DIGITAL FOR SERVICE EXCELLENCE

Wednesday 13 October 2021

John Patrick Shaw
Country Head – Legato Ireland

Covid-19 changed our world and
Accelerated Digitisation is a reality

Data is the New Currency

Digitise or Disappear

Legato is owned by Anthem Health
Anthem 2020 Revenue $ 121 Billion
40 Million Policy holders

Legato Ireland ;

National Technology Park
Plassey
Limerick

John Patrick Shaw

Country Head, Ireland

John leads Legato Ireland's strategy to build digital tools to simplify healthcare. Prior to joining Legato, John held senior technology leadership roles for over 20 years, most recently as Chief Executive Officer of the Data Value Hub. A Chartered Engineer, John holds an MBA degree in Technology Management and a bachelor's degree in Electronics Engineering.

- Accelerated Digitisation
- The Opportunity of Industry 4.0
- Make Better Decisions Faster
- Healthcare context

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Context : Impact of Covid-19

Covid-19 Changed our world.

Health has become the primary concern of our time.

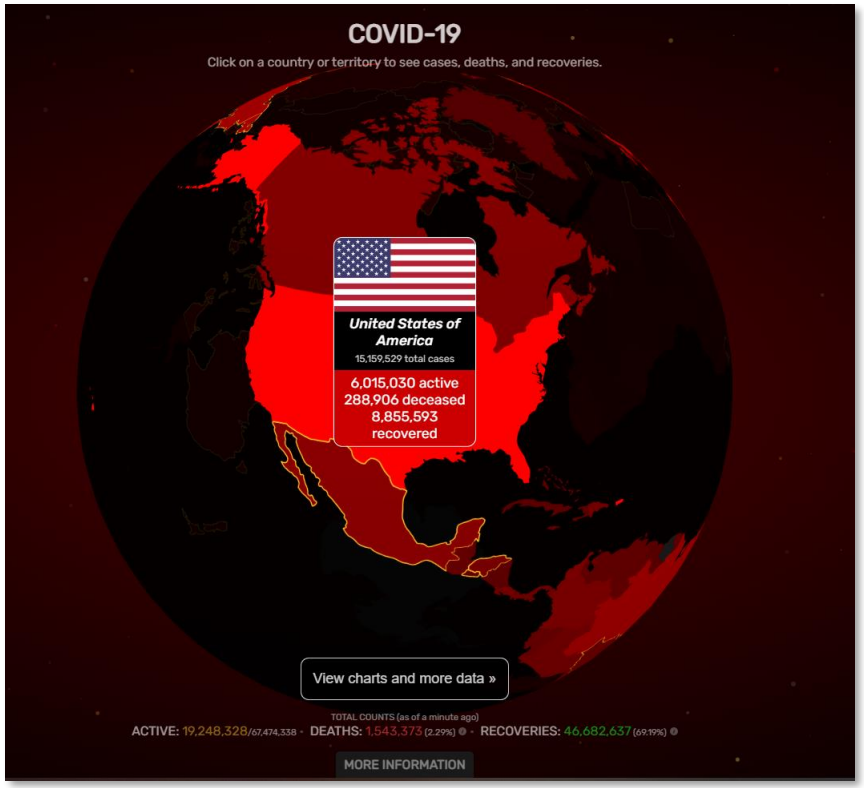
We think today is 13 October 2021. It is not.

It is 13 October 2026.

There are 3 new realities;

- **Health First**
- **Work from Home**
- **Accelerated Digitization**

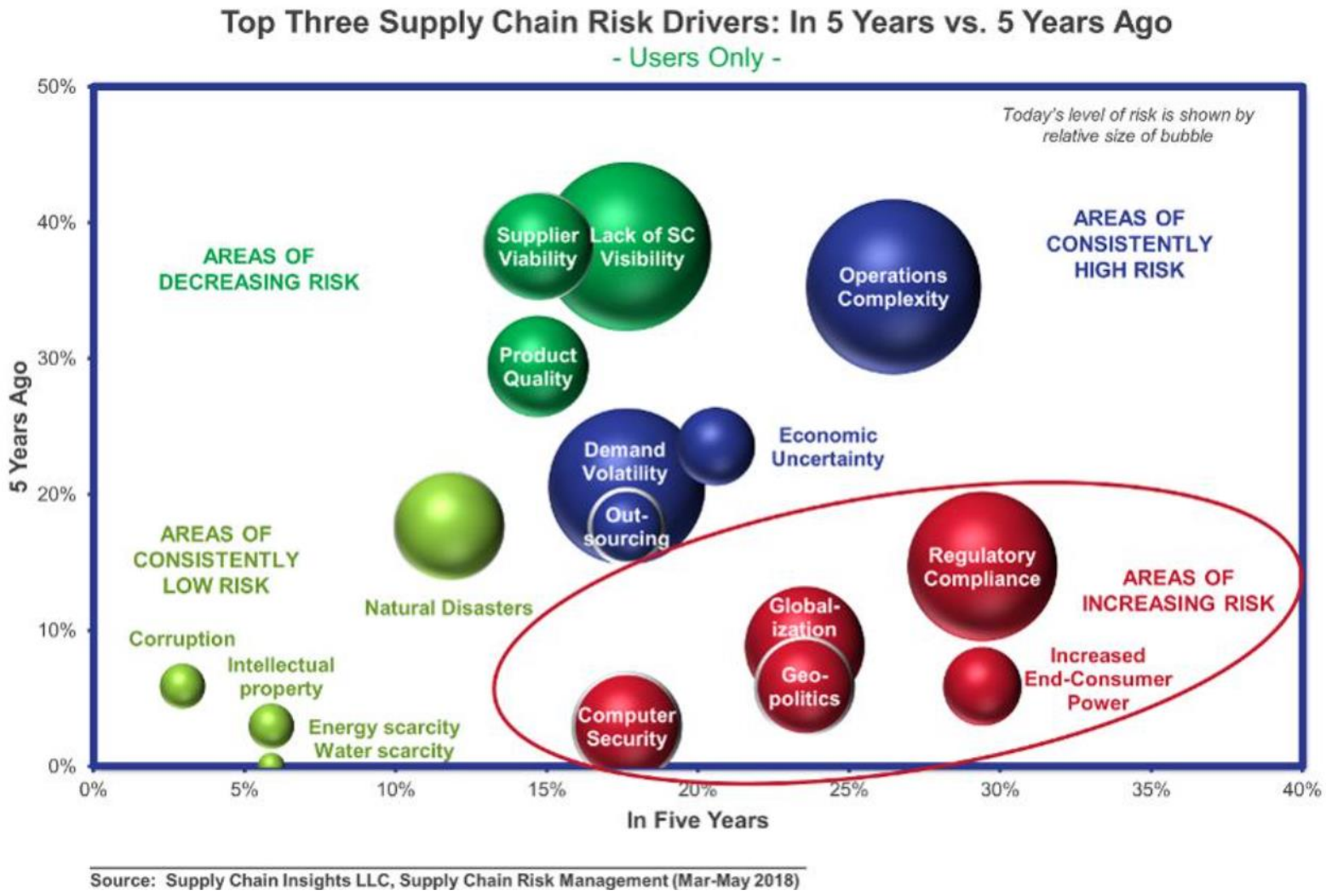
And Healthcare costs are rising.
Soon the USA will spend 25 % of GDP on Healthcare.



https://www.covidvisualizer.com/

COVID-19 exposes weaknesses in Supply Chains & Healthcare Systems

The World before COVID 19



Nassim Nicholas Taleb

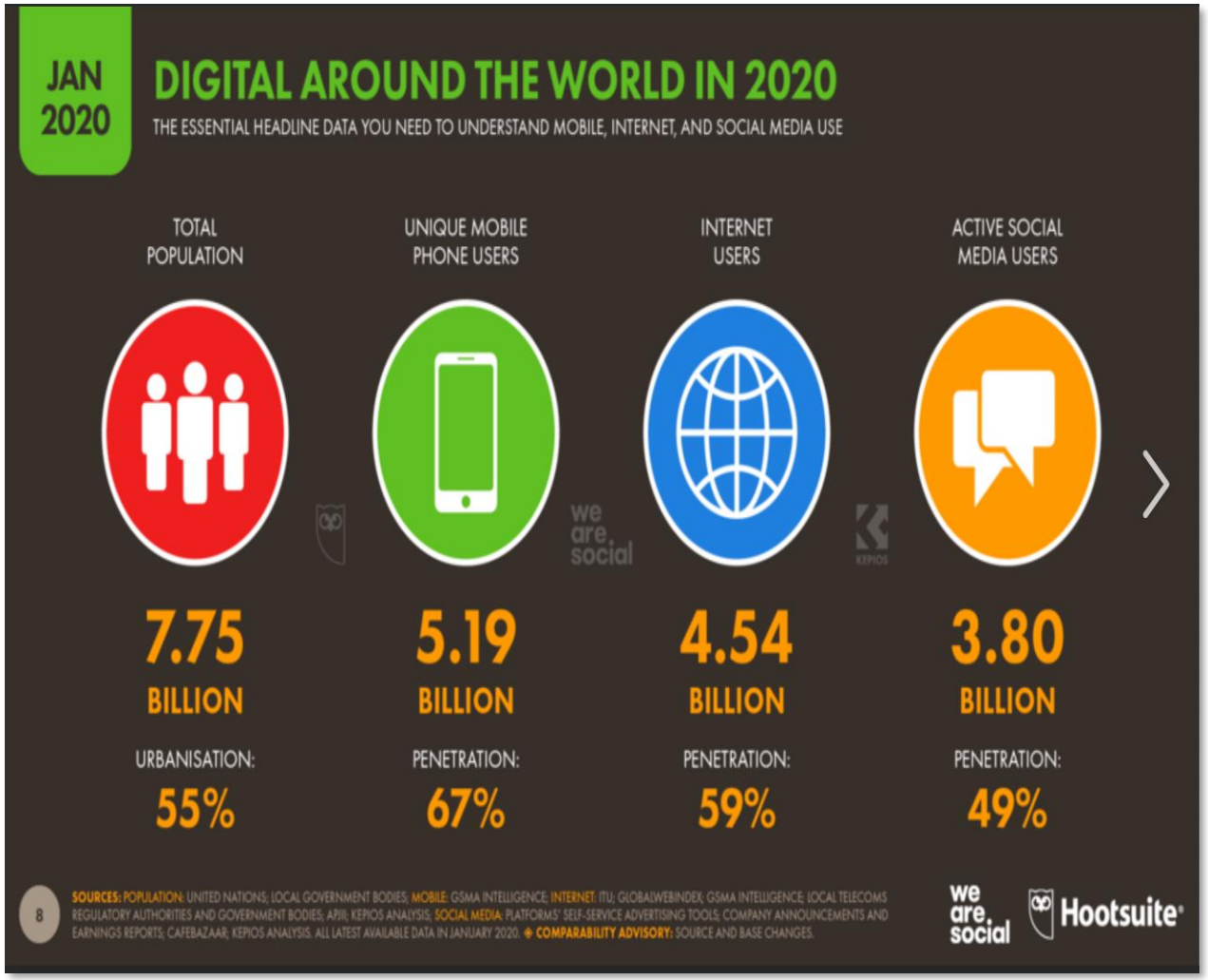
Risk Experts didn't see spot this Black Swan Event

Before COVID-19, huge change already underway

$3.7 Trillion Worldwide Annual IT Spend

5.19 Billion Smartphone Users

3.80 Billion Active Social Media Users



Digitisation was beginning to Disrupt in major ways

Before COVID-19, Shopping Malls already in trouble

YOUTUBE : New, Empty Shopping Mall, 06 Nov 2018

Many Shopping Malls in the US seeing declining visitor numbers due to **online competition**

" Within 5 years, the Shop is dead in North America " Nov 2018

Gary Vaynerchuk

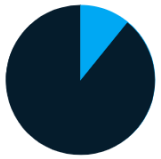
The Stone Age didn't end because they ran out of Stone Sheik Ahmed Yamani

COVID-19 has accelerated underlying trends ;

How has COVID-19 changed the outlook for telehealth?

