MUNI
FI

Přednáška 12

Přesahy IT do dalších oborů

CORE013 Vývoj softwarových systémů: od myšlenky k funkčnímu řešení

12. Přesahy IT do dalších oborů

- Zdravotnictní
- Energetika
- Doprava
- Budovy
- Chytrá města
- Životní prostředí
- Průmysl
- Obrana
- eGovernment
- Finance

Domácí práce a příprava na příští přednášku

- Pročtěte si a okomentujte 2-3 články vložené do diskuzního fóra https://is.muni.cz/auth/discussion/predmetove/fi/podzim2022/CORE013/trendy_a_budoucnost_it/

SMART WORLD

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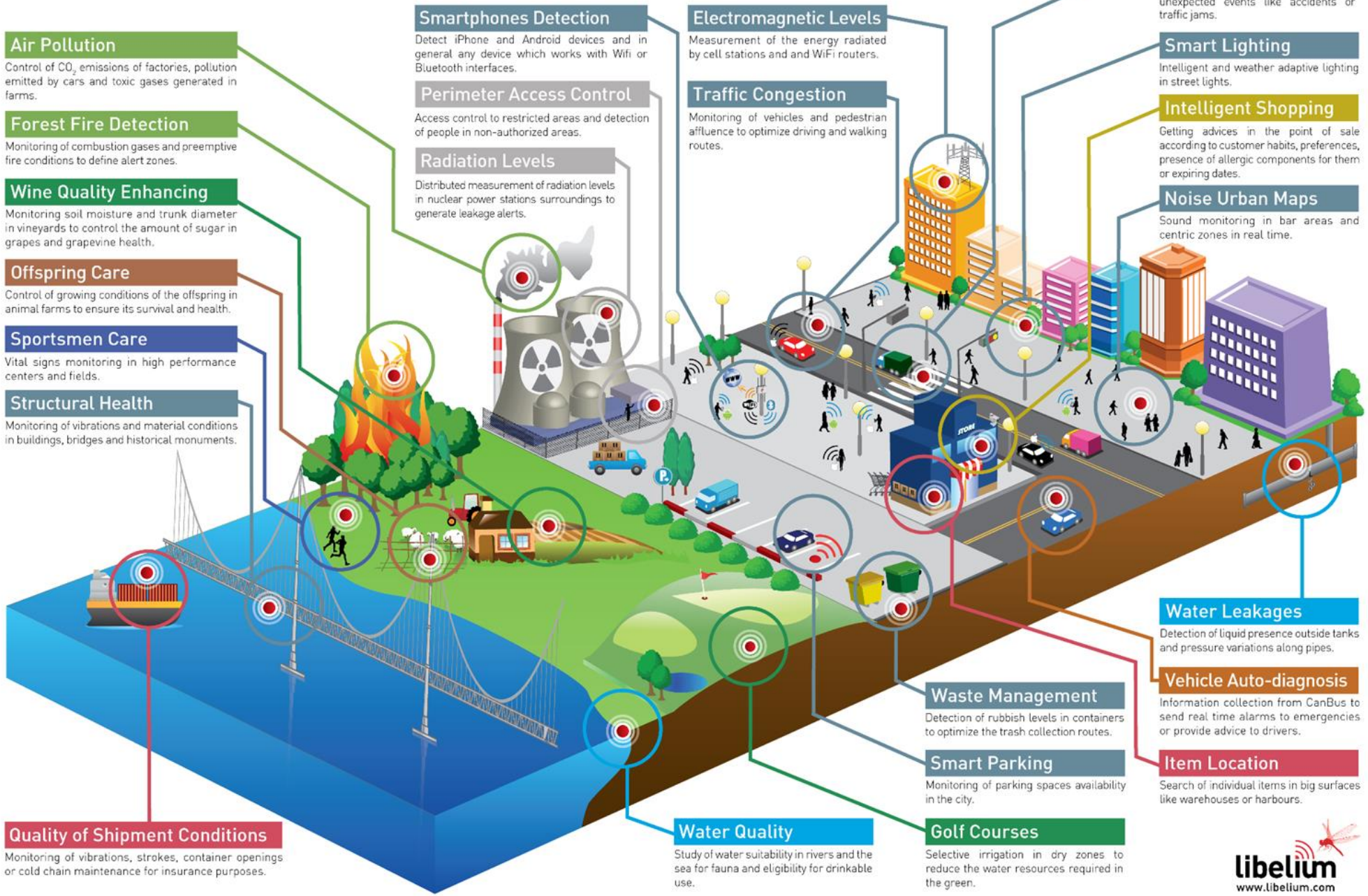
Libelium Smart World



Air Pollution
Control of CO_2 emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection
Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing
Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care
Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care
Vital signs monitoring in high performance centers and fields.

Structural Health
Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Quality of Shipment Conditions
Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Smartphones Detection
Detect iPhone and Android devices and in general any device which works with Wifi or Bluetooth interfaces.

Perimeter Access Control
Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels
Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels
Measurement of the energy radiated by cell stations and and WiFi routers.

Traffic Congestion
Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Water Quality
Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

Golf Courses
Selective irrigation in dry zones to reduce the water resources required in the green.

Smart Parking
Monitoring of parking spaces availability in the city.

Waste Management
Detection of rubbish levels in containers to optimize the trash collection routes.

Item Location
Search of individual items in big surfaces like warehouses or harbours.

Vehicle Auto-diagnosis
Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Water Leakages
Detection of liquid presence outside tanks and pressure variations along pipes.

Noise Urban Maps
Sound monitoring in bar areas and centric zones in real time.

Intelligent Shopping
Getting advices in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Smart Lighting
Intelligent and weather adaptive lighting in street lights.

Smart Roads
Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

libelium
www.libelium.com

http://www.emrebastug.net/internet-of-things-iot-nesnelerin-interneti-sensor-networku-nedir.html

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Obory a multidisciplinarita

- Bioinformatika, chemoinformatika (MUNI, UPOL, VŠCHT)
- Technologie a řízení dopravy (Univerzita Pardubice)
- Jazykové technologie a počítačová lingvistika (UK)
- Biomedicínská a klinická informatika (ČVUT, UK, ...)
- Geoinformatika (UJEP, VŠB)
- Průmysl 4.0 (VŠB)
- Vojenské technologie, obrana a bezpečnost (Univezita obrany)
- Podniková informatika (MUNI)
- IT právo - Infrastruktura, SW, bezpečnost, právo, sociologie, psychologie

ZDRAVOTNICTVÍ

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Zdravotnictví

- Kde v této oblasti se aktuálně IT využívá?
- Jaký je zde potenciál pro další využití IT v budoucnu?

THE INTERNET OF (MEDICAL) THINGS TECHNOLOGY

3.7M Medical devices in use today connect to and monitor various parts of the body

Active implantable medical devices control stimulation &/or precision medicine therapy to treat disease and improve patient quality of life.

Monitors medical conditions specific to patient's disease & other systemic conditions such as heart rate, blood sugar, exercise, etc.

Closed-Loop System
"Smart" software supports device iteration based on data inputs to deliver best patient therapy

One IOMT system solution colleting data from medical devices, medications, & biometrics to modify the therapeutic window towards best care option

97% Wi-Fi adoption rates in hospitals

10% Medical devices enabled with Wi-Fi

NEXEON

OPTIMIZED RESULTS FOR:

PATIENT...

Receives **individually-optimized care** faster, with few doctor office visits, and decreased overall time "thinking" about the disease

HEALTHCARE PROFESSIONALS...

Monitor patient status, disease progression, & device performance. This allows for:

- **Enhanced patient support**
- **Reduced Risk**
- **Feedback on device design improve opportunities**

PATIENT FAMILIES...

Can be included in regular communications to **help monitor or have assurance of patient wellness.**

HEALTHCARE SYSTEM...

Automated advanced product monitoring & verification to **eliminate human error and falsification.**

https://www.information-age.com/medical-innovation-bioelectronics-redefining-healthcare-123464051/

ENERGETIKA

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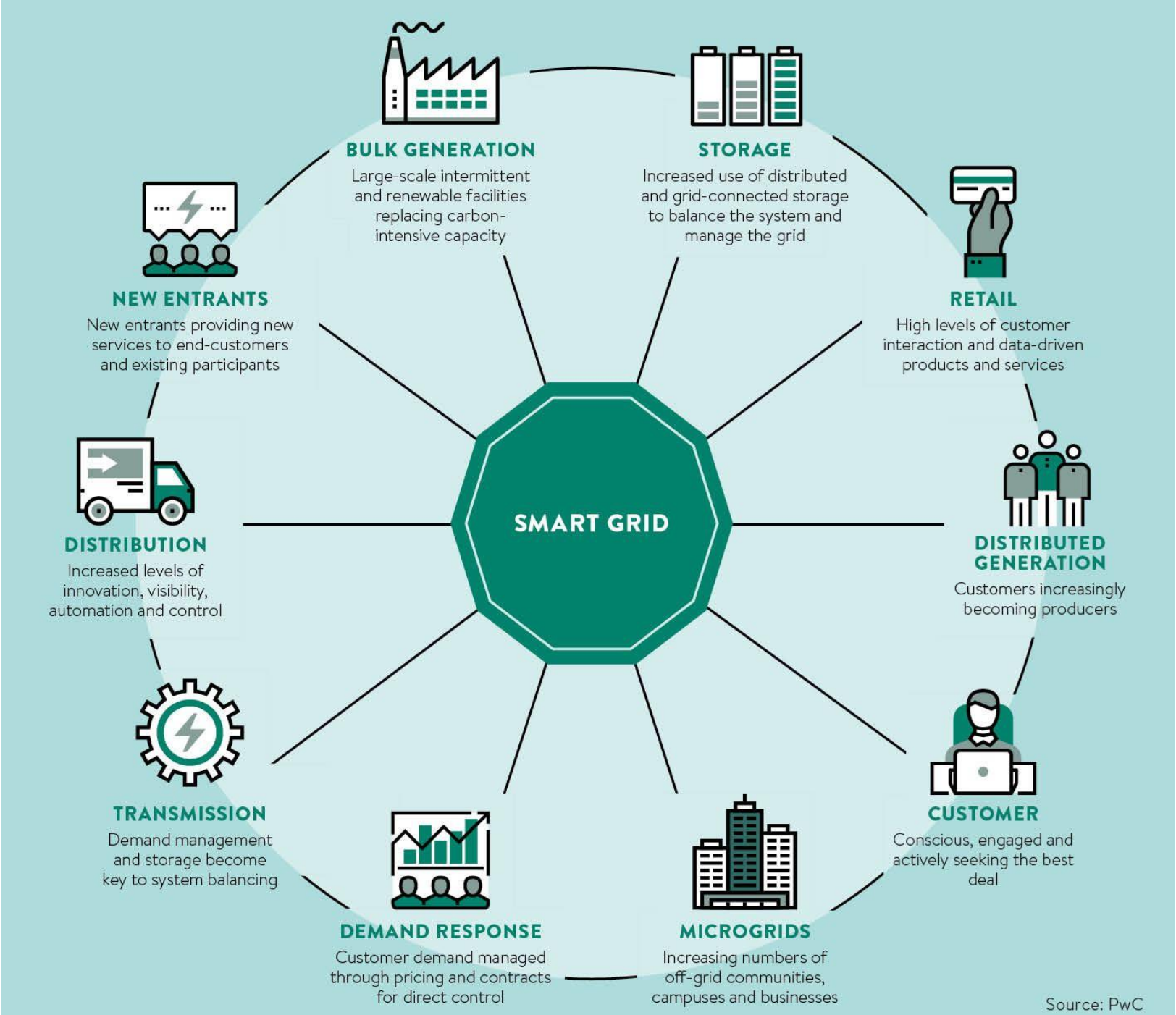
Energetika

- Kde v této oblasti se aktuálně IT využívá?
- Jaký je zde potenciál pro další využití IT v budoucnu?



