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Future of work and socio-economic impact of AI development

Considerations based on selected conclusions of a study prepared for the Government of the Czech Republic

Does AI mean a threat or opportunity?

https://youtu.be/m5uut9pya4g *(Oren Etzioni, CEO Allen Institute for AI)*

- The benefit of automation lies primarily in taking over routine or strenuous work activities by machines and freeing up humans for more creative work activities with higher added value.
- At the same time, automation is a way to compensate for the lack of human labor due to adverse demographic development in developed countries.

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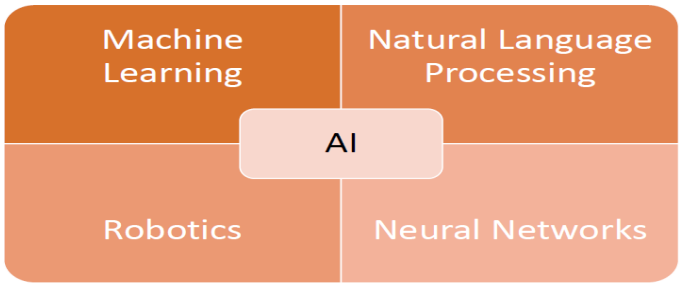
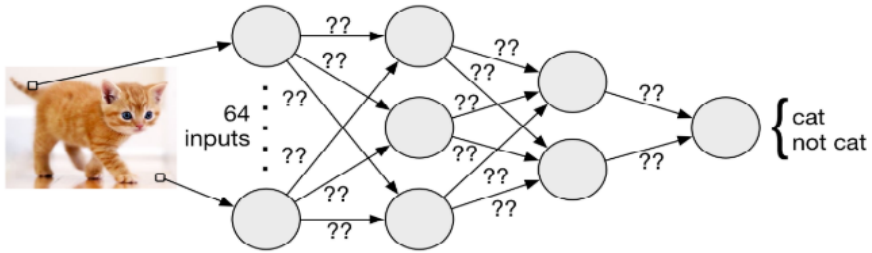
What does AI actually mean?

- **Marwin Minsky (MIT):** AI is the science of making machines do things that would require intelligence if done by men.
- **Policy-maker (EU DSM Strategy):** AI refers to systems that show intelligent behaviour: by analysing their environment they can perform various tasks with some degree of autonomy to achieve specific goals.
- **Computer scientist:** AI is a set of trained algorithms.
- **Observation:** By definition, it does not matter how it works, but how it behaves. We can see it as an imitation of human intelligence by various methods.





Brief history of AI

1950 – formulation of the so-called Turing test (Alan Turing)

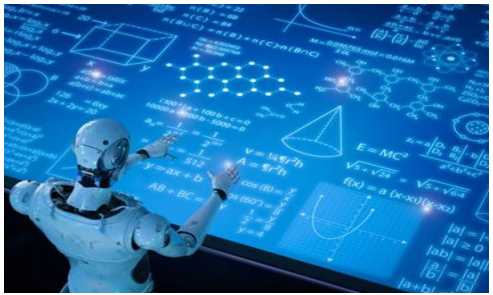
1956 – iconic workshop at the Dartmouth College (New Hampshire)
= > “the golden era of AI“

1973 – criticism of lack of progress and stopping research funding in the US and UK= > “AI winter“ (James Lighthill)

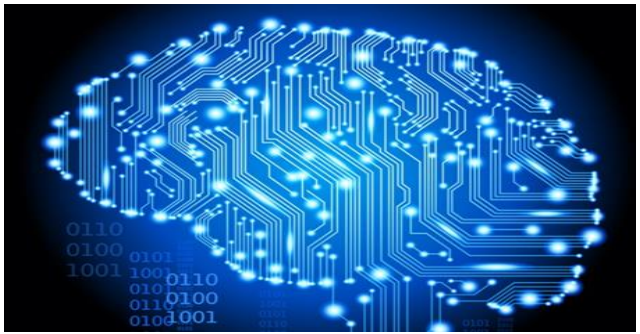
1980s - Japanese government's support for the 5th generation computers encouraged further investment, however powerful hardware was still missing till the end of 1980s

1997 – Deep Blue defeats Garri Kasparov

21st century – boom in developing machine learning applications to solve practical problems



What are today's applications of AI?



