



Master Black Belt Webcast Series

Continuous Improvement in the New Reality of Industry 4.0 (Part 1)

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About MoreSteam

Enterprise continuous improvement from training to project completion

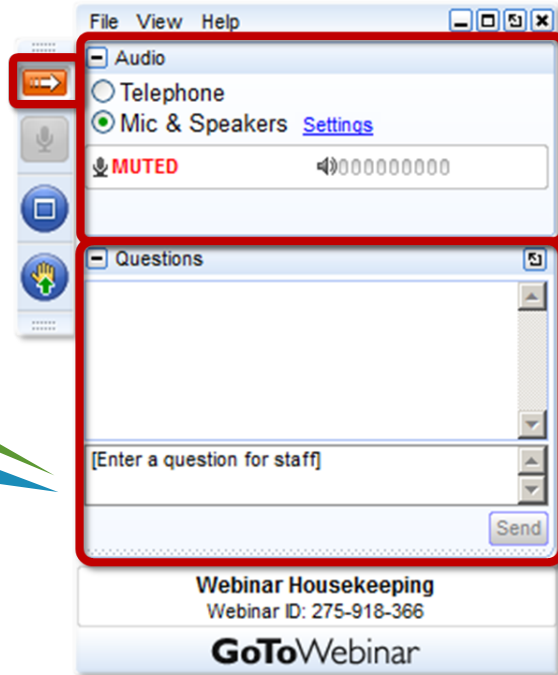
577,000+



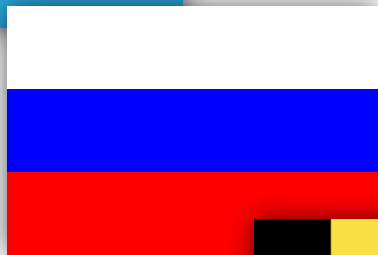
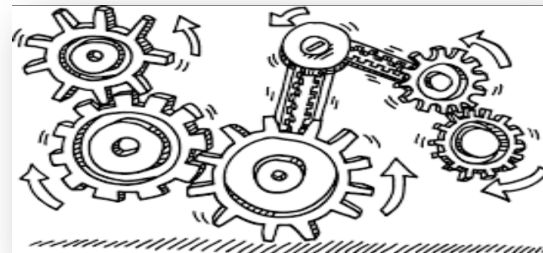
GoToWebinar Attendee Panel

Would you
explain a little
more about
.....

How have you
handled



Something about me



pwc



What is Lean Six Sigma?

Lean

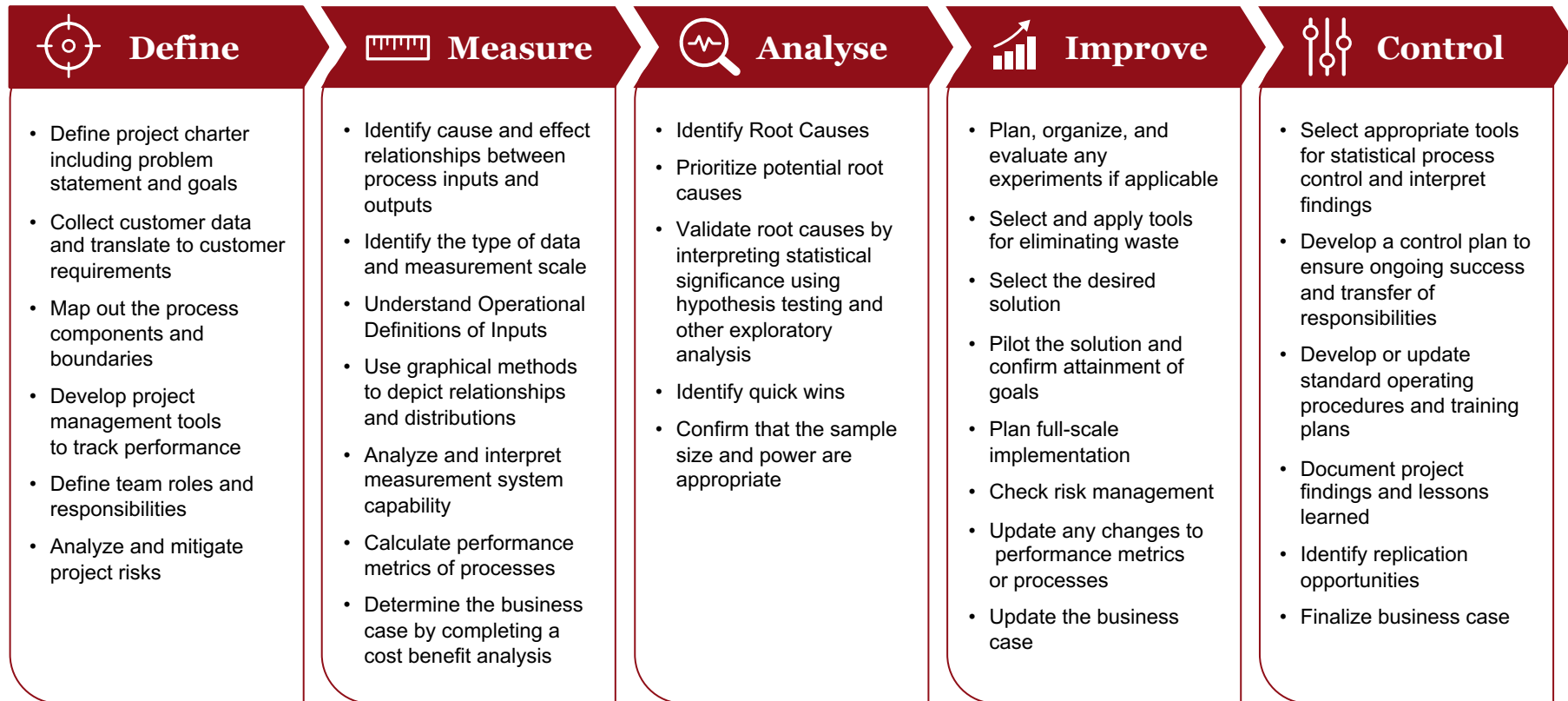
- ❖ **Improvement and problem solving methodology that strives to reduce or eliminate activities that don't add value to the customer.**
- ❖ Founded on two pillars – respect for people and continuous improvement.
- ❖ Never-ending elimination of waste
- ❖ Committed to total customer satisfaction
- ❖ Total commitment to quality
- ❖ Total employee involvement