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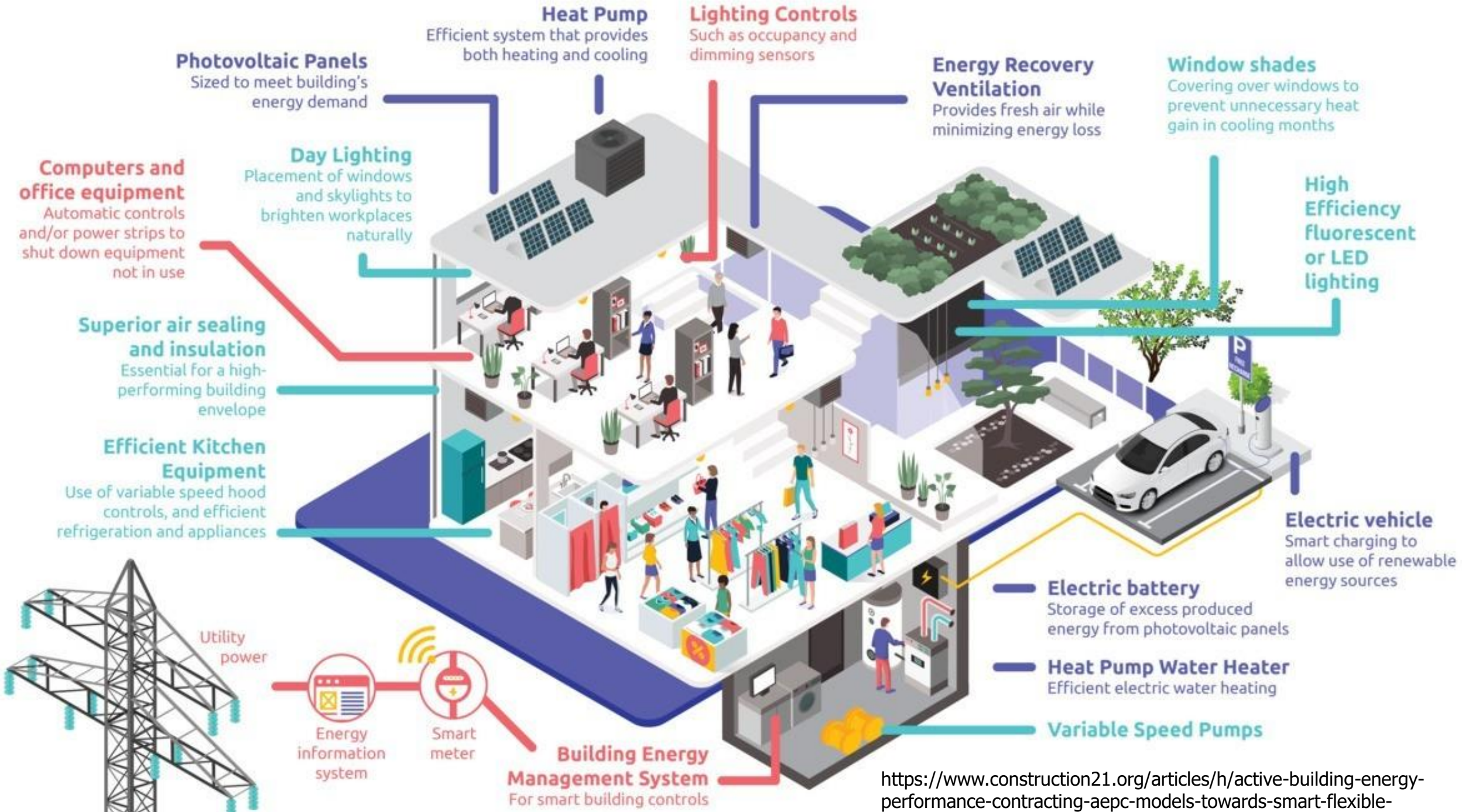
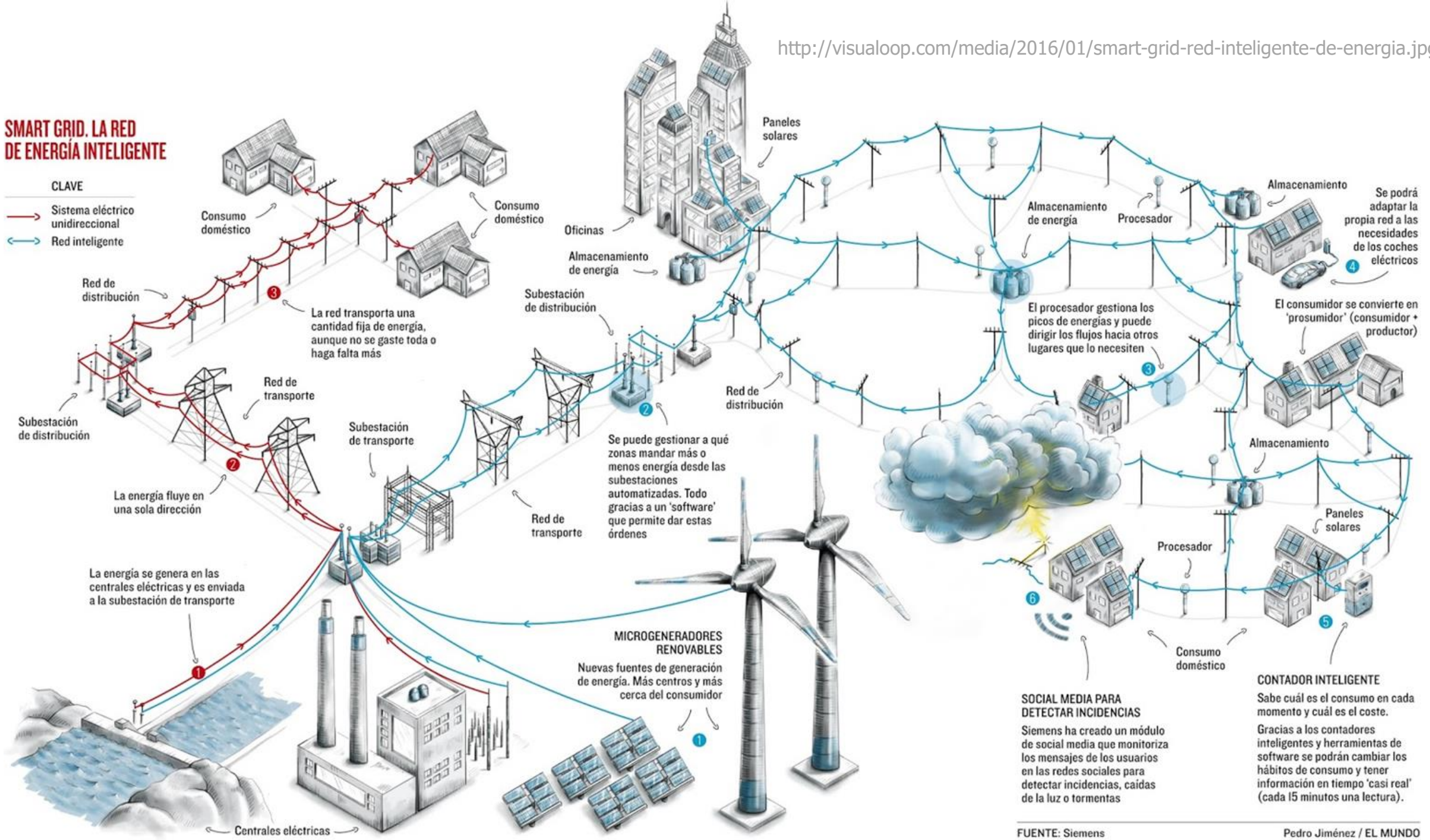


https://www.construction21.org/articles/h/active-building-energy-performance-contracting-aepc-models-towards-smart-flexible-buildings.html

http://visualoop.com/media/2016/01/smart-grid-red-inteligente-de-energia.jpg



DOPRAVA

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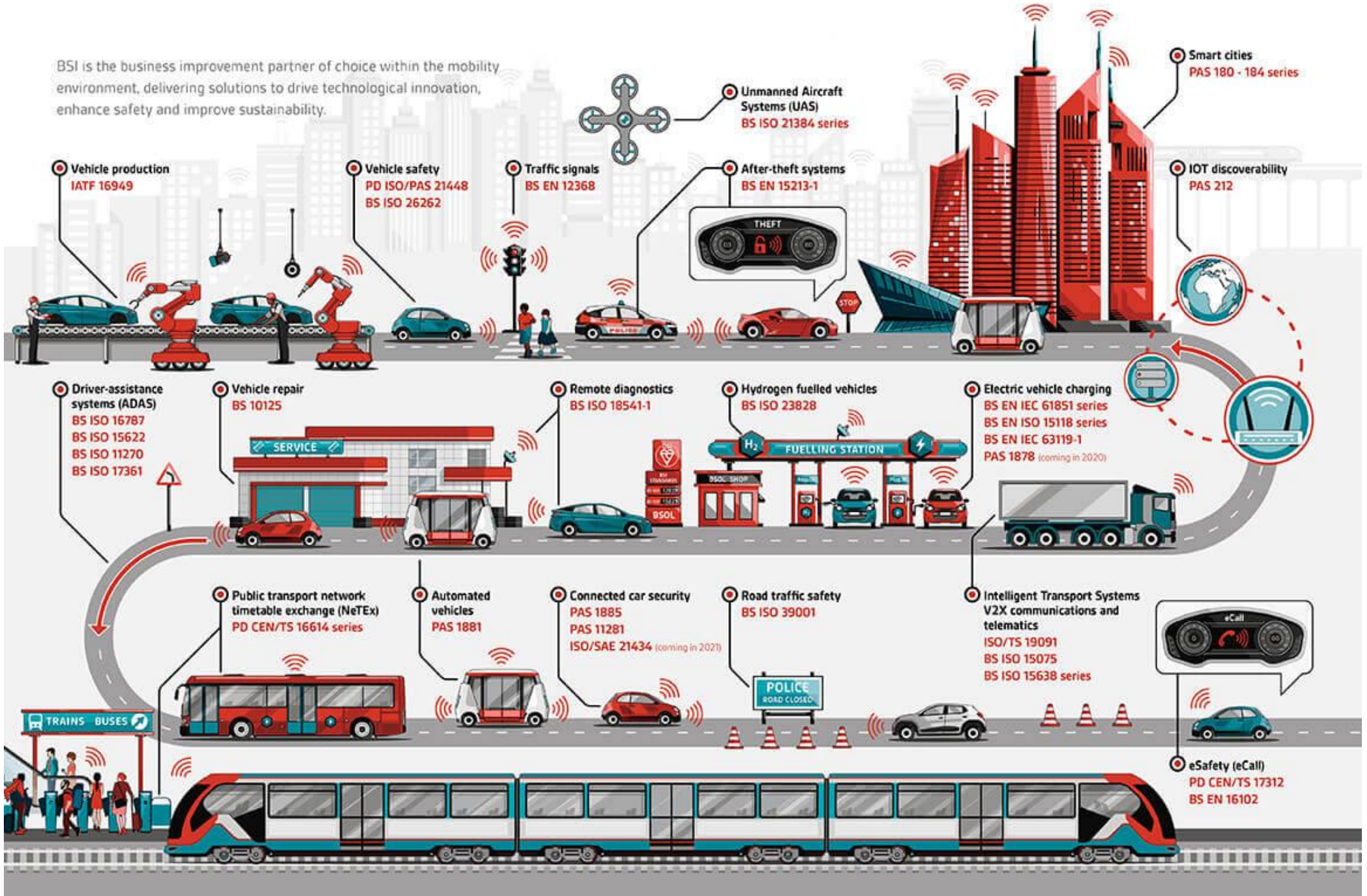
Doprava

- Kde v této oblasti se aktuálně IT využívá?
- Jaký je zde potenciál pro další využití IT v budoucnu?

http://www.3esolutions.net/


BSI is the business improvement partner of choice within the mobility environment, delivering solutions to drive technological innovation, enhance safety and improve sustainability.
Unmanned Aircraft Systems (UAS)
BS ISO 21384 series
Smart cities
PAS 180 - 184 series
Vehicle production
IATF 16949
Vehicle safety
PD ISO/PAS 21448
BS ISO 26262
Traffic signals
BS EN 12368
After-theft systems
BS EN 15213-1
IOT discoverability
PAS 212
THEFT
Driver-assistance systems (ADAS)
BS ISO 16787
BS ISO 15622
BS ISO 11270
BS ISO 17361
Vehicle repair
BS 10125
Remote diagnostics
BS ISO 18541-1
Hydrogen fuelled vehicles
BS ISO 23828
Electric vehicle charging
BS EN IEC 61851 series
BS EN ISO 15118 series
BS EN IEC 63119-1
PAS 1878 (coming in 2020)
SERVICE
FUELLING STATION
Public transport network timetable exchange (NeTEx)
PD CEN/TS 16614 series
Automated vehicles
PAS 1881
Connected car security
PAS 1885
PAS 11281
ISO/SAE 21434 (coming in 2021)
Road traffic safety
BS ISO 39001
Intelligent Transport Systems V2X communications and telematics
ISO/TS 19091
BS ISO 15075
BS ISO 15638 series
POLICE
ROAD CLOSED
TRAINS BUSES
eSafety (eCall)
PD CEN/TS 17312
BS EN 16102

CHYTRÉ BUDOVY

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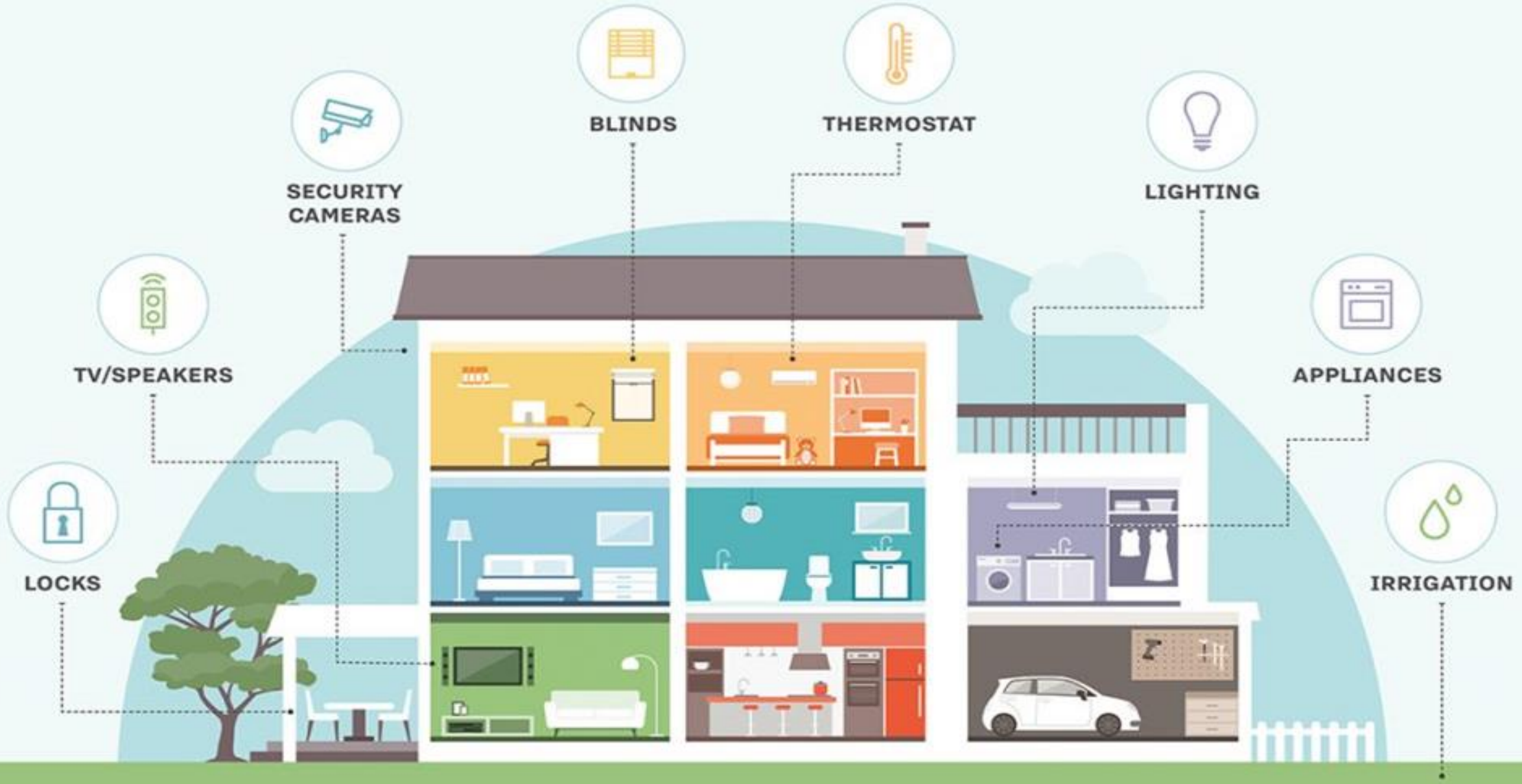
Chytré budovy

- Kde v této oblasti se aktuálně IT využívá?
- Jaký je zde potenciál pro další využití IT v budoucnu?


BLINDS
THERMOSTAT
SECURITY CAMERAS
LIGHTING
TV/SPEAKERS
APPLIANCES
LOCKS
IRRIGATION

SMART BUILDINGS INITIATIVE

How It Works

Smart Buildings is a technology and service that allows PSPC to **track, monitor** and **reduce** energy use.

Smart Buildings improves overall building **efficiency** and **reduces** greenhouse gas emissions, **lowering operational costs.**

Smart Buildings is currently installed in **103 buildings** across Canada. The technology has resulted in **energy cost savings** of **$3.1M** to date and average annual energy savings of **10% per site.**

Smart Buildings continuously gathers raw data from devices that control a building's **heating, ventilation, air conditioning, hot water, heating and lighting systems.** The information collected is then transferred to a "cloud" and the service provider **analyzes** and **provides recommendations** to solve potential operational issues.