Specific (or narrow) AI

- Internet search engines
- Virtual assistants
- Financial market traders
- Diagnostic instruments
- News servers
- Antispam and antivirus tools
- Image recognition (security)
- Targeted advertisement
- Telephone operators
- Autonomous vehicles
- Industrial robots, RPA
- Specialised service robots…

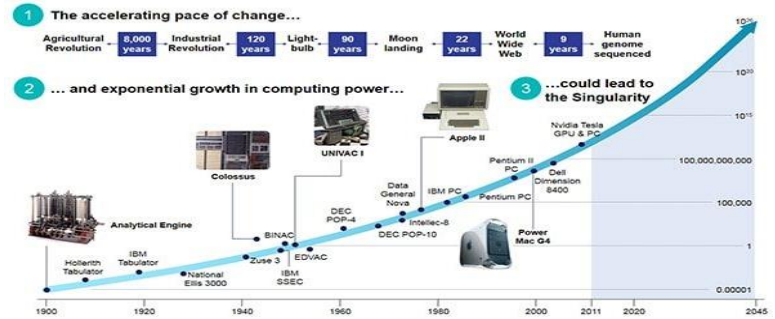
General AI

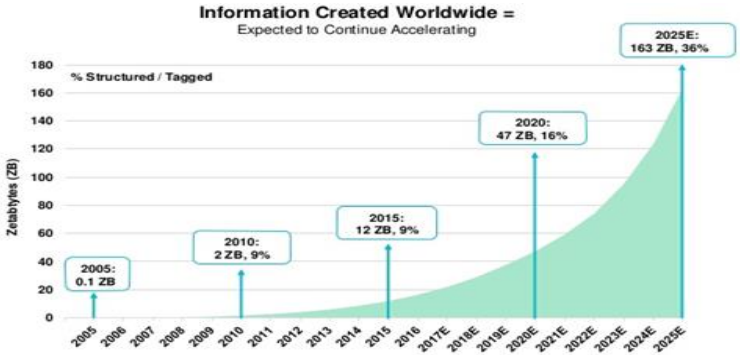
- Sci-fi

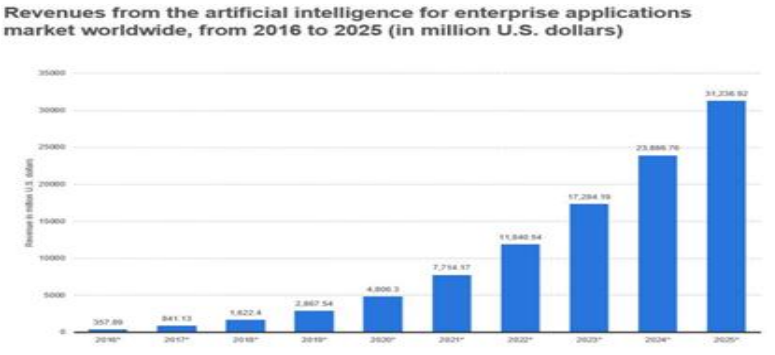
Why are we talking about AI right now?

There is a rapid growth in computing power, the volume of data and the volume of business opportunities.

Source: IDC Data Age 2025 Study, Time Magazine, Statista.com







What the studies say?

47% of professions will be automated in the next 10 years.
(Frey, Osborne, 2013)

Already, technologies have the potential to automate 50% of all global work activities (out of a total of around 2000 assessed activities).

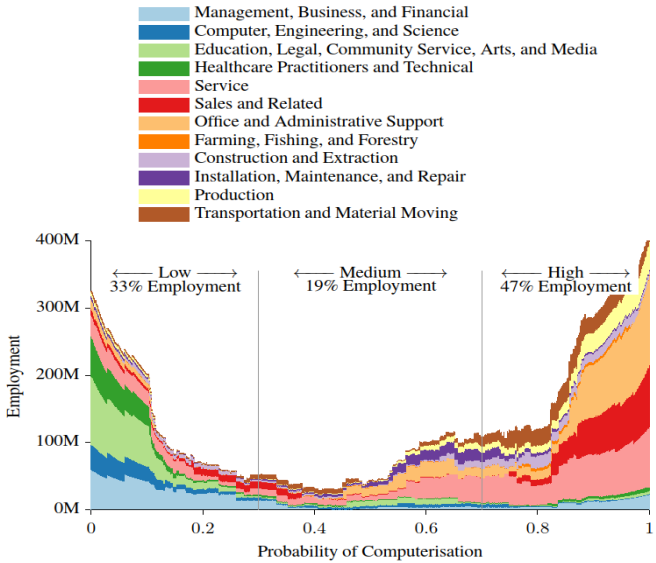
The most endangered professions:
- Telemarketers
- Title Examiners, Abstractors, and Searchers
- Sewers, Hand
- Mathematical Technicians
- Insurance Underwriters
- Watch Repairers
- Cargo and Freight Agents
- Tax Preparers
- Photographic Process Workers and Processing Machine Operators
- New Accounts Clerks
- Library Technicians
- Data Entry Keyers
- …

