



The Promise of INDUSTRY 4.0

To stay competitive, many industries are starting to embrace Industry 4.0 which is now deemed to be the next Industrial revolution.

The business situation



Almost every industrial sector is under pressure from consumers and national governments to reduce costs while localizing supply chains to better support affordability and recover national prosperity.

The industries are also facing increasing legislation on the control of products for reasons ranging from consumer health to national security, significant product and process certification, traceability, proof-of-origin, and preferred localized supply.

Due to this, and to stay competitive, many industries are starting to embrace **Industry 4.0** which is now deemed to be the next Industrial revolution.

This is being driven by the emergence of new advanced technologies generating new forms of innovation some are calling the Age of Technological Disruption.

INDUSTRY 4.0 Productivity to the next level

This INDUSTRY 4.0 initiative is all about improving productivity and eliminating waste in the whole business supply chain by using LEAN business practices and then using Digital Transformation to automate all the remaining value-adding steps and optimise the value stream with new disruptive digital technologies to better manage the control of information, planning, decisions, materials, resources and assets in real time at the point of use.

The goal is to improve operating processes and better manage and harmonize future products and processes to achieve more integrated, waste-free, and sustainable products, processes, materials, resources and services to meet customer expectations and move us all toward the business of the future.

It will assist in reducing direct labor and the supporting workforce, and will improve operational flexibility, reliability and capability across the whole supply chain of a business.

The future challenge of every industry must be to learn how to access and innovate the application of these disruptive digital technologies and plan how to introduce them into the future business.

What is INDUSTRY 4.0

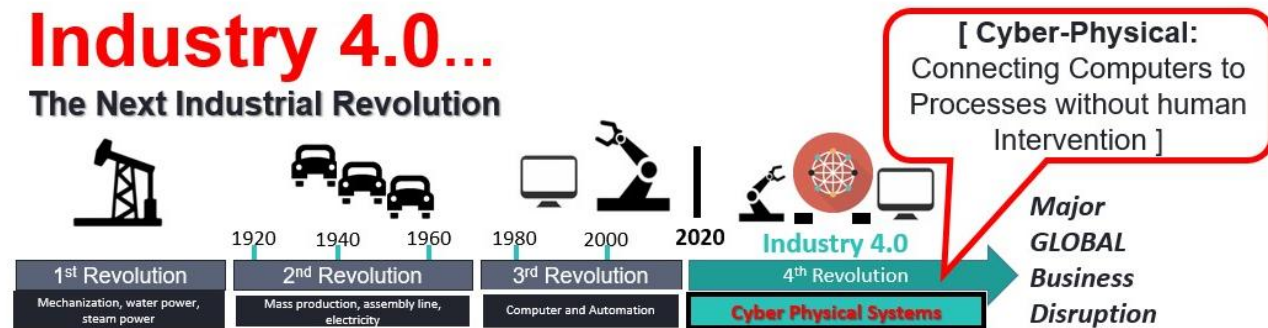
The first industrial revolution (INDUSTRY 1.0) was powered by water and steam to mechanize production.

The second industrial revolution (INDUSTRY 2.0) used electrical power and introduced mass production.

The third industrial revolution (INDUSTRY 3.0) added electronics, computers and information technologies to automate the production process.

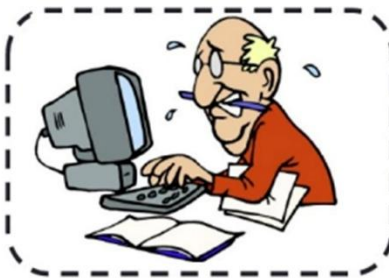
The fourth industrial revolution (INDUSTRY 4.0) began with the digital age in the last few decades and is characterized by a fusion of LEAN thinking to eliminate business process waste and the digital transformation of

the business processes using new technologies such as artificial intelligence, sensors, robotics and advanced automation, the Internet of things and cloud services to provide what are being called cyber-physical systems that will facilitate the next age of technological disruption and innovation in products, operations, processes and supply chains in many business sectors.



This may demand new facilities, capital, knowledge, skills, and systems, and its clear INDUSTRY 4.0 must be fully implemented with LEAN thinking to ensure digital transformation solutions are implemented without automating waste.