Smart Buildings will **lower** energy costs, **reduce** greenhouse gas emissions and **identify** building operation problems so they can be **solved quickly.**

Public Services and Procurement Canada | Services publics et Approvisionnement Canada

Canada

https://www.tpsgc-pwgsc.gc.ca/biens-property/intelligents-smart/index-eng.html

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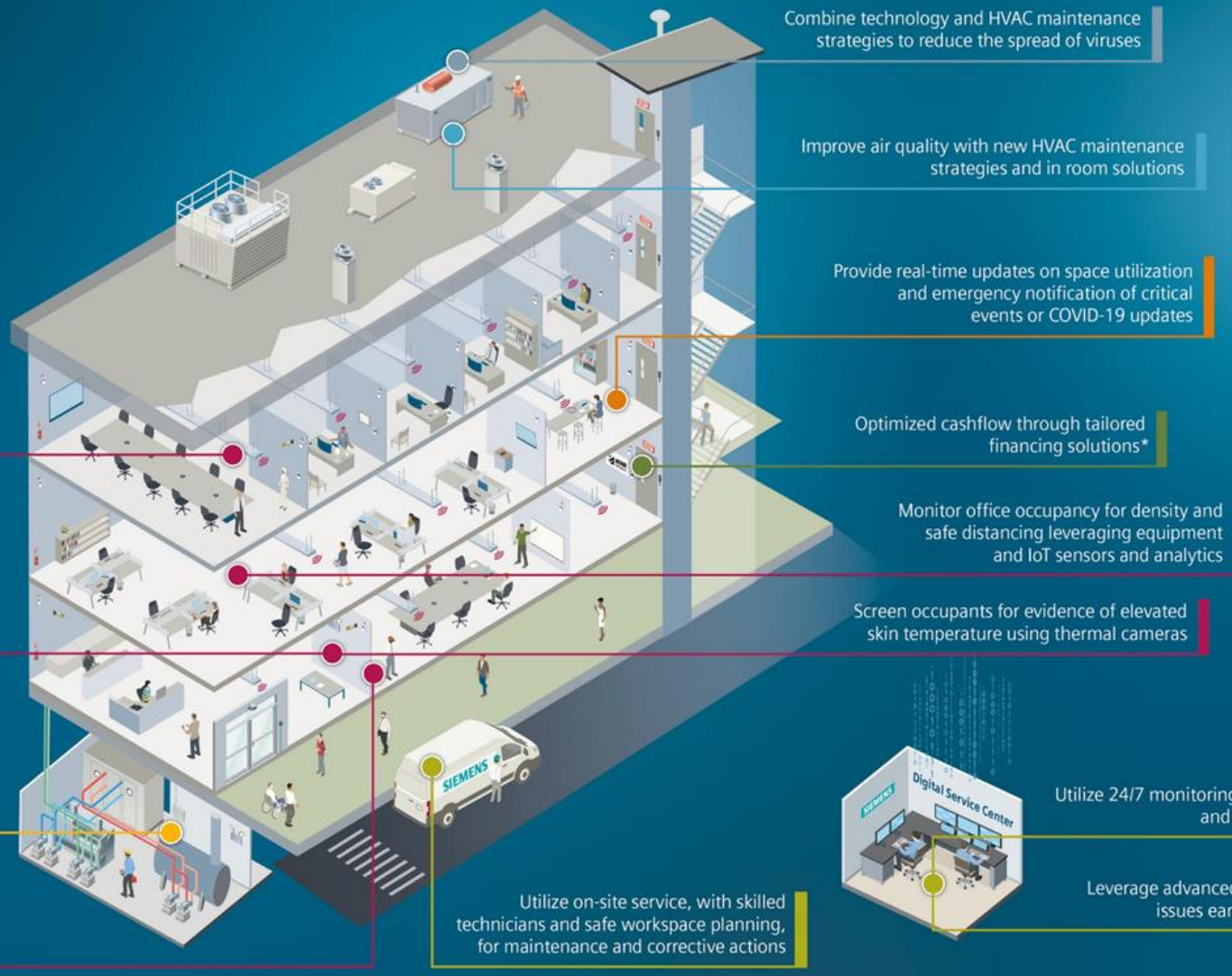
How can smart buildings support when adapting to the "new normal"?

SIEMENS
Ingenuity for life



Combine technology and HVAC maintenance strategies to reduce the spread of viruses

Improve air quality with new HVAC maintenance strategies and in room solutions

Provide real-time updates on space utilization and emergency notification of critical events or COVID-19 updates

Optimized cashflow through tailored financing solutions*

Monitor office occupancy for density and safe distancing leveraging equipment and IoT sensors and analytics

Screen occupants for evidence of elevated skin temperature using thermal cameras

Utilize 24/7 monitoring, remote response and resolution, and maintenance to help onsite teams

Leverage advanced analytics and fault detection to identify issues early and service equipment based on need

Utilize on-site service, with skilled technicians and safe workspace planning, for maintenance and corrective actions

Create a targeted sanitation and surface disinfection strategy with equipment and IoT sensors

Control occupancy in buildings by counting people coming in and out of a building leveraging video analytics or access control readers

Manage energy performance by off-setting new HVAC guidelines with energy efficiency strategies and IoT technology

Contact tracing for individuals who tested positive

*in accordance with local legislation

- Reduce the spread of airborne and surface contaminants
- Improve air quality
- Manage energy performance
- Enable social distancing
- Provide real-time updates
- Sustain healthy & safe environments
- Financing business models

siemens.com/smart-buildings

https://new.siemens.com/bg/en/products/buildings/smart-buildings.html

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CHYTRÁ MĚSTA

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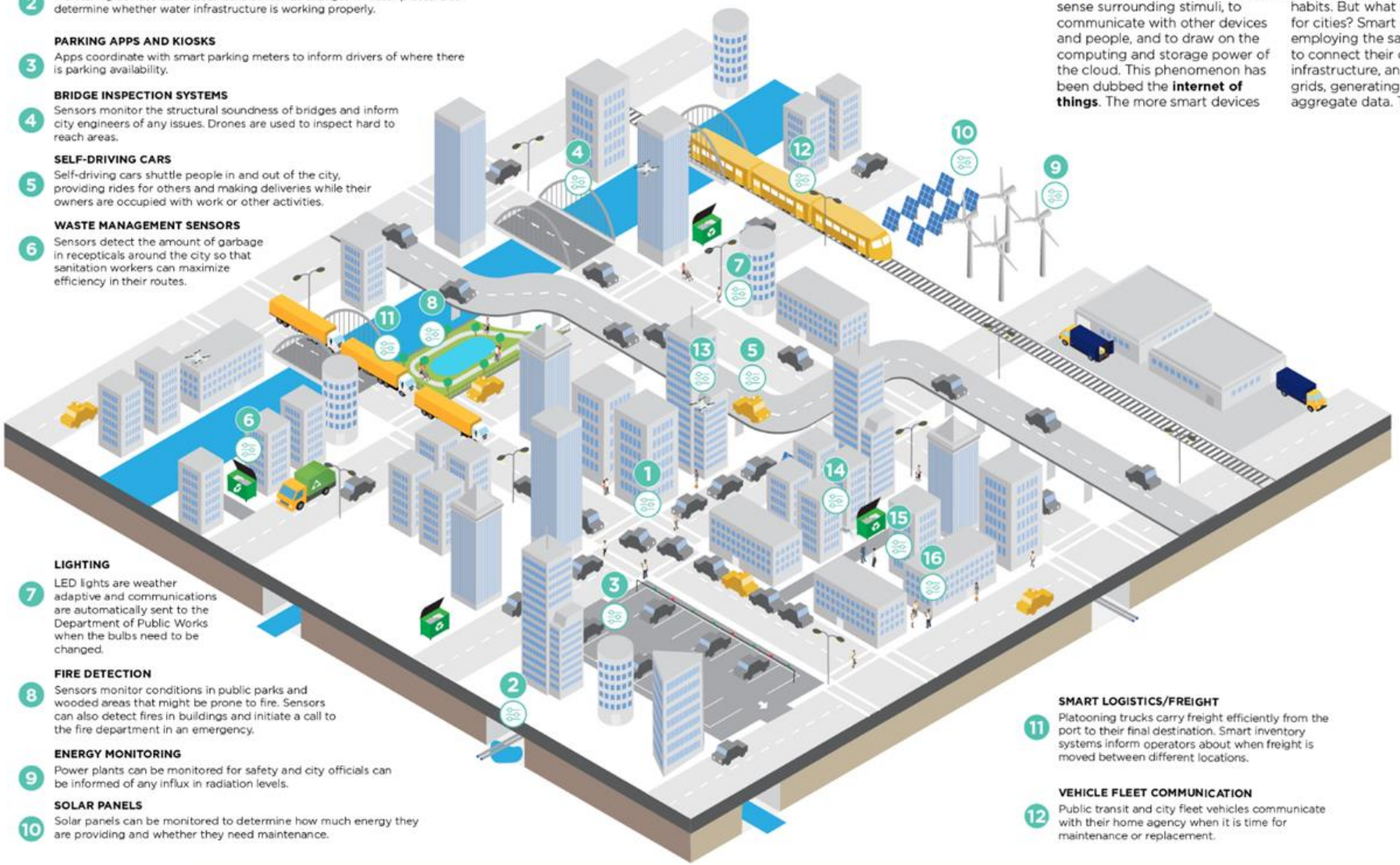
Chytrá města

- Kde v této oblasti se aktuálně IT využívá?
- Jaký je zde potenciál pro další využití IT v budoucnu?

https://www.emunicipality.com

INTERNET OF THINGS IN CONNECTED CITIES

Every consumer product and piece of infrastructure increasingly has the ability to sense surrounding stimuli, to communicate with other devices and people, and to draw on the computing and storage power of the cloud. This phenomenon has been dubbed the **internet of things**. The more smart devices and sharing platforms there are, the more data is generated about consumer's preferences and habits. But what does this mean for cities? Smart cities are employing the same technology to connect their disparate utility, infrastructure, and public service grids, generating real-time aggregate data. This, in turn, can help cities manage their programs and services more effectively and gauge their impact immediately. The city of the future is an interconnected one, where devices communicate with one another in a constant stream of data that provides real-time information to the public and to the municipality.



1. **TRANSPORTATION CONGESTION SENSORS**
Smart transportation systems use sensors to detect congestion and bottlenecks in traffic patterns. They also rely on cameras to enforce speed and traffic infractions. In doing so, these tools gather real time information that can be used by city DOTs to make mobility networks safer and more efficient.

2. **WATER AND WASTEWATER MONITORING**
Monitoring devices can detect leaks as well as changes in water pressure to determine whether water infrastructure is working properly.

3. **PARKING APPS AND KIOSKS**
Apps coordinate with smart parking meters to inform drivers of where there is parking availability.

4. **BRIDGE INSPECTION SYSTEMS**
Sensors monitor the structural soundness of bridges and inform city engineers of any issues. Drones are used to inspect hard to reach areas.

5. **SELF-DRIVING CARS**
Self-driving cars shuttle people in and out of the city, providing rides for others and making deliveries while their owners are occupied with work or other activities.

6. **WASTE MANAGEMENT SENSORS**
Sensors detect the amount of garbage in recepticals around the city so that sanitation workers can maximize efficiency in their routes.

7. **LIGHTING**
LED lights are weather adaptive and communications are automatically sent to the Department of Public Works when the bulbs need to be changed.

8. **FIRE DETECTION**
Sensors monitor conditions in public parks and wooded areas that might be prone to fire. Sensors can also detect fires in buildings and initiate a call to the fire department in an emergency.

9. **ENERGY MONITORING**
Power plants can be monitored for safety and city officials can be informed of any influx in radiation levels.

10. **SOLAR PANELS**
Solar panels can be monitored to determine how much energy they are providing and whether they need maintenance.

11. **SMART LOGISTICS/FREIGHT**
Platooning trucks carry freight efficiently from the port to their final destination. Smart inventory systems inform operators about when freight is moved between different locations.

12. **VEHICLE FLEET COMMUNICATION**
Public transit and city fleet vehicles communicate with their home agency when it is time for maintenance or replacement.

13. **DRONES**
Drones can be used for law enforcement and firefighting, as rural ambulances, for infrastructure inspections, and for environmental monitoring. Commercial uses include precision farming, aerial photography, and in the near future, package delivery.

14. **SURVEILLANCE CAMERAS**
Cameras ensure security by monitoring activity in areas that are not frequented by public safety officers. Areas that are not open to public access can be monitored to keep unauthorized personnel out.

15. **BODY CAMERAS**
Public safety officers can wear body cameras that capture footage of interactions between themselves and city residents to ensure safety for both parties.

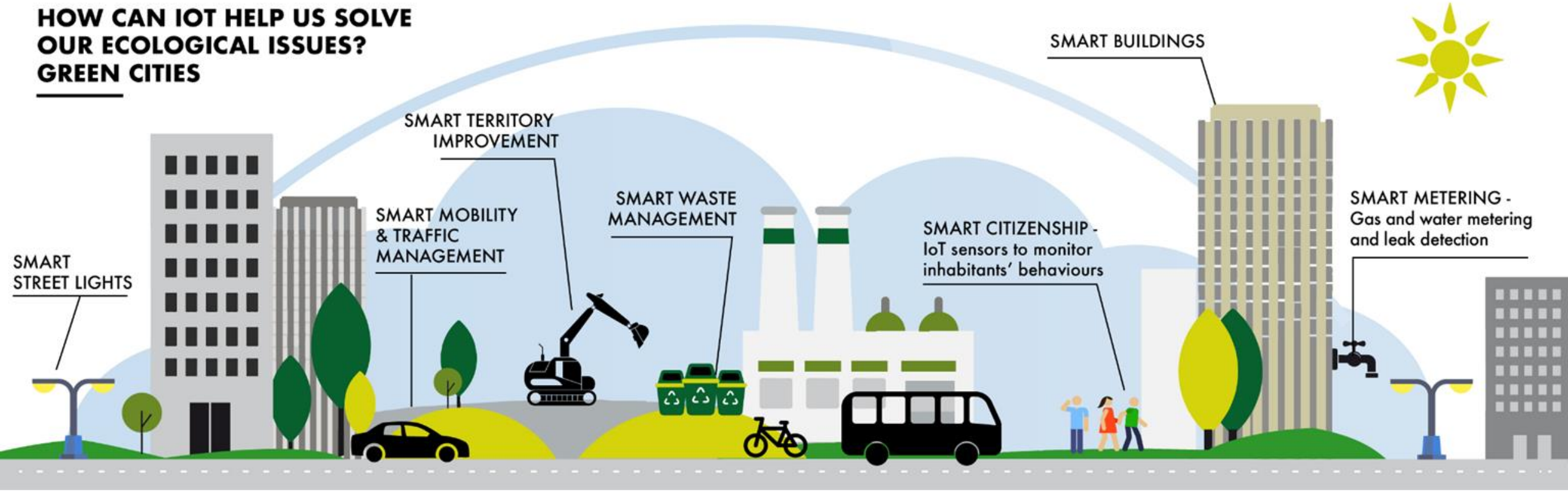
16. **WEARABLE DECTECTION**
Cities can build in smartphone and wearable detection sensors so that people can be an active part of the internet ecosystem, communicating with the city, and with each other.

17. **BROADBAND INFRASTRUCTURE**
A reliable internet ecosystem is the glue that holds the internet of things together.

ŽIVOTNÍ PROSTŘEDÍ

Životní prostředí

- Kde v této oblasti se aktuálně IT využívá?
- Jaký je zde potenciál pro další využití IT v budoucnu?

