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BUSINESS STRATEGY / OPERATIONAL EXCELLENCE

Industry 4.0: The Future is Now

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An Altix Consulting Whitepaper on Industry 4.0







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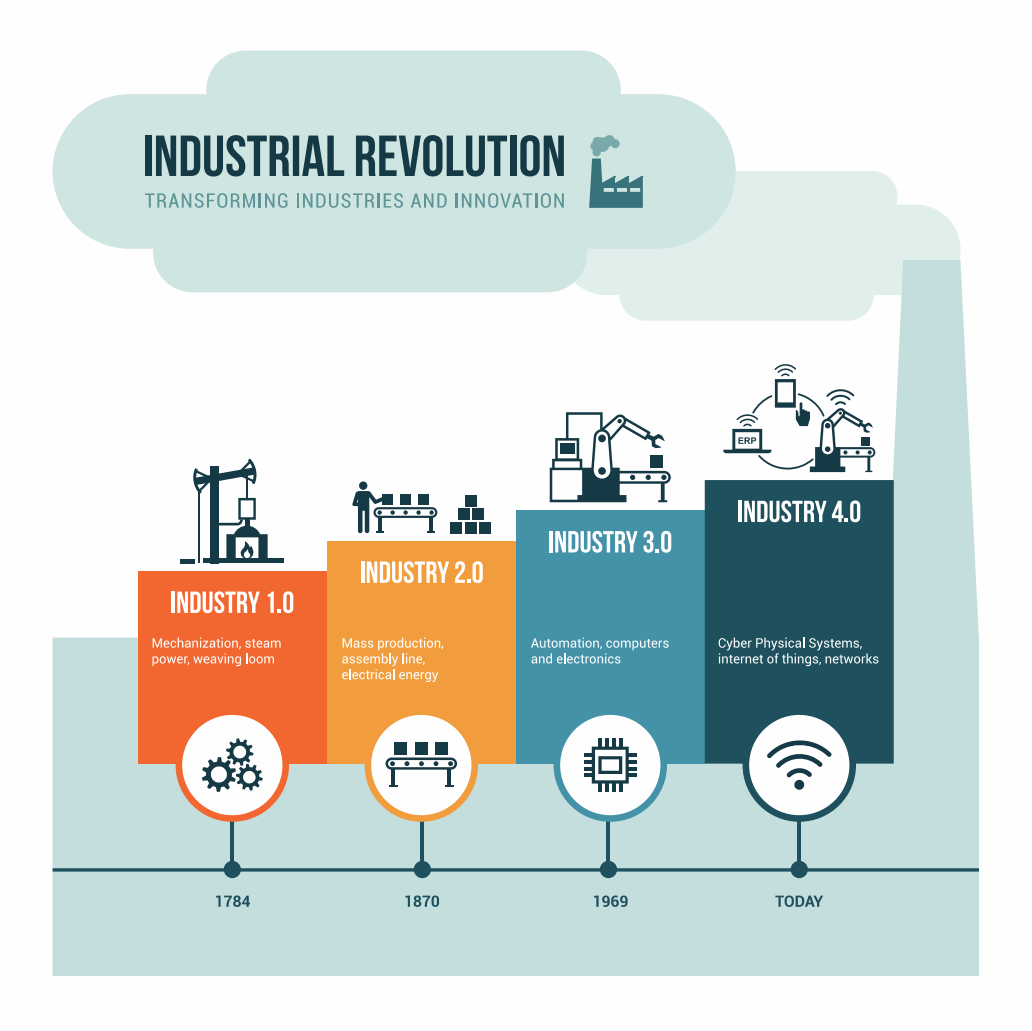




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History and I4.0

Industrialization has played a major role to the quality of life available today. Since the 1700s humankind and corporations have been evolving and revolutionizing manufacturing in ways that have led industries, Engineers, and manufacturers with huge visions and expectations for the future.



Industry 1.0 was the beginning stage of the industrial revolution and introduced mechanical production facilities using water and steam power. Some examples of this mechanization of power include: The spinning wheel, the water wheel, and the steam engine.

Industry 2.0 was a result of the discovery of electricity and the invention of assembly lines. This of course was a major turning point for manufacturers as Industry 2.0 allowed for mass production.

