Ingeniate en Octave

Clase 5

Nuevos Paradigmas

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CONICET

MoCCAi
MODELADO COMPUTACIONAL EN CIENCIAS APLICADAS E INGENIERÍA

UNCUYO
UNIVERSIDAD
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FACULTAD DE
CIENCIAS APLICADAS
A LA INDUSTRIA

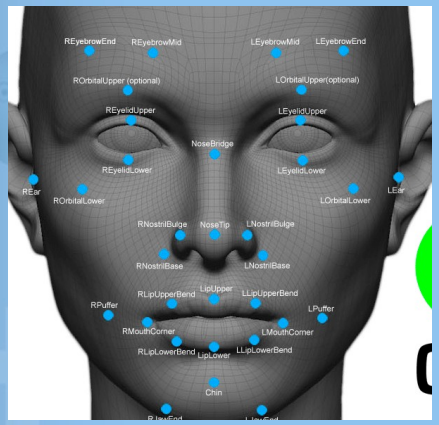
Nuevos paradigmas en la producción

Mayo de 2019

Ing. Iván Ferrari

Vivimos en una época de constantes cambios tecnológicos

- Piensen en aquellas cosas que hoy son cotidianas y que no existían hace 5 años…



TensorFlow

- …o no se usaban de forma masiva

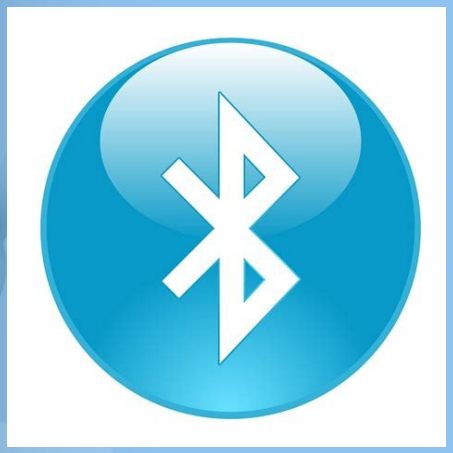
WhatsApp

Vivimos en una época de constantes cambios tecnológicos

- ...y hace 10 años...

Vivimos en una época de constantes cambios tecnológicos

- ...y hace 20 años...



¿Qué es lo que realmente cambia?

- Aparecen nuevas tecnologías
- Tecnologías que ya existían de forma experimental pasan a estar disponibles para producción
- Bajas en los costos hacen vuelven masivo el uso de dispositivos que antes eran específicos de un área
- Aumento en la oferta de productos y servicios tecnológicos incluyendo alternativas libres

¿Todo cambia?
¿Qué es lo que sigue igual?

- El corazón de la mayoría de los procesos productivos no ha cambiado en los últimos 50 años…
- Sin embargo la tecnología modifica en muchos casos la implementación de los mismos
- La gestión sigue siendo un factor **clave** en el éxito de la producción.

¿Podemos seguir llevando adelante los mismos procesos productivos sin modernizarlos?

- Si bien es posible…

  ...estaríamos ante una desventaja competitiva frente a aquellas organizaciones que sí adopten métodos modernos de trabajo

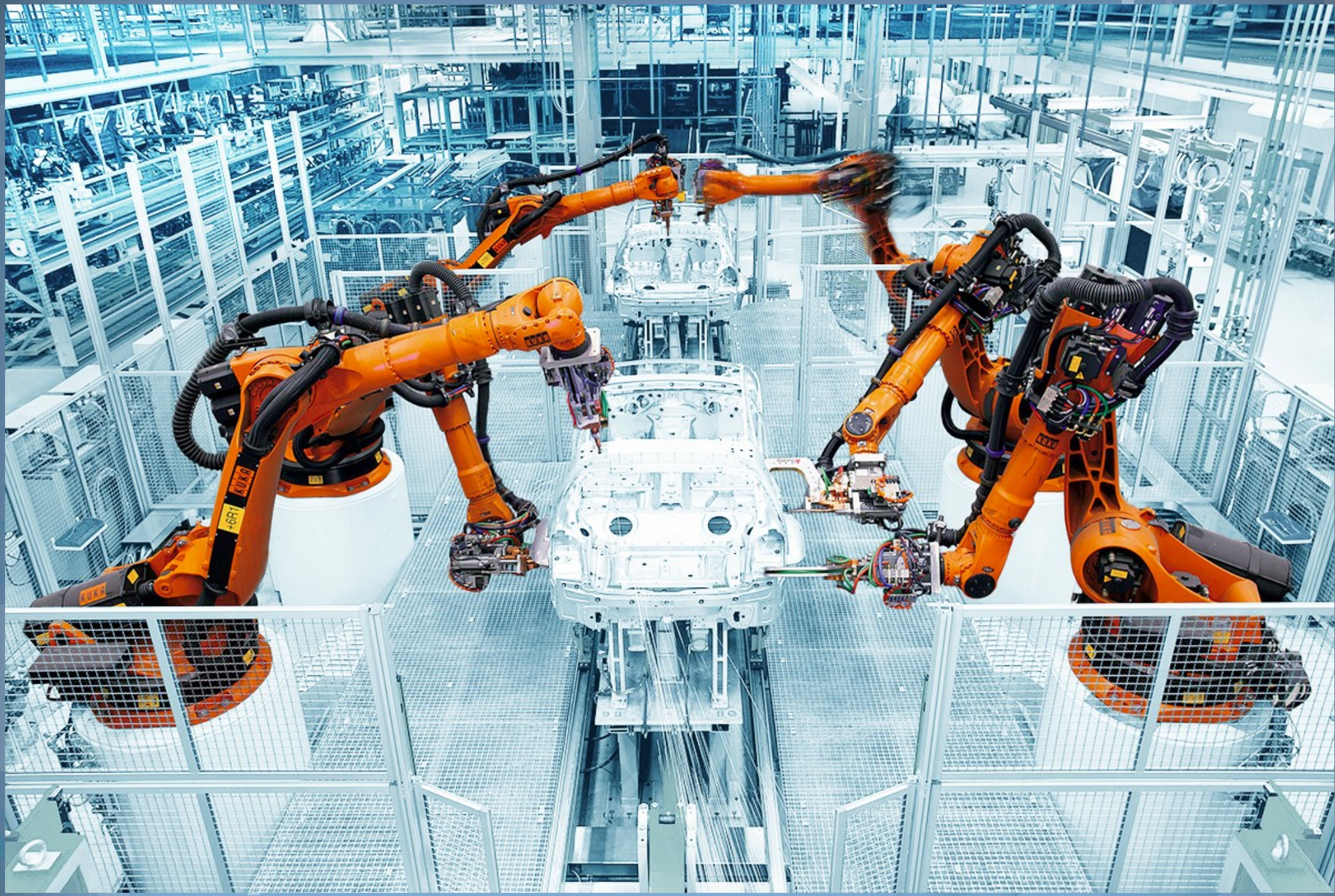
¿Qué sectores creen que podrían y/o deberían modernizarse?

- ¿Sector productivo?
- ¿Gobierno?
- ¿Educación?
- Otro

Es necesario destacar la importancia de la implementación de un sistema de mejora continua para mantener la competitividad de las organizaciones

Cómo se modernizan los sistemas en todo el mundo...