Six Sigma

- ❖ **Problem solving methodology rooted in data.**
- ❖ Applied across organizations, large and small, and is heralded for its rigorous, data-driven approach to improving process performance and instilling continuous improvement.
- ❖ Heart of the Six Sigma methodology is the DMAIC roadmap
- ❖ DMAIC stands for Define-Measure-Analyze-Improve-Control.

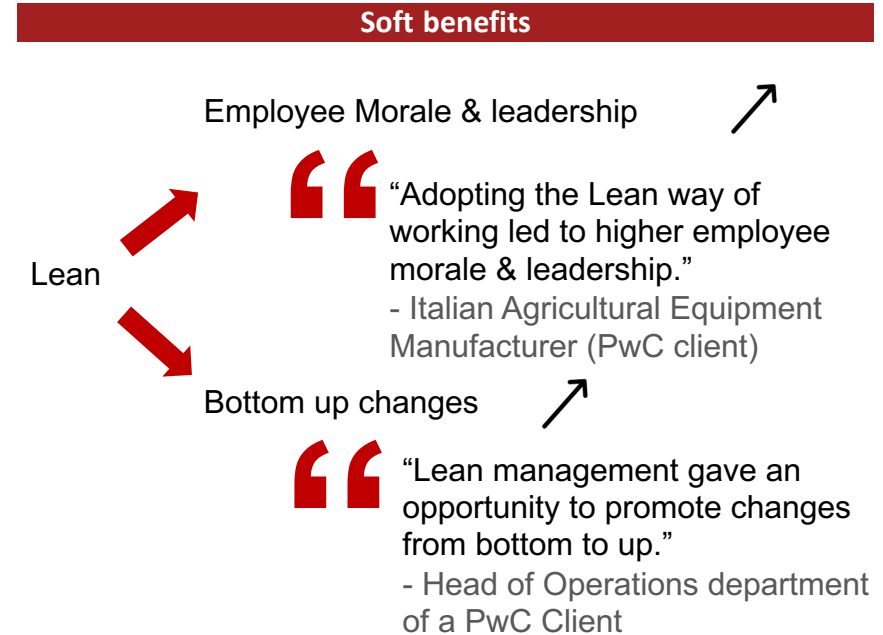


What does a typical Lean Six Sigma projects look like?