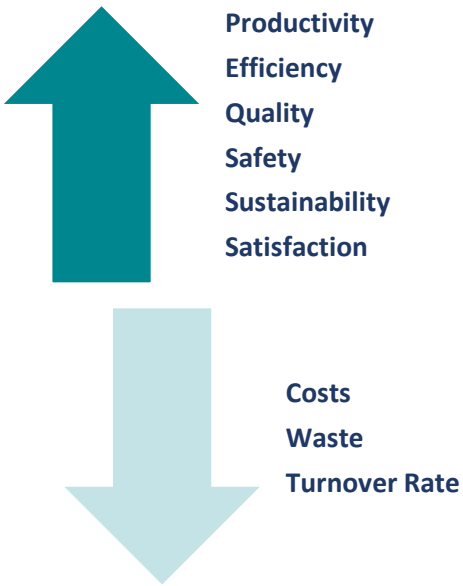
Industry 3.0 introduced computer power to manufacturers which resulted in partial automation using programmable controls. With industry 3.0, robots are now able to perform sequences and processes with minimal human interaction.

Industry 4.0 is where it gets interesting and where manufacturers are aiming to go today. It grabs all computer technology, production systems, logistics, people, and components in the value process and connects them through a network so that they all communicate with each other. By fusing production with communication and information technology, manufacturers are able to create factories that are Connected, Autonomous, Flexible, Transparent, and Agile.

Industry 4.0 (I4.0 for short) is a concept from the German industry and is the next step to revolutionize the way industries produce and improve. I4.0 allows companies to pull real-time information from their entire system to be able to analyze data and come up with smarter solutions to optimize and automate their process. When well adapted, I4.0 will allow continuous improvement processes and product development to optimize and correct themselves.

Benefits and I4.0 Importance

I4.0 brings endless possibilities and solutions to the table and will help companies reach their full potential. Altix sees and acknowledges all the benefits of this new industrial era and excels in transforming companies to achieve operational excellence.



Increase:

- **Productivity**
  Allows companies to produce faster and a lot more quantity with less resources. Increasing productivity goes hand in hand with increasing profits and optimizing production.

- **Efficiency**
  Boost capacity, reduce downtime, increase production speeds, mass customize, trace processes, speed up changeovers, and much more by implementing I4.0.

- **Quality**
  Detect defects more rapidly and even before they occur using data and predictive analytics. I4.0 will also help getting to the root cause of quality issues sooner which will result in less defects and a better-quality product.

- **Safety**
  Reduce the possibility of human error, which could result in serious injury, by automating processes. Safety is Altix's main priority, and it should be everyone else's as well.

- **Sustainability**
  Upgrading systems and processes using industry 4.0 will result in a huge environmental sustainability impact. This reduction in the footprint of the environment comes as a result of reducing waste. I4.0 helps reduce waste in multiple ways like maximizing energy efficiency which will lower CO2 footprint and minimize the usage of water.

- **Internal / External Satisfaction**
  I4.0 benefits both customer and worker satisfaction. Customers are more likely to receive a high-quality product at a lower price, while workers take bigger responsibilities, become more engaged, and gain new skills.

Decrease:

- **Costs**
  Though achieving I4.0 involves heavy investments, ROI can be expected quickly through better throughput, lower operating costs, and reducing lead time. Automation and data analytics work together to decrease overall costs.

- **Waste**
  I4.0 will help companies become Leaner by eliminating non-value-added activities and wastes much easier and quicker.

- **Turnover Rate**
  A huge issue companies come across is a large turnover rate which causes a huge loss in time and money. I4.0 fixes this issue by utilizing full worker potential and keeping employees involved and satisfied with their work. I4.0 is a topic that is very interesting and unique which will attract new and better talent to companies.

Embracing I4.0 will also allow companies to have a huge competitive advantage, drive their growth tremendously, and build a culture and company with a safer, more collaborative team. There is simply not enough room on this paper to state all of the benefits and possibilities I4.0 is capable of producing.

The industry will keep evolving every day, the sky is the limit when it comes to where the industry could go. I4.0 has the potential to make anything from small processes to the full supply chain, quicker and more flexible. In fact, industries have already begun thinking further along in the future and topics like Industry 5.0 have emerged. This soon to be future includes humans and machines working side by side in self-managed supply chains and highly automated factories. The time has come for industries to think of the future and position themselves to be fully prepared for what is to come.