The least endangered professions:
- Lodging Managers
- Dietitians and Nutritionists
- First-Line Supervisors of Fire Fighting and Prevention Workers
- Oral and Maxillofacial Surgeons
- Healthcare Social Workers
- Orthodontists and Prosthetists
- Occupational Therapists
- Audiologists
- Mental Health and Substance Abuse Social Workers
- Emergency Management Directors
- First-Line Supervisors of Mechanics, Installers, and Repairers
- Recreational Therapists

In 60% of professions, at least 30% of work activities can be automated using current technology.
(McKinsey Global Inst., 2017)

In Czechia, 51% of jobs are at high risk of automation, and 21% of jobs are at medium risk.
(Deloitte, 2018)

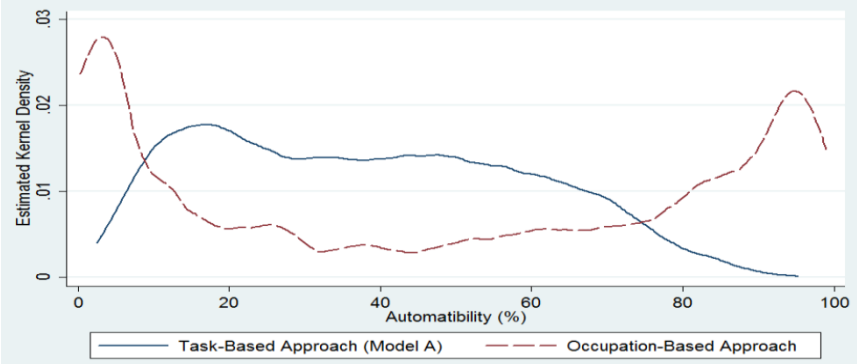
Different approaches, different results…



Frey, Osborne, 2013

Technology will not replace entire occupations, but individual operations.

There are 9% of workers in 21 OECD countries, whose activities are already more than 70% automated.



OECD, 2016

What is our view then?

AI and human skills

- **Combination of certain skills** (sensory, cognitive, language, social and emotional, physical) is required for performing each profession.
- Technology will not usually replace entire occupations, but **individual skills**.
- Technologies will achieve the required skills at the desired levels **in different time horizons** (McKinsey Global Institute 2017).

Up to 5 years	6 – 15 years	16 – 30 years	Over 30 years
• Optimization and planning • Recognising existing patterns • Information retrieval • Navigation • Gross motor skills	• Fine motor skills • Generating novel patterns • Output presentation • Sensory perception	• Mobility • Coordination with multiple agents • Natural language understanding	• Logical thinking and problem solving • Creativity • Natural language understanding • Social and emotional skills