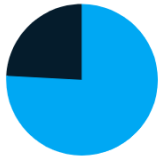
1 Consumer

Shift from:



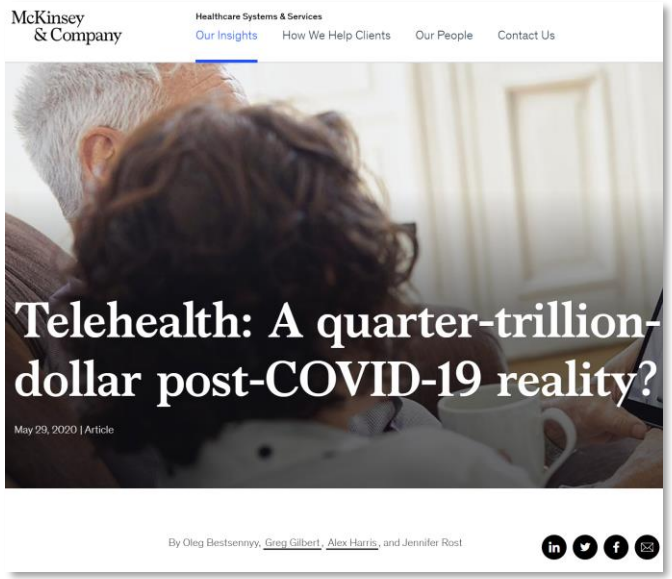
11%
use of telehealth in 2019

To:



76%
now interested in using telehealth going forward

While the surge in telehealth has been driven by the immediate goal to avoid exposure to COVID-19, with more than 70 percent of in-person visits cancelled,[1] 76 percent of survey respondents indicated they were highly or moderately likely to use telehealth going forward,[2] and 74 percent of telehealth users reported high satisfaction.[3]



McKinsey Report

The Future is already here – it's just not evenly distributed William Gibson

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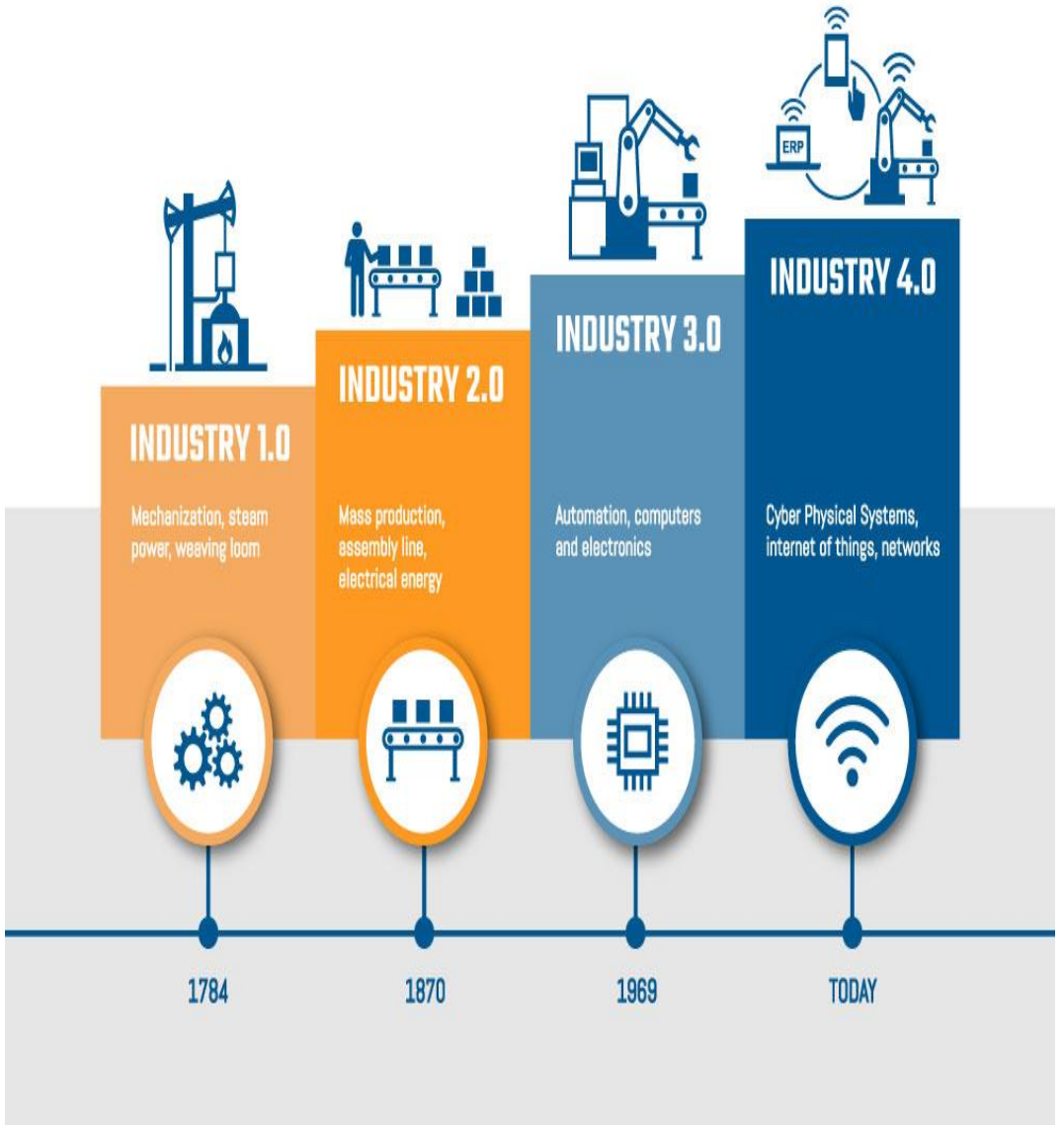
Industry 4.0 Revolution

- **Industry 4.0 is all about Digital Operational Excellence**
- **Bavaria's Car Industry** is where the Industry 4.0 Revolution began 10 years ago.
- In 2010, Bavaria faced fierce competition from across the world. Although home to Hi-Tech Brands, Bavaria has the highest wages in Europe.
- **To compete**, a new Way of thinking was introduced **Industry 4.0 : make better decisions faster**
- Real-Time Decision Making is possible by **Digitising with Lean in mind**



Impact of each Revolution

> Introduction of **new products** and **means of producing existing ones**

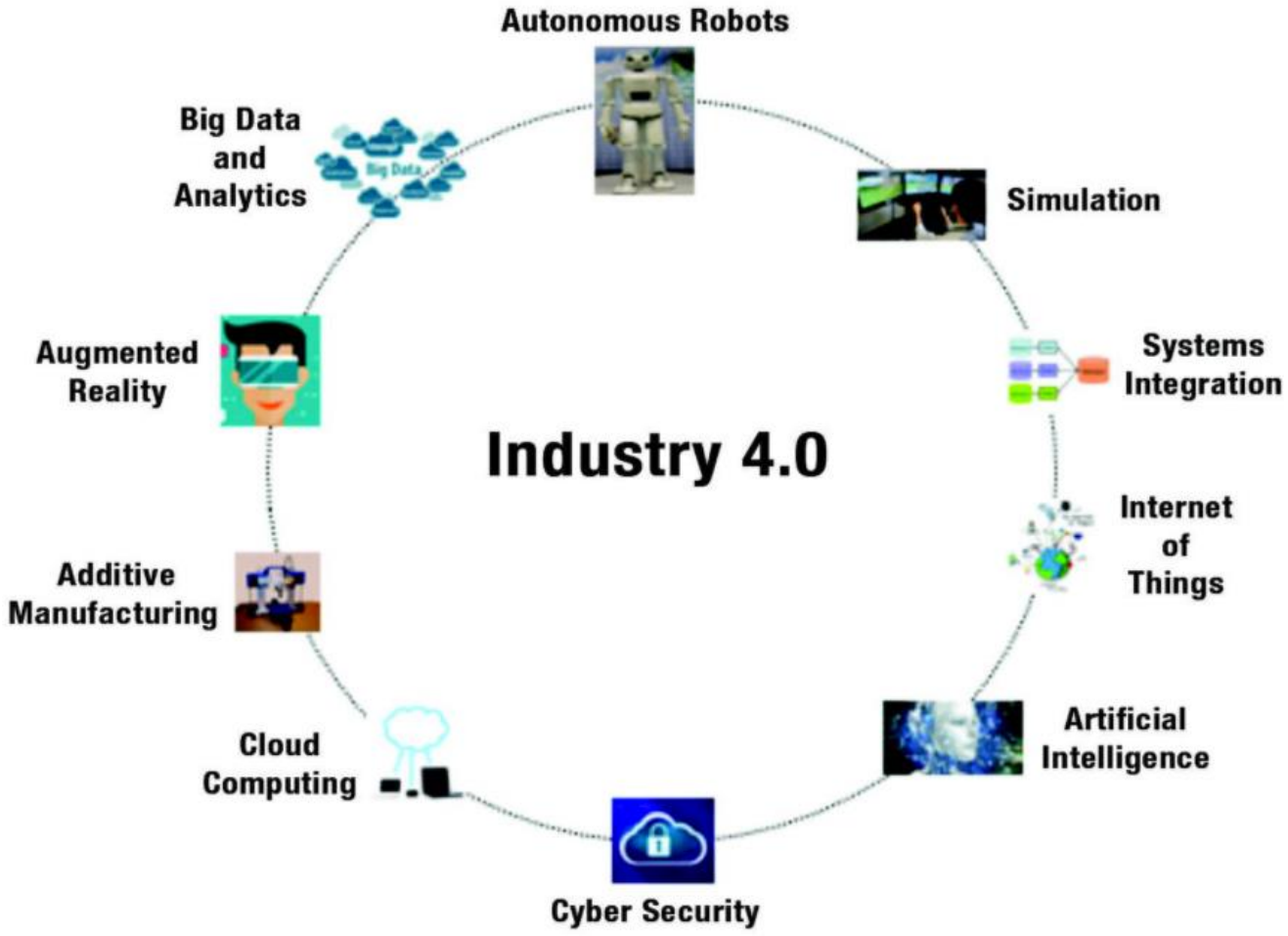
> **Disruption of the competitive status quo** (both within and between countries and enterprises)

> **New requirements** to **workforce** and **infrastructure**

All of the enabling technology already exists

Industry 4.0 Technology ?

- All of these technologies are in use for **at least 10 years**
- But now they are cheaper, more reliable and easier to implement than ever
- **Enterprises across the world** are already doing this to win customers, to reduce cost, to improve their products
- **Technology becomes cheaper by the day** ; Cloud Storage, Internet Connectivity, PCs are cheaper, better and faster than 5 years ago
- **Technology becomes more reliable by the day**; resilience, Evergreen, Warranties deliver better uptime
- But, Skills are in short supply and Cyber Security is a growing and real threat