- Automatización
- Industria 4.0
- Digitalización y transparencia en la gestión gubernamental
- Educación digital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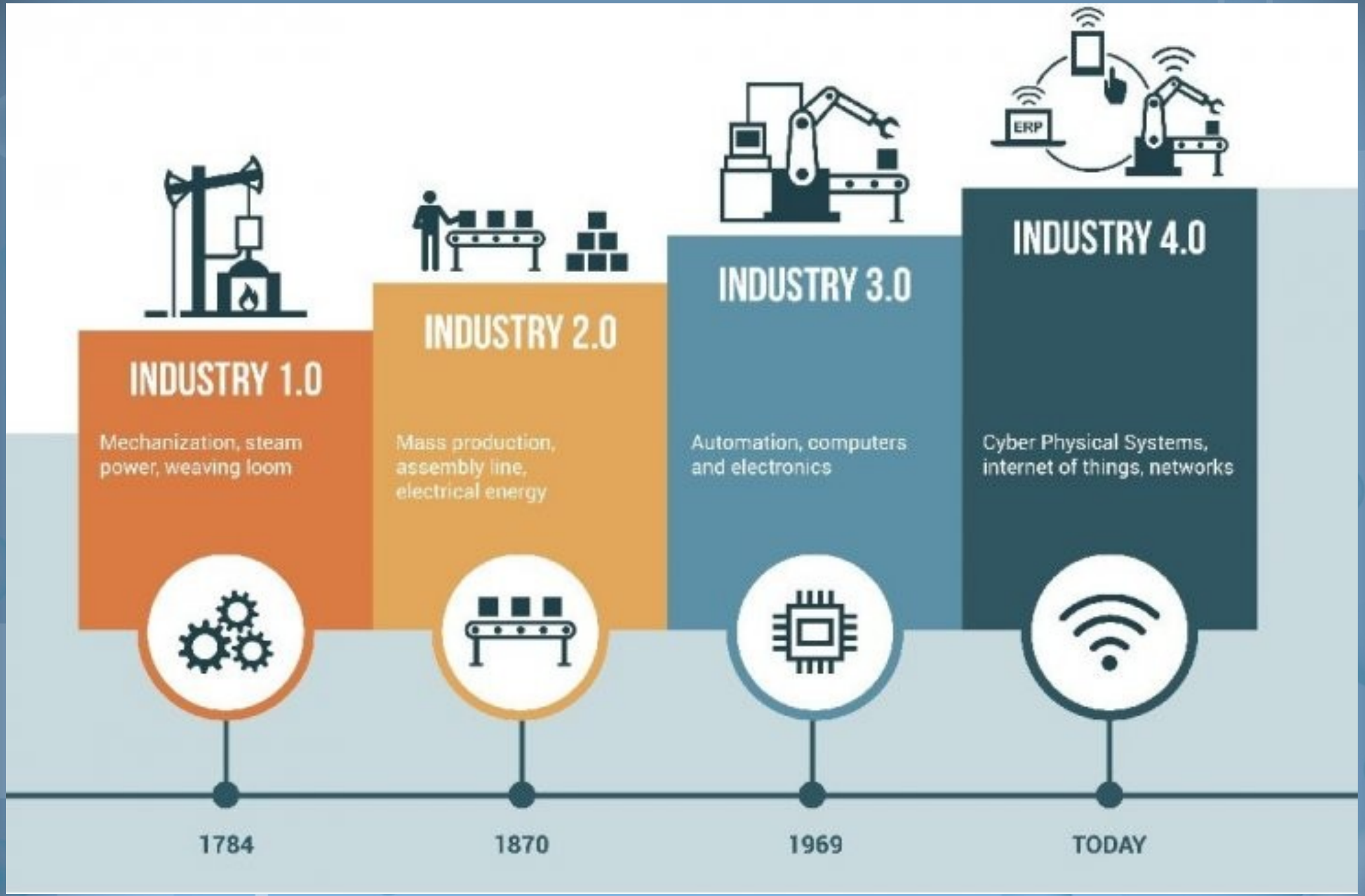
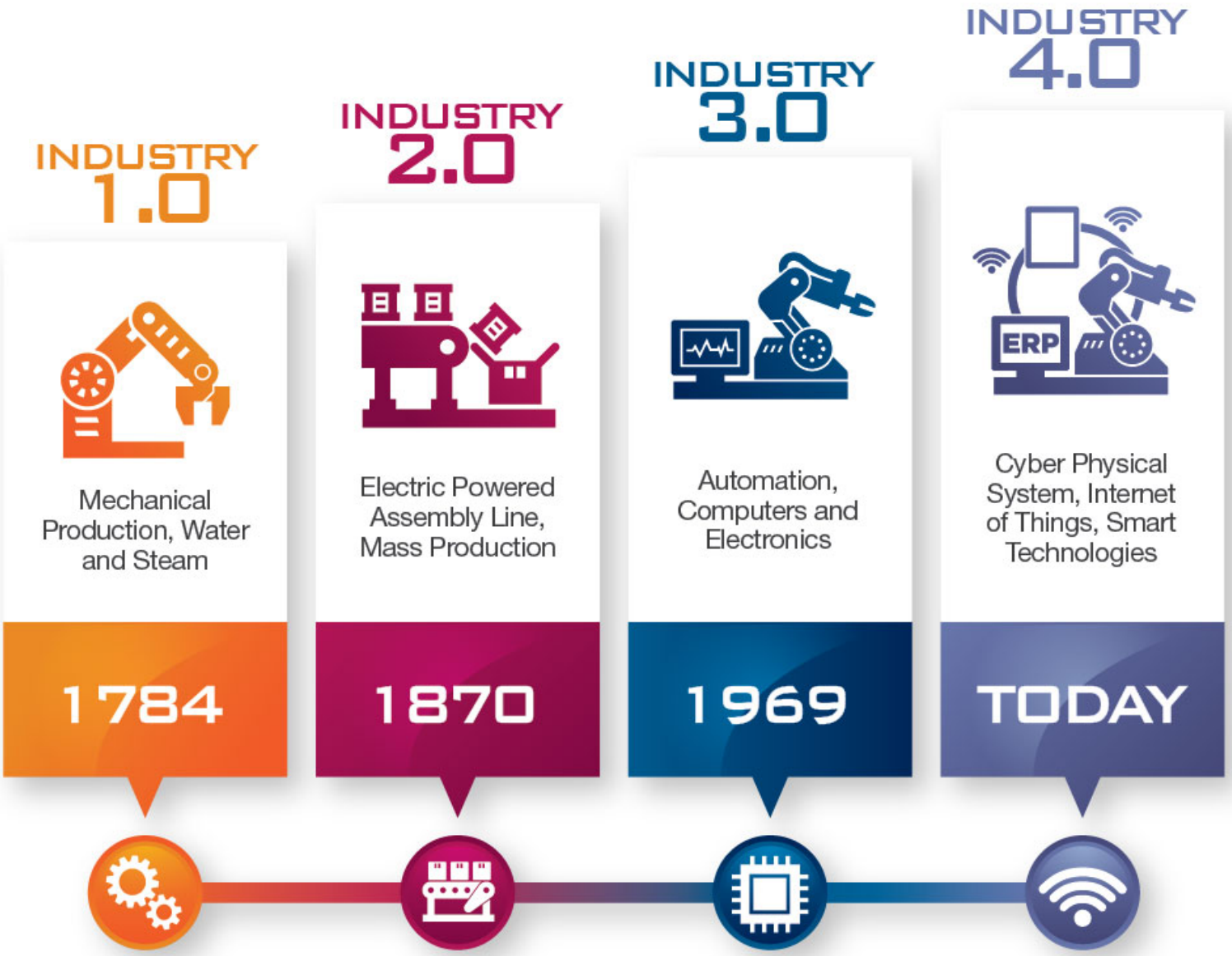