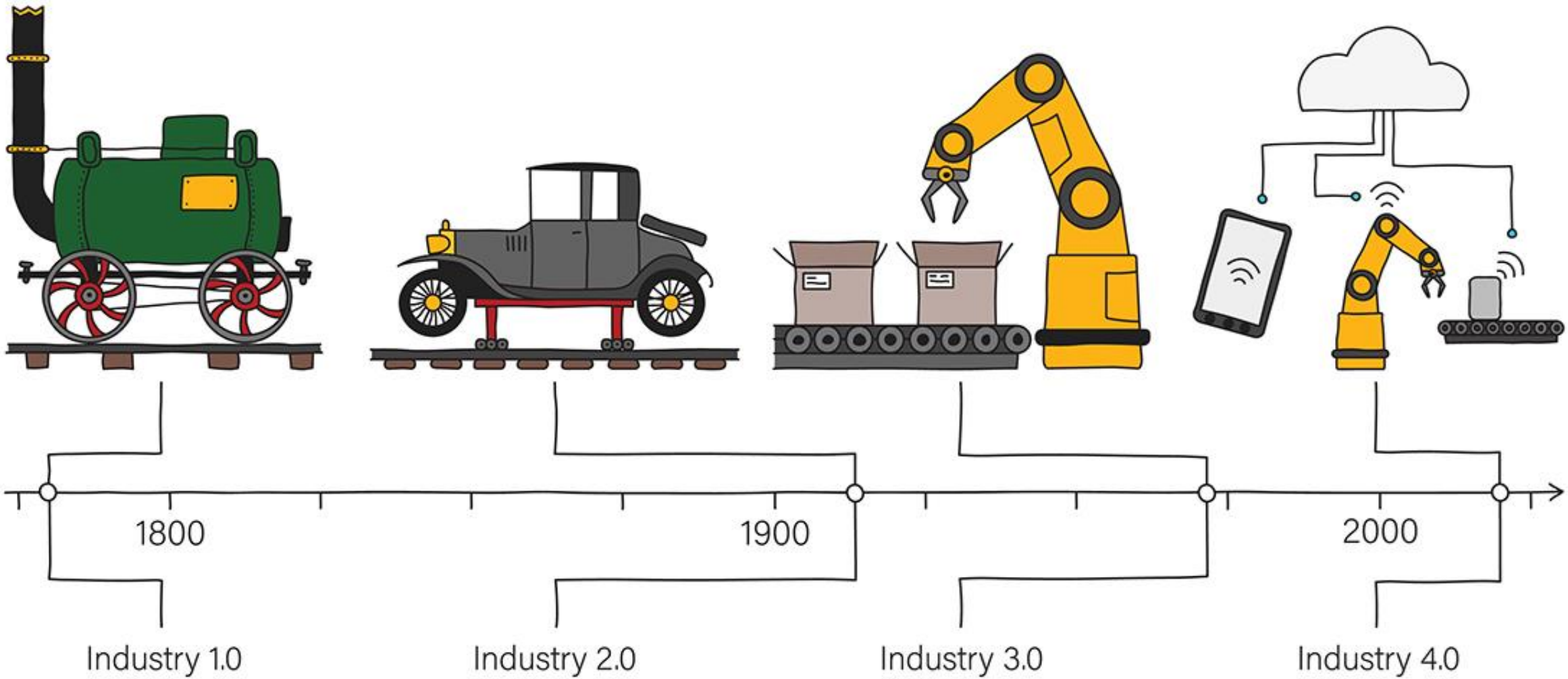


https://www.saftbatteries.com/energizing-iot/how-can-iot-help-us-solve-our-ecological-issues-episode-3-green-cities

PRŮMYSL

Průmysl

- Kde v této oblasti se aktuálně IT využívá?
- Jaký je zde potenciál pro další využití IT v budoucnu?



The Industrial Revolution begins. Mechanization of manufacturing with the introduction of steam and water power

Mass production assembly lines using electrical power

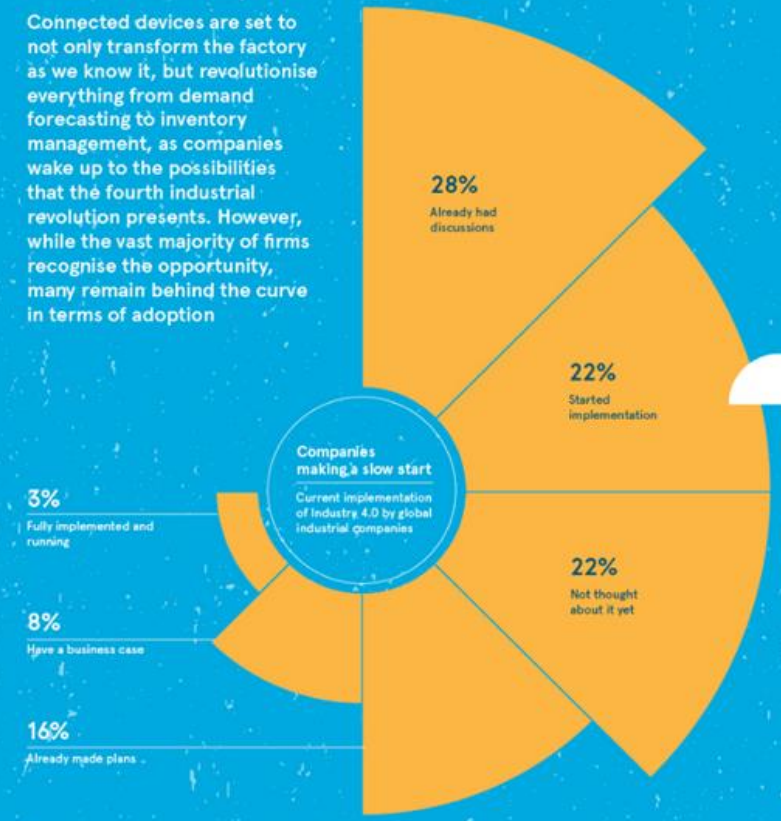
Automated production using electronics, programmable logic controllers (PLC), IT systems and robotics

The 'Smart Factory'. Autonomous decision making of cyber physical systems using machine learning and Big Data analysis. Interoperability through IoT and cloud technology.

https://www.behance.net/gallery/61690915/Industry-40-Infographics

INDUSTRY 4.0

Connected devices are set to not only transform the factory as we know it, but revolutionise everything from demand forecasting to inventory management, as companies wake up to the possibilities that the fourth industrial revolution presents. However, while the vast majority of firms recognise the opportunity, many remain behind the curve in terms of adoption



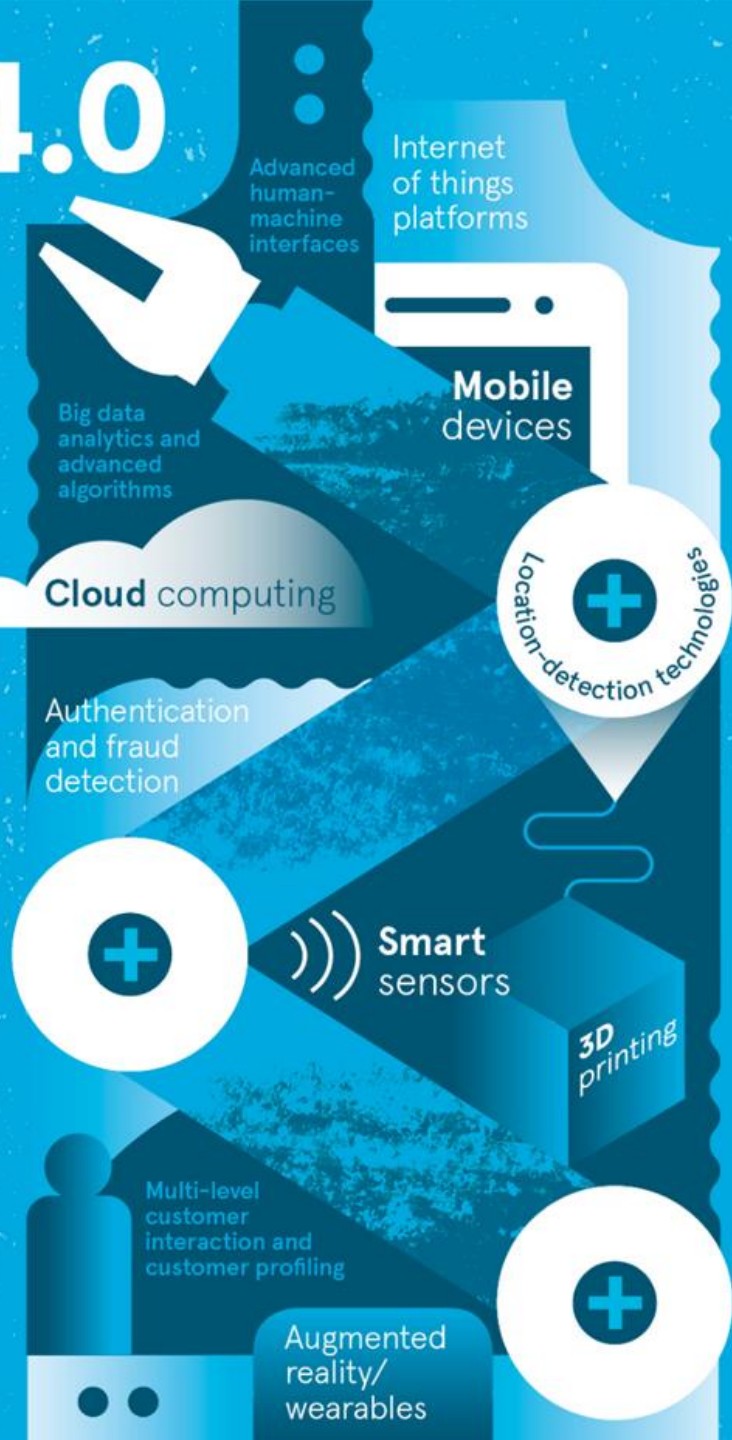
*Percentages do not equal 100 due to rounding
Stanton Chase 2017

88% of global industrial companies agreed that the industrial internet of things (IIoT) is critical to their future success

66% said IIoT will result in new revenue streams and business models for their company

49% believe IIoT will enhance the customer experience

Industry of Things World 2017

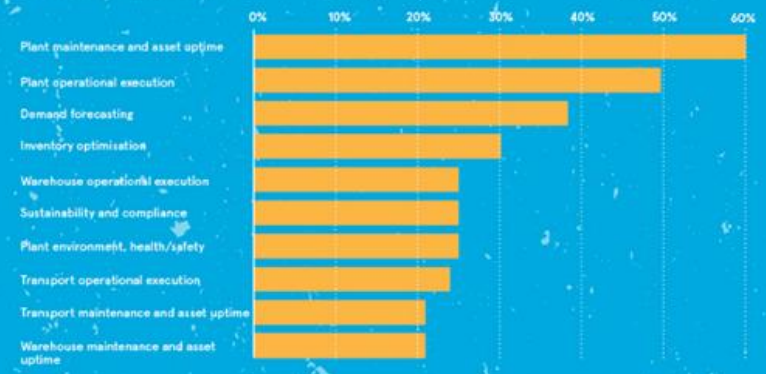


Machine tools and product development take the lion's share of budget

Where manufacturers are allocating capital investment in technology
Current financial year · Next financial year
The Manufacturer/Hennik Research 2017

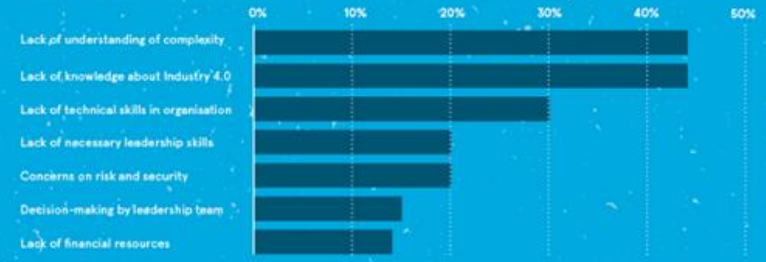
Maintenance and output expected to improve

Percentage of industrial firms that selected the following areas expected to improve through IIoT...
Industry of Things World 2017



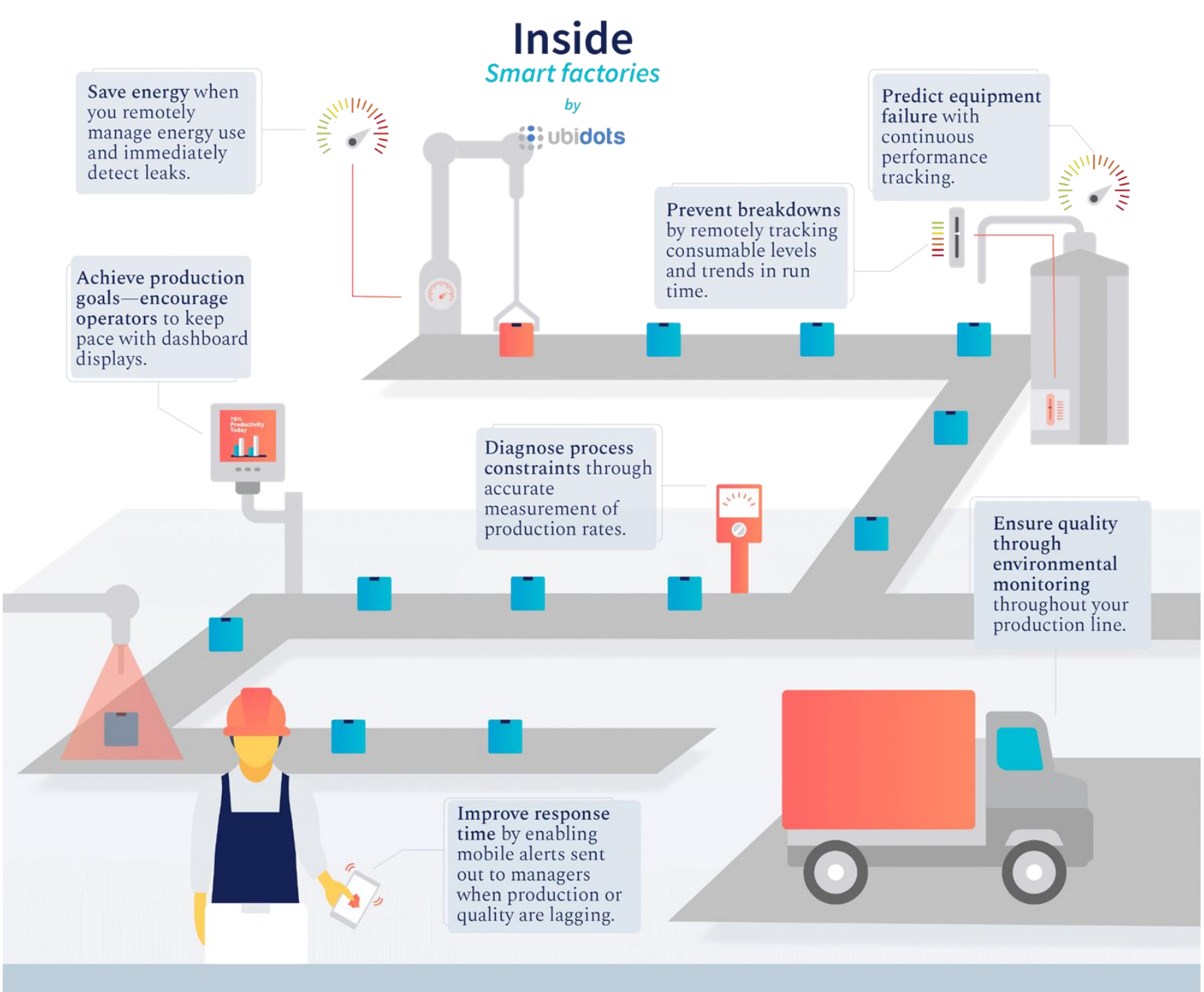
Knowledge gap holding back implementation