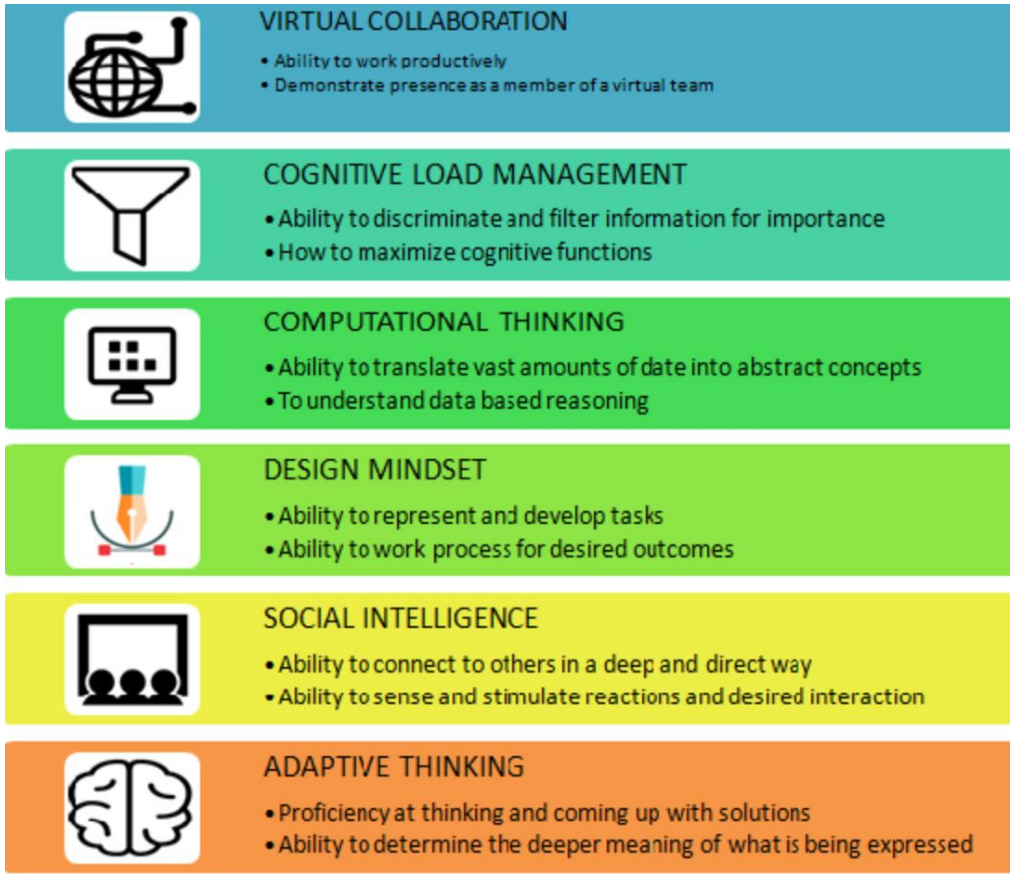


Graphic inspired by Boston Consulting Group discussion on Industry 4.0

A new Mindset is needed : Data is an Asset

Industry 4.0 Mindset

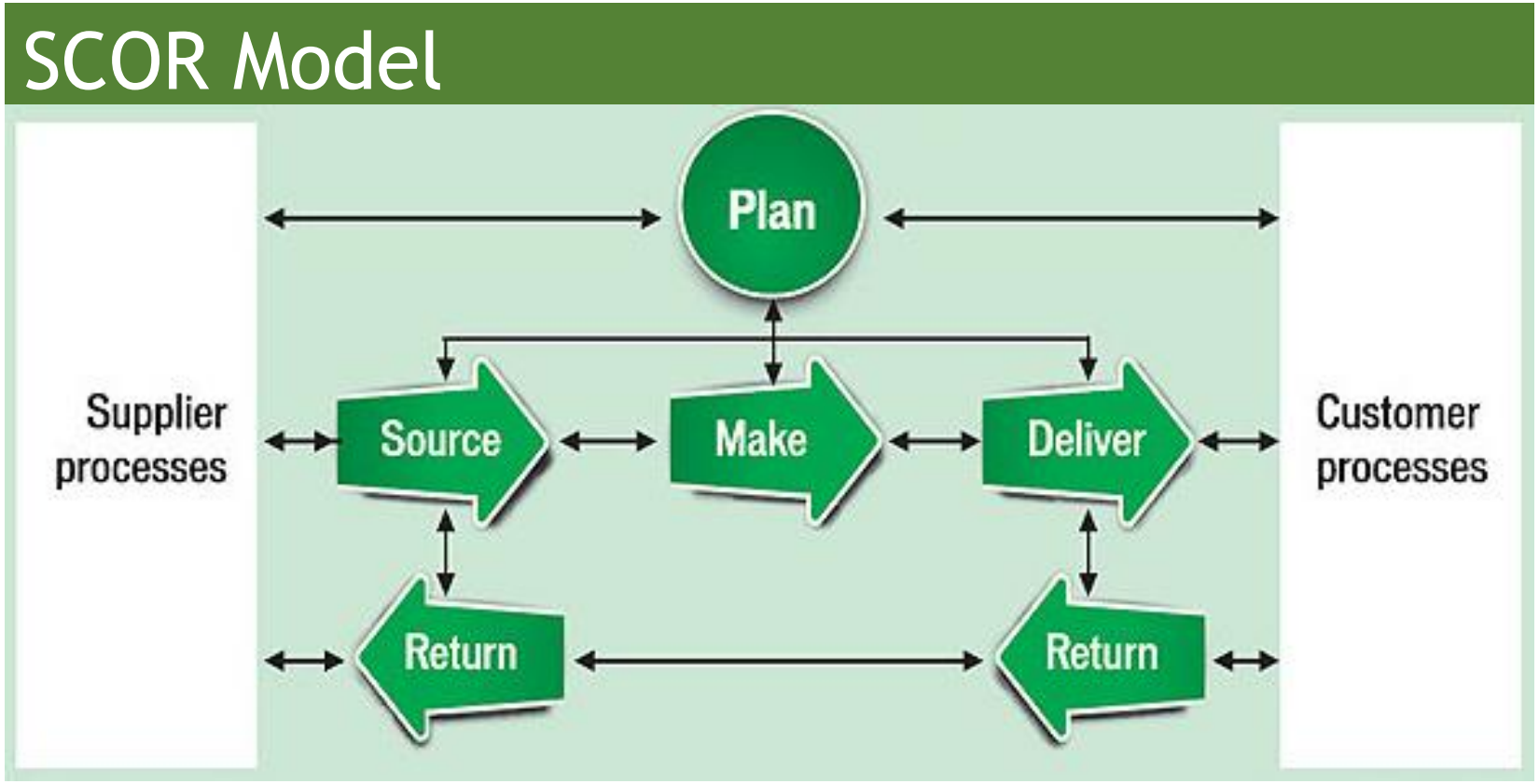
- **New Technology brings new ways of thinking**
- **Data** is the new currency
- **Data Value** is the new Objective
- To succeed, Enterprises need to pivot their Strategy towards **Value from Data;**
    - **Experiment** with ideas, pilot ideas
    - **Partnership** with Suppliers and Customers
    - **Digitise** all Data Collection, remove paper
    - **Attract**, Develop and retain Digital Talent
    - **Upskill** the team to avail of the Technology Opportunity
    - **Focus** on Cyber Security and Data Protection



This thinking can be applied to Value Stream Mapping

Industry 4.0 Value Chain perspective

- **Big opportunity** to align 3 Initiatives;
  - **Supply Chain Management**
  - **Lean Sigma**
  - **Digitisation**
- **The SCOR Model** provides a framework to Map your Enterprise's processes against a standard template
- **Aids in configuring** your ERP system, your Business Reports and KPIs
- Helps to target where **Decisions need to be Automated**



Source: Supply Chain Council of America

Align Industry 4.0 thinking with Lean Sigma thinking

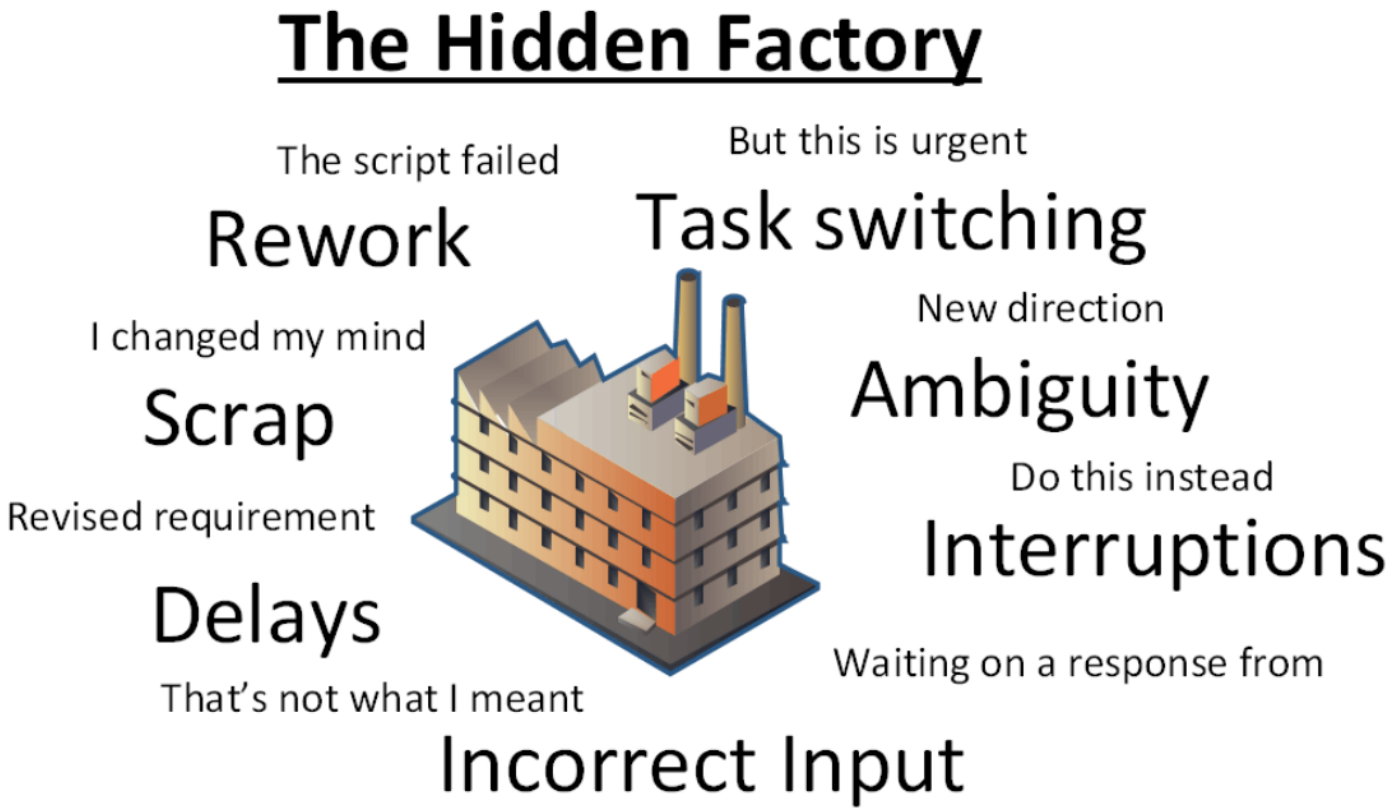
Industry 4.0 Benefits

- **Improve Customer Satisfaction** and Product Flow with RFID, Barcode Labelling, GPS Tracking of vehicles
- **Improve Product performance** with real-time monitoring
- **Reduce Process errors** with Computer Vision Quality Control
- **Reduce Equipment downtime** with IoT Proactive Maintenance
- **Improve Workplace Safety** with protective beams, training monitoring, first aid alerting
- Industry 4.0 is all about **Better Decisions, Now**

In the absence of data, the Enterprise is wasting money

Impact of not Digitising the Enterprise

- **In the absence of Data, a Hidden Factory exists in every Enterprise**
- **A Hidden Factory exists,** where wages, lighting, facilities, machines are paid for with zero return
- **A Hidden Factory** of all the costs associated with Delays, Errors, Waste, Scrap
- **With Industry 4.0**, need to move from ‘ Managing by Gut-Feel ‘ to ‘ Managing with Data’
- **You have to assume the Competitor is already doing this**



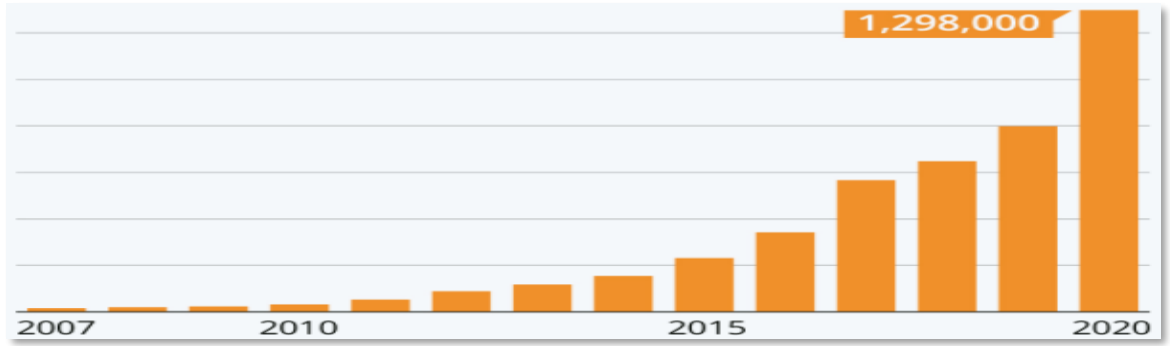
The Competitor is already eliminating Waste, Delay, Errors

Digitise or Disappear

Amazon.com are building Ireland's largest ever Warehouse in Baldonnell, for **Same Day Delivery Everywhere** ;

37 % growth in Amazon Global Revenue in 2020

62 % growth in Amazon Total Employees in 2020



In every Sector, there is a Pace-Setting Competitor

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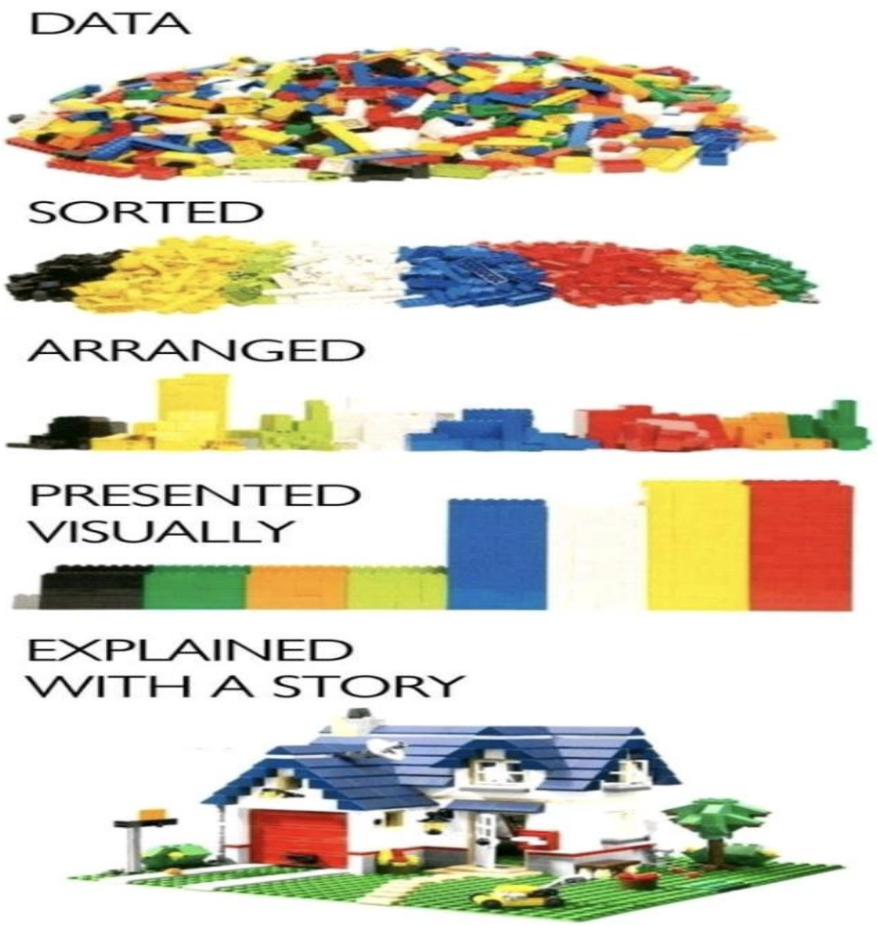
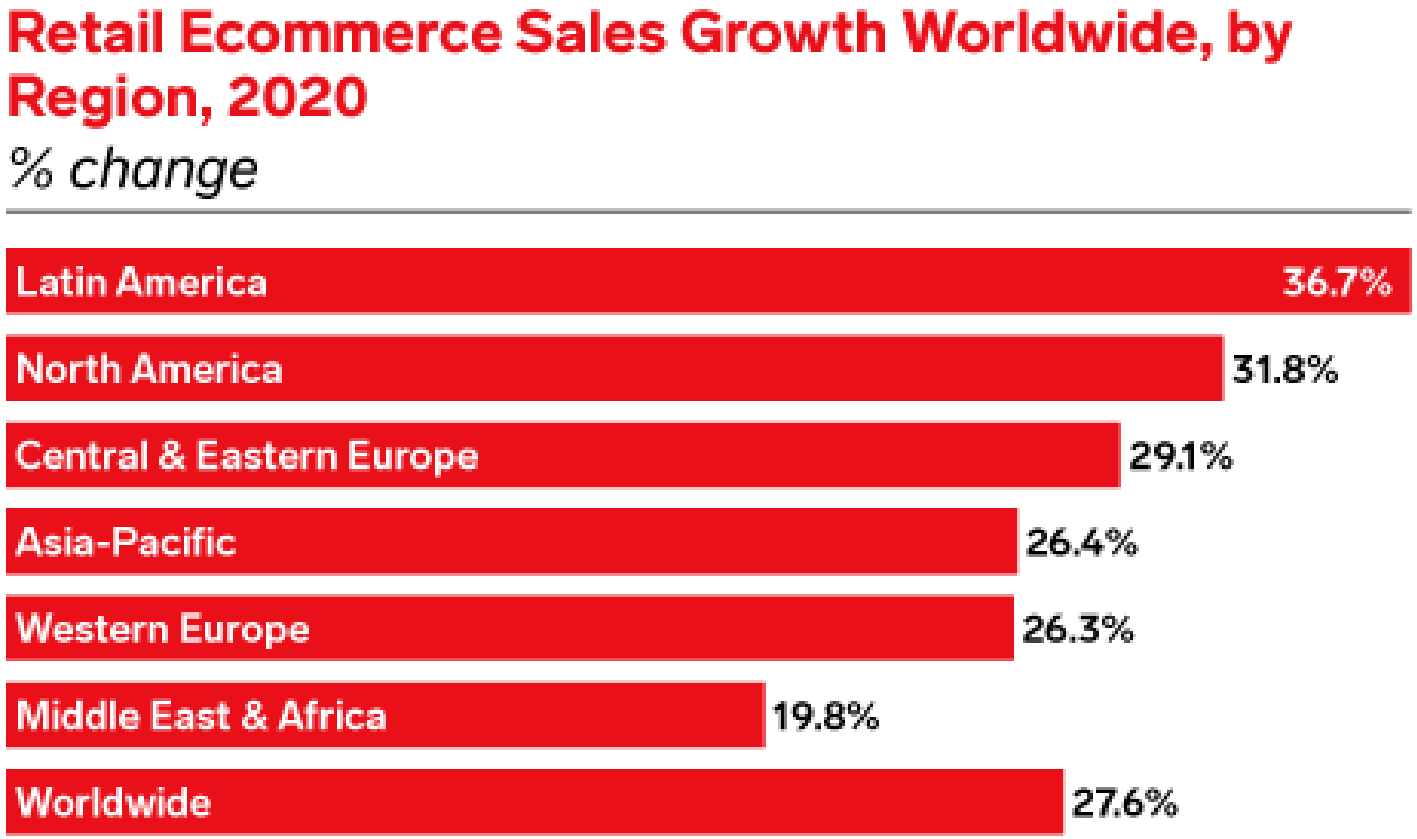
Purpose