https://www.ibtimes.co.uk/mind-gap-industry-4-0-future-manufacturing-1665243

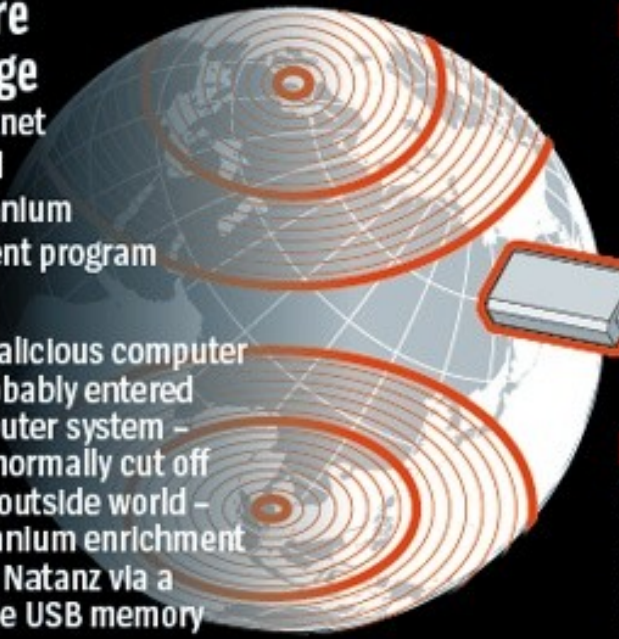


https://www.metaltech.com.my/news/malaysia-and-industrial-4-0-in-the-spotlight-of-metaltech/

Es importante considerar la seguridad de los sistemas informáticos que automatizan nuestros procesos industriales

Software Sabotage

How Stuxnet disrupted Iran's uranium enrichment program



1 The malicious computer worm probably entered the computer system – which is normally cut off from the outside world – at the uranium enrichment facility in Natanz via a removable USB memory stick.

2 The virus is controlled from servers in Denmark and Malaysia with the help of two Internet addresses, both registered to false names. The virus infects some 100,000 computers around the world.

3 Stuxnet spreads through the system until it finds computers running the Siemens control software Step 7, which is responsible for regulating the rotational speed of the centrifuges.

4 The computer worm varies the rotational speed of the centrifuges. This can destroy the centrifuges and impair uranium enrichment.

Iranian centrifuges for uranium enrichment

DER SPIEGEL

5 The Stuxnet attacks start in June 2009. From this point on, the number of inoperative centrifuges increases sharply.

Source: IAEA, ISIS, FAS, World Nuclear Association, FT research

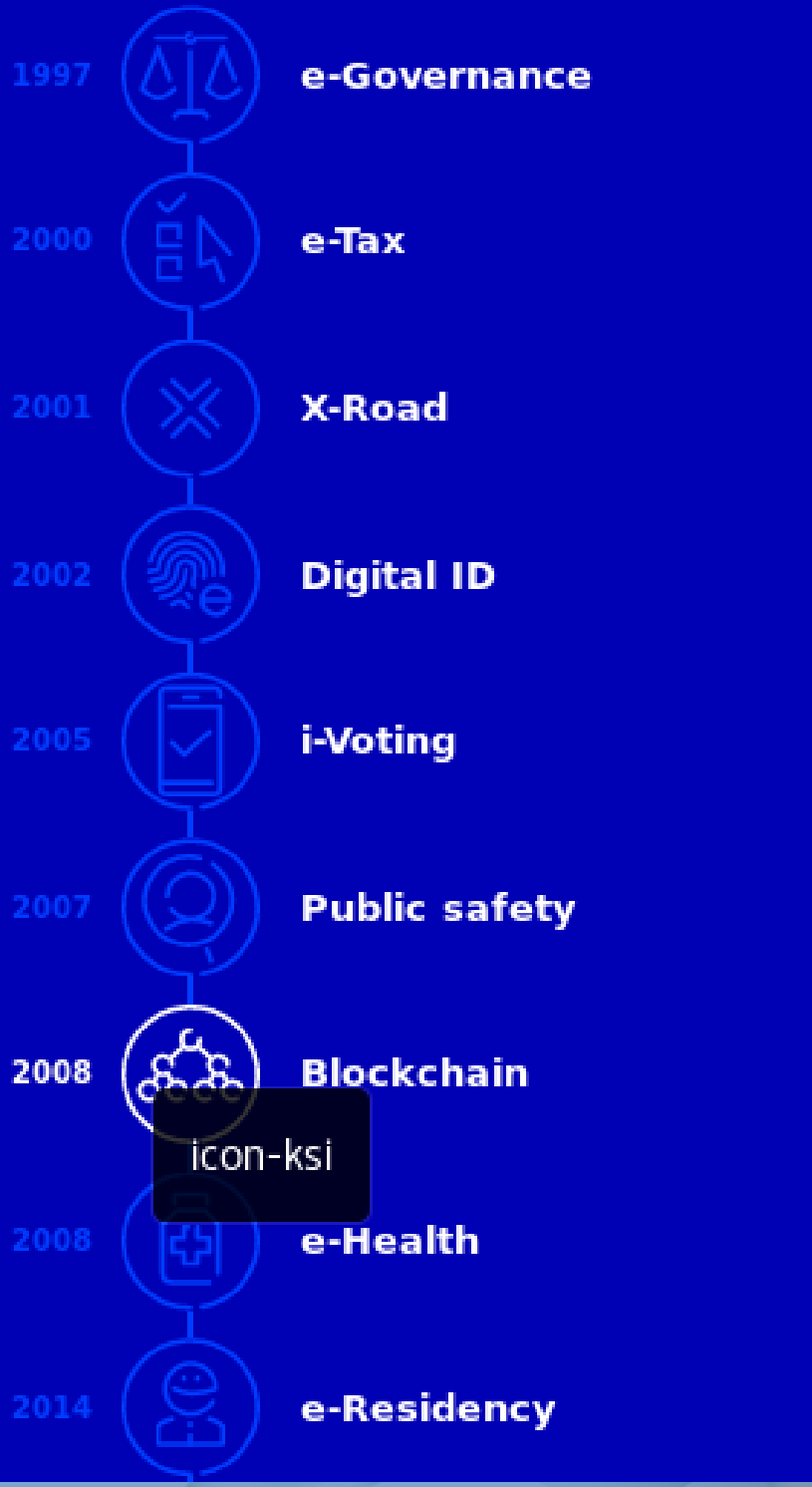
success stories

When Estonia started building our information society about two decades ago, there was no digital data being collected about our citizens. The general population did not have the internet or even devices with which to use it. It took great courage to invest in IT solutions and take the information technology route.

Here are some of our best e-solutions that have led to Estonia becoming one of the world's most developed digital societies.