Percentage of global industrial executives who selected the following challenges to implementation of Industry 4.0...
Stanton Chase 2017



RACONTEUR

https://www.raconteur.net/wp-content/uploads/2018/03/I4.0_dash_2320px.jpg



https://ubidots.com/manufacturing/

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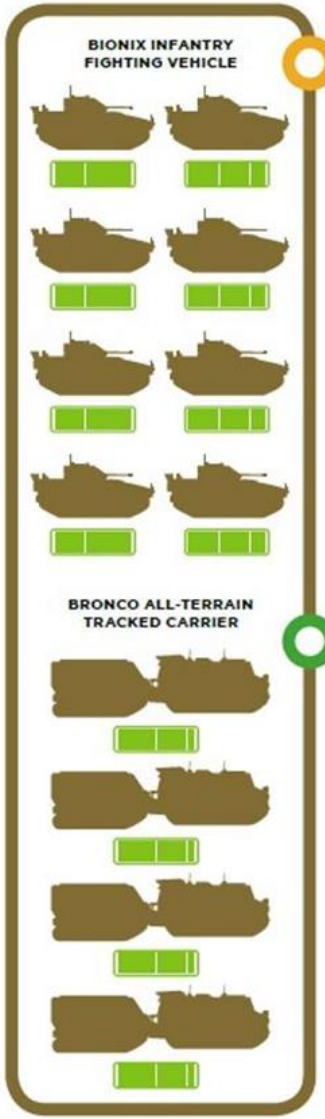
OBRANA

Obrana

- Kde v této oblasti se aktuálně IT využívá?
- Jaký je zde potenciál pro další využití IT v budoucnu?

MORE EFFICIENT MAINTENANCE & MANAGEMENT OF THE ARMY'S TRACKED VEHICLES

The Singapore Army is exploiting data science and forward deploying selected depot-level maintenance capabilities into military camps to strengthen the maintenance support for its equipment fleet and to better meet operational and training requirements.



Health of fleet is tracked digitally

Telemetry & Analytics System

Developed in-house, the system automates the monitoring of the tracked fleet's health, and uses data analytics to enable better fleet utilisation and condition-based maintenance. It will be progressively rolled out for platforms such as the BRONCO All-Terrain Tracked Carrier and BIONIX Infantry Fighting Vehicle from end-2018 onwards.

DATA LOGGER

A plug-and-play module is attached to individual vehicles to collect health and utilisation data.

DATA ANALYTICS ENGINE

With the data collected, the Data Analytics Engine uses a software algorithm to analyse the vehicles' performance and identify anomalies to detect potential component failures and trigger maintenance pre-emptively.

DATA VISUALISATION AND APPLICATION DASHBOARD

All the information is presented in a dashboard for easy visualisation, processing and decision-making.

Marked for repairs

Integrated Forward Maintenance Hub

The Army is collaborating with ST Engineering Land Systems (ST Engineering) to enhance maintenance support for the centralised tracked fleet through the Integrated Forward Maintenance Hub (iFMH). Launched in March 2018, the iFMH at Sungei Gedong Camp (iFMH@SGC) has led to 20% savings in manpower cost for on-site depot-level maintenance tasks and reduced the duration rquired for repairs by 50%.

DEPOT-LEVEL MAINTENANCE WORKSHOP

With ST Engineering technicians forward deployed at iFMH@SGC, the turnaround time for depot-level repairs has been reduced by 50%. There are also savings on labour rate and transportation compared with the previous process of transporting the vehicles to the ST Engineering repair depot.

SPARES SUPPORT WAREHOUSE

Repair turnaround time is further reduced with the forward deployment of spares at iFMH@SGC. Selected spares are also posted and collected at the convenience of technicians using the Independent Spares Retrieval and Exchange System (iSPARES).

TECHNICAL SUPPORT OFFICE

ST Engineering service managers at the Technical Support Office prioritise and synergise their maintenance efforts in tandem with the Army's requirements. The time saved on admin processes can be used to process quotations and warranty claims to shorten the downtime of the tracked vehicles.

Repaired vehicle re-joins fleet

https://www.mindef.gov.sg/web/wcm/connect/mindef/0440 5629-e1ee-43e9-86d2-cb30b0055a5e/army-infographic.jpg?MOD=AJPERES

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E-GOVERNMENT

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E-Government

- Kde v této oblasti se aktuálně IT využívá?
- Jaký je zde Kpotenciál pro další využití IT v budoucnu?

PUBLIC SERVICES ONLINE

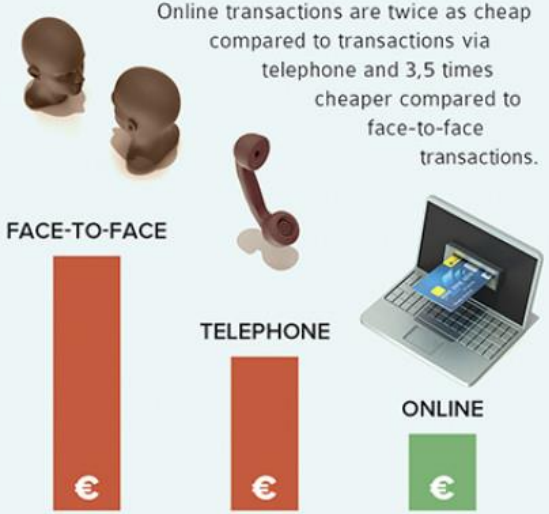
'Digital by default, or by detour'
Towards a new generation of eGovernment services

WHY?

Towards cheaper, better and faster services through eGovernment

ONLINE TRANSACTIONS ARE CHEAPER

Online transactions are twice as cheap compared to transactions via telephone and 3,5 times cheaper compared to face-to-face transactions.



BETTER SERVICES ARE DESIGNED AROUND USER NEEDS

- Available online, both for nationals and foreigners
- Easily usable
- Time saving & flexible
- Personalised
- Interaction through social media

HOW?

Addressing collaboration, commonality and transparency

Transformation is required to achieve a new 'outside-in' model and vital to achieve a new generation of eGovernment services. It requires collaboration across government domains (joined up) to establish common building blocks that all public service providers can use consistently. Transparency is unmistakably part of that transformation: to demonstrate how public administrations operate and function as well as to empower citizens to access and control their own data.

USING TECHNOLOGY TO REALIZE A NEW, FASTER GENERATION OF E-SERVICES

- Key enablers enable eGovernment
- 'once-only' registration and use of authentic sources to deliver services electronically or even automatically
- Using data consistently and securely across public agencies
- Big data analytics

WHAT?

The eGovernment Benchmark offers comparison and insight on 3 inter-related areas

1

DEMAND-SIDE CITIZEN SURVEY

The survey reached 28,000 internet-using citizens across 32 EU countries, exploring 27 questions, and 19 most common citizen services. This provides a picture with 95% confidence (relevancy) of the views of the 600 million European citizens.

2

LIFE EVENT SERVICE PROVISION

BUSINESS START UP AND EARLY OPERATIONS | LOSING AND FINDING A JOB | STUDYING

- Data on 15 to 30 specific services per life event, in 32 countries resulting in 100.000+ data points
- New life events will be added in 2013

3

AVAILABILITY OF KEY IT ENABLERS

- eID
- eDocuments
- eSafe
- Authentic sources
- Single Sign On

https://visual.ly/community/Infographics/economy/public-service-online

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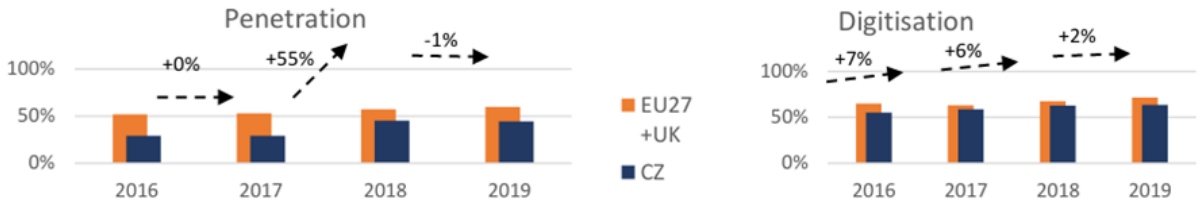
eGovernment Benchlearning performance

Performance

	Penetration	Digitisation
EU27+UK	60%	72%
CZ	44%	64%



Czech Republic is characterised by a medium-low level of Penetration and Digitisation. Therefore it is included in the Non Consolidated eGov scenario, a scenario where countries are not fully exploiting ICT opportunities. Despite a significant improvement in Penetration in 2018, and a constant growth in Digitisation, the country is still not aligned with the European levels.

Relative Indicators and Environment

	User characteristics		Government characteristics		Digital context characteristics	
	Digital Skills	ICT usage	Quality	Openness	Connectivity	Digital in the private sector
EU27 + UK	50%	58%	70%	69%	52%	44%
CZ	49%	54%	68%	66%	45%	50%

Czech Republics's relative indicators show a country with all the characteristics (User characteristics, Government characteristics and Digital context characteristics) in line with the European average.

Considerations

Penetration

Underperforming

Digitisation

Underperforming

Compared to countries with a similar environment, Czech Republic is Underperforming in both Penetration and Digitisation, with performances lower than expected. This means that countries with similar environmental characteristics have reached a better Penetration and Digitisation level. A country can improve the Penetration level by increasing the number of people that submit official forms online to administrative authorities or by automating processes and requesting fewer forms from citizens. Regarding Digitisation, its performance level can be increased by improving the level of the back-office and the front-office digitisation.

FINANCE

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Finance

- Kde v této oblasti se aktuálně IT využívá?
- Jaký je zde potenciál pro další využití IT v budoucnu?

WHAT THE STATE OF FINTECH COVERS

PAYMENTS

Payments processing, card developers, money transfer platforms, and tracking software

BANKING

Digital-first banks or companies digitizing banking services for credit and debit

DIGITAL LENDING

Companies creating new solutions for personal or commercial lending

WEALTH MANAGEMENT

Personal finance tools, investment and wealth management platforms, and analytics tools

INSURANCE

Companies selling or distributing insurance digitally or providing data analytics and software for (re)insurers

CAPITAL MARKETS

Sales and trading, analysis, and infrastructure tools for financial institutions

SMB

Companies focused on providing solutions to small- and medium-sized businesses

REAL ESTATE

Mortgage lending, transaction digitization, and financing platforms

https://www.cbinsights.com/research/report/fintech-trends-q1-2021/

How a ₿itcoin transaction works

Bob, an online merchant, decides to begin accepting bitcoins as payment. Alice, a buyer, has bitcoins and wants to purchase merchandise from Bob.

WALLETS AND ADDRESSES

Bob and Alice both have Bitcoin "wallets" on their computers.

Wallets are files that provide access to multiple Bitcoin addresses.

An address is a string of letters and numbers, such as 1HULMwZEPkjEPeCh43BeKJL1ybLCWrfDpN.

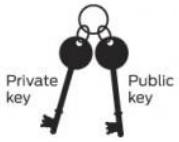
CREATING A NEW ADDRESS

Bob creates a new Bitcoin address for Alice to send her payment to.

Each address has its own balance of bitcoins.

SUBMITTING A PAYMENT

Alice tells her Bitcoin client that she'd like to transfer the purchase amount to Bob's address.



Public Key Cryptography 101
When Bob creates a new address, what he's really doing is generating a "cryptographic key pair," composed of a private key and a public key. If you sign a message with a private key (which only you know), it can be verified by using the matching public key (which is known to anyone). Bob's new Bitcoin address represents a unique public key, and the corresponding private key is stored in his wallet. The public key allows anyone to verify that a message signed with the private key is valid.

It's tempting to think of addresses as bank accounts, but they work a bit differently. Bitcoin users can create as many addresses as they wish and in fact are encouraged to create a new one for every new transaction to increase privacy. So long as no one knows which addresses are Alice's, her anonymity is protected.

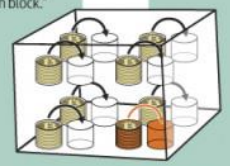
Alice's wallet holds the private key for each of her addresses. The Bitcoin client signs her transaction request with the private key of the address she's transferring bitcoins from.

Anyone on the network can now use the public key to verify that the transaction request is actually coming from the legitimate account owner.

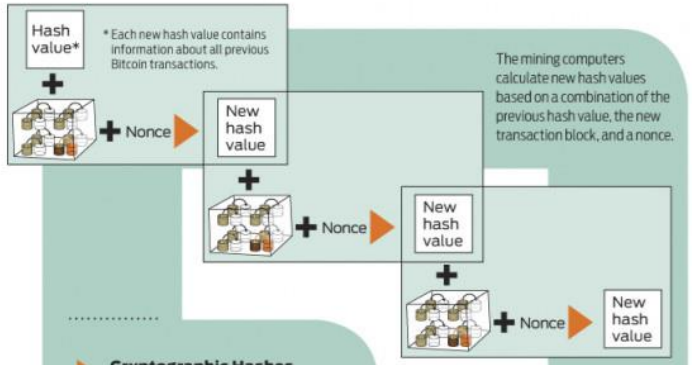
VERIFYING THE TRANSACTION

Gary, Garth, and Glenn are Bitcoin miners.

Their computers bundle the transactions of the past 10 minutes into a new "transaction block."



The miners' computers are set up to calculate cryptographic hash functions.



The mining computers calculate new hash values based on a combination of the previous hash value, the new transaction block, and a nonce.

Cryptographic Hashes
Cryptographic hash functions transform a collection of data into an alphanumeric string with a fixed length, called a hash value. Even tiny changes in the original data drastically change the resulting hash value. And it's essentially impossible to predict which initial data set will create a specific hash value.

The root of all evil	6d0a 1899 086a... (56 more characters)
The root of all evil	486c 6be4 6dde...
The root of all veil	b8db 7ee9 8392...

Nonces
To create different hash values from the same data, Bitcoin uses "nonces." A nonce is just a random number that's added to data prior to hashing. Changing the nonce results in a wildly different hash value.

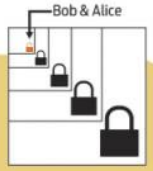
The root of all evil ???	0000 0000 0000 ...

Creating hashes is computationally trivial, but the Bitcoin system requires that the new hash value have a particular form—specifically, it must start with a certain number of zeros.