Need a method to assess Digital Maturity

Why engage in Digital Innovation Projects ?

- **The Competition are Automating**, selling Online, using AI to optimise their business, developing Digital Products
- **In May-June 2020, 85,000** UK businesses launched eCommerce sites due to COVID-19
- **37 % growth in Amazon.com** sales in 2020 globally
- Anyone fluent in English, with a good Internet connection, **is now your competitor**



Source: InsiderIntelligence.com

To win, A new way of thinking is needed

An Approach to Digitising

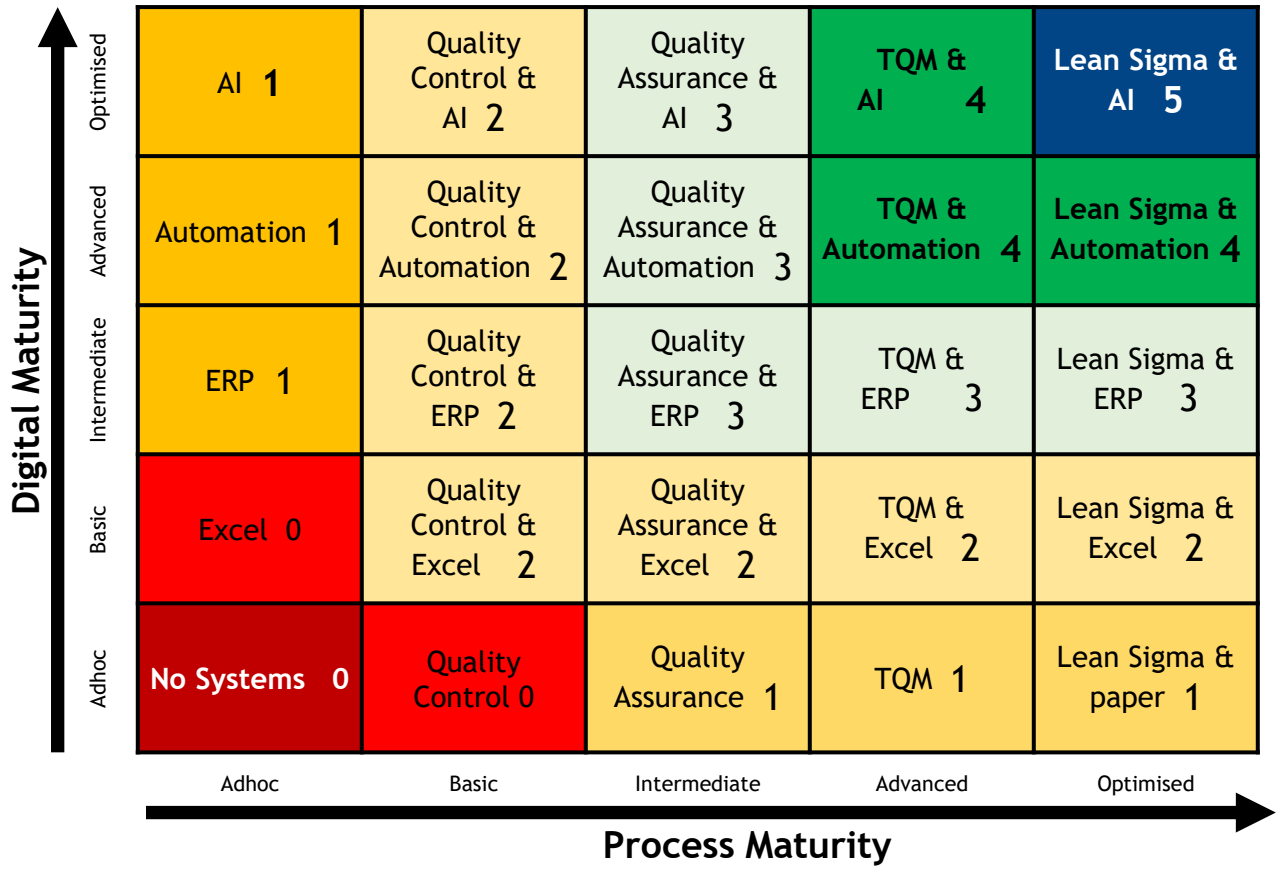
- Digitise to help your Enterprise **Compete.**
- Find Better, Faster, Simpler, Cheaper ways of working via Technology.
- Do this by focusing on Data.
- 3 strands to this approach for the Enterprise;
    1. **Digital Operational Readiness** Assessments
    2. **Incubator Projects** to build self-sufficiency in Enterprises
    3. **Technology Upskilling** including Online Courses, open days, webinars, guest lectures and workshops

Begin by Understanding the Enterprise

1. Enterprise Maturity Assessment

- **We begin by understanding** an Enterprise's Maturity, in terms of Process and Digital
- **Digital Maturity** is about AI Readiness
- We help Enterprises at level 2/3 who want to advance to level 4
- **A project for a Level 4 Enterprise** is very different to a project for Level 2 Enterprise
- **Important for every Enterprise** to have a Roadmap to get to Level 4 within 3 years
- Need to assume your competitor is on the way to Level 5 Maturity

Enterprise Maturity



Work with the Enterprise to explore potential projects

1. What Technology is right for the Enterprise ?

Data Domain for Artificial Intelligence	Value Proposition	SECTORS						
		AgriFood and Beverages	Manufacturing products	Engineering - making equipment and parts	Architecture & Construction Management	Transport and Logistics	Financial Services & Legal Services	Retail & Hospitality
ERP Optimising Systems	Enterprise Resource Planning - Forecast , Schedule, Optimise	X	X	X	X	X	X	X
Expert Systems	Inference Engines, Knowledge Base	X	X	X	X	X	X	X
Factory Floor Robots	Automate manual process effectively, reactive machines	X	X	X				
Robotic Process Automation Software	Automate manual process effectively, reactive machines	X	X	X	X	X	X	X
News Feeds	Increase customer engagement	X	X	X	X		X	X
Machine Learning Algorithms	Forecast Utilisation, Predictive Analytics, Price/Purchase Prediction, Virtual Sales Assistant	X	X	X	X	X	X	X
Computer Vision	Quality Assurance, Virtual Diagnostics, high speed Image recognition	X	X	X	X		X	X
Chatbots & Intelligent Agents	Customer Service, Customer Experience, Personal Productivity, Knowledge Management	X	X	X	X	X	X	X
Speech Recognition	Speech to Text, Text to Speech, Language translation	X	X	X	X	X	X	X
Augmented Reality	Equipment maintenance and training, Virtual Shopping	X	X	X				X
Virtual Reality	Teleconferencing, virtual Exhibition / product demonstration	X	X	X	X			X
Natural Language Processing	Language Translation, Interpreting text (unstructured data), Converting to structured data	X	X	X			X	X
Autonomous Vehicles & Drones	Safe movement, safe delivery	X	X	X		X		
Quantum Computing	Solve intractable Business Optimisation problems rapidly, improve data encryption	X	X	X	X	X	X	X

Begin by Assessing an Enterprise's Industry 4.0 Readiness

2. Assessing Incubator Projects

It begins with a conversation ;

- Do you have a Concept for **a new Product** ?
- Do you have a Concept **to make your Business run Better**, Faster, Simpler, Cheaper ?
- Do you have a Concept for **a new way to serve your Customer** ?

- Focus on Benefits;

BENEFIT	COMMITMENT	DATA
An Opportunity to understand your Customer better ?	Can you provide a person to work with us on the project ?	Do you have Historical Data ?
New Product/Service Opportunity ?	Do you have the technical resources in-house to support this project ?	Is the Historical Data Labelled ?
Process Improvement Opportunity ?		Is there a means to capture Real-time Data ?
		Is the Data Management Process compliant with GDPR ?

- Once approved, we agree Project Scope, Deliverables and Milestones
- The first project is free ; this is all about ‘ **Learn by Doing** ‘

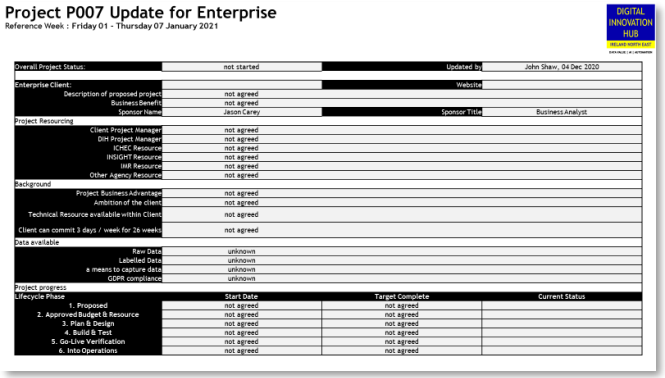
The Incubator Project advances the Enterprise’s Digital Capability

2. How to run a project

PLAN

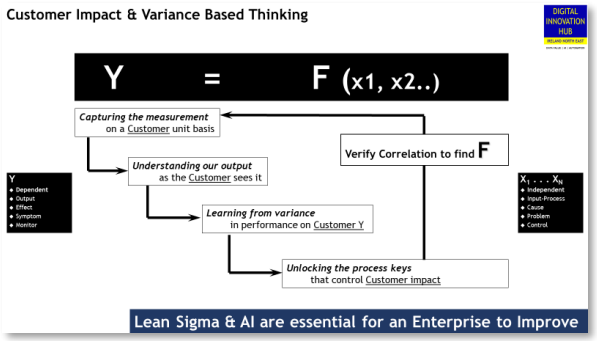
We work with you to Create a **Project Plan** with Clear Deliverables & Milestones

We track progress with you in a bi-weekly **Project Review Meeting**

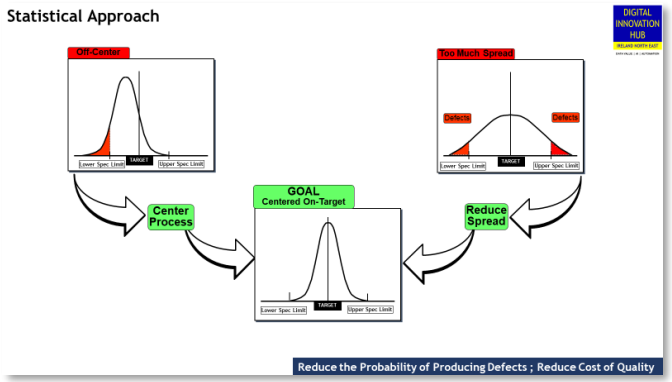


ANALYSE

We identify a **Pattern in the data**, leading to a better understanding of Process Controls ;