Caso de estudio: ESTONIA con su políticas gubernamentales de digitalización

Fuete: https://e-estonia.com/



New digital nation

Cyber security

Data Embassy

Intelligent transportation

Reporting 3.0

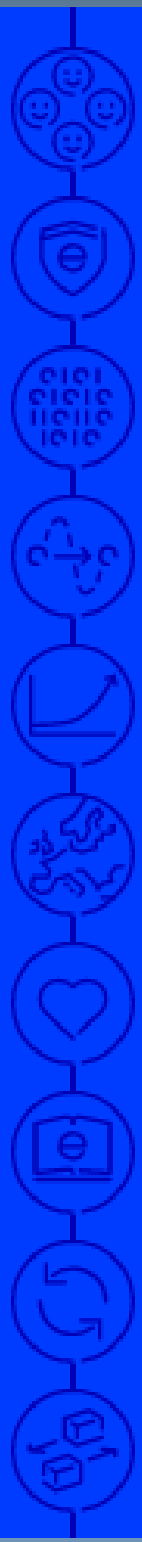
Cross-border data exchange

Healthcare 4.0

Digital Transformation in Education

Real-Time Economy

Industry 4.0



ambitious future

Successful countries need to be ready to experiment. Building e-Estonia as one of the most advanced e-societies in the world has involved continuous experimentation and learning from our mistakes. Estonia sees the natural next step in the evolution of the e-state as moving basic services into a fully digital mode. This means that things can be done for citizens automatically and in that sense invisibly.

In order to remain an innovative, effective and successful Northern country that leads by example, we need to continue executing our vision of becoming a safe e-state with automatic e-services available 24/7.

Digital Transformation in Education

We in Estonia believe that raising smarter kids is the smartest investment a country can make. But we also understand the importance of lifelong learning. The educational digital revolution in Estonia aims to implement modern digital technology more efficiently and effectively in learning and teaching, to improve the digital skills of the entire nation. One example of the digital transformation in the education system is that by 2020 all study materials in Estonia will be digitized and available through an online e-schoolbag.

Industry 4.0

Introduction of Industry 4.0-type solutions could impact everything from how quality is monitored to how much effort goes into supply chain management. Several players in Estonia's ICT sector focus on Industry 4.0 solutions development.

At the center of their strategy is a concept called Real Time Factory which, as the name suggests, allows managers to track key performance indicators in real time, showing where improvements can be made and allowing the entire factory to operate as one integrated system. Tallinn-based SimFactory, for example, specializes in helping electronics manufacturers adopt the Real Time Factory approach, giving them the kind of data-driven production that can streamline every aspect of their operations.

Main objectives in the new strategy period

Reliable information

Implementing the official statistical programme, incl. REGREL 2021, as well as producing indicators of sustainable development and other international and development plan indicators in the domains of population, social life, environment and the economy.

Low administrative burden

Implementing Reporting 3.0, i.e. automatic data collection, as well as adopting **additional data sources for big data and administrative data** and ensuring the application of the once only principle.

User-friendly information

Visualizing and offering important information in as **personalised format** as possible, through governance dashboards and development of statistical literacy, in order to contribute to making knowledge-based decisions.

Rapid real-time data mining

Establishing and offering real-time data mining related to important social phenomena for the purpose of **quick and relevant decision-making**, and establishing a basis for twice used data use.

Automatización vs desempleo

- ¿La automatización crea desempleo?
- Qué sucede en paises con alto nivel de automatización como se China, Japón y Corea de Sur?

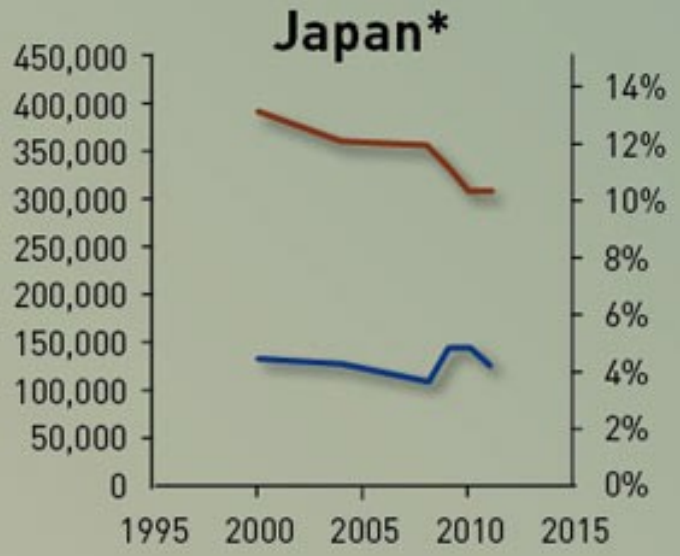
Man and Machine

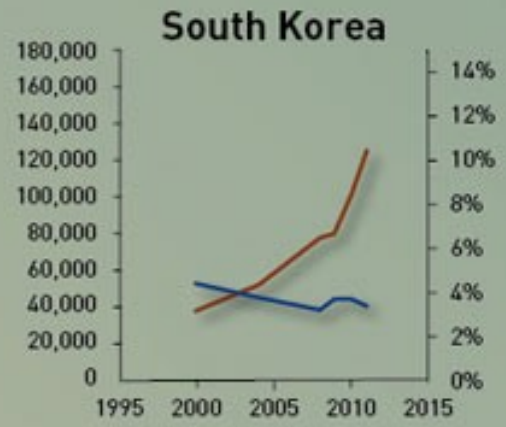
Rate of unemployment vs. number of robots in use