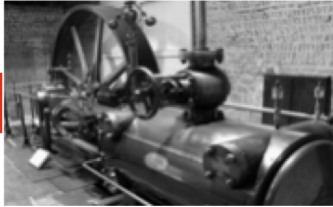
Typical results of Lean six sigma projects

Hard benefits			
	Baseline	Improvement (%)	Achieved value
Output production	38 tons/shift	31%	50 t/sh
Scrap reduction	2.5%	75%	0.5%
Overall equipment effectiveness (OEE) increase	60%	30%	82%
Lead time reduction	15 weeks	66%	5 w
Scrap reduction	4%	50%	2%
Inventory reduction	24m euros	42%	14m euros
Technical failures	1,800 hours	86%	250 hours
Production output	30 tons/shift	27%	38 t/sh



The 4th industrial (r)evolution allows a more flexible, resource-efficient and customized manufacturing

Industry 1.0



End of 18th century

Mechanical production
powered by water and
steam engines

Industry 2.0



**Beginning of 20th
century**

Mass production
powered by electricity
and combustion
engines

The first assembly lines

Industry 3.0



1970s

Introduction of
automation and
robotics

The beginning of the
information age with
electronics, computers
and the internet

Industry 4.0



2015+

Digitized products and services

Vertical and horizontal
integration & digitization
operations value chain

New Business Models

Data analysis & action as a core
competency

Industry 4.0 is not only about being digital, it is about integrating your business and removing silo's over the entire value chain

I

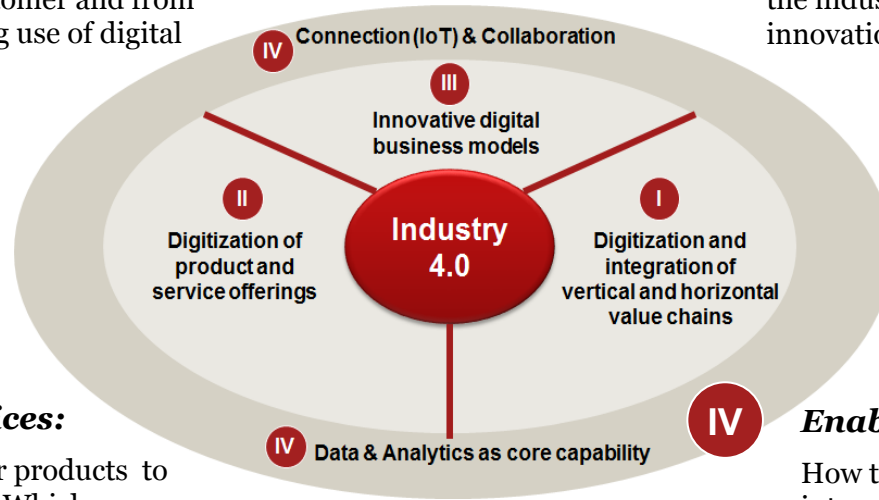
Integration:

How to fully integrate all processes from supplier to customer and from R&D to sales, making use of digital technologies?

III

Business models:

How to strengthen your position in the industrial ecosystem and grow by innovation?



II

Products & services:

How to innovate your products to solutions to services. Which new business can you develop with digital technology?

IV

Enabling layer:

How to turn data into information into power by processes and technology?

“Digitisation and best-in-class processes are the key enablers to reach profitable business growth in an Industry 4.0 era.”

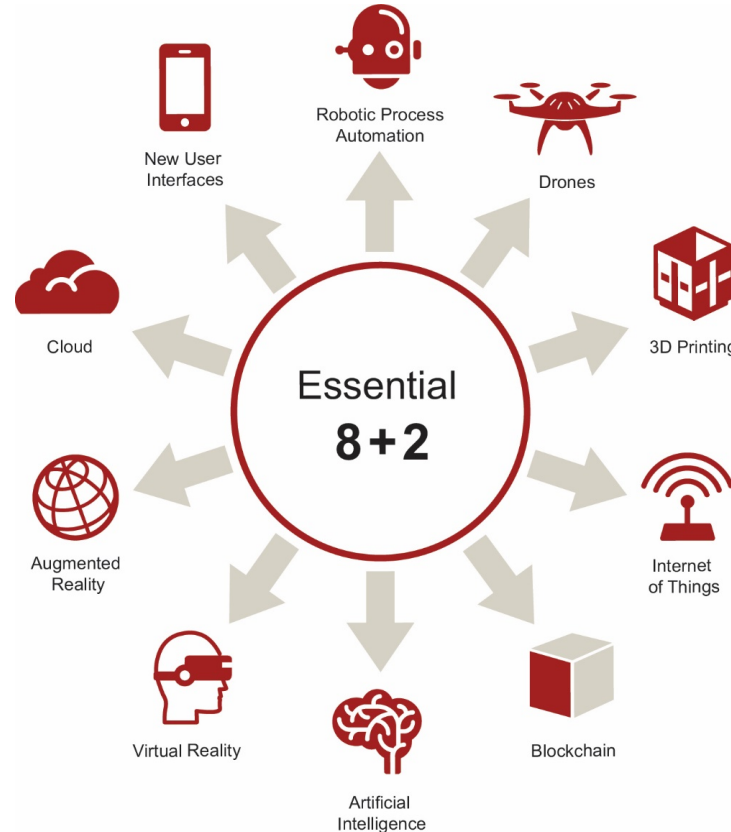
Our world is rapidly changing...