Correctly adopting such an imperative will provide an opportunity to change the competitive game, but much more needs to be done to assist the industries learn how these new technologies will be implemented.



In INDUSTRY 3.0 we added significant computerization to our manufacturing and business processes, but it created many environments in industry where we as humans got trapped in the process and ended up working for the computer, not the computers working for the process and benefiting us.

This has, in many cases, made us slaves to the computer with many business systems although computerized struggle with multiple semi-manual or manual transactions that are still needed to keep a firm real-time grip on a dynamic business process.

But INDUSTRY 4.0 will employ cyber-physical systems that will eliminate the human interface with sensors and smarter systems, so we will have computers working for us, not us working for the computers and should eliminate the burden of managing computers by humans and allow direct linkage between the computers, software systems and the operational business processes.

This will probably demand new facilities, capital, knowledge, skills, services and systems, and demand full integration with LEAN thinking to ensure the solutions eliminate the waste in business processes before the process is automated.

The Key Disruptive Technologies

Here are the key disruptive technologies and how they will impact the future.

Networks / The industrial Internet of Things (IIOT).

Although the technical term is “connectivity,” the public is embracing the Internet of Things and its industrial version, the Industrial Internet of Things (IIoT).

This is suggesting that devices and therefore the knowledge they carry will be connected more than ever before. Again, it is about information and knowledge at the point of use in real time.



Advanced Robotics

Advanced Robotics means linking traditional computerized machine and automation technology with smart sensor systems and we are witnessing this technology growth as defined by the upturn in the shipments of industrial robots and automation systems of all types.

These automation systems using smart-sensor solutions are being described as “cyber physical systems” because they place the computer power even more in control of the process without human intervention, which solves most of the major interface issues between robots, computers and process management.

Artificial Intelligence (AI) and Big Data

In the last few years, computer technology has taken a huge leap forward in terms of computing power measured in operations per second. They can operate upon massive and multiple algorithms much faster than human thought, with almost the same level of complex logic and decision capability.

This will generate enough information density and complex algorithm management to become a form of artificial intelligence. This improved computing power will enable computing systems to handle what the computer industry calls “Big Data,” so that everything we want to know about a subject or event can be stored as a complete body of knowledge at the point of use and used at will in real time.

Collaborative Connected Platforms

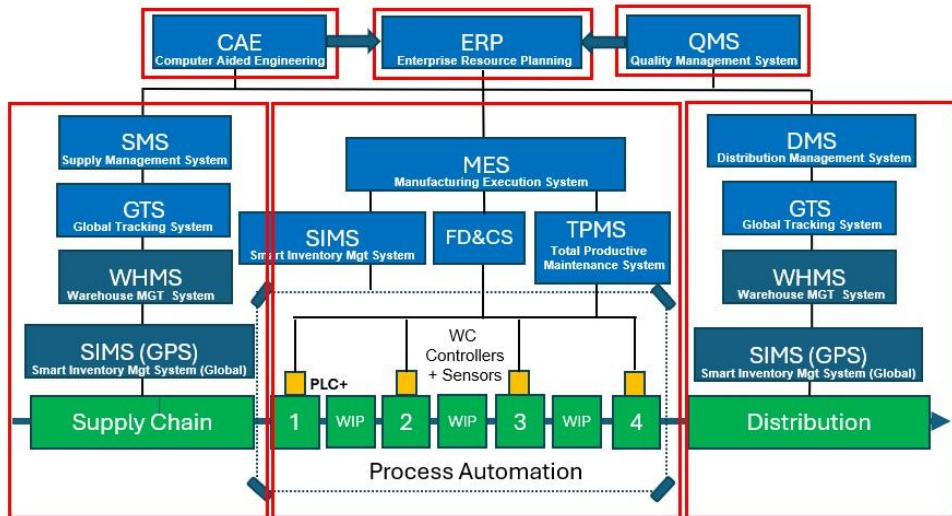
The other disruptor is collaborative and connected platforms that allow integration of both the physical and information, so that major system functions in a business become fully integrated across a whole supply chain.

It can link the supply management and the execution systems and the distribution systems seamlessly together so that the major product development and planning tools such as Computer Aided Engineering and Enterprise Resource Planning can collaborate seamlessly to manage a total business.