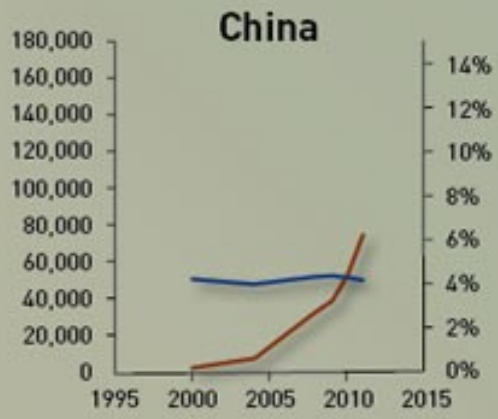
Unemployment in %

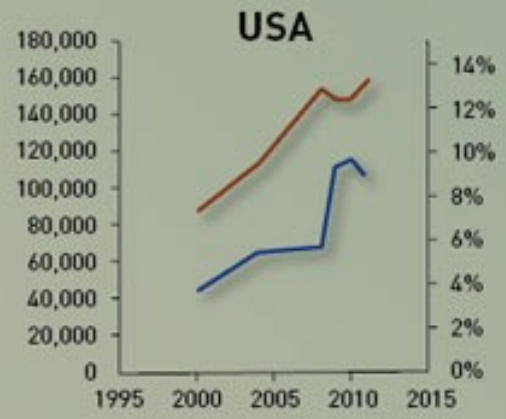
Number of robots

*Note the different left hand side scale for Japan









Source: International Federation of Robotics

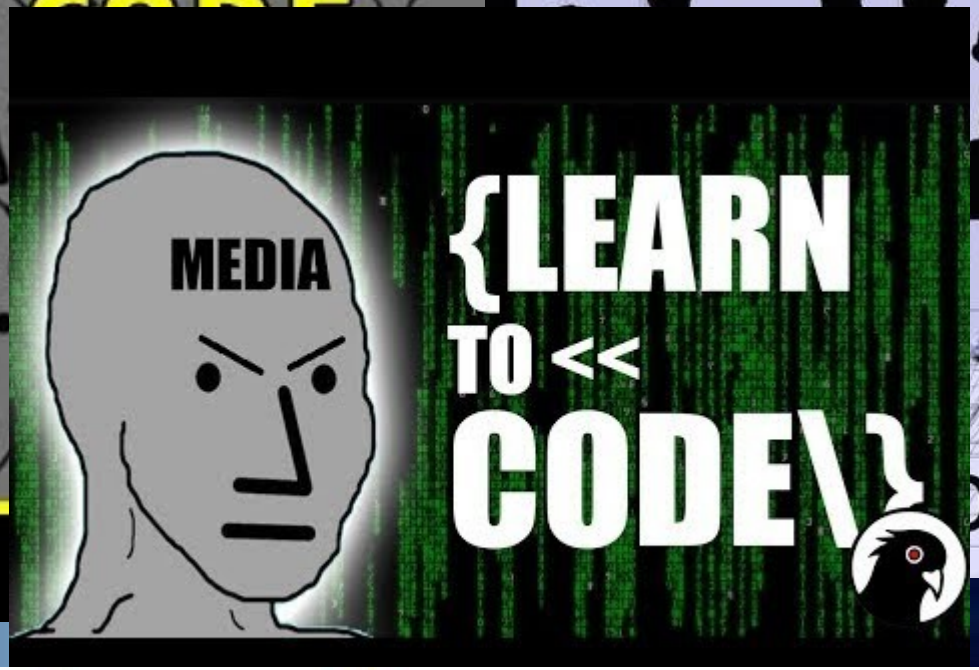
Automatización vs desempleo

- Se genera un desplazamiento de recursos laborales de una actividad a otra

¿Cómo encaramos esta transición?

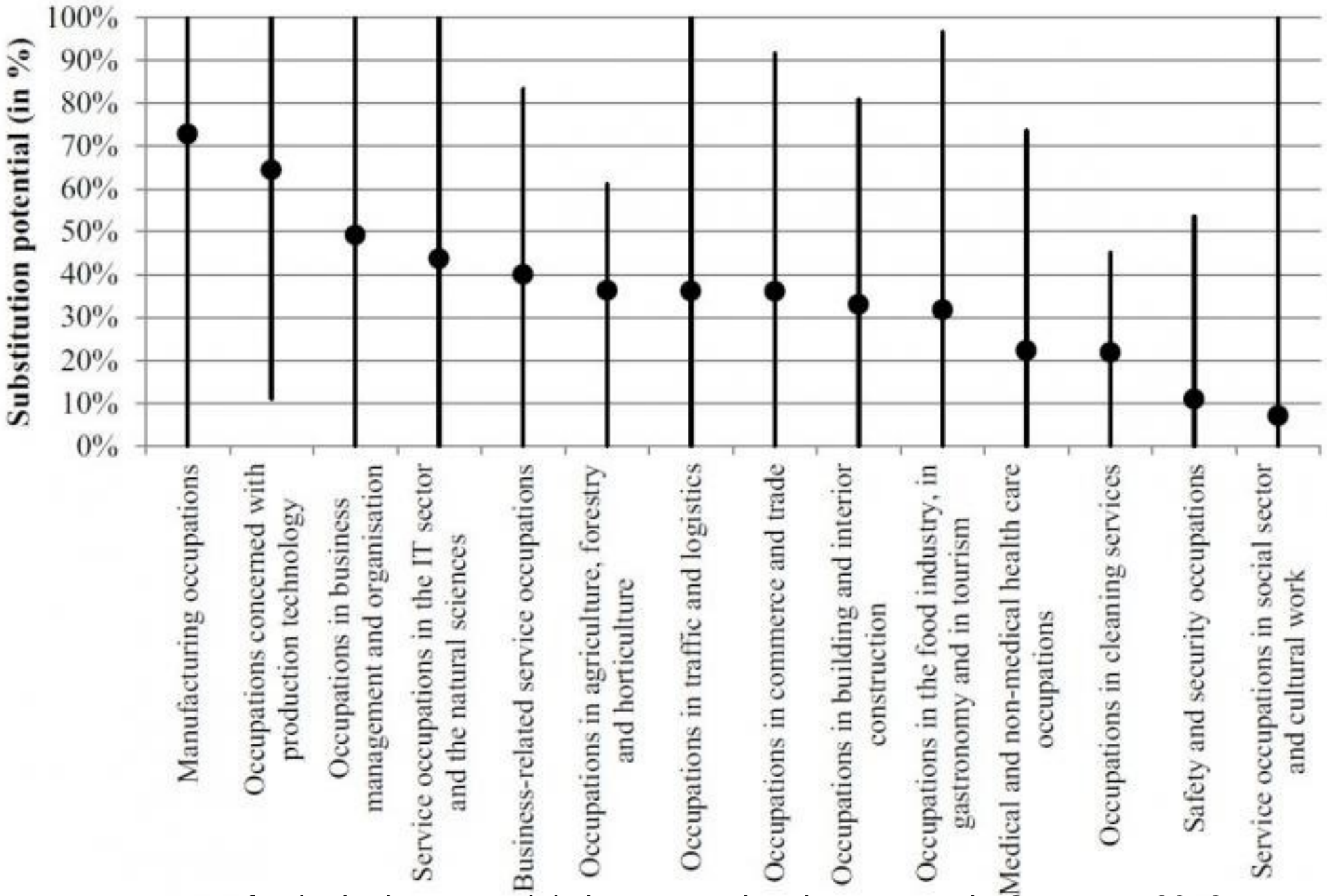
¿es posible negarse a estos cambios?

¿Qué áreas serán más afectadas?