64% of CEOs believe technology will disrupt how they do business in the next 5 years.

—*PwC 21st CEO Survey*

What is Industry 4.0?

We analysed 250+ technologies to zero in on the 8+2 having the biggest business impact right now.



3D Printing



3D printing

3D Printing is the process of creating a three-dimensional object by **successively printing layers** of materials on one another until an object is formed.

In practice:

spare parts

rapid prototyping

architectural models

complex
manufacturing

Top industries making 3-D printing investments over next three years



35%
of automotive
companies



29%
of industrial
product
companies



29%
of healthcare
companies

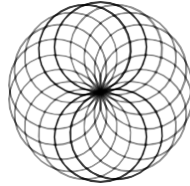
Source: PwC 2017 Global Digital IQ Survey

What does 3D Printing bring to the table?



In Situ On-demand Printing

3D Printing allows parts to be manufactured on-the-spot if and when the need arises. This is especially useful in use cases where supplying new parts would be logistically challenging.



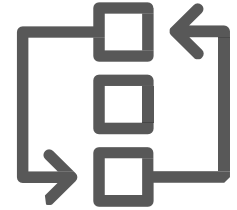
No Assembly Required

By virtue of the layer-by-layer construction of 3D printed artefacts, they can be designed such that minimal/no assembly is required. This opens up new design paradigms where computers can optimise material use in unorthodox shapes, while performing the same function.



Dematerialised Supply Chains

To 3D print a part, all one needs is material filament and a digital file of the 3D model. Sending 3D models over the Internet across the world and printing in situ would dramatically reduce the need for complex supply chains, warehouses, freight etc.



Advanced Customisability

Since users have or can create their own 3D models, they have the option to customise parts as desired, offering personalisation and customisation as a feature.

Artificial Intelligence





Artificial intelligence

AI is an umbrella term for “smart” technologies that are **aware of and can learn from their environments** to assist or augment human decision making.

In practice:

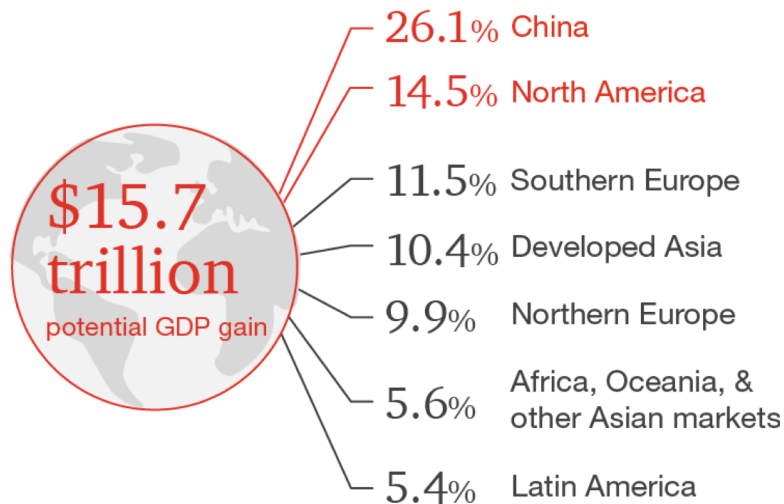
machine learning

recommendation
engines

chatbots

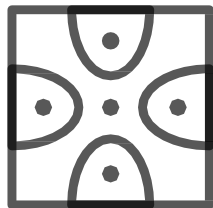
image recognition

China and North America will see biggest AI gains by 2030



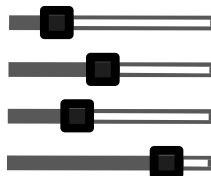
Source: PwC Global Artificial Intelligence Study, 2017

What does Artificial Intelligence bring to the table?



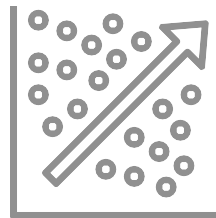
Finding Non-linear Patterns

AI techniques like deep learning can find patterns that may be unintuitive to human eyes. This has applications in systems with many interrelated dependencies like cancer screening, weather predictions or relieving traffic congestion.



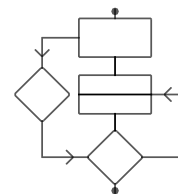
Multi-criteria Optimisation

AI systems can help to optimise systems where multiple interrelated criteria need to be optimised especially when improving one factor means tradeoffs for the other factors.



Predictive Capabilities

With enough training of historical conditions, AI systems can analyse real-time data to predict future outcomes at limited time horizons.



Co-managing Complex Systems

While an AI may not replace humans in managing complex processes (for now), it can provide decision support and automate low-level issues so that humans can focus on the big picture. Examples include “cruise control” in driverless cars, or “autofocus” in digital cameras.