This capability is breeding a “globalization of ideas” mentality using a cloud-based capability, and can enable constructive crowd sharing of resources, skills, knowledge, and funds in an interactive manner.

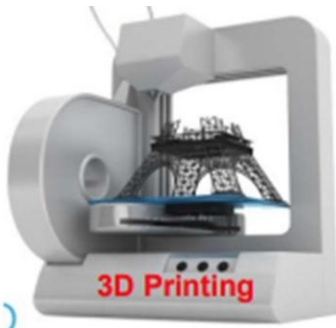
The control of IP may become an issue, but in principle the globalization of ideas is far more sustainable than the globalization of manufacturing and materials.

Industry 4.0 MAJOR SYSTEM FUNCTIONS



Advanced Manufacturing

Advanced Manufacturing has been a continuum, but computerization and automation have made many advances into manufacturing techniques in recent years, and it has also changed the way information is planned and transferred such as CAD/CAM and the computer simulation of processes.



Perhaps the most recent addition to the manufacturing process toolkit has been 3D printers.

This “additive technology” is now becoming highly capable in both plastic and metal and driving change in how and where traditional component manufacturing will be undertaken.

It is already changing the game for both Rapid prototyping and hi performance tooling strategies to re-life traditional industries and breed new industries.

This technology is also being successively incorporated into medical and custom products to provide real time and close-to-customer solutions.

New printable building materials and composites is changing building fabrication, and it's clear that the future marriage of this technology and new materials will take this technology into many sectors that will touch the population far more directly at the point of use much more than traditional manufacturing.

The next Industrial Revolution is on the way.

INDUSTRY 4.0 will embrace all functions in a business and provide an integrated and computerized business.

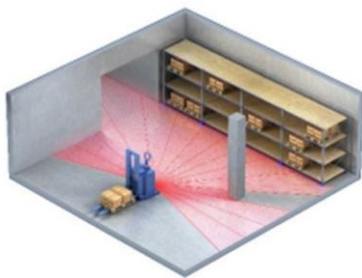
These cyber-physical systems will use sensor technology, IIoT networking technologies, and advanced wireless positioning and transaction system technology. They will enable not only the advancement of robotics and

autonomous guided vehicles but also allow us to seamlessly integrate computers into our processes and connect computing devices with integrated analytics.

These smart sensor systems are being described as “Cyber Physical Systems” because they place the computer power even more in control of the process without human intervention and solve some of the major interface issues between computers and process management.

It will control the whole supply chain from raw materials to finished products, including the management of all the manufacturing automation processes and it will integrate them with the customer demand and fulfillment process and allow the “smart-factory” concept to be conceived and start us on a journey toward a new “business of the future”.

Working in partnership with LEAN thinking, we can eliminate transactional waste and solve some of the major interface issues between computers and process management.



This will allow us to redeploy human skills toward improving our processes and evolve how we do business to better satisfy the demand of the local customer in the most sustainable manner.

This will allow business process and factory designers to take the business process to the next level, so they can effectively and cost-efficiently manage a broad scope of physical assets, such as processes, buildings, autonomously self-guiding vehicles, machinery, equipment, and inventory.

INDUSTRY 4.0 will reenergize the drive for the completion of LEAN projects to eliminate waste and transactions and better control processes. It will be applied across all forms of asset and inventory management and will also assist with the implementation of more automated safety systems to further reduce business risks.

Also, when coupled with global positioning systems INDUSTRY 4.0 will provide enhanced visibility and real time information at the point of use across the whole supply chain to improve decisions and actions at the point of use to optimize the control of materials and products throughout the resource, conversion, distribution and end user processes.

All this will greatly assist in reducing the labor, product loss, and associated costs incurred in supporting transactions within long and complex supply chain.

The goal is to achieve more integrated, waste free and sustainable products, processes and services to meet customer expectations.

Business improvement has always been a continuum, but the integration of these new disruptive technologies under the banner of INDUSTRY 4.0 constitutes a near-perfect storm to change the face of business, industry, and manufacturing into the next decade and provides a window of opportunity to offer not only business improvements but a chance for the renewal of national prosperity.

INDUSTRY 4.0 will enable reshoring.