The miners have no way to predict which nonce will produce a hash value with the required number of leading zeros. So they're forced to generate many hashes with different nonces until they happen upon one that works.

Each block includes a "coinbase" transaction that pays out 50 bitcoins to the winning miner—in this case, Gary. A new address is created in Gary's wallet with a balance of newly minted bitcoins.

TRANSACTION VERIFIED



As time goes on, Alice's transfer to Bob gets buried beneath other, more recent transactions. For anyone to modify the details, he would have to redo the work that Gary did—because any changes require a completely different winning nonce—and then redo the work of all the subsequent miners. Such a feat is nearly impossible.

JOSHUA J. ROMERO, BRANDON PALACIO & KARI SSOMMER, AGR INC.

https://thumbnails-visually.netdna-ssl.com/bitcoin-infographic_5029189c9cbaf_w1500.jpg

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LESSONS ON LIFE-LONG LEARNING

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IT je budoucnost

- Všechny společnosti se stávají **technologickými** společnostmi.
- Nejlépe **placená** jsou pracovní místa v oblasti technologií.
- Miliony pracovních míst zanikají v důsledku **automatizace**.
- V technologickém průmyslu **chybí** miliony lidí.

> Education is the most powerful weapon which you can use to change the world.
>
> – Nelson Mandela

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Průzkum StackOverflow mezi vývojáři 2017

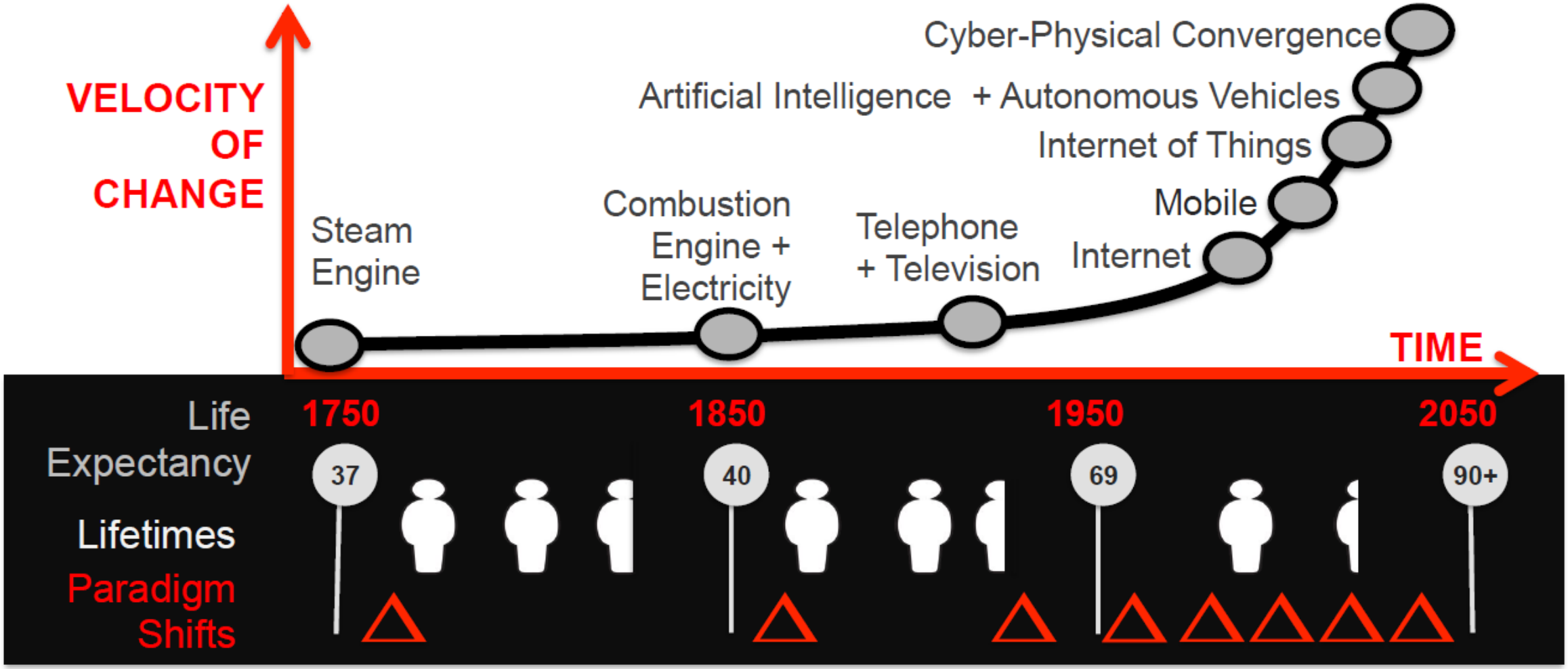
- 90 % respondentů tvrdí, že jsou alespoň částečně samouky. Mezi současnými profesionálními vývojáři,
- 55,9 % uvádí, že absolvovali online kurz, a 53,4 % uvádí, že absolvovali školení na pracovišti.

THE FORCES TOWARDS LIFE-LONG LEARNING

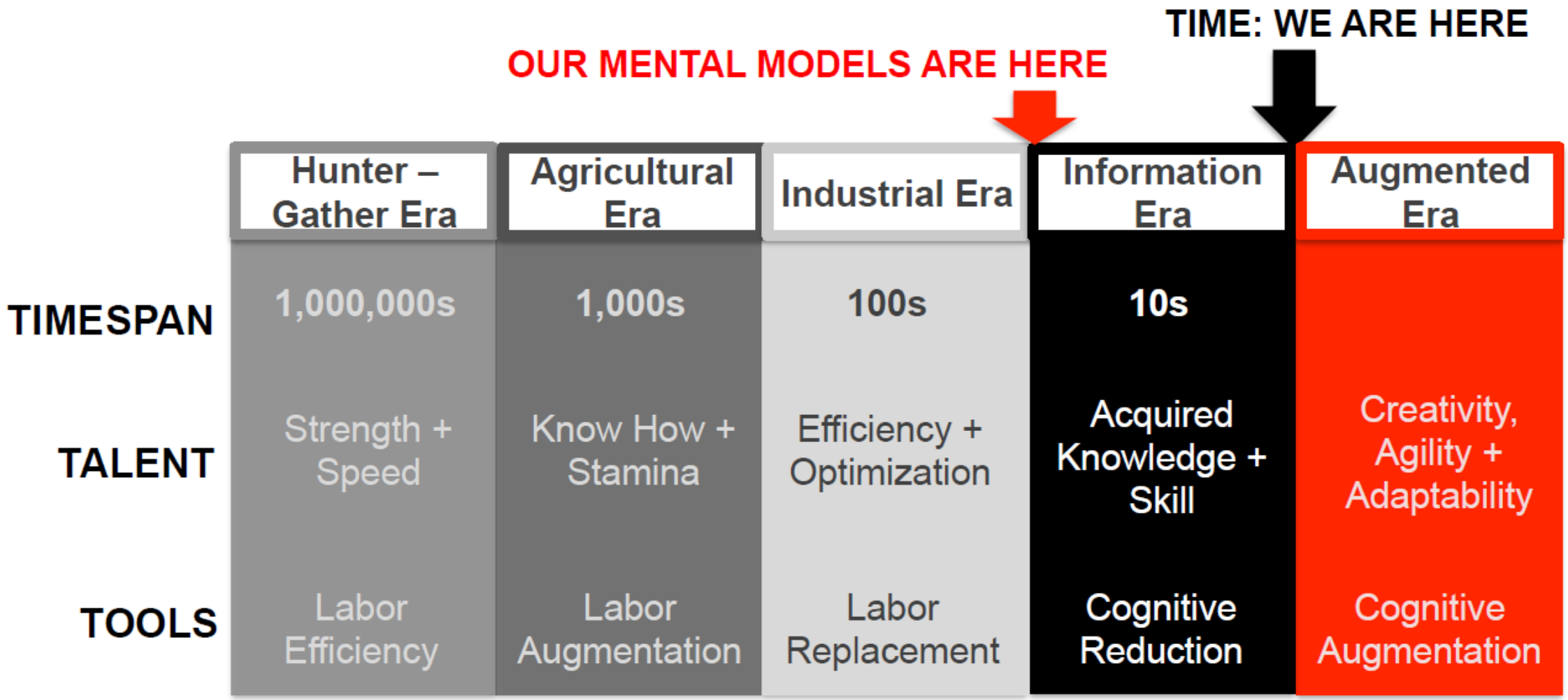
PRESSURE#1

The world is accelerating.

Context: Change Requires Adaptation



Context: Talent Shifts in The Next Era



Concept of Augmented Era © Jeff Kowalski, CTO Autodesk

PRESSURE#2

Workforce from different eras is mixing at the workplace.

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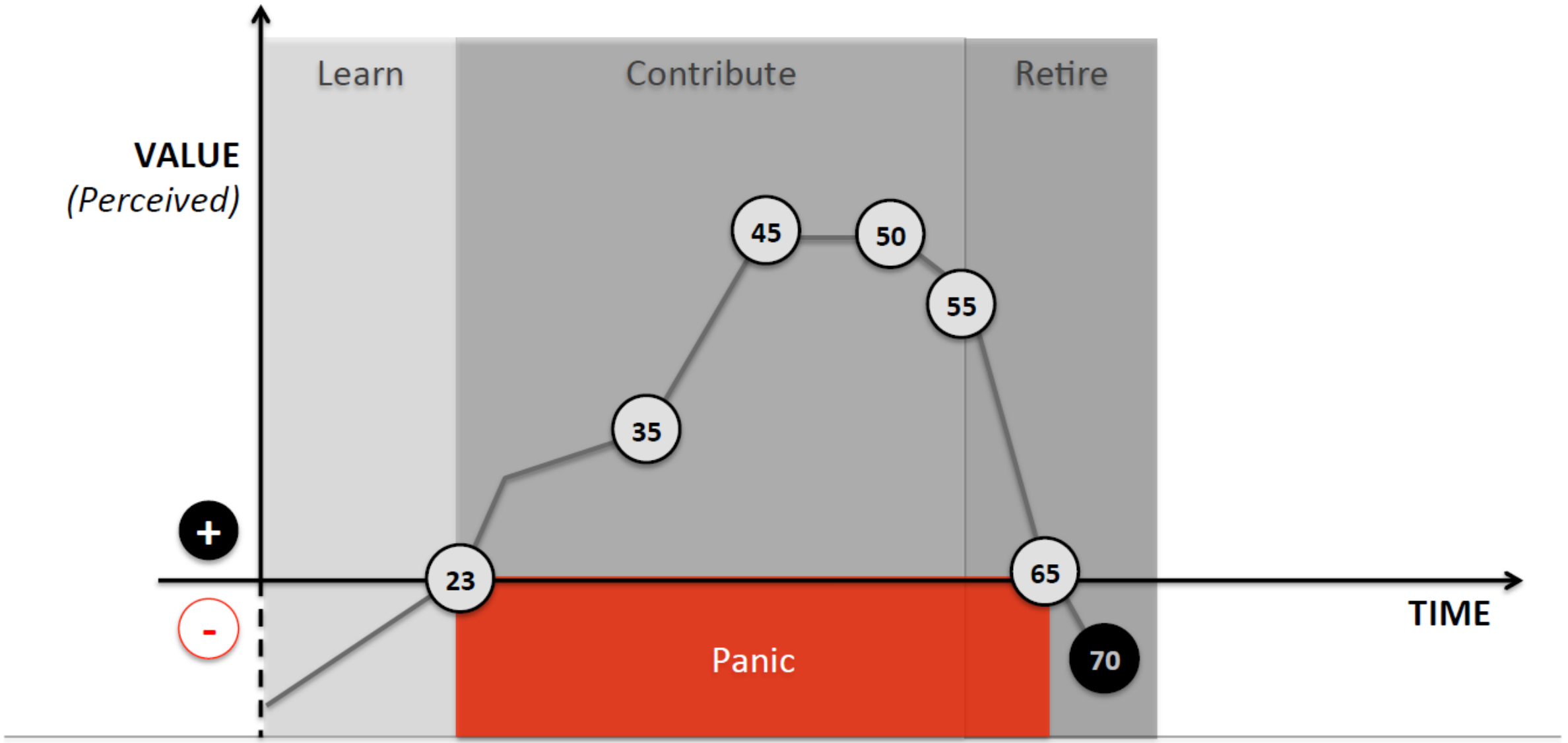
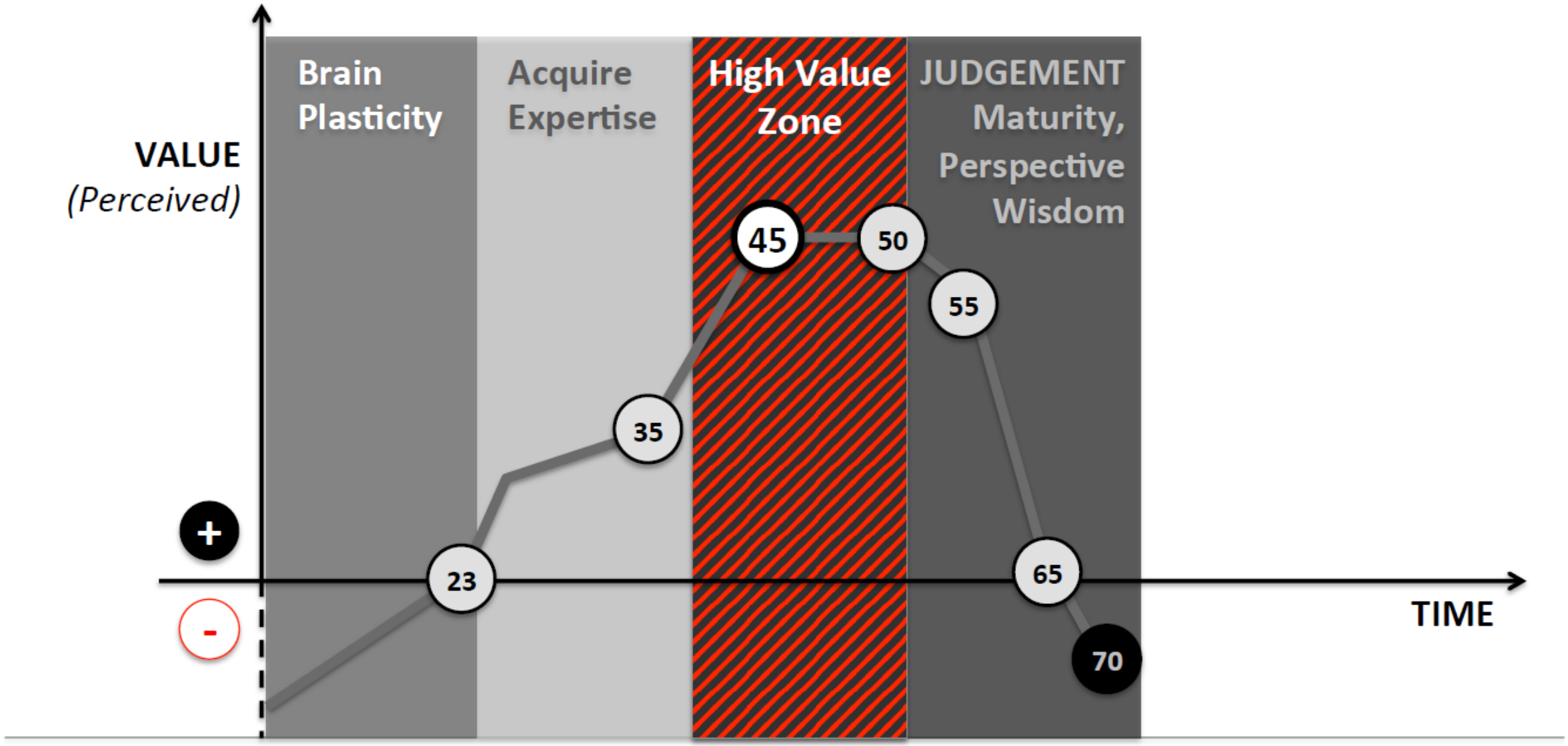
CONTEXT: The Career Arc (The Old Model)