Challenges

Transitioning to I4.0 will not be easy; it is going to be full of obstacles and challenges. To lead a successful transition, industries must be prepared to face these challenges and be ready for any obstacle that may come in the way. Industries who try to transition without acknowledging these challenges will just be setting themselves up for failure. Below are areas that need to be addressed prior to beginning the I4.0 journey:

- **Consciousness**
  The first challenge industries must overcome is for manufacturers to be aware of the endless possibilities made feasible by I4.0. Awareness is critical because the risks of not embracing I4.0 or possibly starting the journey too late are huge and potentially catastrophic. Though it is a lot to take in, companies like Altix who specialize on I4.0 can educate and raise awareness to potential industrialized improvements.

- **Lean Six Sigma**
  An important steppingstone to I4.0 is a Lean factory. If lean principles are not present, companies will trip and not be successful in their transformation process. Step one would be applying Lean and Six Sigma tools to obtain a productive and waste free mindset. Once achieved, the challenge is to mold Lean, Six Sigma, and I4.0 together into one to achieve operational perfection.

- **People and Culture**
  I4.0's main purpose is to connect everything and everyone. This could cause communication problems amongst processes or people. To overcome this challenge, companies must be able to incorporate I4.0 into their culture and make sure all employees have a good vision of what is to come. Management, stake holders, and workers must all be excited and ready to adapt this change to guarantee a smooth transition. They must also be ready to train people, not just in the change of culture, but also in new technology or positions that may evolve the implementation of I4.0. In general, it is critical that people adapt to digitalization and learn to work closely with more advanced technology.

"Culture is what people do when no one is looking"

-Herb Kelleher

- **Every Company is Different**
  All industries, supply chain networks, companies, factories, processes, machines, and products are different and there is not just a single I4.0 solution. Companies must do their research or find the right partner to identify how I4.0 could be customized to meet their own unique needs.

- **Digital Skills and Modernization**
  Transitioning over to I4.0 will require a good amount of modernization in IT and in machinery. This will require a great amount of investment in hardware, software, and training since all workers will have to be proficient in the new technology. Companies might also be faces with finding new talent with the right skills.

- **Data**
  Data is one of the most valuable assets of a modernized company. Capturing tons of data will be critical in a successful I4.0 implementation, which could be challenging. Also, some I4.0 implementation projects might require companies to share data with third parties, which could result in resistance and challenges for companies.

- **Cyber Security**
  One of the main challenges that companies are facing is a concern with cyber security since security threats have the capability of shutting down production for indefinite amounts of time. This concern is so large that it is keeping companies from embracing the future. It is well known that a plant shutdown could potentially leave businesses with millions of dollars in losses, so this concern is quite serious. IT will have to evolve and all IIoT systems must be well secured and ready for any potential breach.

Though I4.0 implementation comes with a few challenges, companies that fail to transition will result in them falling behind their competitors. If they do not want to be left behind and potentially eliminated, companies must adapt to innovation and transition to this new digital world as soon as possible.

"Competitiveness is key, and Industry 4.0 should be part of the future readiness agenda"

-Yannick Schilly

Success

In the manufacturing business, failure is not an option. Yet pursuing I4.0 is not an easy task, so let's narrow implementation down to **7** key success points that will help industries reach their full I4.0 potential.



1. **Clear Vision**
   Establishing a clear vision is a major key to making sure everyone is onboard with what is to come. Applying I4.0 is quite complex, making sure managers, employees, and stakeholders have full transparency of the future changes and goals is critical and will help for a smooth transition.

2. **Lean is Vital**
   Lean should no longer be an option for optimizing processes and removing waste. It is a critical aspect of I4.0 and hence should be treated as a requirement. Think of I4.0 as the coffee for Lean manufacturing, the possibilities of success, quality, efficiency, and profitability obtained from combining Lean and I4.0 are endless.

