences, agriculture and electronics.

Software

Embedding software is pivotal to a seamless transition into the digital age. Challenge Advisory focuses on implementation so our clients can get back to innovating. Our wide know-how and contacts with vital industry players meant we provide the best solutions, at low risk and high reward. We integrate software that encourages vertical as well as horizontal integration.

Advanced Data Management

Within the rise of Machine-to-Machine (M2M) communication and big data proving instrumental to Industry 4.0, we help you to keep on top of data proliferation and analysis technologies. With these advancements, we give you the edge in this emerging industrial landscape. We help you to reshape your business models to adapt, focusing on digitisation, mobility, sustainability and urbanisation.

Globalising The Supply Chain

Challenge Advisory helps our clients to build a massive ecosystem to help our clients to maximise value from their supply chain. We don't limit ourselves when it comes to any aspect of the supply chain, and our wide range of contacts in a number of countries mean our clients can gain maximum value and quality from their supply chain.

Re-Aligned Business Models

As-a-service business models are fast replacing traditional models for capital-intensive products, and this will only intensify in the next five years. Challenge Advisory ensures that our clients will be ahead of the game. We give our clients a detailed lowdown on swarms of data on their products. We create service platforms that are essential to creating a profitable digital ecosystem.

Manufacturing Execution Systems (MES)

A Manufacturing Execution System (MES) enable organisations to respond to market changes, adopting production processes in real time. **It improves production efficiency with quality, visibility, production optimisation and higher manufacturing responsiveness**. As the manufacturing environment grows in complexity, system-wide best practices will not be enough to gain an advantage. In today's digitised world, Manufacturing Execution Systems have to be completely integrated with the supply chain, with guarantee of a positive Return on Investment and a low total cost of ownership.

Challenge Advisory offers easily applicable solutions that optimise investments and guarantee a short-term payback period. Once we analyse your production plant in depth to a high level, we can provide you with a specially-targeted MES solution that will ensure strong value. In order to provide the strongest results, we compare our tools with the components and specific needs of your plant. **This enables us to draw up an accurate and precise blueprint for effective client service.** All critical paths can be analysed ahead of time to ensure your investment is protected. Challenge Advisory provides key functionalities for improving our customers' business.
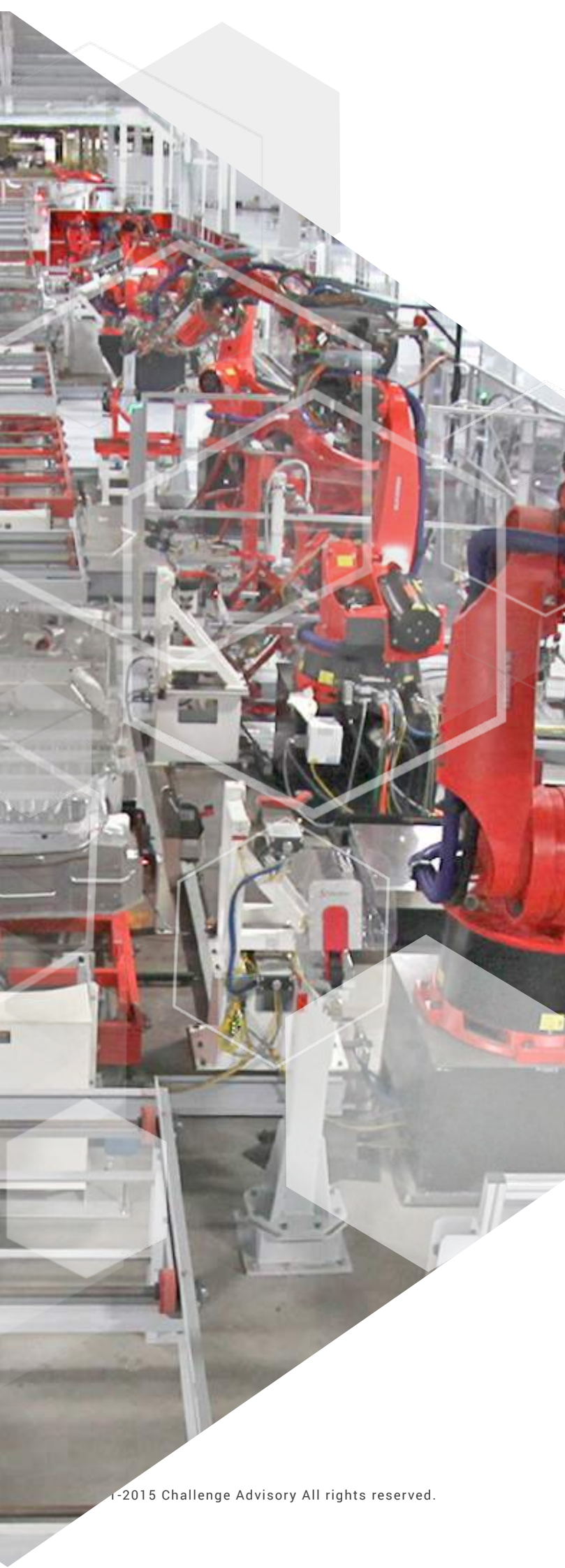
While MES plays a huge role in providing organisations with a competitive advantage, it still must be regarded as an investment and is thusly judged by its Return On Interest (ROI) and justified by a business case. Challenge Advisory facilitates a client decision by **highlighting the financial value of MES using Break-Even Analyses, ROI projections and an estimated payback period.**

In order to take full advantage of the economic and efficiency-based benefits on show, our clients also have access to our Implementation service.