Many western nations are generating political interest in having their future manufacturing capacity re-located geographically closer to their citizen customers within a local trade bloc with much shorter supply chains.

Industry 4.0 will greatly assist in this reshoring journey by reducing the level of labor in the local business and so eliminating any advantage of low-cost labor offered at the other end of those long and expensive supply chains.

This is why 85% of the major corporations are embarking on Industry 4.0 and planning to reshore back to regional supply chains in keeping with new capital investment cycles and the new political outlook.

Industry benefits.

Every industrial sector will experience the benefits of Industry 4.0 in many different ways across many different applications, but most will see the benefit across the whole supply chain.



For the raw material providers and fabricators, it means remote monitoring of the process using equipment and applications that can define and optimize the reduction of labor, errors, waste and better manage final yields. It means automated traceability and environmental record-keeping, as well as the reduction of waste with improved automated quality screening and control.

For general product assembly and processing it means “hands off” automation and integrated traceability and environmental record keeping, and the reduction of waste with improved automated quality screening and controls.

For manufacturing processes such as automotive, electronics and aerospace it will enhance scheduling, batch management, inventory control, maintenance and performance optimization leading to reducing waste, inventory and improved labor productivity.

For the product distribution, logistics and freight systems, it will ensure safety and traceability and proof of origin as well as improved inventory integrity and management of orders.

For the retail owners it means much lower disposal of spoiled goods, improved shelf life and improved supply management and internal operations.

For the consumers it should mean lower prices, fresher, higher quality, and better delivery of products.

For the nuclear, construction, mining and resource industries it means improved management of assets and personal across large campus facilities.

For the healthcare sectors it means improved client care through improved integration of information and transactions and inventory and scheduling of critical diagnostic equipment and expert practitioners.

For the food industry the benefits will be felt across the entire supply chain.

For the crop farmer, it means remote monitoring of crops using equipment and applications that can define irrigation and fertilization plans and improve growth and pick optimization.

For the livestock manager, it will mean health and feeding optimization of the individual livestock and better management of final yields.

For the food distribution system, it will ensure safety and traceability and proof of origin as well as improved inventory integrity and management.

For the fishermen it will mean remote monitoring of catches using equipment and applications that can improve catch quantity and quality. It will also require adding improved capability to undertake final sorting and certified batching of the catch prior to reaching the dock.

For fish farming it will mean health and feeding optimization and better management of final yields.

For food material processing it means improved control and containerization and automated traceability and environmental record keeping, and the reduction of waste with improved automated quality screening and control – saving downstream waste while improving product quality and traceability.

For the food manufacturing process, it means improved scheduling, batch management, inventory control and automation maintenance and performance optimization that will lead to reduced waste and improved labor productivity.

For the food distribution system, it will ensure food safety and traceability and proof of origin as well as improved inventory integrity and delivery management.

For the retail owners it means much lower disposal of spoiled goods, improved shelf life and improved supply management and internal operations.

For the food consumers it means lower prices and fresher products.

For the general food and drug industries the new government legislation driven by consumer health and national security will demand traceability requirements to support more stringent product and process certification, including traceability and proof-of-origin from producers through storage, distributors, retailers, and end users that can be provided without added costs with an INDUSTRY 4.0 solution.

The Seafood industry and others that have short product shelf-life is a strong opportunity area for INDUSTRY 4.0 as currently struggles with product and operational waste that is almost 60% of the total cost across the entire supply chain.

For the seafood industry, experts predict that when fully installed, the benefits of INDUSTRY 4.0 will be a massive reduction in waste and improved compliance to meet the demands of consumers, new regulations, and demanding NGOs such as the Marine Stewardship Council (MSC) and the Global Dialogue on Seafood Traceability (GDST).

INDUSTRY 4.0 benefits will drive restructuring.

To unlock the benefits of INDUSTRY 4.0 many industrial sectors will need to undertake a massive LEAN and Digital Transformation of their whole supply chain. This will drive the need to change many traditional roles and product responsibilities to reduce the complexity of the overall supply chain, and will mean significant restructuring and consolidation of existing businesses, that may cause some painful but necessary local job dislocation to gain improved productivity.

Consumer culture may be questioned.

Although much of the waste problems in industry can be solved by undertaking INDUSTRY 4.0 some of the product waste is driven by our consumer throwaway culture.