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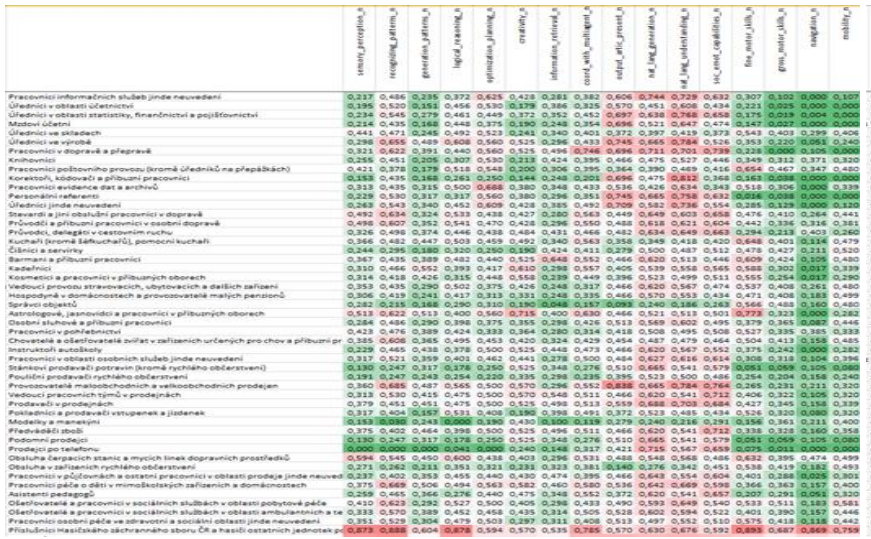
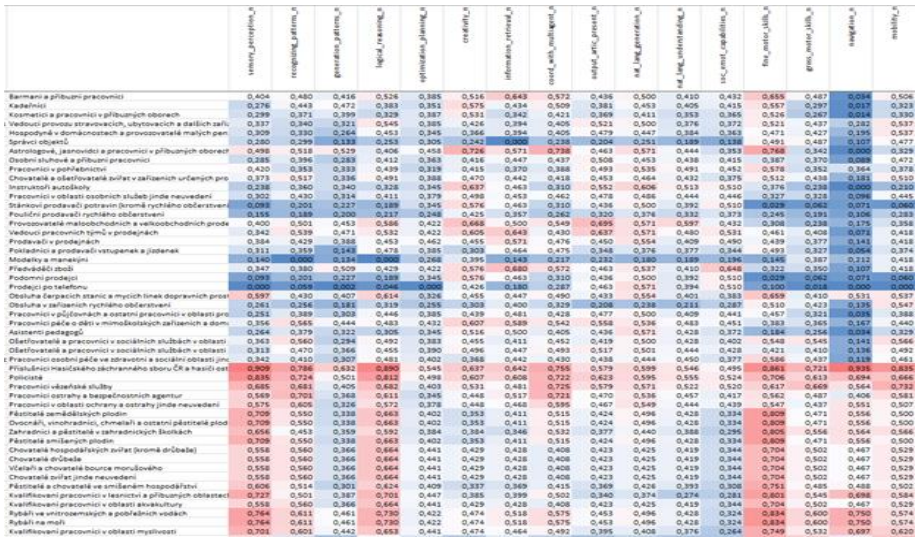
(McKinsey Global Institute 2017)

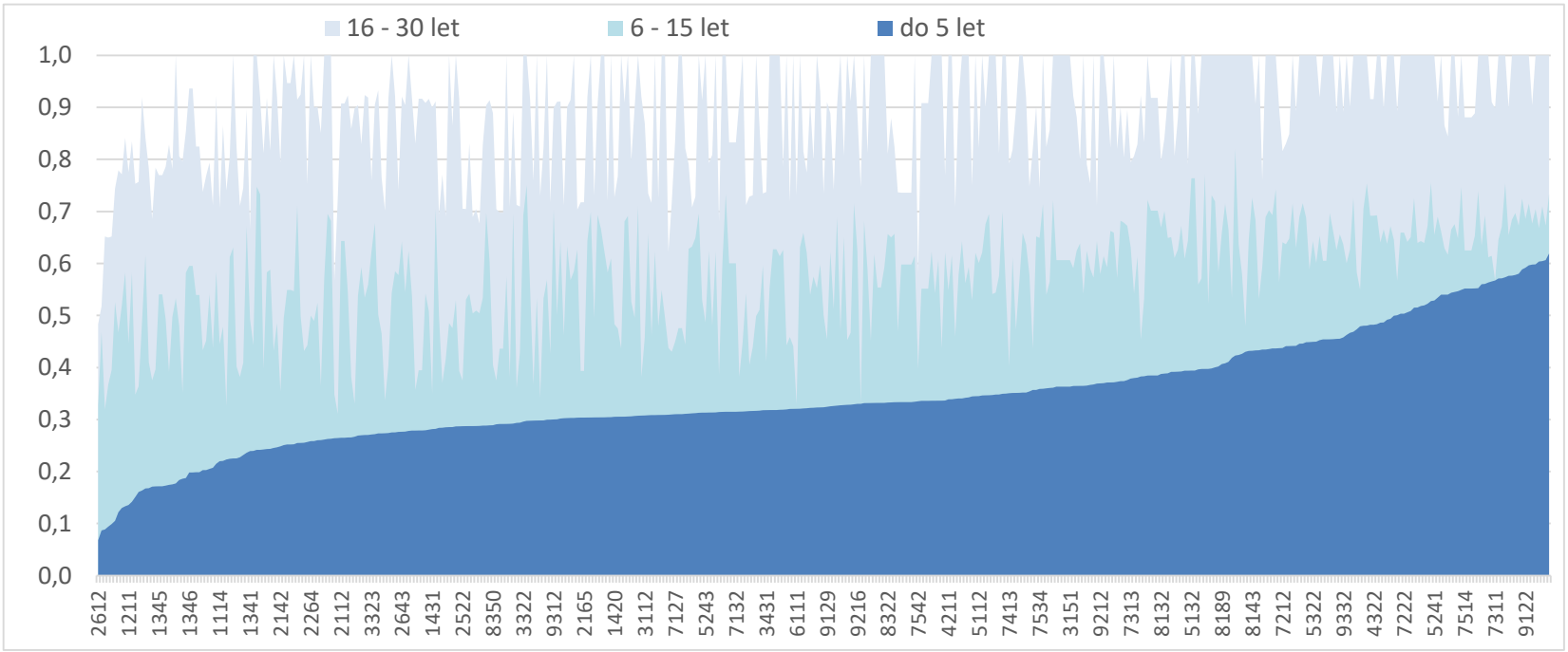
A profession is a unique combination of skills