3. **Data is Key**
   Data is a very important portion of smart manufacturing. Without the right collection of data, there would not be anything to analyze, hence making AI, machine learning, or networks impossible. Companies are currently obtaining data every day, but a lot of that data is not being utilized. I4.0 helps use all that data (more from new IIoT devices) to optimize production. The goal for I4.0 is to collect and utilize data from every process along the entire

supply chain to connect everything and using it for predictive maintenance, energy management, production optimization, smart manufacturing, etc.

4. **Company Maturity**
   A company cannot expect to transform into an I4.0 industry overnight. It is quite an extensive process and a major factor in being able to do that successfully is making sure the company is ready for it. Know where the company stands to be able to identify where improvements need to be made before transitioning. Does the company not have enough data? Do they not have enough technology? Is everyone ready for change? Do they have a solid and adaptive IT and engineering department? Is the company currently utilizing Lean and Six Sigma tools, and are they performing with excellence?

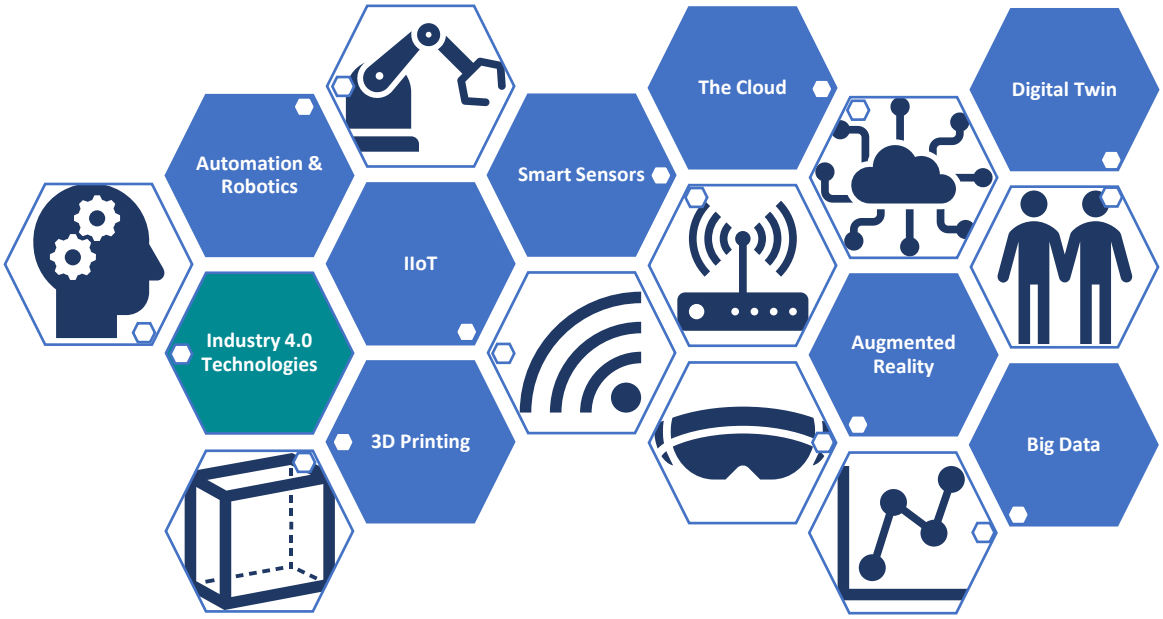
5. **Motivated People**
   Perhaps the most important part of implementing I4.0 are the people involved. Management, Employees, and stakeholders must be excited about the opportunities I4.0 can offer and must be ready for all the changes that it brings.

6. **Industry Benchmarking**
   Stay engaged in the industry community with other companies and/or consulting firms to stay up to date on the latest I4.0 trends. Teaming up with subject matter experts like Altix can help implement Industry 4.0 and any changes that may come with it.

7. **Strategic Patience**
   Implementing I4.0 is a must, but companies must really take a good look at where they are, where they want to be, and how they want to get there. This will be an extensive process and there is no way around that. Taking the time to go through planning and implementation slowly while making sure to do it correctly the first time will guarantee a successful implementation project. This complex ideology is one that should not be rushed.