This is due to our affluence expanding our broad choices of products that does create redundancy and obsolescence and short product life cycles well below product operating life.

This situation is also accentuated by marketing practices by corporations trying to maximise revenue through encouraging consumer demand that creates “wants” way above the level of “need”.

Constraining this situation is not going to be easy, but some taxation to maximise the choice toward local produced products that consume less supply chain waste and maximise local employment may be deemed acceptable to consumers and would also assist in reducing the broad choice of products and the associated waste.

Are we there yet?

INDUSTRY 4.0 solutions are being developed in each manufacturing sector by the sector-specific manufacturing equipment and automation suppliers and the business-system-solution providers.

Much more needs to unfold in this journey but it's well underway, and the goal is to improve operating processes and better harmonize future products and processes to achieve more integrated, waste-free, and sustainable products, processes, and services to meet customer expectations.

A recent industrial study indicates that 70 percent of business leaders in North America are looking at how to embrace the INDUSTRY 4.0 environment, and they are revisiting both continuous improvement and disruptive technologies as strategic differentiators.

The application of INDUSTRY 4.0 and these disruptive technologies have a current global market size specific to the manufacturing industry of about \$3.9 trillion and are rapidly growing with investments predicted to exceed \$60 trillion during the next fifteen years.

Although this journey of industrial revolution has historically been centred on the manufacturing industries, INDUSTRY 4.0 will be embraced by other industries such as farming, fishing, mining, forestry, and distribution with all types of services looking to engage INDUSTRY 4.0 to gain business and process improvements, advancing their market and operational positions, as well as meeting the increasingly passionate and knowledgeable consumer demands, while meeting governments regulations in health, safety, security and sustainability.

Business improvement must always be a continuum, but the integration of these disruptive technologies under the within INDUSTRY 4.0 constitutes a near-perfect storm.

A recent industrial study indicates that 85% of business leaders in North America are looking at how to embrace the INDUSTRY 4.0 environment by revisiting LEAN practices and utilizing these disruptive technologies as strategic differentiators.

The INDUSTRY 4.0 implementation global market is about \$4 trillion and is rapidly growing with investments predicted to exceed \$60 trillion during the next fifteen years.

How to approach the INDUSTRY 4.0 challenge.

All businesses must learn how to implement these INDUSTRY 4.0 initiatives, requiring them to undertake LEAN education and training to develop their own critical mass of improvement culture led by change agents and

thought leaders, as well as engaging with the leading providers of these LEAN practices and disruptive technologies.

It's not just about the implementation of automation hardware and application software and services, but also making sure the final solution provides a process of transformation of existing operating practices and organizational culture. It will need to leverage the existing industry knowledge-ware to ensure it can be successfully integrated into a business system that can be deployed across the whole supply chain.

As already mentioned, INDUSTRY 4.0 is the combination of the application of LEAN practices to squeeze out the business waste and undertaking a digital transformation on the remaining value adding parts of the business.

Many organizations are looking at INDUSTRY 4.0 as the next magic pill they can swallow to improve their overall competitiveness. Of course it's not in any way a magic pill, but it is a key operational "do differently" to move the organization toward much needed business productivity and prosperity for everyone involved.

Getting the whole organization mobilized and combat ready for such a productivity improvement transformation will require significant awareness building and focused education for all those involved and will require a call-to-action message that is simple and easy to communicate and understand.

So, here is a simple **INDUSTRY 4.0 Implementation Checklist** to get everybody ready.....

- ☒ If it's a Waste? Eliminate It!
- ☒ If you cannot Eliminate Waste? Reduce It!
- ☒ If it adds Value? Integrate It!
- ☒ If it's Dumb? Make It Smart!
- ☒ If it has to Move? Track It!
- ☒ If it needs to Communicate? Connect It!
- ☒ If it can Learn? Teach it!
- ☒ If it's a Cost? Measure it!
- ☒ If it's got Human Intervention? Start Over!
- ☒ If it's Not Competitive? Continuously Improve it!

Exploring the checklist one at a time...

If it's a Waste?.....Eliminate It!