We review the Patterns to generate **Options for better performance** ;



IMPROVE

Depending on the type of project, we make recommendations on what **Technology to deploy** to achieve you Concept ;

- Prediction Algorithm
- Analytics Service
- Expert System
- Robotic Process Automation
- Computer Vision
- Factory Floor Robots
- Real-Time Measurements

3. Approach to Technology Upskilling

Aim to provide Enterprises with the Technology Skills to become self-sufficient

Schedule courses based on demand, sometimes with a small fee and always with a feedback form

Don't want to reinvent the wheel ; work alongside ICT Skillnet, Colleges and Institutes who already offer courses

There are 3 areas for Upskilling ;

ANALYTICS

1. Artificial Intelligence Strategy
2. Artificial Intelligence fundamentals
3. Edge Computing

PROCESS

1. Industry 4.0 Strategy
2. Robotic Process Automation with MS PowerApps
3. Chatbots with MS PowerApps

PRODUCTIVITY

1. MS Office 365 for personal productivity
2. Using MS Teams for Collaboration ; Channels, Files and Calls
3. Data Analysis with MS Power BI

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Digital Health & Wellness Capability Maturity

- Hosted by the **Innovation Value Institute**
- In Discussion with 10 Organisations to build the **Digital Health and Wellness Capability Maturity Framework**
- Representation from **Medtech, Pharma, Digital Sectors, Global and Local,** in addition to Academia
- Assessing an Enterprise Ireland **Innovation Partnership Programme** to develop Version 1.0 of the Digital Health and Wellness Capability Maturity Framework
- In Discussion with **22 other organisations**, to form a community of like-minded Innovators

IVI INNOVATION™ VALUE INSTITUTE

Maynooth University
National University of Ireland Maynooth

Innovation Partnership Model to accelerate progress

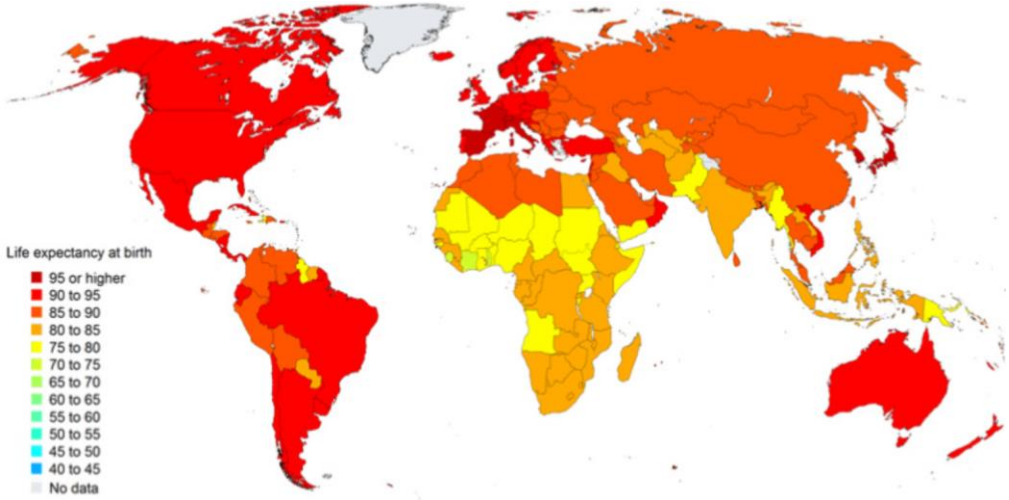
2050 World Health Projections

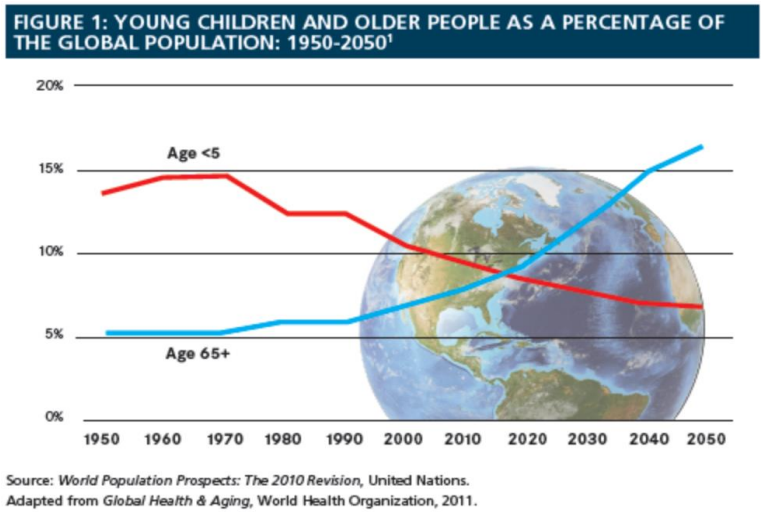
Life expectancy will continue to rise, reaching 90+ years in several countries.

15 % of the population will be > 65 years, only 7 % < 5 years.

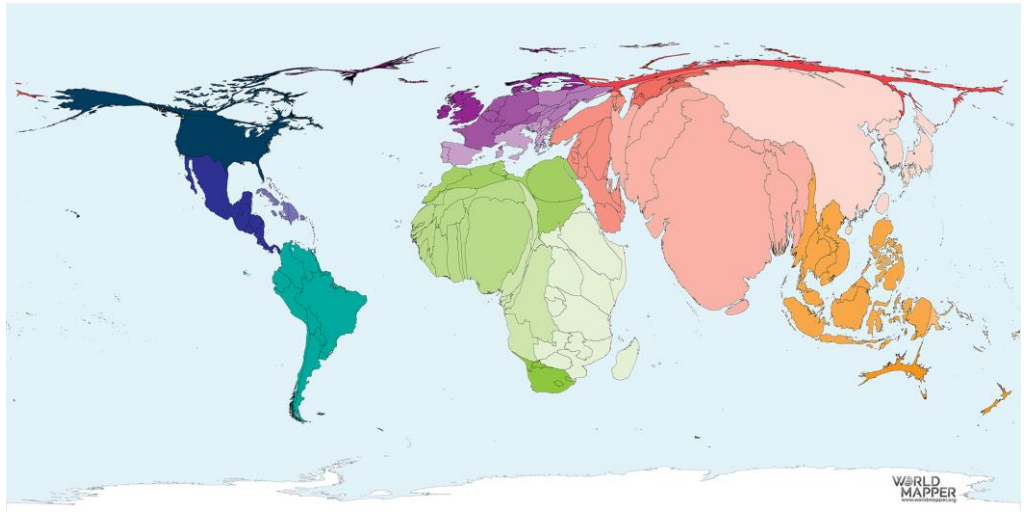
India will have > 1.5 Billion citizens, 60 % of the world's population will be in Africa, South & East Asia.

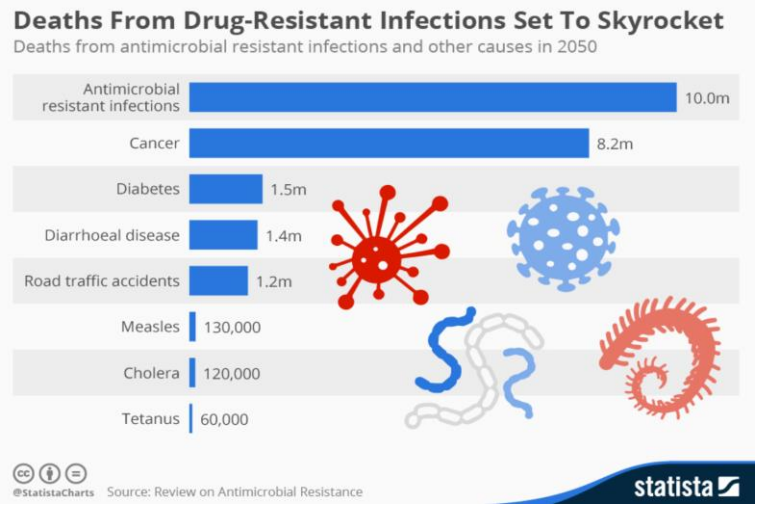
Drug Resistant infections will be the leading cause of early death





Source: *World Population Prospects: The 2010 Revision*, United Nations.
Adapted from *Global Health & Aging*, World Health Organization, 2011.





By 2050, DNA Analysis and real-time health monitoring will help prevent illness

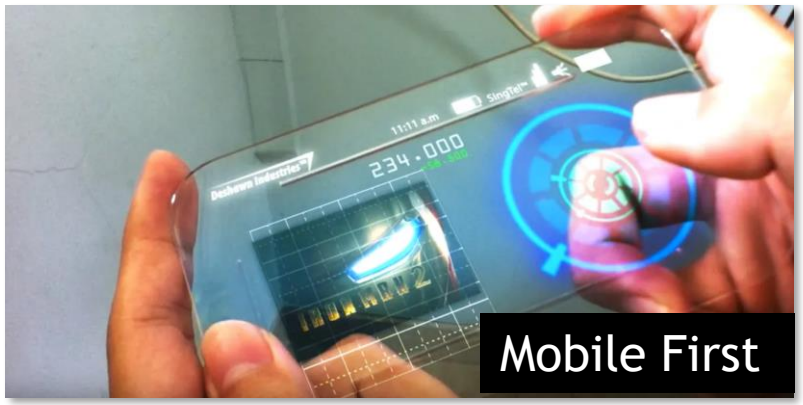
2050 Digital Health & Wellness

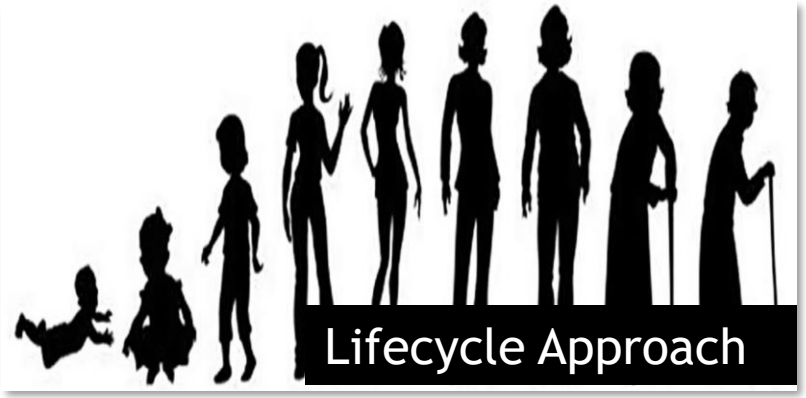
In 2050, a person's health is monitored in real-time and managed over their full lifespan, a **Digital Life**

In 2050, Patterns in Disease, DNA, Diet, Exercise and Behaviour are correlated to maximise **Personal Wellness**

In 2050, Patterns in Society are identified and lead to a better approach to **Societal Wellness**

Real Time Monitoring + Pattern recognition will inform Government Policy





We will each have our unique Digital Health Record

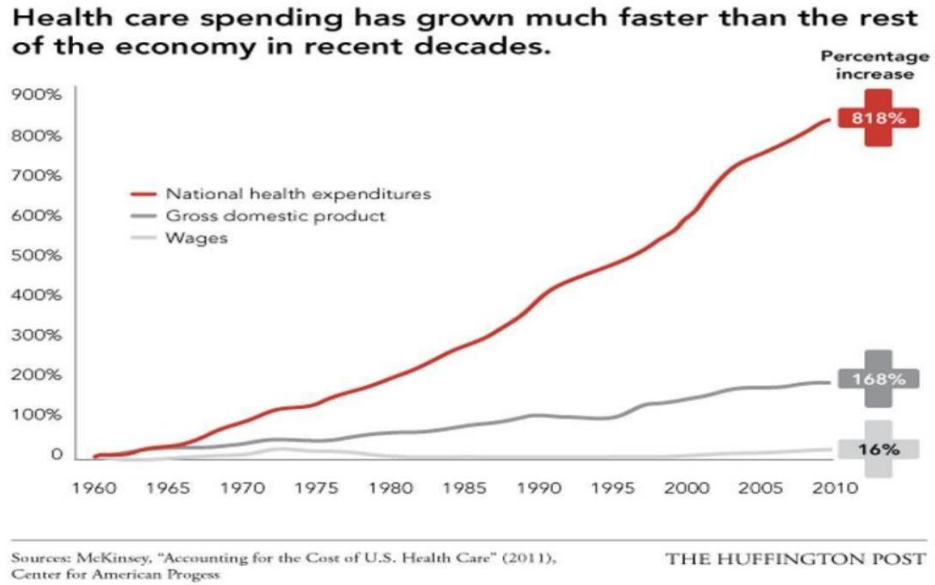
2021 Health & Wellness Reality

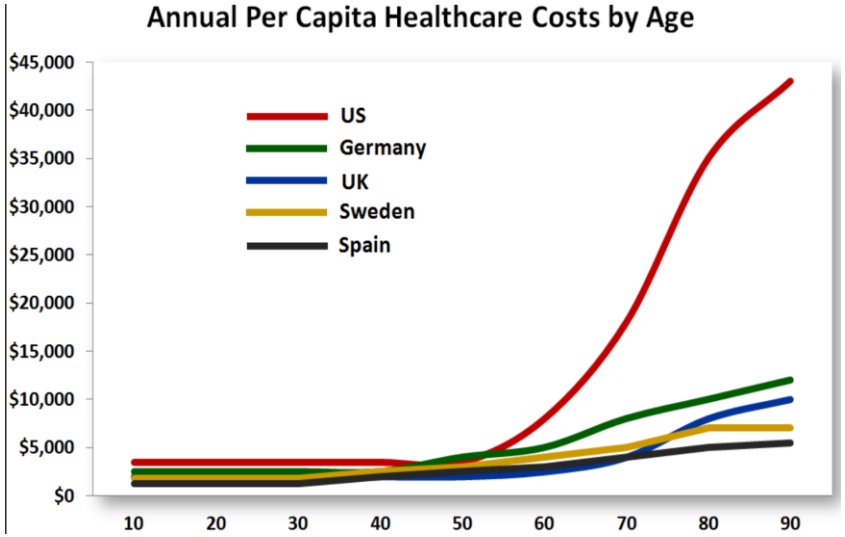
The cost of healthcare is rising, everywhere.