I4.0 in Practice

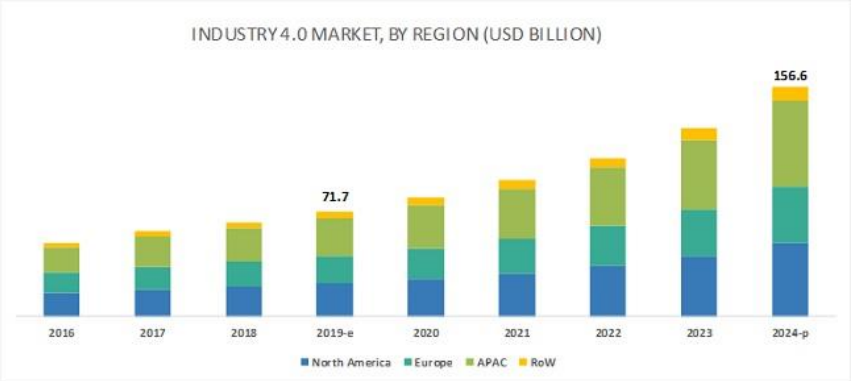
Just like every industrial revolution era before, I4.0 will transform how every industry sees and practices manufacturing. Today, companies from every field are implementing I4.0 in various creative ways. From warehouses tracking inventory and handling all supplies automatically to production lines using minimal human interaction to create consumer goods, technologies are being developed and utilized every day.



I4.0 Technology	What is it?	Applications
Industrial Internet of Things	Network of interconnected smart devices that collect, monitor, and analyze data	• Prevent understocking / overstocking by putting sensors in the warehouse that sends information to the WMS, giving management complete control and visibility of real-time inventory • Use IIoT for predictive maintenance
Automation & Robotics	Automation and robots link together to perform tasks and manage complex information	• Use AMRs or AS/RS systems for automating warehouses • Relieve employees from monotonous tasks or tasks that may be impossible for humans to increase efficiency • Move heavy elements on a production line

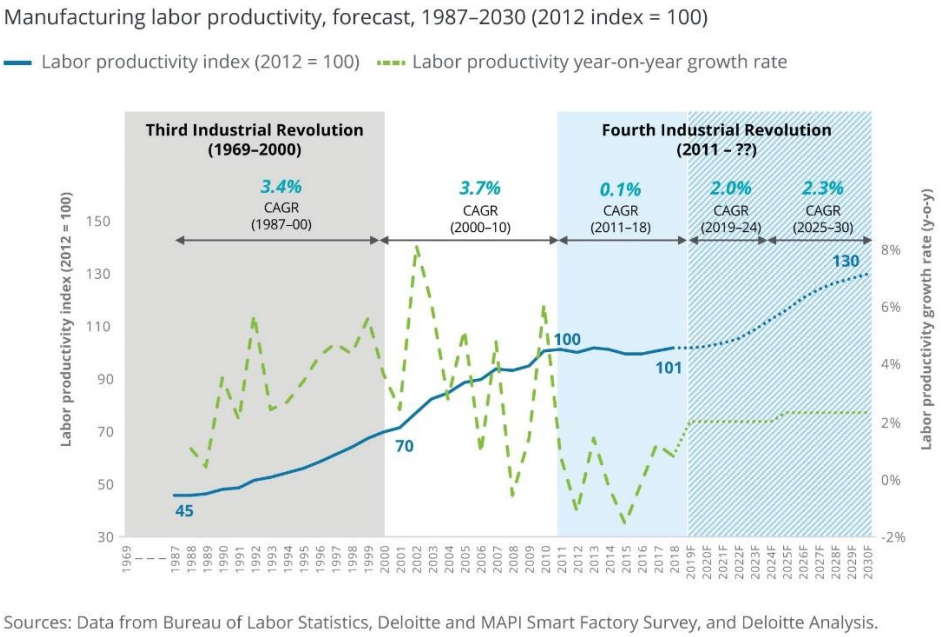
Smart Sensors	Smart devices that collect data from any physical situation while using programmable tasks on the data	• Use sensors to monitor machine temperatures through the cloud • Use smart sensors to keep an eye on inventory making sure to have real-time information of inventory
The Cloud	Storage on remote internet servers for on-demand availability of data/information.	• Hold large amount of costumer data and data from the entire supply chain with high security and low cost • Complete computationally exhaustive tasks on the cloud to reduce expenses
Augmented Reality	Interactive experience of digital information integrated onto the real world	• Use AR glasses to understand or train for a system before applying it to real life • Use AR equipment to practice welding without wasting resources • Doctors might use AR equipment to practice complicated surgeries and reduce real risk • Production workers might use AR glasses to project data about the production line for a more efficient and productive process
3D Printing	An additive manufacturing process that lets users print three-dimensional computer designs to physical objects	• Eliminate the need for fixtures and expensive tools • Allows for mass customization • Print out parts that are no longer being manufactured
Big Data	Complicated and huge data sets obtained from IIoT	• Use predictive analytics tools with big data to predict where in the supply chain a defect is going to occur and keep processes running • Data analytics help determine where bottlenecks are happening
Digital Twins	A digital interpretation of a process for real-time simulation analysis	• Use digital machine twins to look inside of machines without cost or affecting production • Observe entire factories digitally along with any information like maintenance needs or uptime/downtime • Try out new hardware/software for products before spending time and money