8 Types of Waste

- | | |
|---|---|
| ☒ Waiting | ☒ Defects |
| ☒ Inventory | ☒ Over-processing |
| ☒ Excess Transportation | ☒ Excess Motion |
| ☒ Over-production | ☒ Under-utilized Talent |

This is straight out of the LEAN thinking playbook. Traditional business processes have at least double-digit waste in every step. And it's best to eliminate the waste in a process before it is automated.

Waste reduction opportunities exist across all 8 Types of Waste utilized in LEAN Thinking.

Many tools exist to attack waste, and skills can be developed to map and redraw the process to identify the waste and

restructure the business process to eliminate the waste to reduce product delays, inventory and improve product quality and reduce business costs significantly.

If you cannot Eliminate Waste?.....Reduce It!

This is a continuation of the LEAN thinking approach where each process is further analysed to see if it has elements that can be reduced via improvement projects.

If it adds Value ?.....Integrate (and automate) it!

Once waste has been eliminated or reduced then the true value in the business process can be restructured to combine and integrate it into a common process methodology, or if its data integrated into a common data base. What remains can then be fully automated to remove human effort or interaction.

It it's Dumb?.....Make it Smart!

If parts of the process cannot be a part of a digitized and computerized system then the challenge is to add smart technology to enable it to be integrated and automated using smart physical automation or digital transformation solutions.

If it has to Move?.....Track It!

If we want to manage our assets of all types, then we need to know where they are and what state they are in. Adding the ability to track these items is part of the INDUSTRY 4.0 approach.

If it needs to Communicate?.....Connect it!

Once we have assets and resources rationalized and made “smart” within our business systems, we need to review the kind of communication needed, and if so, the business system needs to connect these items together to ensure automated communication in real time.

If it can Learn?.....Teach it!

As subsystems and process elements become “smart” we need to see if they can have the ability to learn... this is the essence of Artificial Intelligence (AI) and this will mean far less human intervention and improving the ability for real time decision making at the point of use.

If it's a Cost?.....Measure it!

As we focus on waste reduction, we need to continuously measure our costs to see how much more waste can be squeezed out, or how much benefit we will get from any form of automation.

If it's got Human Intervention.....Start Over!

The goal is to eliminate most, or even all, of human intervention within a business process to move toward INDUSTRY 4.0. The ongoing will be the ongoing reduction of human intervention.

If it's Not Competitive.....Continuously Improve It!

As we embrace the culture of Continuous Improvement it will be a natural process to stay focused on this journey to competitiveness.

Become a disruptor or get disrupted!

Business history shows that when a disrupting influence, such as INDUSTRY 4.0, enters a business environment, a business has only one of two choices: either become a disruptor or get disrupted and suffer the consequences.

All industries clearly face the pressure to improve productivity, and many will struggle with how to cope with business restructuring and the organizational changes typical of a LEAN business transformation.

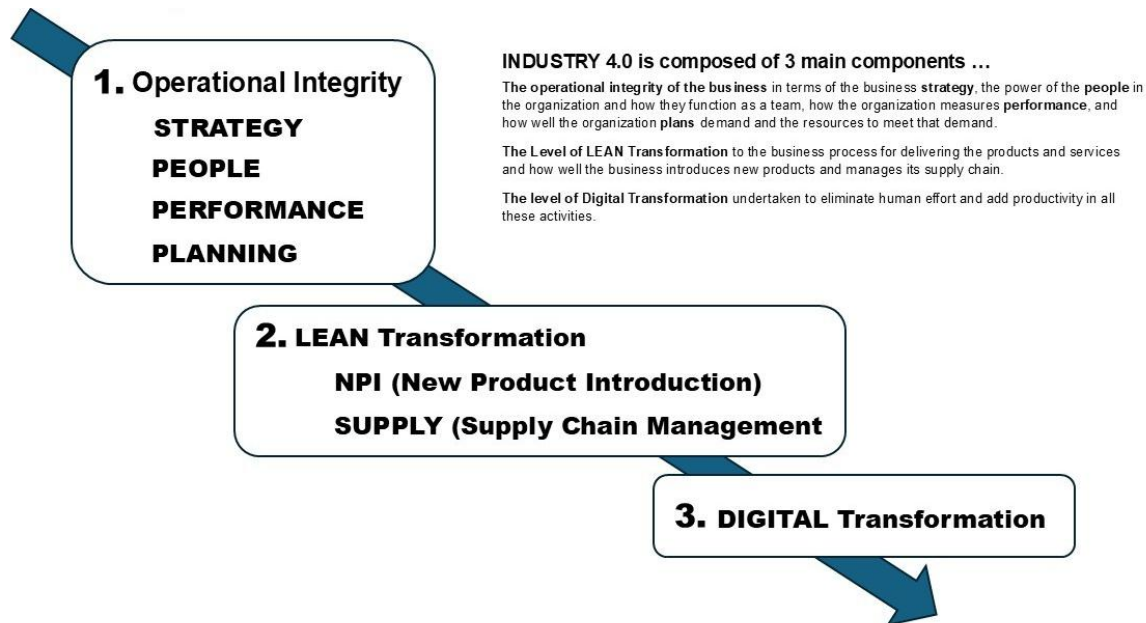
Many industries may struggle with compliance to new legislation for product and process certification, traceability and proof-of-origin from producers to storage, distributors, retailers, and end users.