Augmented Reality





Augmented reality

Augmented reality (AR) is a data or information “**overlay**” on the **physical world** that uses contextualized digital information to augment the user’s real-world view.

In practice:

data visualization

transportation safety

customer experience

manufacturing
operations



24%

of companies will make significant investments in AR in three years;
5% think it will be the most disruptive tech to their industry.

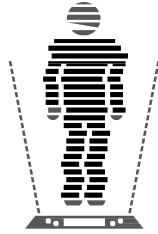
Source: PwC 2017 Global Digital IQ Survey

What does Augmented Reality bring to the table?



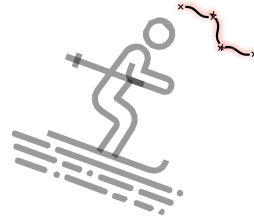
Rich Information Overlays

The first and most obvious ability of augmented reality would be to reveal a dynamic informational layer on top of physical objects.



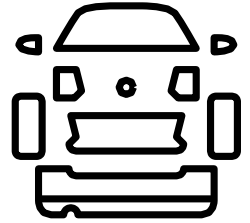
Virtual Holograms

3D holograms can be superimposed onto physical spaces, allowing usecases such as immersive teleconferencing or interactive advertisements.



Real-time Decision Support

Augmented Reality in wearables like Google Glass or smart helmets allow surgeons or athletes to get critical information in real-time without breaking focus or eye contact, like a sixth sense.



Spatio-visual Thinking Aid

Augmented Reality allows students, designers and engineers to think and work in 3D interactively and intuitively, as opposed to 2D representations on paper or on-screen.

Blockchain



Blockchain

Blockchain technology is a **distributed shared ledger** where transactions are recorded and confirmed without the need for a central authority.

In practice:

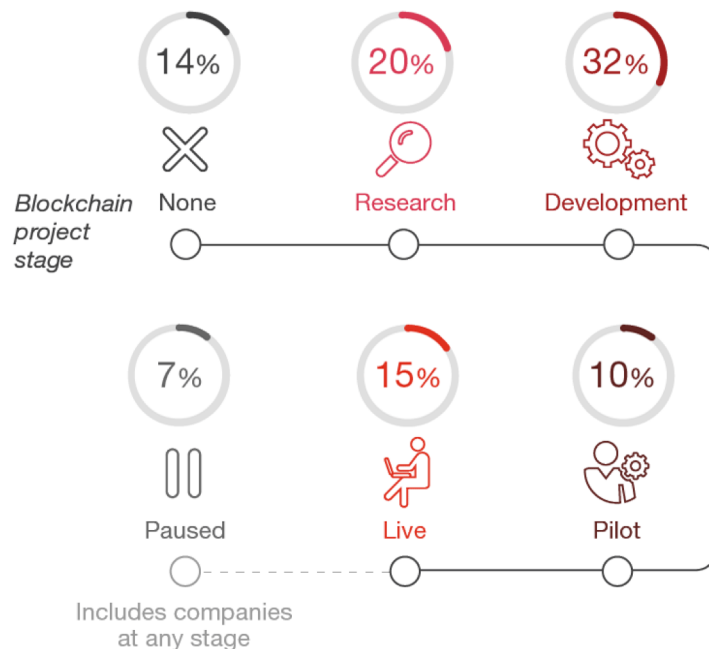
supply chain
traceability

financial processes

identity verification

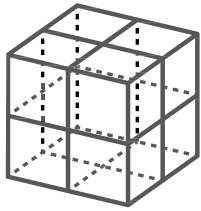
digital currencies

How far along are companies with blockchain?



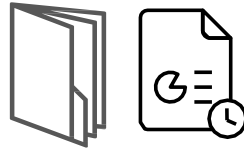
Note: Numbers are rounded (sum does not equal 100 due to rounding).
Source: PwC Global Blockchain Survey, 2018

What does Blockchain bring to the table?



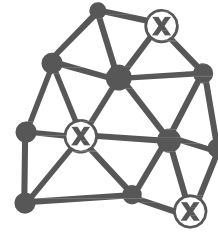
Transparent Transactions

On the Blockchain, every single transaction is logged and stored securely, so transparency is an inherent feature of the system.



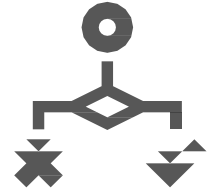
Immutable History

Not only is every transaction recorded, it can also be stored indefinitely in a secure way. This increases trust because you can follow an item back to its origin.



Trust By Consensus

Since the Blockchain is designed as a decentralised system, at any moment, hundreds of peers have identical records of the system's history, and new transactions are processed only when all peers are in consensus. This replaces the need to trust a single third-party with important transactions.