CRA: Summit On Technology and Jobs

@heathermcgowan

CONTEXT: The Career Arc (The Old Model)– Perceived Value



CRA: Summit On Technology and Jobs

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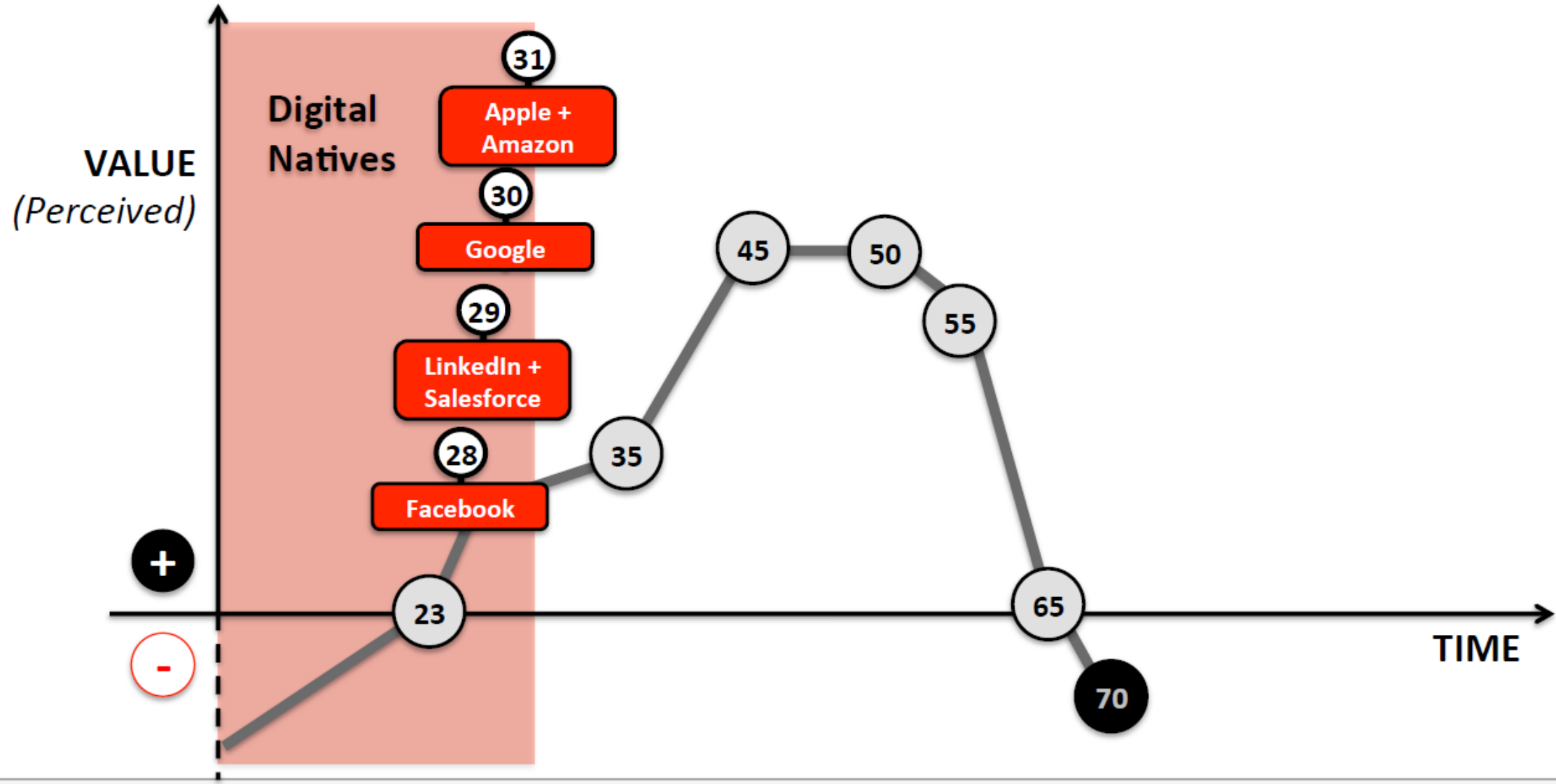
CONTEXT: New Economy + Digital Natives



CRA: Summit On Technology and Jobs

@heathermcgowan

PRESSURE#3

The required skillset is changing.

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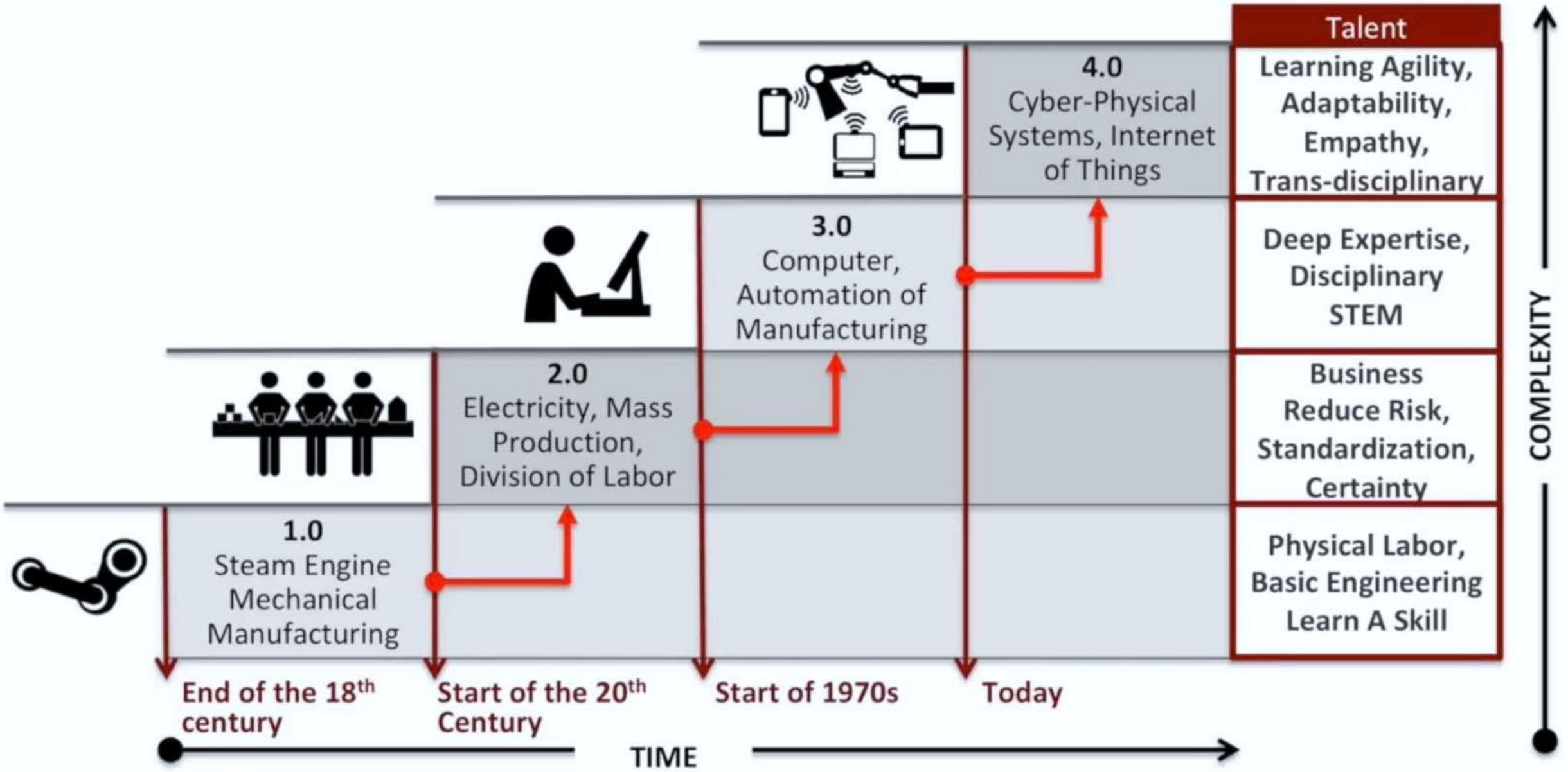
CONTEXT: Next Industrial Revolution (World Economic Forum 4th)



Emerging Solutions: **Agile Learning Mindset**

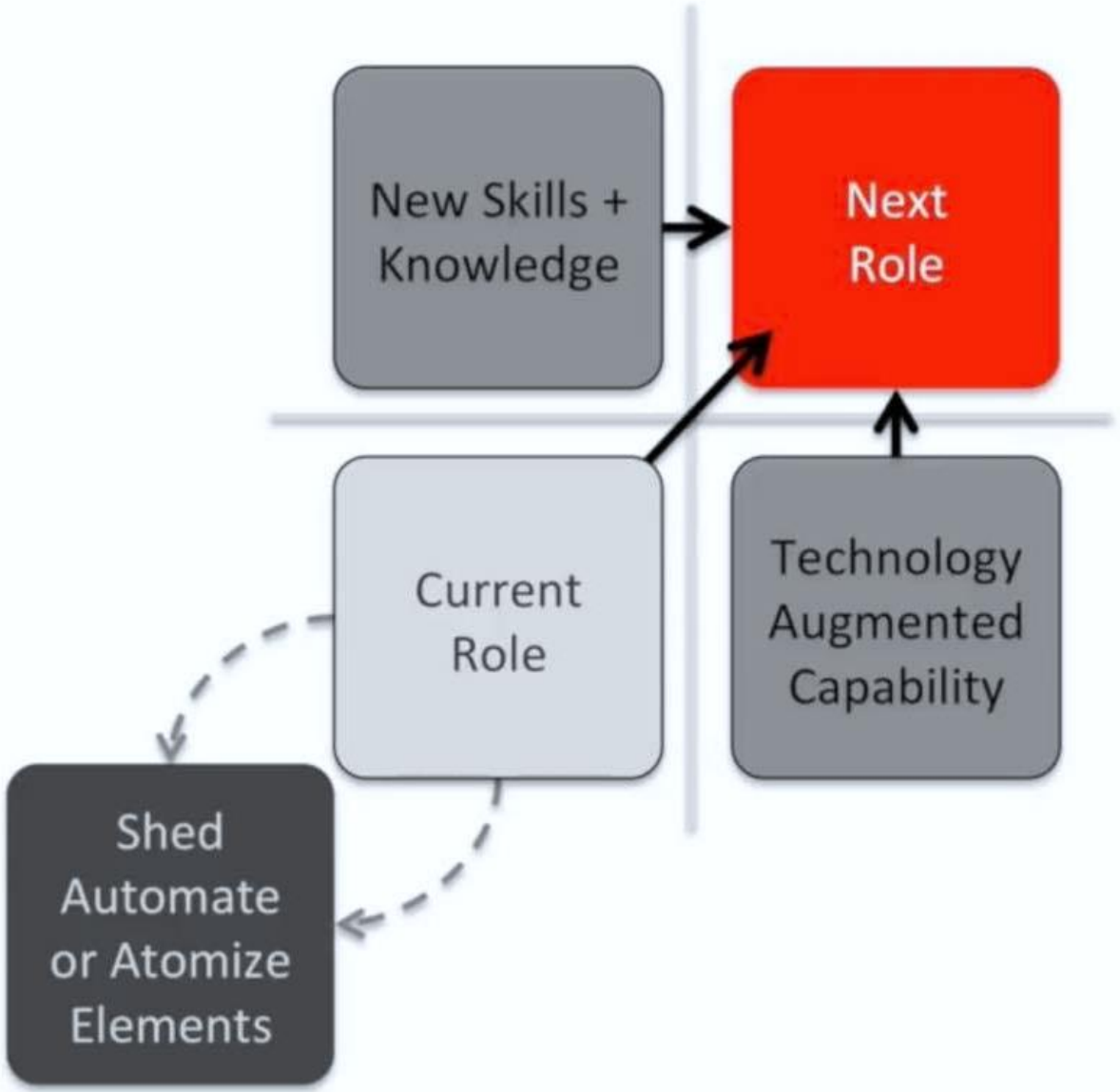
Learning Agility
(Learning + Unlearning, Learning Styles)

Uniquely Human Skills
(Empathy, Social Intelligence, Creativity, etc.)

Adaptability
(Navigate Ambiguity, Unstructured Problems)

Agency
(Motivation, Self Awareness, Personality Types)

THINK DIFFERENTLY: Career Map: Assess + Evolve (Learn + Adapt) Continuously)



Current Role and Self Definition

\- Tasks Automated or Atomization

\+ New Skills + Knowledge (Business Models Evolution)

\+ Extended Human Potential (Augmentation)

= Next Role

REPEAT PROCESS

PRESSURE#4

Career agility becomes a new norm.