Unfortunately, many may try a “quick fix” by implementing manual and paper documentation, but this will certainly add cost and overhead and may even add delivery delays.

Some will certainly face ongoing disruption from those who have quickly and correctly implemented an INDUSTRY 4.0 approach!

Implementation structure of INDUSTRY 4.0

INDUSTRY 4.0 is composed of 3 main components ...



The operational integrity of the business in terms of the business **strategy**, the power of the **people** in the organization and how they function as a team, how the organization measures **performance**, and how well the organization **plans** demand and the resources to meet that demand.

The Level of LEAN transformation to the business process for delivering the products and services and how well the business introduces new products and manages its supply chain.

The level of digital transformation undertaken to eliminate human effort and add productivity in all these activities.

A successful INDUSTRY 4.0 Implementation should follow these 3 main components in sequence, as it's clear that without solid business integrity the other components will not work and if the LEAN transformation is not in place the digital transformation will just automate waste.

Who are you going to call?

New providers for INDUSTRY 4.0 technology solutions need to offer integration, automation, traceability, integrity and waste reduction solutions that deliver improved operations to seamlessly deliver products and services while meeting new regulation requirements. You may also require support for the Business integrity restructuring and the LEAN transformation as well as the toolkit for Digital transformation.

INDUSTRY 4.0 Readiness Survey

I recommend you take the latest TSRB INDUSTRY 4.0 Readiness Survey to see how your business stacks up for INDUSTRY 4.0.

Link to TSRB Survey.... [SURVEY](#)

The survey is organized around the 3 main components of the INDUSTRY 4.0 implementation structure of:-

The **Operational integrity** of the business,

The Level of **LEAN Transformation** to the business process,

The level of **Digital Transformation** undertaken to eliminate human effort and add productivity in all these activities.

It offers an understanding of your business readiness and progress toward INDUSTRY 4.0

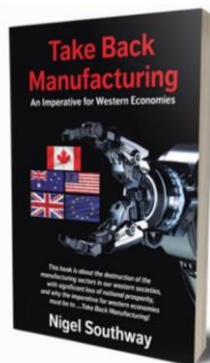
It provides a snapshot of how your organization is currently positioned across several important areas of operational readiness, including leadership alignment, process discipline, data visibility, technology use, supply chain readiness, and improvement capability.

The purpose of this survey is not to produce a pass/fail score but to help identify where your organization may already be strong, where gaps may exist, and where focused action could create the greatest business improvement.

Link to TSRB Survey.... [SURVEY](#)

.....

Nigel Southway is based in Toronto Canada and is an independent business consultant and the author of *Take Back Manufacturing: An Imperative for Western Economies*, and *Cycle Time Management: The Fast Track to Time-Based Productivity Improvement*, an early LEAN thinking textbook.



He consults and educates worldwide on Business Productivity Improvement, LEAN business practices, Advanced Manufacturing Engineering, Future Supply Chain Management, Industry 4.0, National Sustainability, Global technology transfer projects and joint ventures and more.

He is a past chair of the Society of Manufacturing Engineers and the leading advocate and spokesperson for the Take Back Manufacturing Forum, and the North American Reshoring initiative in Canada.

More at www.nigelsouthway.org