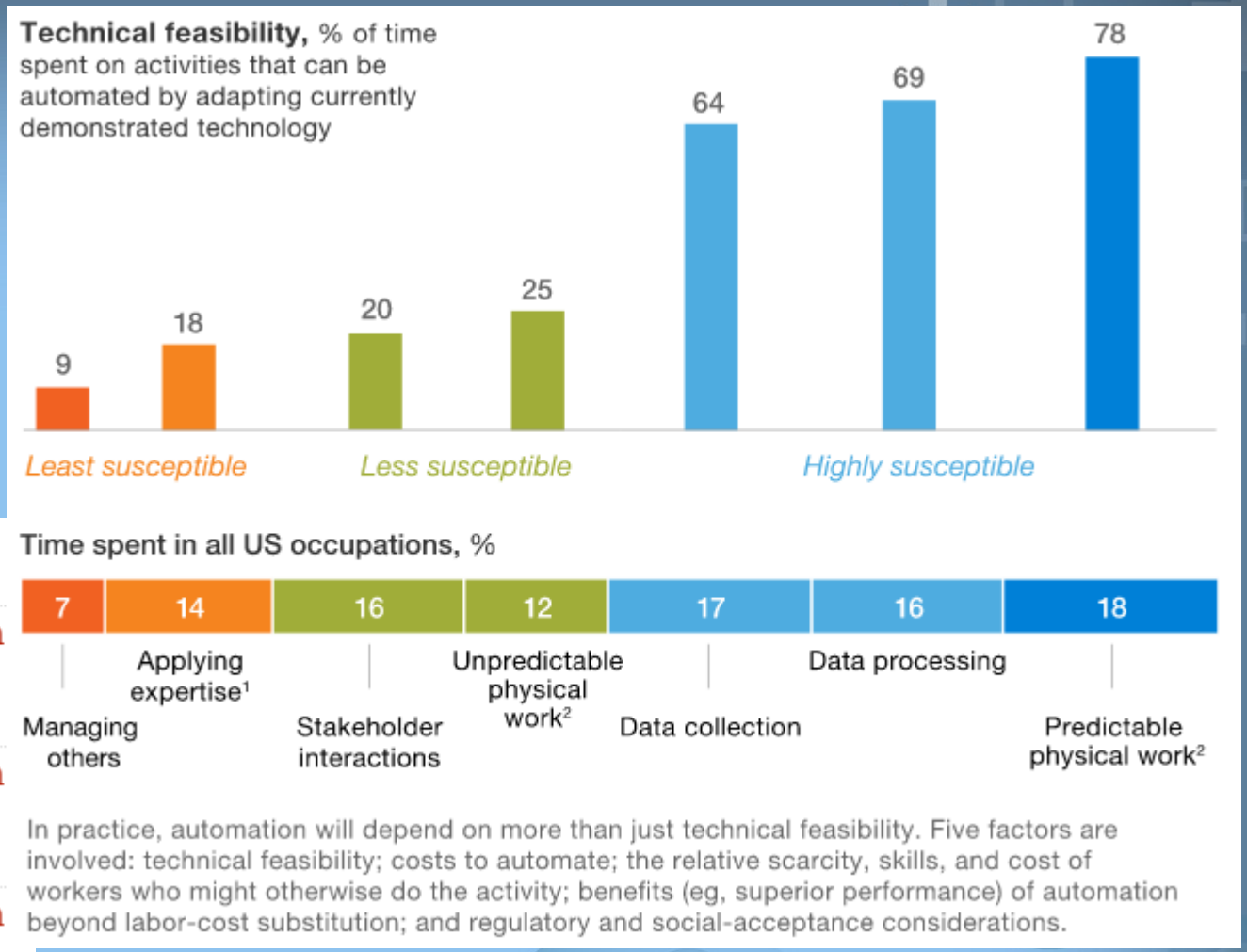


Jon Levine
@LevineJonathan

I am told by a person in the know that tweeting "learn to code" at any recently laid off journalist will be treated as "abusive behavior" and is a violation of Twitter's Terms of Service



Percentage of substitution potentials by occupational segments in Germany, 2013.
Source: Dengler and Matthes (2018) , consultado en https://e-estonia.com/will-machines-replace-us-not-really/



The least safe jobs

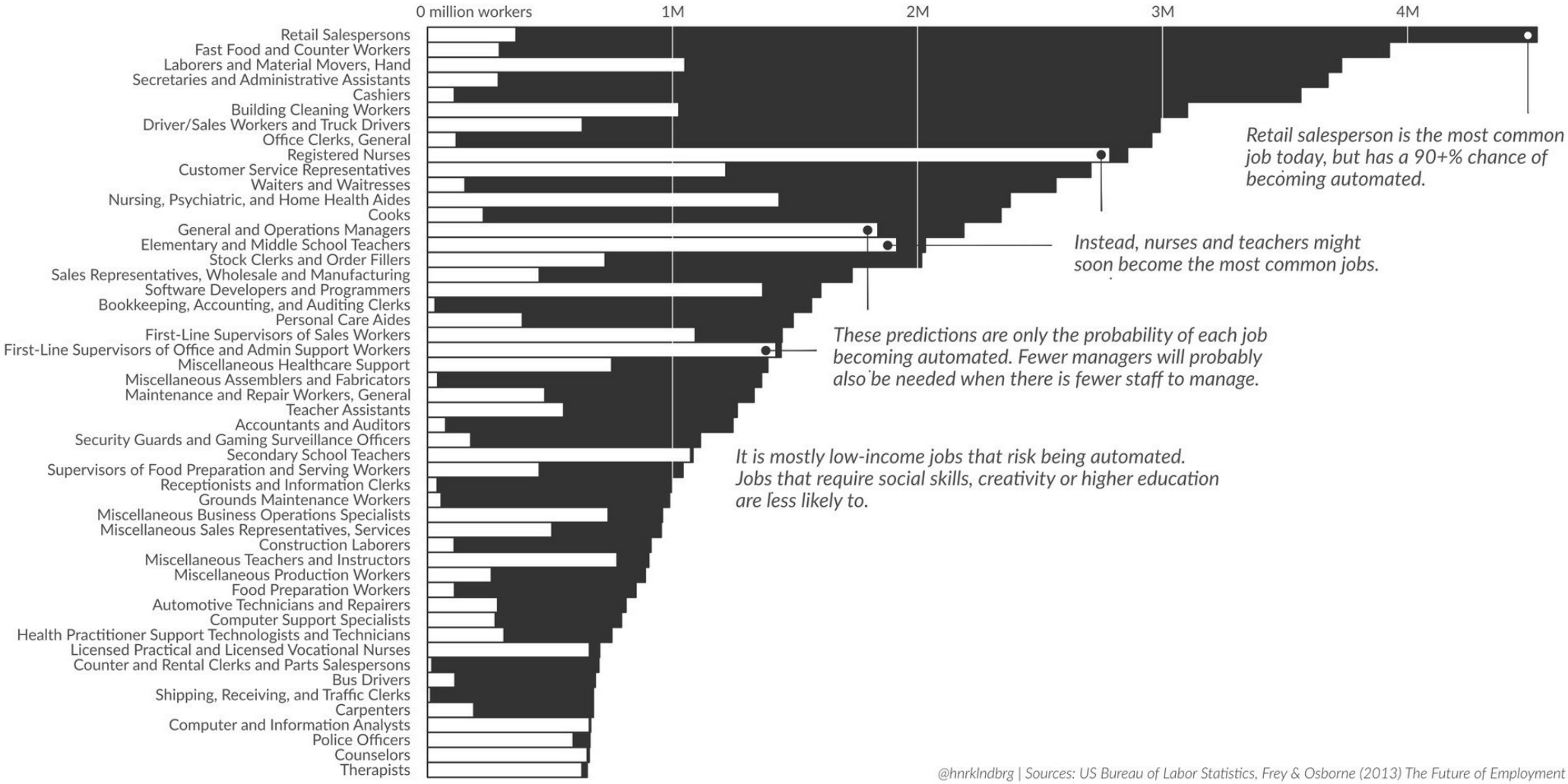
Telemarketer	Chance of automation **99%**
Loan officer	Chance of automation **98%**
Cashier	Chance of automation **97%**
Paralegal and legal assistant	Chance of automation **94%**
Taxi driver	Chance of automation **89%**
Fast food cook	Chance of automation **81%**

https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/where-machines-could-replace-humans-and-where-they-cant-yet

https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

The future of employment

About half of today's jobs will likely be done by computers in a decade or two. Automation has so far taken over mostly well-defined routine tasks, shifting jobs from middle-income manufacturing to lower-income service jobs. As computers get better at for example perception - think self-driving cars - those services jobs are likely next up to be replaced by machines. Frey and Osborne (2013) estimate the probability of each job becoming automated. Here are how their predictions apply to 2016 US employment statistics.
Black fields are jobs likely to be automated and white fields are jobs that are likely to remain.