Smart Contracts

Since every transaction is digitised, they can also be automated to occur when certain conditions are met. Effectively, this allows users to “program their money” to work for them.

Drones





Drones

Drones are devices that fly or move **without the presence of a pilot** and can be used to collect a wide range of data or execute tasks remotely.

In practice:

maintain
infrastructure

remote delivery

provide security

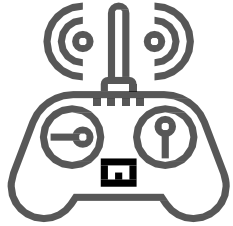
capture video

5%

of businesses are making significant
investments in drones today;
14% will in the next three years.

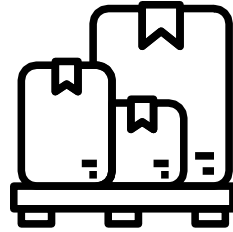
Source: PwC 2017 Global Digital IQ Survey

What do Drones bring to the table?



Autonomous/Remote Control

Drones can be controlled manually or be autonomous, depending on the usecase. This hybrid flexibility allows for easy adoption in any process.



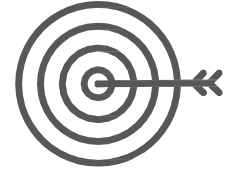
Transport of Goods/Persons

Drones can carry goods or persons from point to point. In this sense, they can be thought of as non-linear conveyor belts.



Accessing Hard-to-Reach Areas

Drones (equipped with cameras) can provide a live-feed to a remote viewer. Since drones are cheaper than human lives, they can be deployed into dangerous areas (like disaster zones, enemy territory, other planets).



Targeted Delivery

Supply chains are usually efficient until the last mile. Drones can complement the process by providing targeted delivery capabilities from local hubs.

Internet of Things





Internet of things

The Internet of things (IoT) **extends network connectivity** and enables a diverse range of devices to collect, process, and send back data.

In practice:

asset tracking

smart metering

fleet management

predictive
maintenance

73%

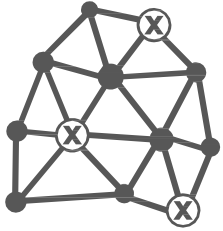
of companies
are making **IoT**
investments
today;

47%

say it will be the
most important
tech for **cutting**
costs.

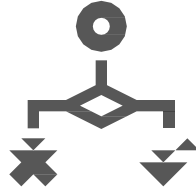
Source: PwC 2017 Global Digital IQ Survey

What does IoT bring to the table?



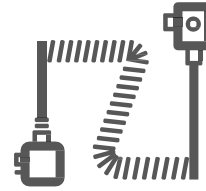
Granular Transparency

When the cost of sensors is no longer a bottleneck, they can be embedded in every thing and every corner, relaying extremely localised data on-demand.



Conditional Triggers

With data streams from sensors at key locations, IoT allows deviations to trigger automated responses in other parts of connected systems.



Remote Control & Observation

Since all sensors and devices on the IoT are connected, it becomes possible to remotely manage these devices anytime, anywhere.



Mix-and-Match Modularity

While specialised sensors can be deployed in different areas depending on the usecase, incoming data becomes exponentially useful when it can be combined across silos.





Robotics

Robotics is the **combination of engineering and computer science** to create, design, and operate mechanical devices, i.e., robots.

In practice:

industrial
manufacturing

medical procedures

transportation
operations

product fulfillment

31%

of businesses will
make **significant
investments in
robotics** in three
years;

13%

say it will be the
most disruptive tech
to their business
model within the
next five years.

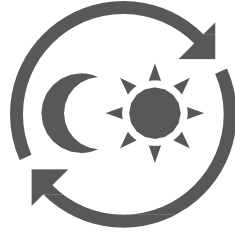
Source: PwC 2017 Global Digital IQ Survey

What does Robotics bring to the table?



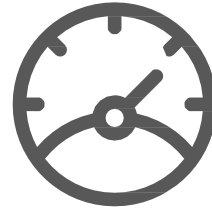
Precision Results

Once a robot is trained to do a specialised task, it will deliver results at the same quality requiring little or no supervision. A single robot may not replace a human, but dozens of robots working together can outperform humans easily.



24/7/365 Operations

Unlike humans, robots do not get bored, have mood swings or get sick. They do not require holidays, work-life balance or bonuses/pensions. From a purely cost perspective, robotics is a good investment.



High Speed Automation

Once programmed, robots can perform a specialised task at high speed. With Moore's Law, it is a guarantee that this speed can only get faster over time. Notably when events trigger action, robots eliminate the lag of human response time.