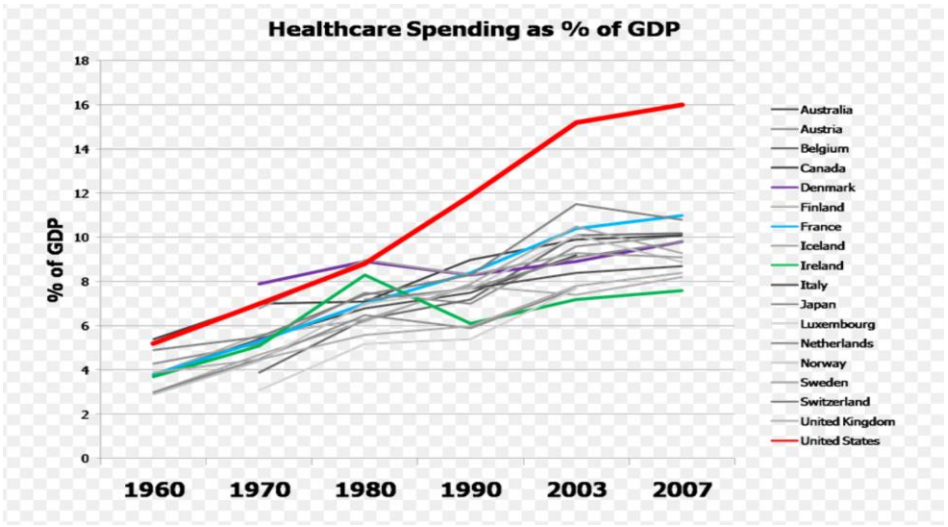
1960-2010 saw a 818% increase in USA healthcare spending v 16% in wages.

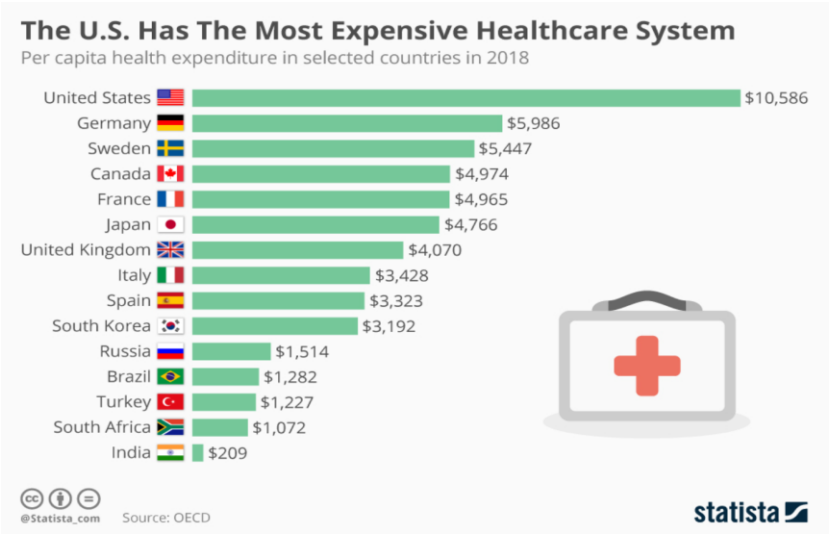
An increasing % of GDP is devoted to Healthcare and this will rise.

An aging population will drive the cost higher.









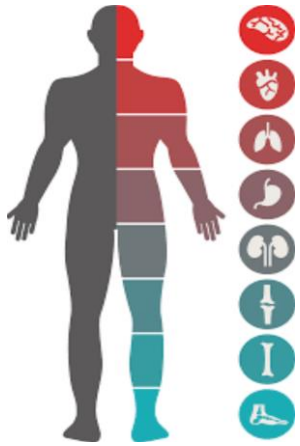
Simpler, Better Approaches to Healthcare are needed

2021 ; A pre-Digital approach

Conventional Approaches to medicine can often treat the **Symptom, not the cause.**

Conventional Approaches can often treat **a problem in isolation, not as part of a larger systemic issue**

Conventional Approaches can often **lack data when diagnosing an issue**



Symptom v Cause

Problem v System

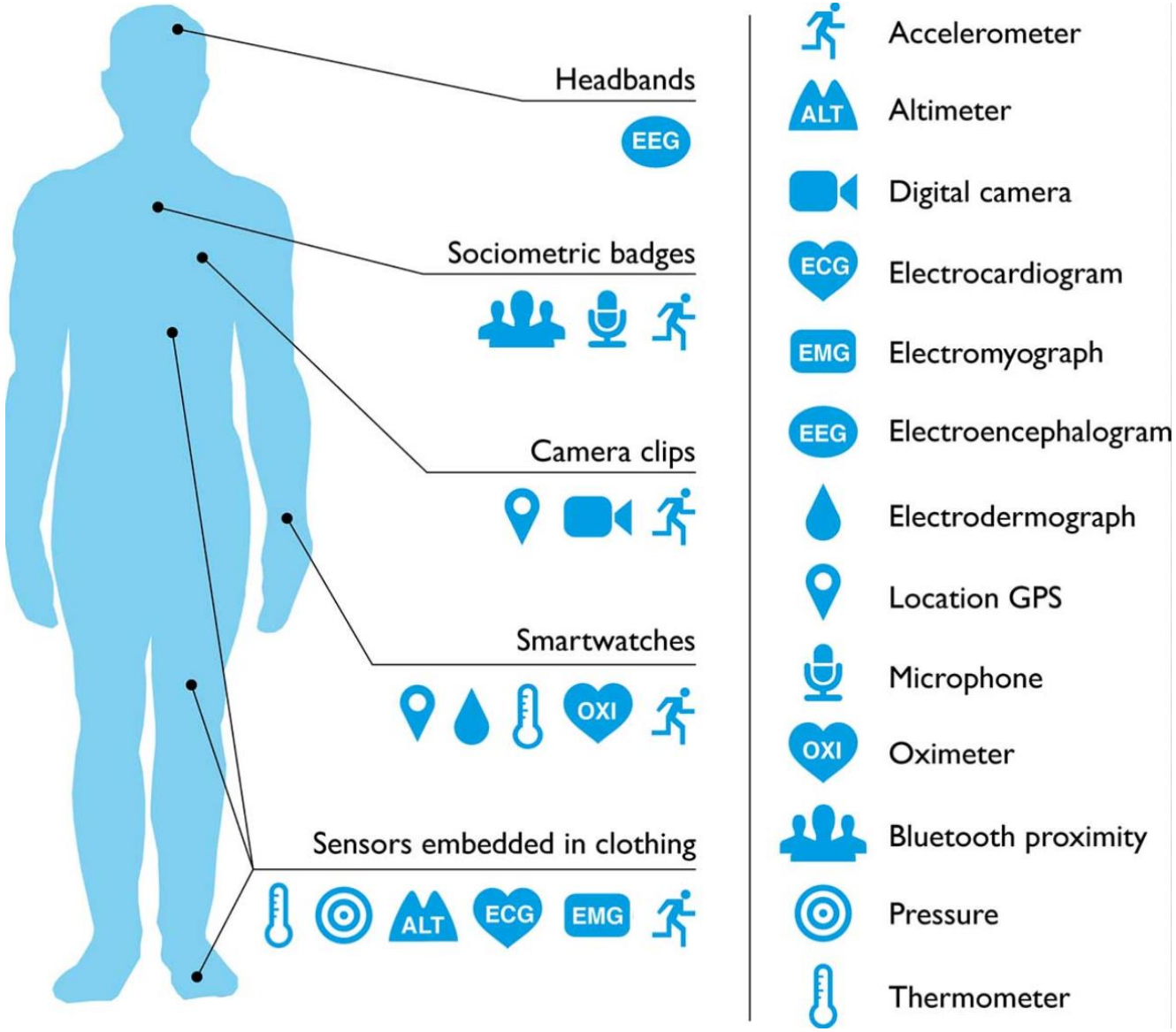
Data v Diagnosis

Digital Wellness must encompass the Whole Person

2021; The Potential of Wearables

Smartwatches, wearable cameras, sensors in clothing all provide data sources that can identify risks

Real-time monitoring and alerting of acute medical issues are now possible



Wearables + AI represents a big opportunity to improve Digital Wellness

Begin with the Patient's Quality of Life

A Patient-centric approach aligned Health Outcomes with Health Informatics.

Always-On Monitoring, Large population pattern recognition, preventative interventions and targeted care will improve Quality of Life.

Emerging Technology and emerging Patient awareness drive the need for a New Approach.

Source: 2025 Strategic Plan | UK HealthCare (uky.edu

Emerging Technology + Emerging Patient awareness drive Need for New Approach

Health & Wellness Ecosystem

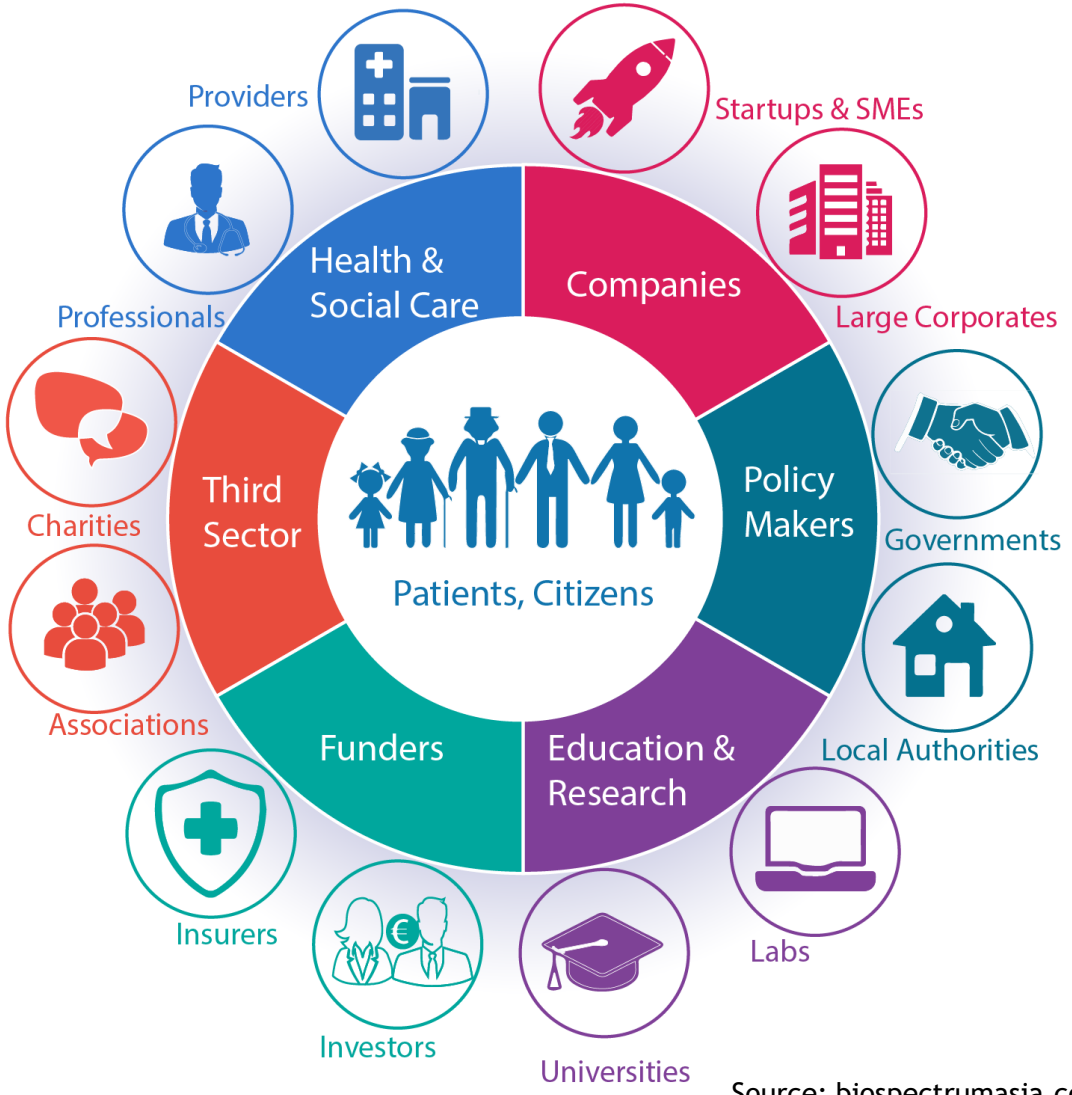
Data is currently disjointed across the Wellness Ecosystem, **preventing effective analysis and decision-making**