Significance and level of skills required for each profession:





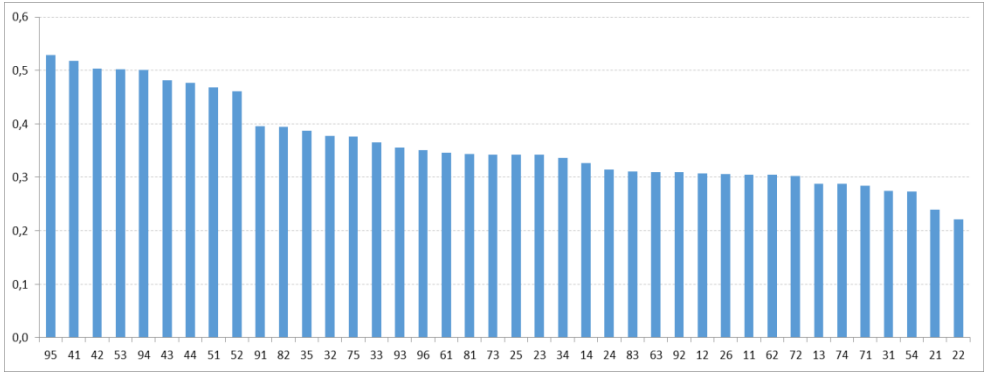
Share of substitutable skills in individual categories of employment



Impact within 5 years

In **11%** of professions technology will be able to replace more than 50% of the required skills.

Some of the skills will be replaceable by technology for **1.3 million** employees in Czechia.



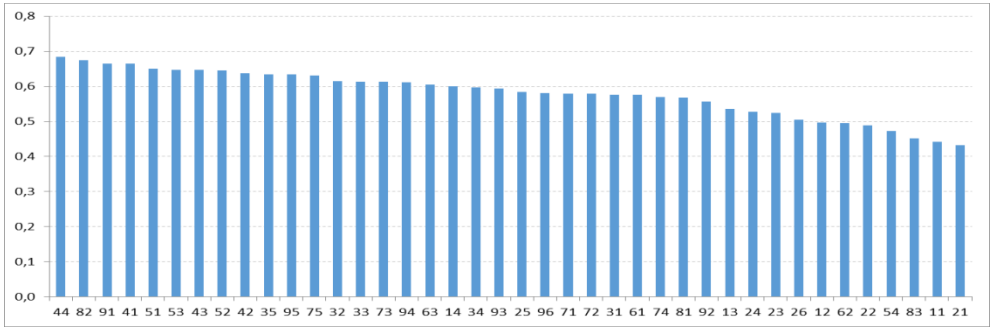
- **Product graders and testers (excluding food and beverages)**
- **Text processing staff, typists**
- **Sales and shipping agents, customs declarants**
- **Accountants an bookkeepers**
- **Employees of labour offices and employment agencies**
- **Data loggers and archivers**
- **Medical records and health information technicians**
- **Treasurers and ticket vendors**
- **Clerks not mentioned elsewhere**
- **Information service staff not mentioned elsewhere**
- **Librarians**

- **Dentists**
- **Biologists, botanists, zoologists and related specialists**
- **Veterinarians**
- **Civil engineers**
- **Geologists, geophysicists and related professions**
- **Specialists in eye optics and optometry**
- **Members of the fire brigade of the Czech Republic and other fire-fighters**
- **Chemical engineers and related specialists**
- **Building architects**
- **Aircraft pilots and related associate professionals**
- **Physicists and astronomers**

Impact within 15 years

In **70%** of professions technology will be able to replace more than 50% of the required skills.