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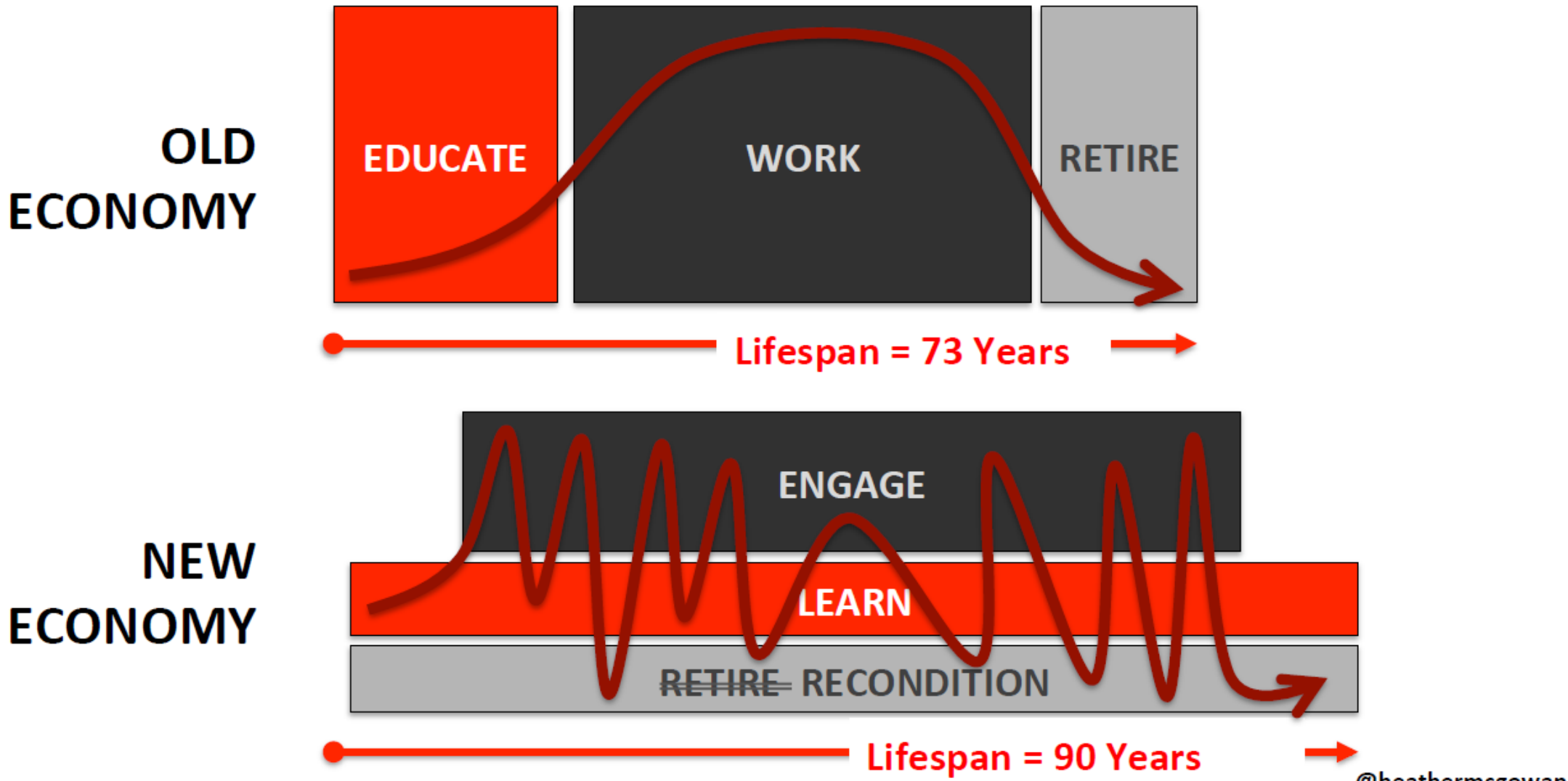
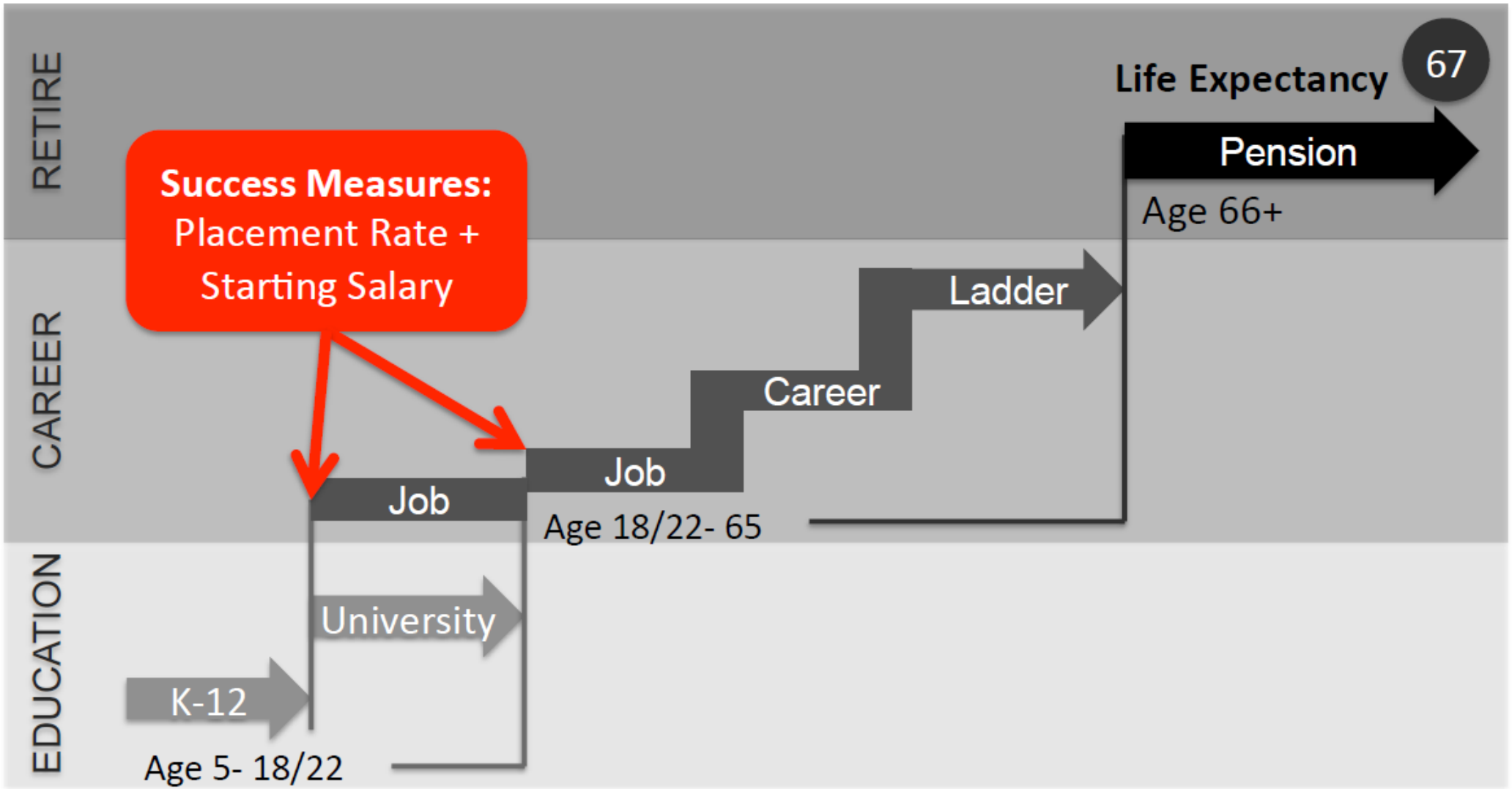
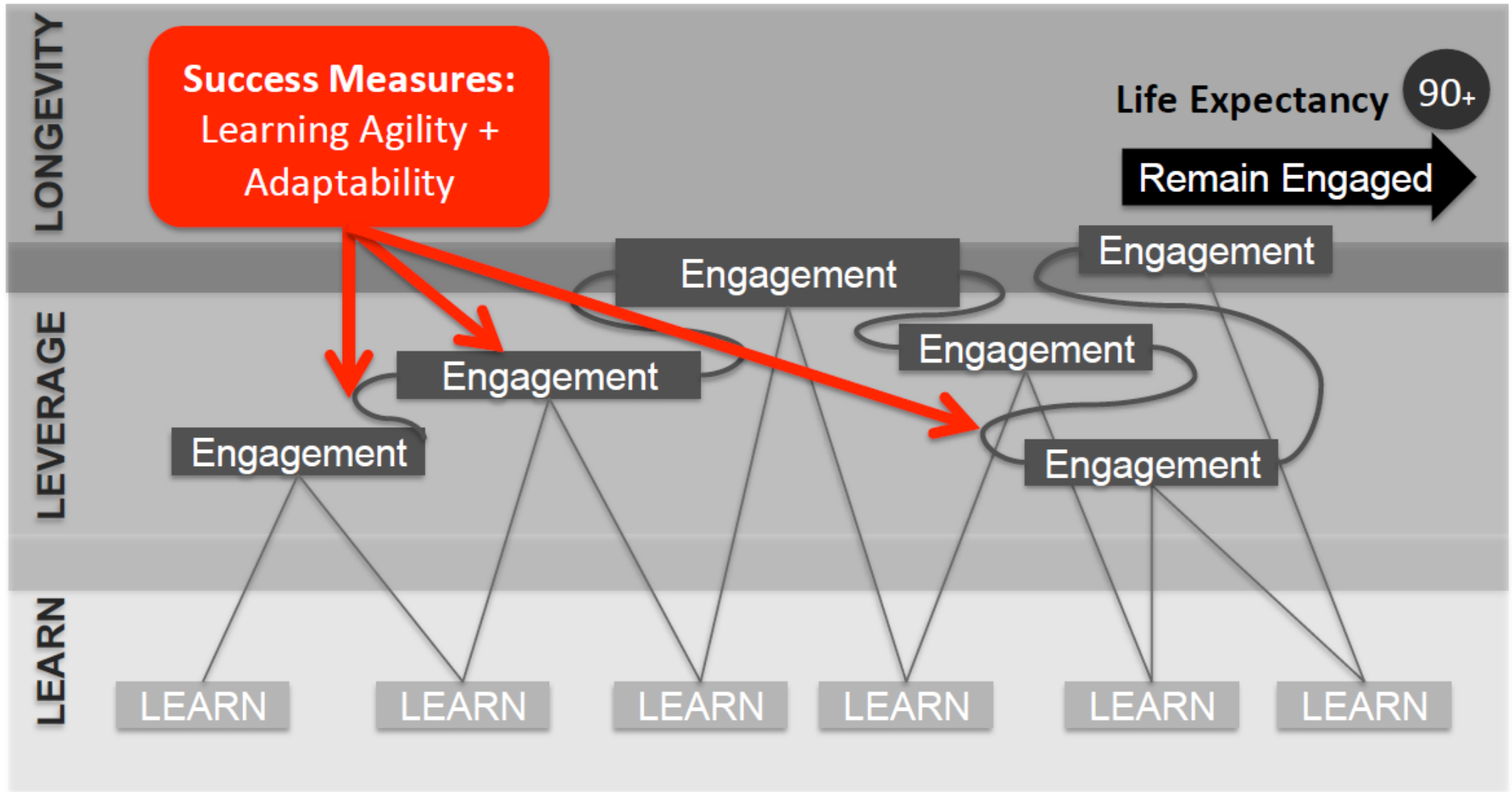
New Economy Shifts Life Blocks



NATURE OF WORK: Old Economy Paradigm (Context)



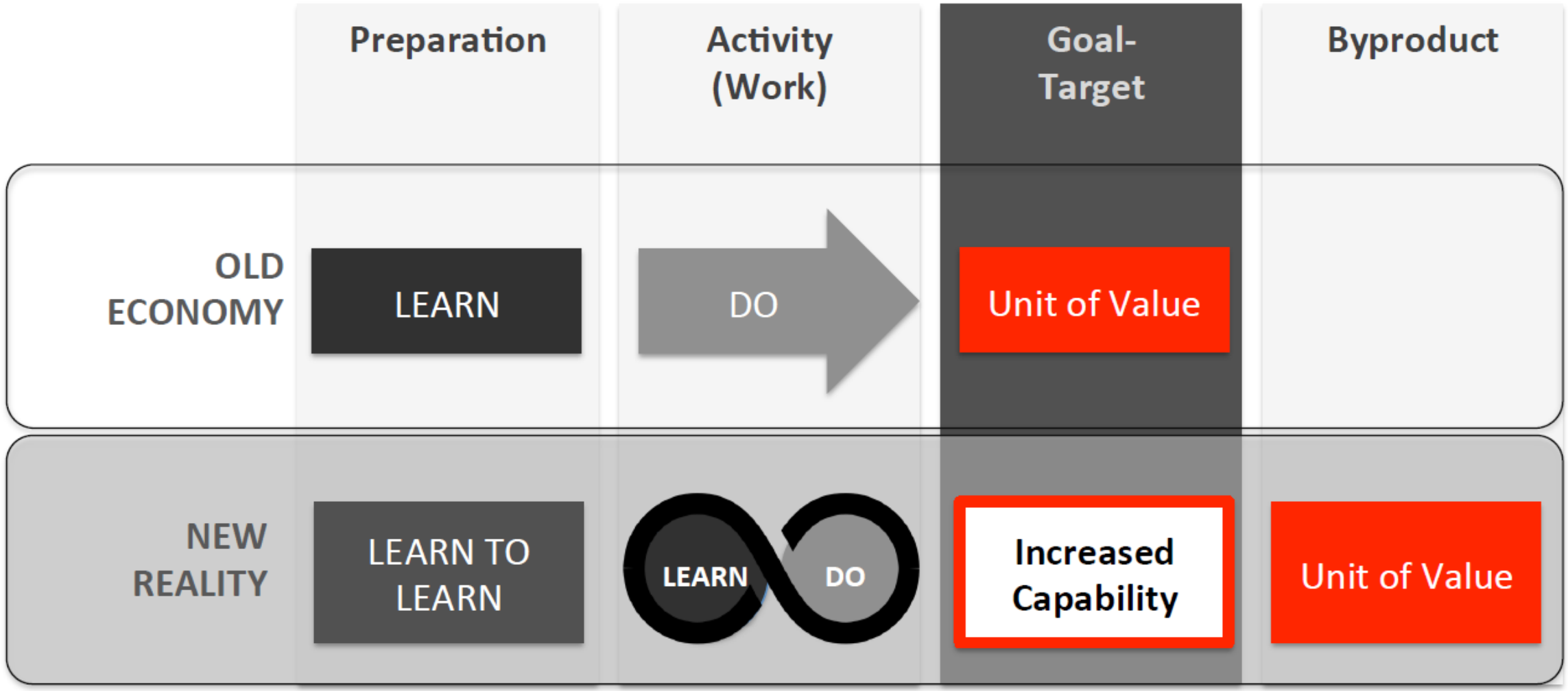
NATURE OF WORK: New Reality Paradigm



PRESSURE#5

The ability to learn becomes the ultimate value.

New Paradigm = New Goals



Tips on how to learn to learn

- Understand the principles – information coding, consolidation, actualization.
- Get clear about your motivation and learning goal.
- Create a plan – when and where to learn. When to take rest.
- Choose the right tools and techniques.
  - **Visualization** – sketch noting, mind maps.
  - **Recall** – rephrase the main insights after a section, tell them to a friend.
- Learn to control your focus
  - **Inner dialogue** – with the author or yourself, comparison to the known, validation of hypotheses.
  - **Limit distractions**, manage procrastination
- Celebrate your (even the smallest) progress.

Learning can be hard, but it pays back

- Learning new things might be hard, but it is the right kind of hard.
- Being a novice learner is a great act of bravery.
  - Overcome the **fear of it** (to start from zero, make mistakes).
- Work towards improvement and innovation.
- Choose the learning path that cultivates your talents and strenghts that you might not be fully utilizing in the context of your job or life.

The more you learn, the easier it gets!

> The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.
>
> – Alvin Toffer

CO NÁS ČEKÁ NYNÍ

Co nás čeká nyní

- Zkouška a její organizace
  - V testu půjde o 2 otevřené otázky, formulované spíše na přehledové znalosti a jejich uvedení do souvislostí a příkladů situací.
  - Druhý termín bude vypsán v lednu podle těch, kteří ho budou potřebovat.
  - Pokud by byl nezbytný třetí termín, bude nabídnut i ten.
  - Pro zadání hodnocení bude kontrolováno i splnění vstupů do DF předmětu.
- Předmětová anketa
- Zdroje dalšího (samo)studia