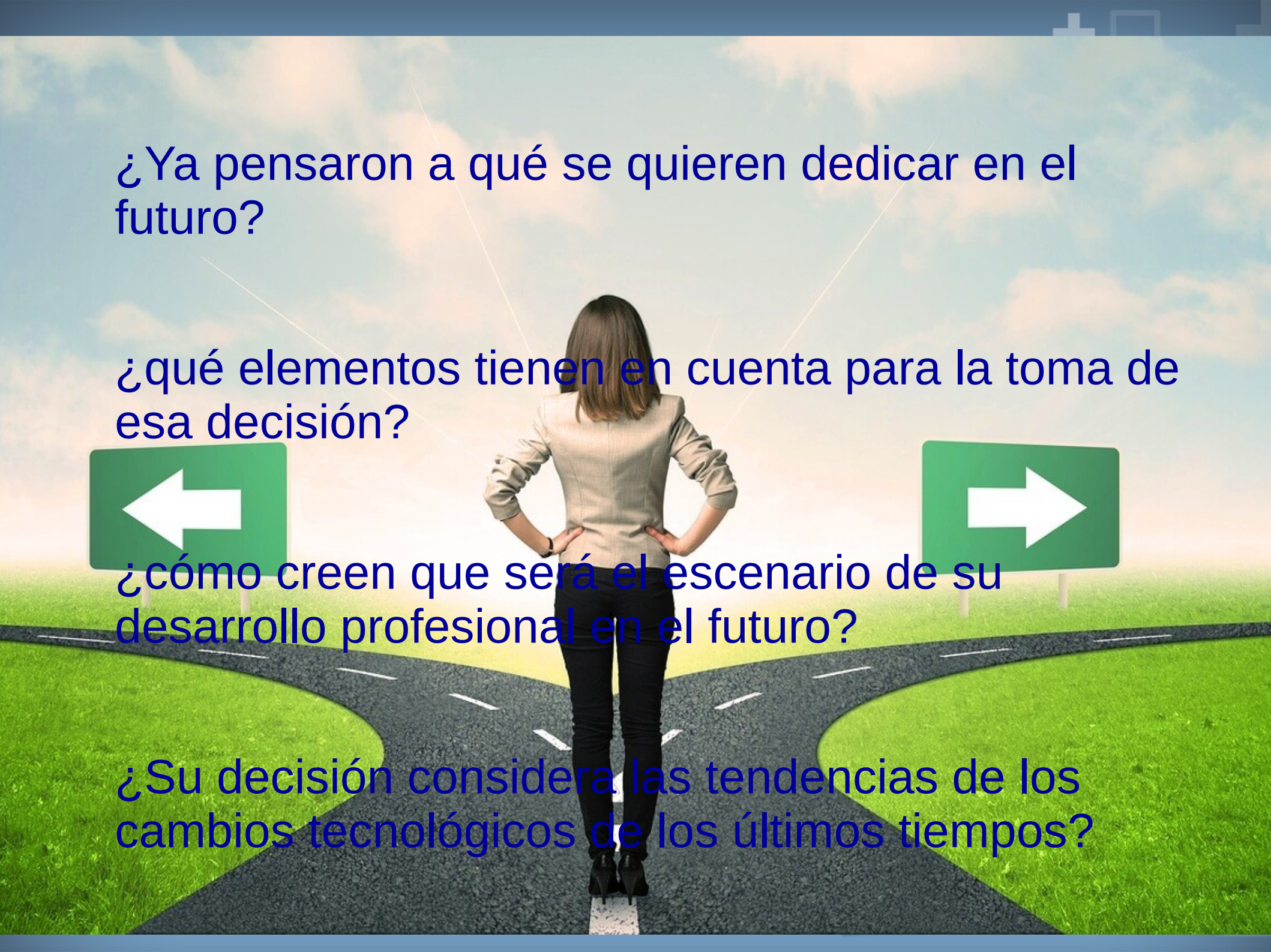


@hnrklndbrg | Sources: US Bureau of Labor Statistics, Frey & Osborne (2013) The Future of Employment

https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

¿Ya pensaron a qué se quieren dedicar en el futuro?

¿qué elementos tienen en cuenta para la toma de esa decisión?



¿cómo creen que será el escenario de su desarrollo profesional en el futuro?

¿Su decisión considera las tendencias de los cambios tecnológicos de los últimos tiempos?

¿Quién es nuestro competidor?

Ya sea para la producción de bienes o servicios, vivimos en un mundo cada vez más globalizado…

Globalización

- Esto genera nuevos desafíos, que se traducen en amenazas y oportunidades
- Por un lado competimos con todo el mundo…

Desafíos de la globalización: amenazas y oportunidades

Por otro lado podemos elegir proveedores de todo el mundo

- Podemos expandir nuestras ventas a nuevos mercados

“Mi generación la tuvo fácil: nosotros teníamos que ‘encontrar’ un empleo. Pero cada vez más, nuestros hijos deberán ‘inventar’ un empleo”