The Citizen cannot see their **Digital Health Lifecycle data** in one place : childhood vaccination records, Genome, Familial health risks

Society cannot target Root Causes to eliminate **underlying health issues**

Costs are rising, Health Risk are rising faster

A new **Framework** is needed, to encourage collaboration between Commercial organisations, Academia and Public Services, a **Virtuous Helix**



Source: biospectrumasia.com

A Virtuous Helix representing all Stakeholders

The Need

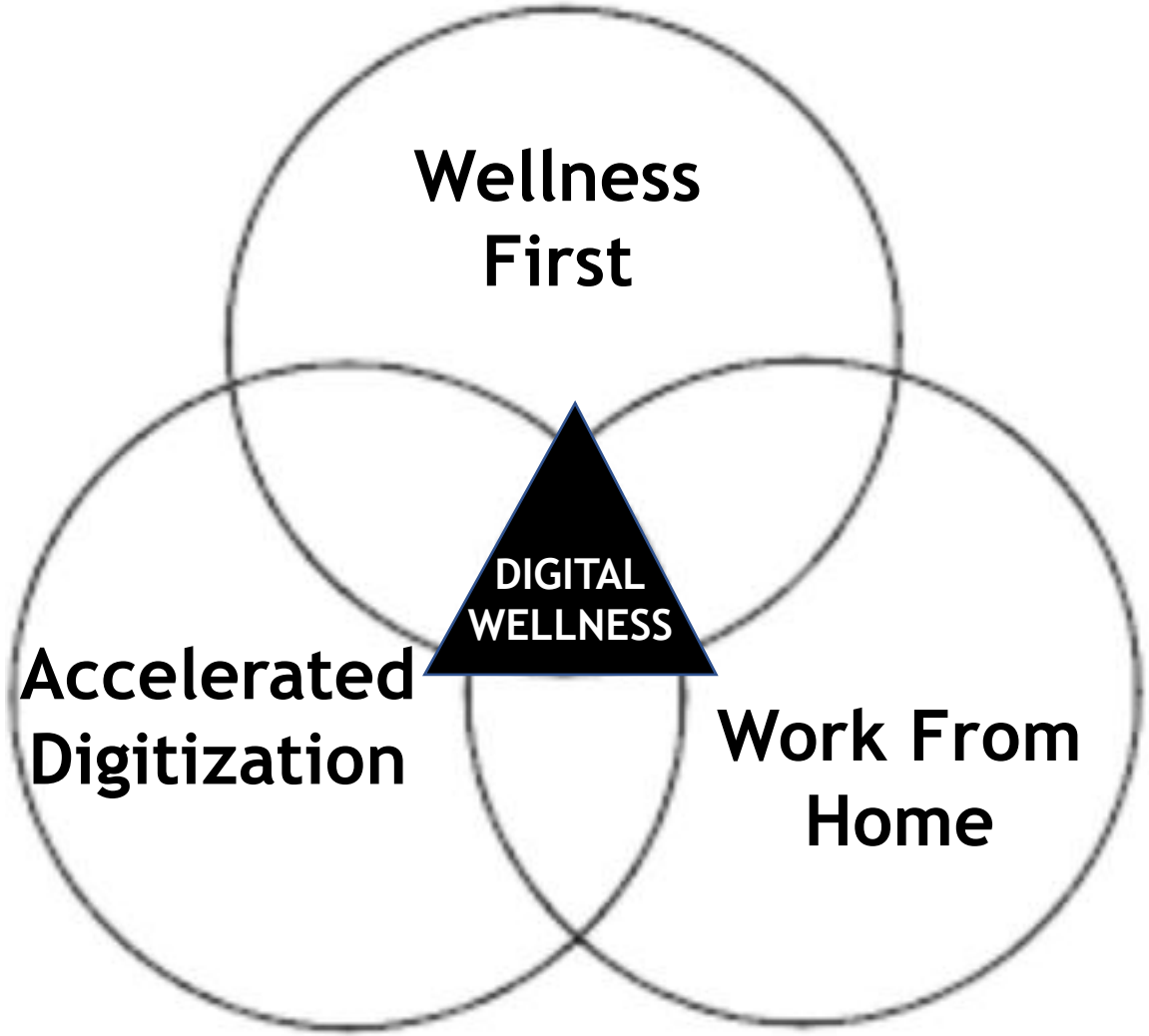
Health Costs are rising, **Disease Risks** are rising faster

There is no Unifying Framework to align and optimise investment in Digital Wellness

The Citizen cannot easily understand their **Wellness Lifecycle**

Society cannot easily understand and address **Broad, Underlying, Long-Term Health Trends**

Commercial Organisations, Academic and Public Services need a mechanism to collaborate on **Open Standards and Share Learning**



Digital Wellness Innovation Institute is Industry Led to optimise Investment

Digital Life Institute

Dr Sean Ennis has a vision for the Virtual Human, a Digital Twin, taking data in real-time, assessing DNA data and combining this with large datasets to optimise lifelong health

UCD School of Medicine
Scoil an Leighis UCD

This borrows concepts from the Aircraft Industry

Analogy ?

DIGITAL TWINNING IN AIRCRAFT PRODUCTION

DESIGN

Specific design of the aircraft based on direct client customisation

▽

BENEFIT

Better customer experience, "right first time" design and faster time to market

MANUFACTURING

Manufacturing and assembly of the aircraft based on digital twin plans

▽

BENEFIT

Improved planning, flexible supply chain, leaner production, seamless testing and certification

IN SERVICE

Aircraft is monitored in service in real time through sensors and data interpretation

▽

BENEFIT

Predictive maintenance, optimised asset utilisation, smart product upgrade and other value-based services

Oliver Wyman 2016

10 Safest Airlines

Airline	Country	IOSA	EU Allowed	Fatality Free	FAA Endorsed	ICAO Country Audit	Safety Rating
Air New Zealand	New Zealand	✓ ✓ ✓	✓	✓	✓	✓	★★★★★★★
Qantas	Australia	✓ ✓ ✓	✓	✓	✓	✓	★★★★★★★
Singapore Airlines	Singapore	✓ ✓ ✓	✓	✓	✓	✓	★★★★★★★
Emirates	United Arab Emirates	✓ ✓ ✓	✓	✓	✓	✓	★★★★★★★
Royal Jordanian	Jordan	✓ ✓ ✓	✓	✓	✓	✓	★★★★★★★
Cathay Pacific	Hong Kong	✓ ✓ ✓	✓	✓	✓	✓	★★★★★★★
Virgin Atlantic	United Kingdom	✓ ✓ ✓	✓	✓	✓	✓	★★★★★★★
Etihad Airways	United Arab Emirates	✓ ✓ ✓	✓	✓	✓	✓	★★★★★★★
Swiss International Air Lines	Switzerland	✓ ✓ ✓	✓	✓	✓	✓	★★★★★★★
Japan Airlines	Japan	✓ ✓ ✓	✓	✓	✓	✓	★★★★★★★

10 Worst Airlines

Airline	Country	IOSA	EU Allowed	Fatality Free	FAA Endorsed	ICAO Country Audit	Safety Rating
Conviasa	Venezuela	✗ ✗ ✗	✓	✗	✓	✓	★★☆☆☆☆☆
Pakistan International Airlines	Pakistan	✗ ✗ ✗	✗	✗	✓	✗	★☆☆☆☆☆☆
Air Algerie	Algeria	✓ ✓ ✓	✓	✗	✓	✗	★☆☆☆☆☆☆
Pegasus	Turkey	✓ ✓ ✓	✓	✗	✓	✓	★☆☆☆☆☆☆
Scat	Kazakhstan	✓ ✓ ✓	✓	✗	✓	✗	★☆☆☆☆☆☆
Aerocaribbean	Cuba	✗ ✗ ✗	✓	✗	✓	✓	★☆☆☆☆☆☆
Airblue	Pakistan	✗ ✗ ✗	✓	✗	✓	✓	★☆☆☆☆☆☆
Blue Wing	Suriname	✗ ✗ ✗	✗	✗	✓	✓	★☆☆☆☆☆☆
Iran Aseman Airlines	Iran	✓ ✓ ✓	✗	✗	✓	✓	★☆☆☆☆☆☆
Nepal Airlines	Nepal	✗ ✗ ✗	✗	✗	✓	✗	★☆☆☆☆☆☆

https://www.airlineratings.com/safety-rating-tool/

Human Health-care can learn from Airline Machine-care

Innovation Vectors for a Digital Life

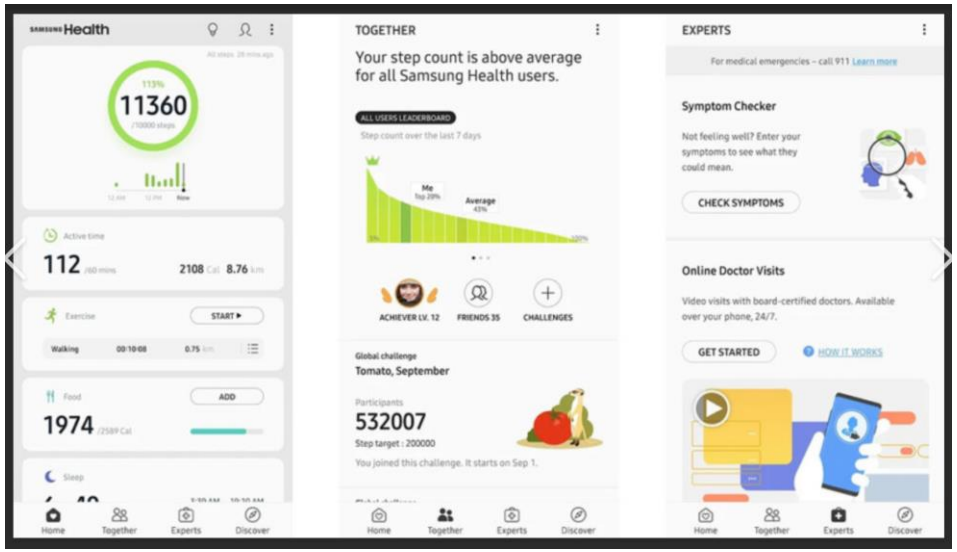
Many Commercial Organisations are interested in Supporting **Digital Health & Wellness**

There is an opportunity to create **Certified Medical Wearables**, prescribed by GPs

It is essential to Build **Machine Learning and Artificial Intelligence into all Products**, enabling Peer-Reviewed Studies on Large Populations

Bio-mimicry is also a big opportunity to achieve **x1000 increase in sensitivity to achieve**

Researching **the Digital Human** is about aligning AI + Wearables + IOT to produce a better Digital Life for all



A Compute Continuum Vision for Digital Health

Why ?

-------- Citizens' Health Charter --------

Every Citizen is Healthy until 100 years

Every Citizen is proactively cared for to prevent illness

Infectious Diseases are very rare

Heart Disease, Arthritis, Diabetes Type 2, Alzheimers and Cancer are very rare

Invasive Surgery and Organ Transplants are very rare

Physical and Mental Injuries are very rare

How ?

Real-time Diagnostics v Lifetime Wellness	Monitor Leading Indicators for healthy Cardiovascular system	Monitor Leading Indicators for Digestive system	Monitor Leading Indicators for Cognitive system	Monitor Leading Indicators for Muscular-Skeletal system	Detect Infection by Pathogen in Individual	Detect, Track and Trace Epidemics	Accelerated Vaccine Discovery & Deployment	Decision Support for 100 year Healthy lifespan
Wearable Sensors	X	X	X	X	X			X
Quantum Computing						X	X	X
Personal Genomic Data Store	X	X	X	X	X	X	X	X
Machine Learning					X	X		
Artificial Intelligence					X	X		
Embedded Sensors	X	X	X	X				X
Digital Twin								X

A Framework is needed to Optimise Investment Decision-Making

Capability Maturity Framework

	Maturity Levels	Digital Health & Wellness Improvement Strategies			
		Digital Budget	Digital Capability	Digital Value	Digital Business Model
5.	Optimizing	Sustainable Economic Model	World Class	Optimized Value	Value Centre
4.	Advanced	Funding Amplification	European Leader	Managed Yield and Portfolio	Investment Centre
3.	Intermediate	Managed Spending	Average	Value Measurement	Service Centre
2.	Basic	Low Spending	Mediocre	Establish Benchmark	Cost Centre
1.	Initial	Beginning	Beginning	Beginning	Beginning