These technologies are growing and being implemented quickly which is causing the I4.0 market to skyrocket. Predictions indicate that by 2024, the I4.0 market will be valued at US$156.6 billion, that is over a 50% increase since 2019[14].



Industry 4.0 Market, By Region (USD Billion)[14]

Industrial companies from all around the world are seeing the benefits and investing in digitally connected, smart factories. This investment is driving their productivity through the roof and putting them ahead of the competition.



Smart factory initiatives that are part of fourth industrial revolution could ignite labor productivity growth[15]

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Conclusion

Industry 4.0 is here to boost engineering and manufacturing to new levels. Though it comes with a good number of challenges, it is clear that the benefits far outweigh them. Lean targets like achieving True North, are more feasible now than ever.

Hop onboard to perfect processes, predict the future, empower workforce, and increase efficiency and profits. With a connected system the possibilities I4.0 offers are endless and companies cannot afford to not take advantage of this. Industries that take advantage of the I4.0 potential are on path for success, sustainable outcomes, and a significant competitive advantage.

It's the future and it's here, so embrace it and join the new digital world and get positioned for the new era of future industry advancements.







About the Authors



Yannick Schilly | yannick.schilly@altixconsulting.com

Yannick is the cofounder, president, and CEO of Altix Consulting. He is an Industrial Engineer with an outstanding background in automation and industry 4.0. His global experience and broad knowledge make him an excellent advisor to help companies reach their full potential.



Andre Tello | andre.tello@altixconsulting.com

Andre is a Junior Associate Industrial and Systems Engineer for Altix Consulting who is passionate about Industry 4.0 and what the future of automation entails. With his B.S. in Systems Engineering and Green Belt in Lean Six Sigma, his interest lies in process improvement and smart manufacturing.

About Altix

Altix is the middle market international industrial champions' management consulting partner who specialize in Industry 4.0 and advanced manufacturing. Altix provides business strategy, technology and innovation, and operational excellence support, in the world of advanced manufacturing and international supply chain.

Let Altix help reach your full potential. For more information, visit:
http://www.altixconsulting.com



Altix Founders: Yannick Schilly and Anne Cappel

Altix Industry 4.0 Experts



Yannick Schilly

Yannick is an industrial engineer and senior management executive with more than 25 years' experience developing and executing complex global expansion strategies throughout Germany, China, and the US.

Yannick's unique expertise includes all aspects of global and international business, market entry, industrial best practices and excellence in advanced manufacturing, industrial engineering, logistics and multi-national supply chain management. During his successful career as Chief Operating Officer for a leading German based, international industrial technology company, Yannick established and managed regional production and logistic centers in China and North America.

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Thomas Lichtenberger

Thomas is a senior management executive with more than 25 years' experience and a leadership track record of generating sustainable sales growth and EBIT in the dynamic global automation technology marketplace, having led major organizational transformations in Germany, Canada, and USA.

Thomas is passionate about innovation and technology and equally dedicated to bringing businesses to the next level by developing and implementing targeted growth strategies and optimizing the P&L.

Thomas Lichtenberger has dedicated his career to advancing the global automation industry. As CEO of Festo Didactic Inc., a leading provider of advanced solutions for technical and industrial education, Thomas was responsible for all market and sales activities in North America. As an advocate for career and technical education, he possesses unique skills and experience to improve workforce development and Industry 4.0 career-readiness.