Exponential Synergies

As robots perform tasks, they can learn and improve, just like humans. However, robots can be mass-manufactured, and algorithms can be copy-pasted. When one learns, all improve almost instantaneously. Humans cannot compete.

Virtual Reality



Virtual reality

Virtual Reality (VR) is a **simulation of a 3-D image** or complete environment where a user can interact in a seemingly realistic way.

In practice:

marketing

virtual tours

training

prototyping and
design



7%

of companies are making significant investments in VR today; **15% in three years.**

Source: PwC 2017 Global Digital IQ Survey

What does Virtual Reality bring to the table?



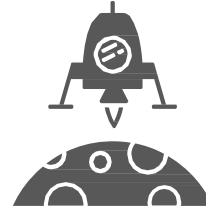
Rare Occurrences

Virtual Reality allows rare occurrences to be captured and shared among a larger audience, that would otherwise be inaccessible to the masses.



Dangerous Situations

Virtual Reality allows people to experience dangerous situations (like floods, plane crashes etc) in relative safety, so that they can be calmer in real crises.



Impossible Scenarios

Virtual Reality allows people to experience impossible/expensive scenarios, like landing on alien planets or diving alongside whales in deep ocean.



Immersive Empathy

The immersive capabilities of VR can really put the viewer in “someone else’s shoes” seeing what they see. This has been shown to generate compassion and empathy for others in a whole new way.



New User Interfaces

New User Interfaces means the **interaction between a user and a computer system**, in particular the use of input devices and software.

The latest trends in new user interfaces include chat-bots and conversational user interfaces, such as Alexa, Google Home and Apple Siri.

In practice:

chat-bots

conventional user
interfaces

44% of consumers have used their voice assistants to control another smart device in their home.

-PwC Consumer Intelligence Series 2018: Consumer Voice Interfaces



Cloud computing is the **location-independent delivery of IT management services**, in which resources may be requested from the Internet through web-based tools and applications. It allows employees to work remotely.

In practice:

infrastructure as a
service (IaaS)

platform as a service
(PaaS)

software as a service
(SaaS)

Companies providing cloud services enable users to store files and applications on remote servers, and then access all the data via the internet.



Process mining

Process mining is the **automated creation and construction of process models** based on information system event logs and other event records.

In practice:

Data-driven
analysis tool

Process monitoring

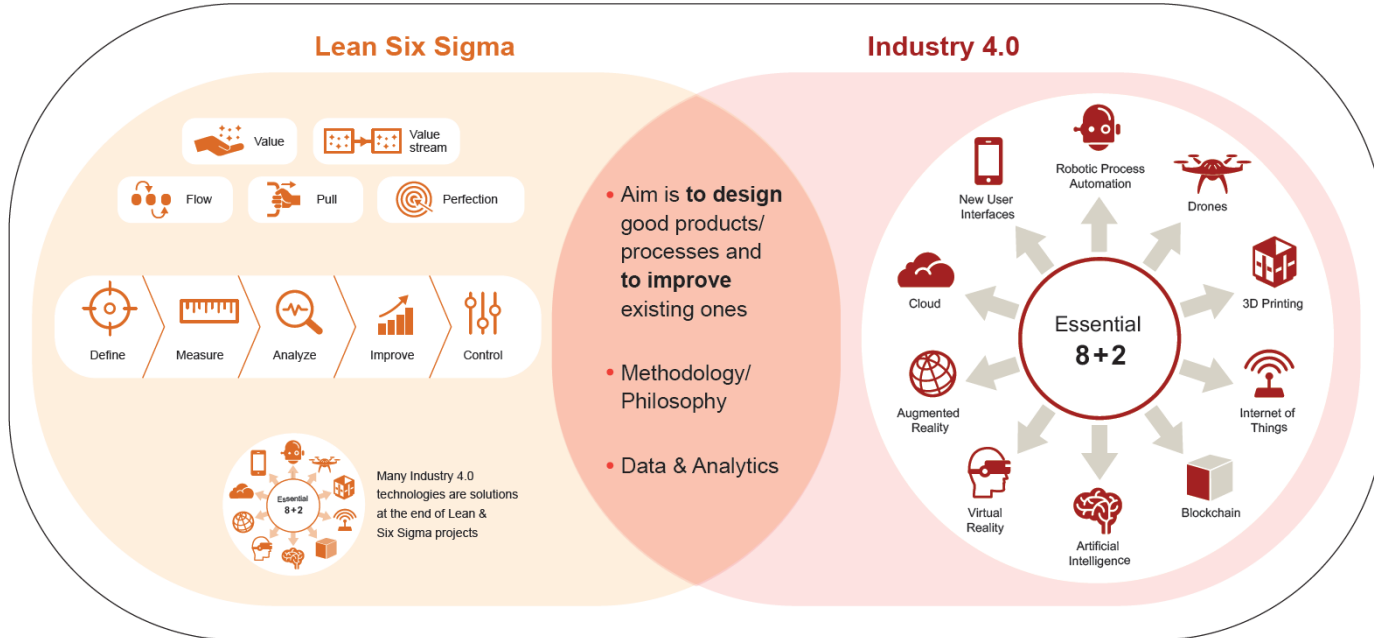
Transparency and
visualization

Dashboards

Process mining creates end-to-end transparency of processes, which supports the identification of bottlenecks, inefficiencies and anomalies.