We deliver turnkey solutions to every one of our clients, recruiting assistance from our teams all across the world to ensure global delivery capabilities. Implementation also provides a wide selection of our consulting services designed to tackle problems at any point in the MES lifecycle; from planning & building solutions to upgrading and managing projects.

We help to improve operations, lowering cost of ownership and to generally optimise your investment in our client solutions. We collaborate with your organisation to monitor project process, guide you in designing architecture of business processes and apply our know-how and expertise to advise you on **the best ways to implement our solutions, tailored to your specific needs and maximising your Return on Investment.**

MES
Expertise

Data

We collect, archive, contextualise and analyse your data, using real-time response and back-end data sources such as automation, Supervisory Control And Data Acquisition Systems (SCADAs) and Laboratory Information Management Systems (LIMS) to optimise your productivity and performance, increase flexibility and responsiveness, and improve production and maintenance costs, improving quality and reliability.

Product Specification Management Systems

Challenge Advisory foster development in process industries, to develop, configure and manage all product specifications and enhance vertical integration and functionality. We guarantee faster times to market, with reduced purchasing costs, administrative costs and errors. We work hard to ensure brand consistency and protection for all of our clients.

Line Monitoring Systems

We take a close look at your production line, increasing efficiency and optimising performance. We use real-time proliferation of data to full advantage with the hope of improve product yields. This ensures higher responsiveness, production efficiency, operational cost control, real-time capabilities for decision support, low project risk and a better understanding of your plant capabilities and performance.

Advanced Planning and Scheduling

Advanced Planning and Scheduling (APS) systems are designed to work alongside and facilitate your existing systems, rather than necessitate a costly replacement process. It can be integrated with your other planning software, and is helpful for long-term strategic planning months and even years ahead, building detailed sequencing and scheduling programs.

Laboratory Information Management Systems (LIMS)

Today, laboratories are under massive pressure to become more efficient and cost effective, even as regulations become more complex and stringent. This is achieved by bridging the gap between the lab and the production line, which will ensure high efficiency and quality. Effective LIMS with Challenge Advisory reduces IT cost and operational errors, and ensures reduced scrap and reworks across the plant.

Electronic Batch Records (EBR)

Electronic Batch Records allow for operational excellence with optimised, controlled, secure manufacturing processes, accelerating your time to market by avoiding process delays and eliminating errors. Challenge Advisory provides advanced workflow tools, optimising manufacturing processes across multiple facilities. We help you to streamline your process while ensuring full compliance with government regulations. We also allow for real-time visibility, which allows for the construction of tasks with greater efficiency, instantly gaining access to exceptions and associated solutions, which simplifies the entire validation process.

Case Study:
North American Manufacturer

The Challenge

A North American electronics manufacturer came to Challenge Advisory wishing to boost their profit margins. Their previous years were successful, but last year they suffered a revenue loss of 35%. Eager to learn from their mistakes, they approached Challenge Advisory to ensure there was no repeat.

Revelation

Challenge Advisory started to research the client in order to resolve their issue. The research team came together to conclude that while the client's revenue had a track record of being consistently strong over a ten-year period, profits were lower than they should have been. This was due to unusually high operating costs, and further investigation and collaboration with the client confirmed that labour costs were particularly to blame. Although the company was based in North America, the components of their electronic products were manufactured abroad. The company also produced bespoke products, which required a separate order and could be subject to several amendments.

Solution

Challenge Advisory consulted with its strategy team, organisation and manufacturing teams in order to conjure a solution to the high operating costs. The teams consulted with the client and together, they devised a solution that would secure lower labour costs. This would be achieved by improving the client's supply chain and introducing new technologies. It was decided that customer demand for bespoke products was too high for outsourcing to be economically feasible. Challenge Advisory introduced the client to new automation and Digital-To-Physical Transfer (3D printing) technology, that would allow for some of their components to be manufactured at their own factory and meant that for bespoke products, the time to market and the costs were significantly lowered. Challenge Advisory also helped the client to improve Product Lifecycle Management with new software designed to integrate all aspects of their business for leaner operations. The new technology also helped them to improve their labour costs overall, as more work could be done in their own offices, and the need for outsourcing became substantially lower.

Conclusion

This proved to be a substantial success for the client. The new technology reduced labour costs by 43%, which meant they could afford to offer their products at a significantly lower price. This boosted their revenue by 20%, but more importantly, it improved profit margins by as much as 50%. The client plans to use this extra capital to invest in more sustainable raw materials, with the hope of making their business more profitable in the long term.

CONTACT

Charles King
Head of the Practice
E: cking@challenge.org

David West
Senior Partner
E: dwest@challenge.org

Mark Scott
Research Director
E: mscott@challenge.org

CHALLENGE.ORG