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Hong Zhou

Dr. Hong Zhou is a senior global executive, with more than 30 years' experience developing and leading global operations and supply chain in advanced manufacturing.

Target driven, Dr. Zhou's global views, teamwork spirit, and exceptional network bring valuable knowledge and proven results to industry champions seeking to establish and grow their international footprint in Asia. Working across cultures and continents, Dr. Zhou facilitates communication and fill in the cultures gaps to ensure market development and project infrastructures are delivered in quality, in cost, and on-time.

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Christian Leonhard

Christian is a mechanical engineer and senior management executive with 30 + years' experience leading operations around the world for multinational companies such as BASF and P&G and family-owned industry leaders like Festo, based in France, Ireland, and Germany.

Strong, result-focused, and success-oriented technical leader, Christian led complex industry expansions and transformation across Europe, North America, and Asia. In his various roles leading manufacturing for global operations, Christian planned and executed numerous factory expansion and relocation projects in Europe, Asia, and North America, developing and implementing new strategies including integration of acquired companies, introduction of fully integrated production systems, restructuration of product portfolio, harmonization of worldwide manufacturing standards.

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Altix Supply Chain 4.0 Experts



Ramesh Chandra

Ramesh is a senior consultant with over 20 years of leadership experience with multinational giants such as GE Aviation, Cummins, and Carrier Corporation, designing and executing supply chain, logistics and product strategy for automotive, industrial, aerospace, transportation and retail industries across Asia, Europe, South America, and the US.

As a change leader, Ramesh has managed numerous global strategic and continuous improvement initiatives across full spectrum of supply chain activities – strategic sourcing, procurement, inbound logistics, compliance, supply side risk management, manufacturing operations, quality, demand management, inventory planning, distribution center logistics, network design, supply chain technology, new product introduction and channel capability development.

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Lucy Davila

Lucy is a senior consultant with 20 years of leadership experience leading supply chain redesign, expansion and productivity projects for dozens of business units resulting in competitive advantages for two multinationals and multiple SMEs.

Lucy's experience across sourcing, manufacturing, distribution, and business planning for multinational industry leaders allows her to quickly understand the interdependencies inside the firm and opportunities with external partners. Lucy works collaboratively to implement a mix of proven tools and innovative supply chain solutions tailored to serve the particularities of the business needs.

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Altix Lean Experts



Liam Cassidy

Liam is a senior advisor and consultant with a 40+ year track record of turning around poorly performing operations, supply chains and suppliers. His unmatched expertise in applying Lean Principles – without compromise – coupled with the leadership skills necessary to implement them and ensure long term success, has been recognized by major international institutes and journals.

Liam started his career in operational roles for General Motors in the UK, and eventually rose to become a Senior Operations Manager, as well as General Manager of Lean Practices for Gillette and Procter & Gamble where he created benchmark sites in Ireland, Europe, USA, India and China. This included a large operation in the USA mid-west that he was assigned to prepare for closure but instead led a Lean Transformation Program that within 2 years eliminated China & Mexico as threats and made it the best performing operation in the global organization.

https://altixconsulting.com/people/liam-cassidy/



Jim Schreck

Jim is a senior manufacturing manager with 35+ years of broad-based leadership experience, and a track record of delivering site initiatives including organizational change, lean practices, and new product implementation and launch.

Jim started his career in the automotive industry working engineering roles at United Technologies Automotive. He later joined Gillette and the leadership team at the Oral-B Laboratories manufacturing site. His leadership accountabilities at Gillette, and post-acquisition Procter and Gamble, included operations, engineering, HS&E, product development, human resources, and facilities management.

Jim was a key member of the leadership team implementing a Lean Transformation Program that transitioned the site into a benchmark operation, delivering significant improvements across all key manufacturing measurables.

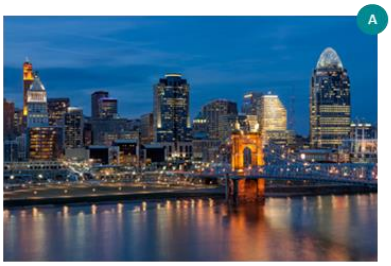
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