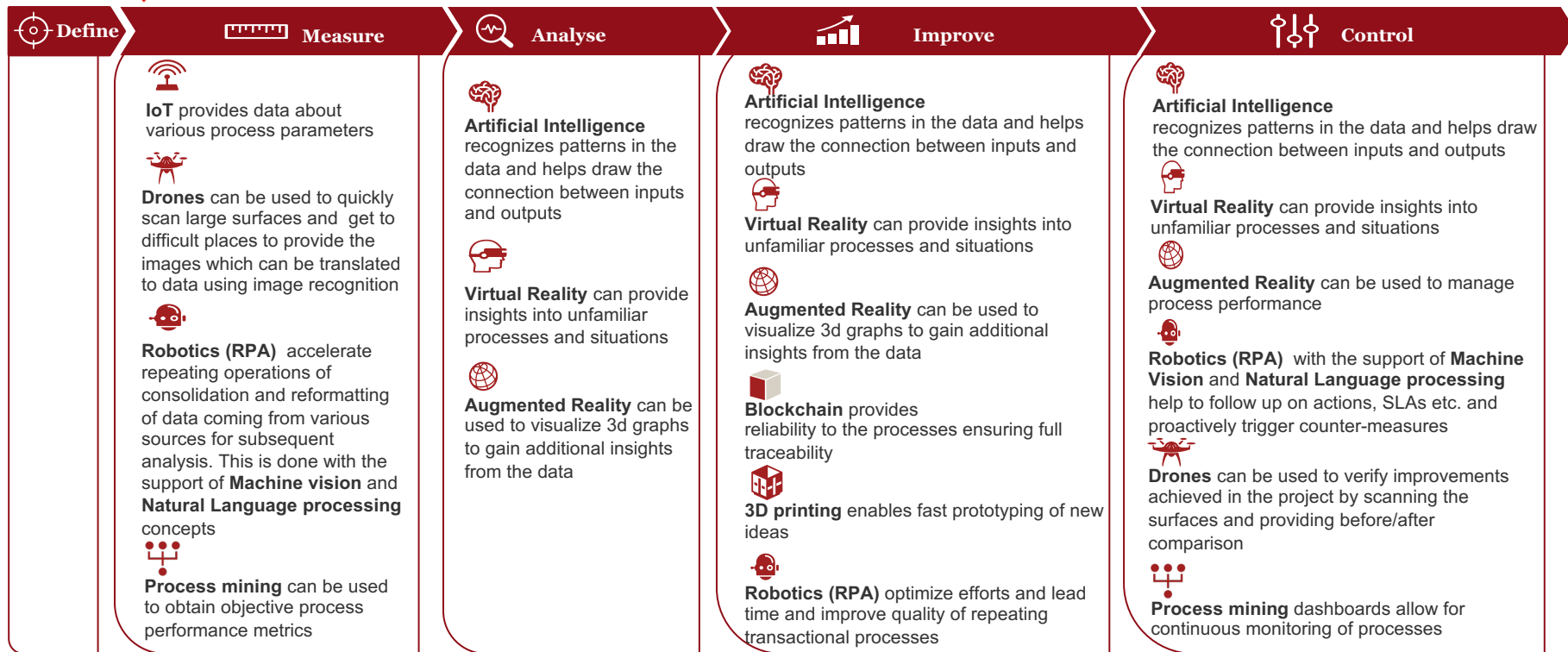
A new reality of Continuous Improvement

Continuous Improvement



Industry 4.0 and Lean Six Sigma are both integral parts of Continuous Improvement today!

How can CI projects benefit from Industry 4.0?



Cloud infrastructure serves as an enabler for most of the essential digital technologies

Talk to you in one week

- User cases of Industry 4.0 in the context of Operational Excellence
- Advice on building the implementation roadmap
- Register at <https://www.moresteam.com>

The future of continuous improvement is calling!

Are you ready?

Keep in Touch

The background of the slide is a grayscale image of a laptop. Overlaid on this are several white, stylized envelope icons of various sizes, some appearing to float or be scattered around the laptop. A thin red horizontal line is positioned below the title.

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