Source: Martin Curley, Intel / IVI

We need to move beyond Best Practices to Next Practices

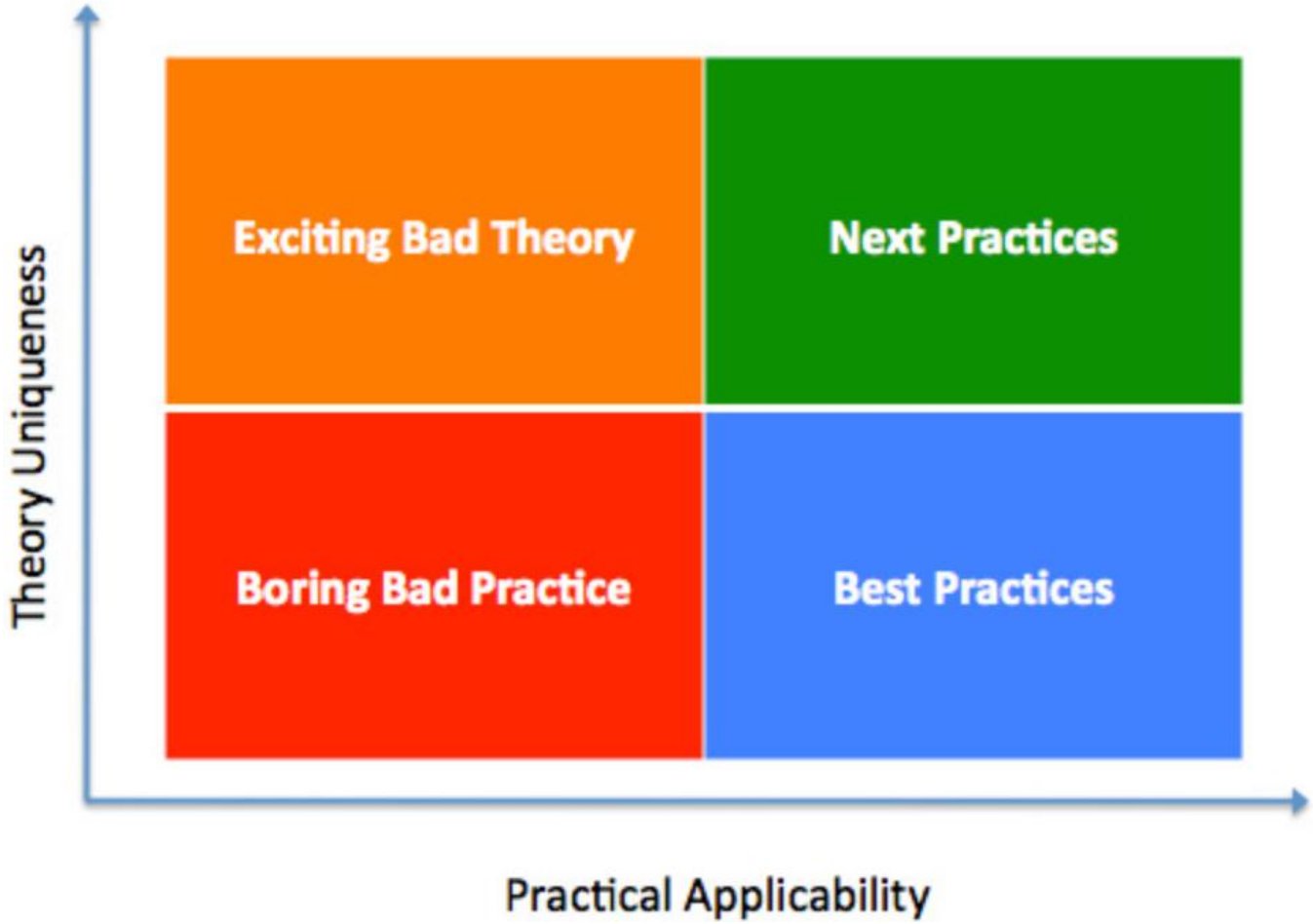
A focus on Next Practice, not Best Practice

The Best Practice of 2020 **is not good enough** for the problems of 2050

A Next Practice approach is needed, to identify the emerging Opportunities earlier, faster, better

A Next Practice approach takes the **best of Global & Local ideas** into the DWII

A philosophy of Next Practices means engaging in a **Virtuous Helix** with Academia + HealthCare + State Agencies + Commercial Enterprises to think of the **Best Possible 2050**



A unifying Framework is needed

Benefits of this Framework approach

- **Faster,** Better Decisions
- **Improved** Strategic Impact
- **Less** Technical Debt
- Provides **roadmap for Digital Investment**
- Provides the ability to **co-design the Digital Health & Wellness future**

INNOVATION™ VALUE INSTITUTE

Maynooth University
National University of Ireland Maynooth

The DHW-CMF is adapted from the Intel IT-CMF model.

The IT-CMF is peer tested with 100+ organisations.

The DHW-CMF doesn't compete with other frameworks, instead there is a focus on complementing other frameworks.

	Maturity Levels	Digital Health & Wellness Improvement Strategies			
		Digital Budget	Digital Capability	Digital Value	Digital Business Model
5.	Optimizing	Sustainable Economic Model	World Class	Optimized Value	Value Centre
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1.	Initial	Beginning	Beginning	Beginning	Beginning

Source: Martin Curley, Intel /

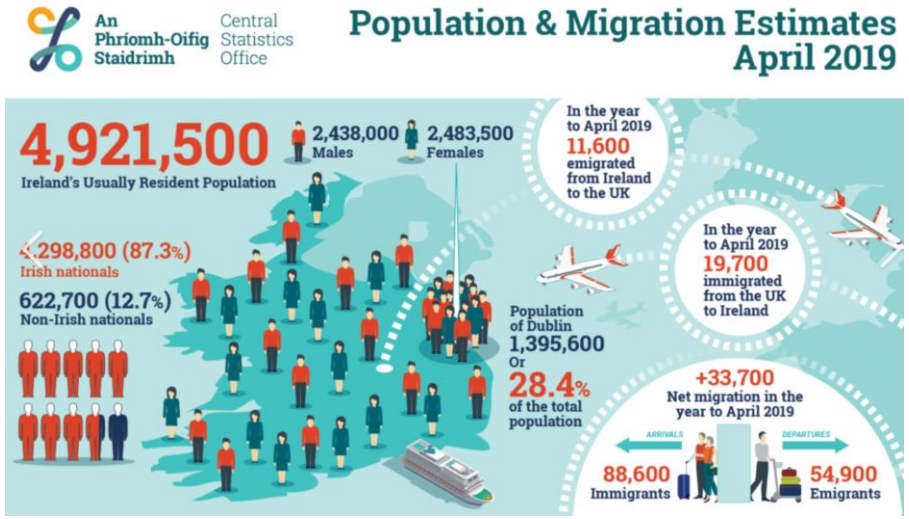
Accelerate the move to Next Practices

Living Lab

5 million population represents a Living Lab for better approaches to lifetime Wellness

Patterns in DNA, Diet, Exercise and Behaviour can be correlated to maximise **Personal Wellness**

Insights and Methods can be replicated to other parts of the globe



All of the major Life Science and Digital Corporations operate in Ireland

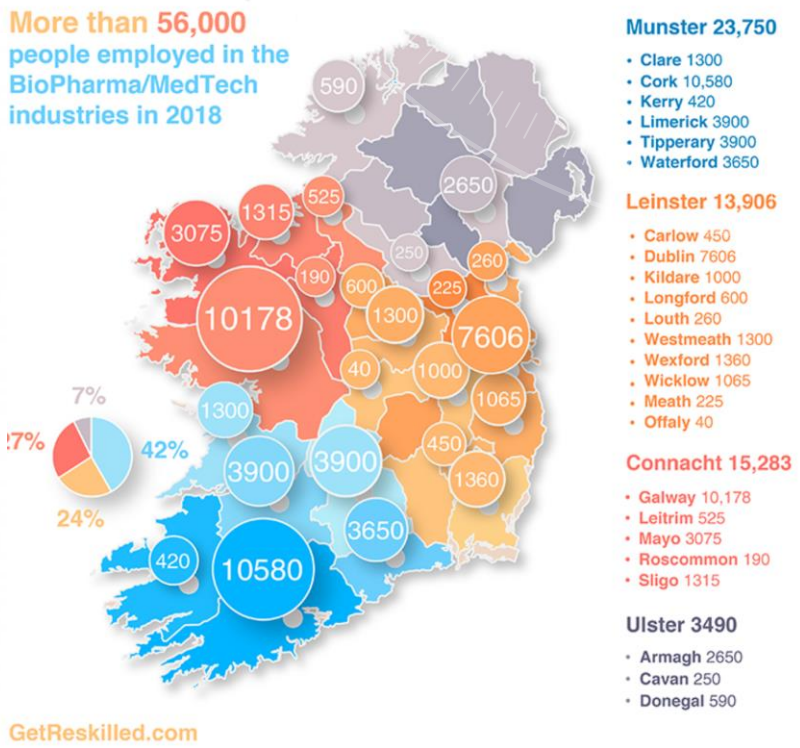
Why Ireland ? Life Sciences Perspective

Ireland is home to all of the major Medtech, Pharma and BioPharma players ;

Medtronic, Roche, Boston Scientific, Stryker, Abbott, WuXi, Pfizer, J&J, Sanofi, Merck, Novatis, Abbvie, Amgen, BMS

All the major BioPharma players are in Ireland;

56,000 work in Life Sciences ;



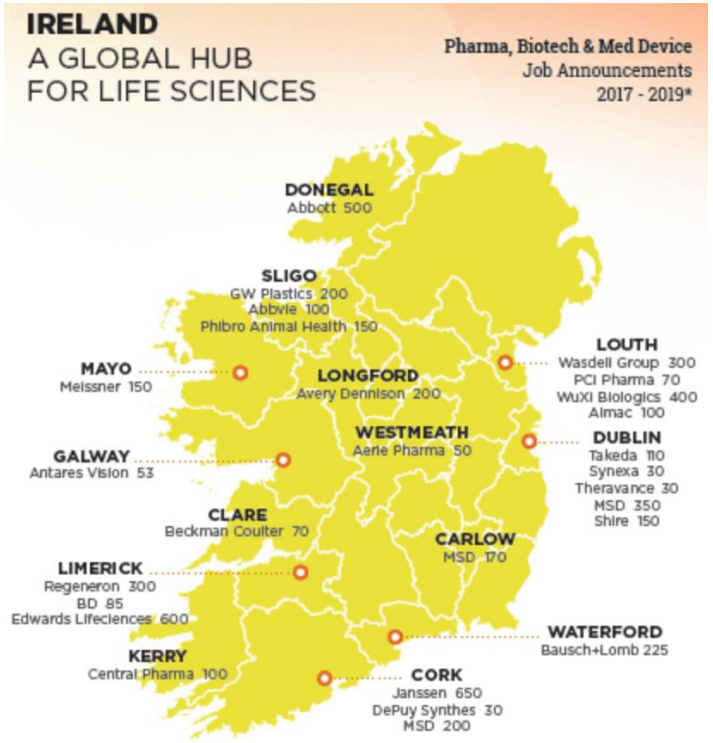
Munster 23,750
- Clare 1300
- Cork 10,580
- Kerry 420
- Limerick 3900
- Tipperary 3900
- Waterford 3650

Leinster 13,906
- Carlow 450
- Dublin 7606
- Kildare 1000
- Longford 600
- Louth 260
- Westmeath 1300
- Wexford 1360
- Wicklow 1065
- Meath 225
- Offaly 40

Connacht 15,283
- Galway 10,178
- Leitrim 525
- Mayo 3075
- Roscommon 190
- Sligo 1315

Ulster 3490
- Armagh 2650
- Cavan 250
- Donegal 590

Continued Expansion of existing operations underway;



Ireland is a major hub for Life Sciences

Why Ireland ? Tech Sector perspective

Ireland is the European Home for all of the major Global Tech Players ;

Huawei, Microsoft, Dell, Intel, Cisco, Google, Facebook, LinkedIn, Amazon, Apple, HP, IBM, Oracle, LinkedIn

Ireland also has a large indigenous tech sector operating in the Health and Wellness sector, with companies like **PatientMPower.com, 8West.ie, WebDoctor.ie**

Ireland is a major hub for Tech Companies

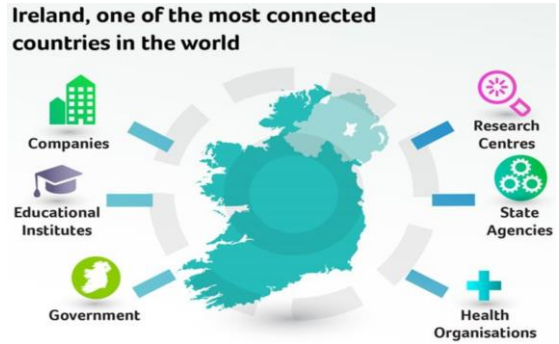
Why Ireland ? State Perspective

Ireland is positioned well for **Global Collaboration**. A set of **Connected Kinetic Vectors** make Ireland the ideal location for the Digital Wellness Innovation Institute.

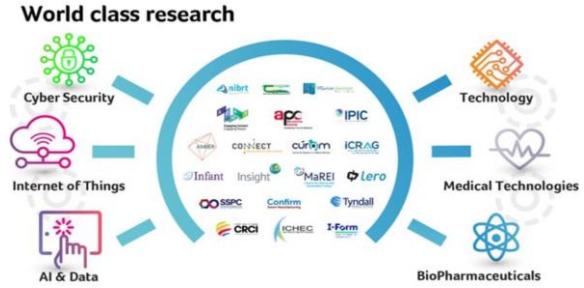
Ireland is **Europe's Tech Gateway**, all the major Life Sciences companies have picked Ireland, all the major Software companies have picked Ireland.

Open for Business ;

Inter-Connected approach ;



Co-located Research hubs ;



Ireland is Open and Inter-Connected

Digitise or Disappear

Data is the New Currency

Covid-19 changed our world
and Accelerated Digitisation is
a reality