Thomas Friedman,

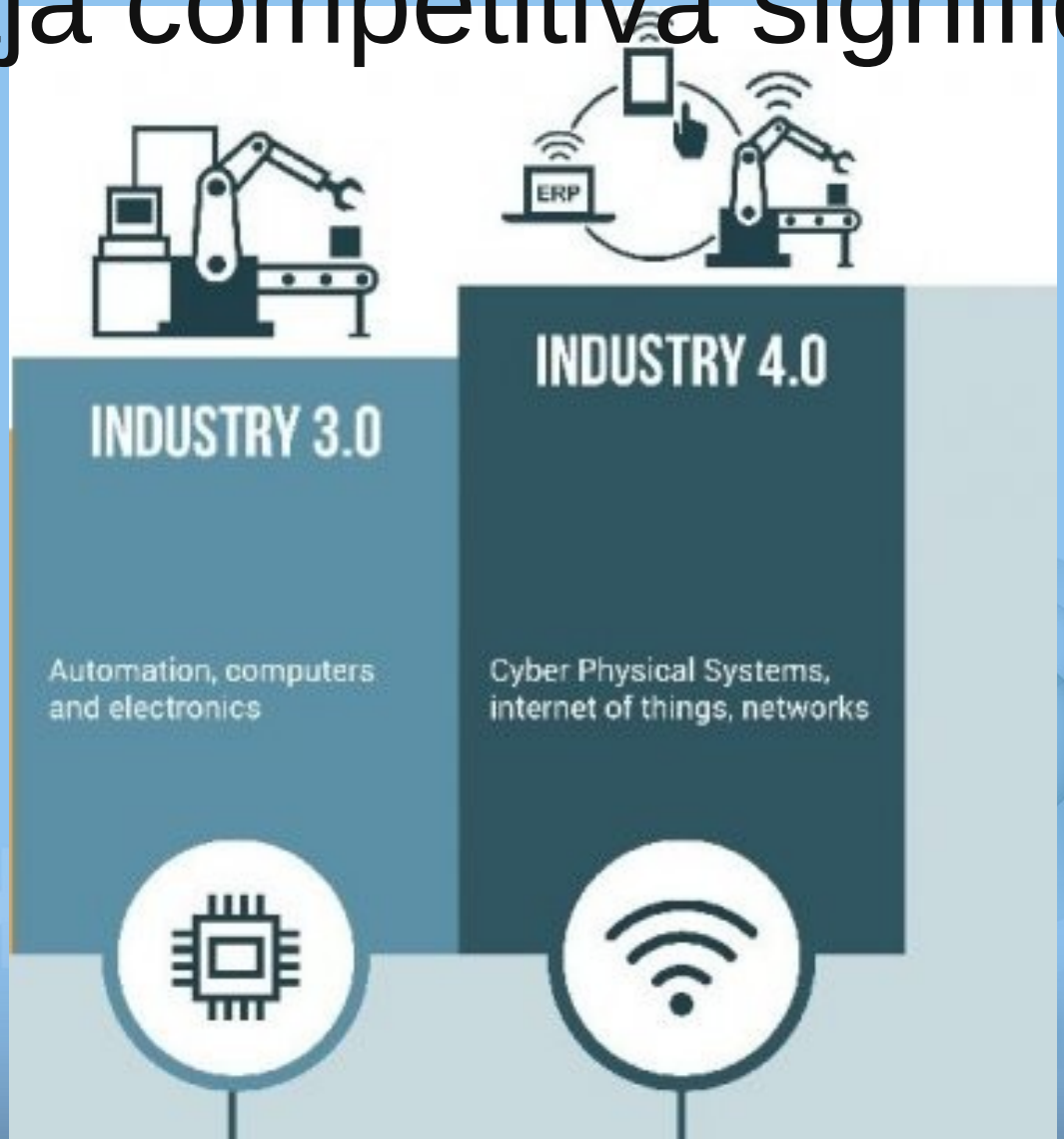
The New York Times

Conceptos claves

- Muchos trabajos van a desaparecer
- Deberemos crear nuevos trabajos, bienes y servicios.
- Las mejoras tecnológicas brindan ventajas competitivas.
- En un mundo de competencia globalizada es necesario optimizar el funcionamiento de las organizaciones

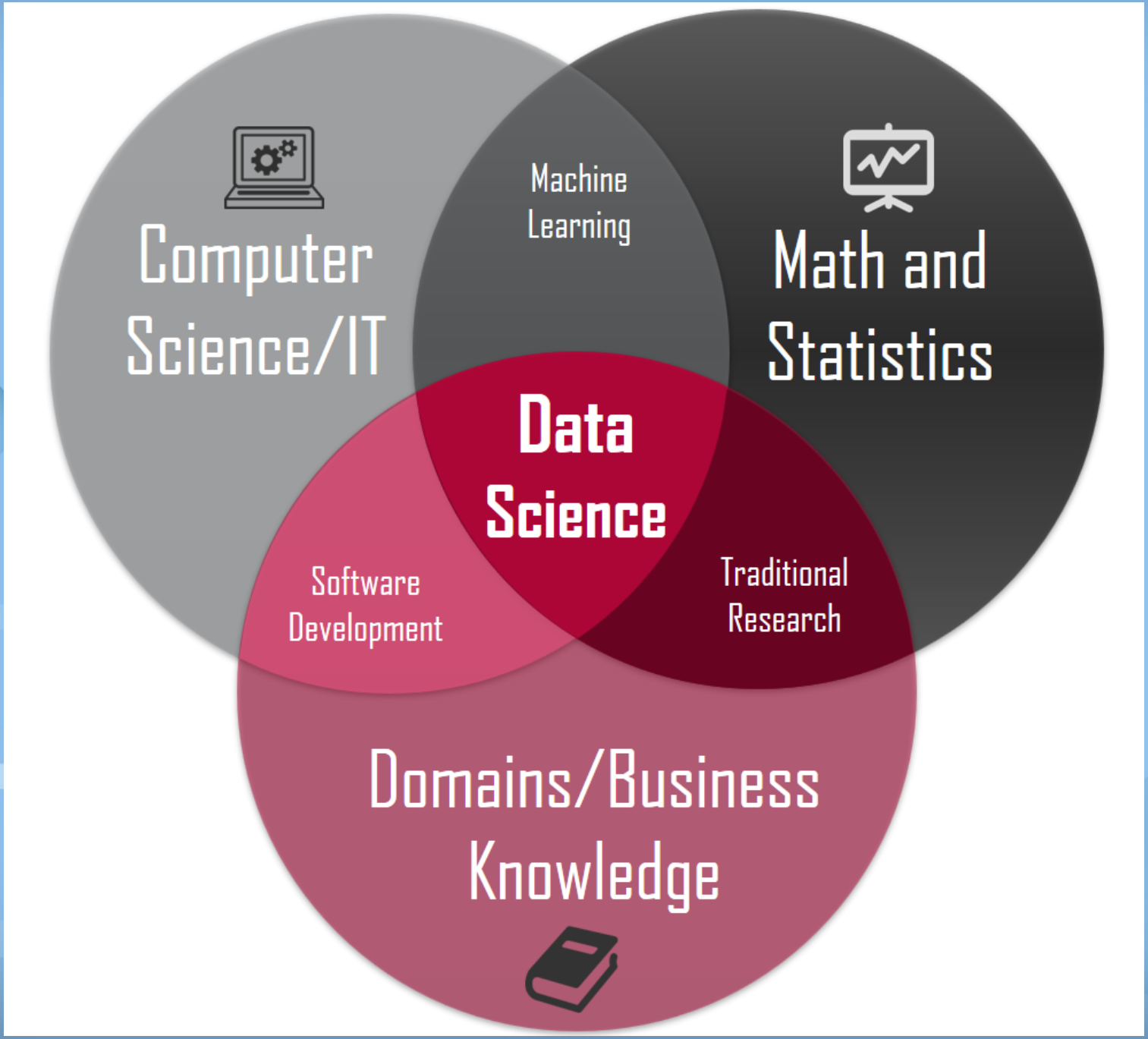
  ¿cómo podemos lograr esta optimización?

¿Cómo podemos optimizar nuestra organización para conseguir una ventaja competitiva significativa?



Procesar las mediciones para obtener datos útiles para la toma de decisiones...

Capacidades para procesar sistemas complejos...



MODERN DATA SCIENTIST

Data Scientist, the sexiest job of 21th century requires a mixture of multidisciplinary skills ranging from an intersection of mathematics, statistics, computer science, communication and business. Finding a data scientist is hard. Finding people who understand who a data scientist is, is equally hard. So here is a little cheat sheet on who the modern data scientist really is.

MATH & STATISTICS

- Machine learning
- Statistical modeling
- Experiment design
- Bayesian inference
- Supervised learning: decision trees, random forests, logistic regression
- Unsupervised learning: clustering, dimensionality reduction
- Optimization: gradient descent and variants

PROGRAMMING & DATABASE

- Computer science fundamentals
- Scripting language e.g. Python
- Statistical computing package e.g. R
- Databases SQL and NoSQL
- Relational algebra
- Parallel databases and parallel query processing
- MapReduce concepts
- Hadoop and Hive/Pig
- Custom reducers
- Experience with xaaS like AWS

DOMAIN KNOWLEDGE & SOFT SKILLS

- Passionate about the business
- Curious about data
- Influence without authority
- Hacker mindset
- Problem solver
- Strategic, proactive, creative, innovative and collaborative

COMMUNICATION & VISUALIZATION

- Able to engage with senior management
- Story telling skills
- Translate data-driven insights into decisions and actions
- Visual art design
- R packages like ggplot or lattice
- Knowledge of any of visualization

...obtener modelos predictivos

Y ustedes...

¿están listos para procesar los datos?