Some of the skills will be replaceable by technology for **2.2 million** employees in Czechia.



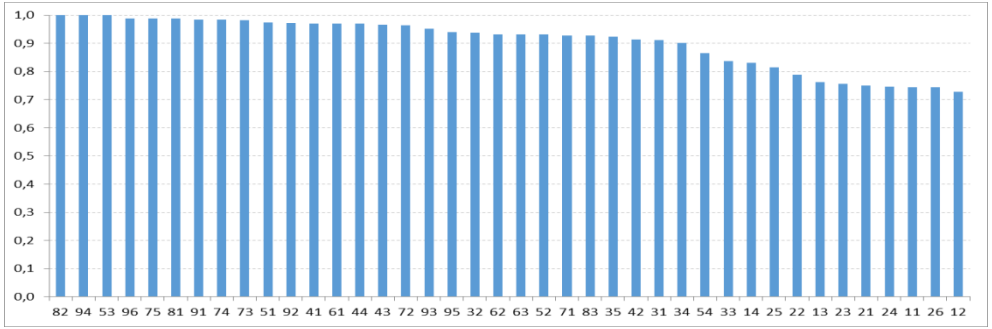
- **Sewing and embroidery machine operators**
- **Other product assemblers**
- **Handicraft workers in textile, leather and related materials**
- **Shoemakers and related workers**
- **Electrical, energy and electronic assembly workers**
- **Dressmakers, seamstresses, embroiders and related workers**
- **Librarians**
- **Toolmakers and related workers**
- **Public space cleaners, sewage cleaners and related workers**
- **Painters, engravers and related workers**
- **Ancillary and unskilled service workers not listed elsewhere**
- **Blacksmiths**
- **Craftsmen and other workers**
- **Fashion models**

- **Lawyers, prosecutors and related professions**
- **Meteorologists**
- **Judges**
- **Mining and metallurgical engineers and specialists**
- **Top government officials**
- **Managers in advertising and public relations**
- **Industrial and production engineers**
- **Railway, earthmoving and related machinery and equipment operators**
- **R&D managers**
- **Physicists and astronomers**
- **Industrial ecology engineers**
- **Building architects**
- **Town and traffic planners**

Impact within 30 years

In **40%** of professions technology will be able to replace all the required skills.

Some of the skills will be replaceable by technology for **3.4 million** employees in Czechia.



- Other product assemblers
- Operators of machines and equipment for paper production
- Workers for refilling of goods
- Producers of dairy products
- Growers and breeders in mixed farming
- Operators of painting and other surface treatment equipment of metal and other materials
- Glassmakers, glass cutters, jewellery manufacturers Sheet metal workers
- Fast food staff
- Operators of machines for fibre processing, yarn spinning and winding
- Operators of waste sorting machines
- Security officers and workers of security agencies

- Philosophers, historians and political scientists
- Human Resources Managers
- Biologists, botanists, zoologists and related specialists
- Specialists in law and related areas not listed elsewhere
- Building architects
- Members of the Fire Rescue Service of the Czech Republic and other fire protection units
- Chemical engineers and specialists in related fields
- Sociologists, anthropologists and specialists in related fields
- Teachers at universities and colleges
- Judges and related workers
- Aircraft pilots and related associate professionals
- Physicists and astronomers

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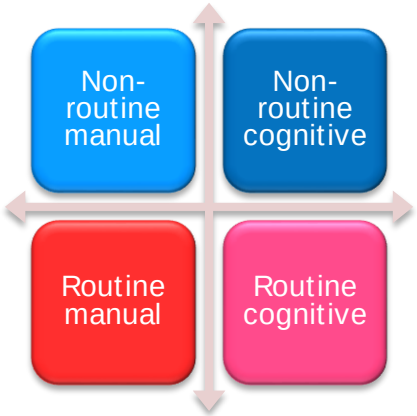
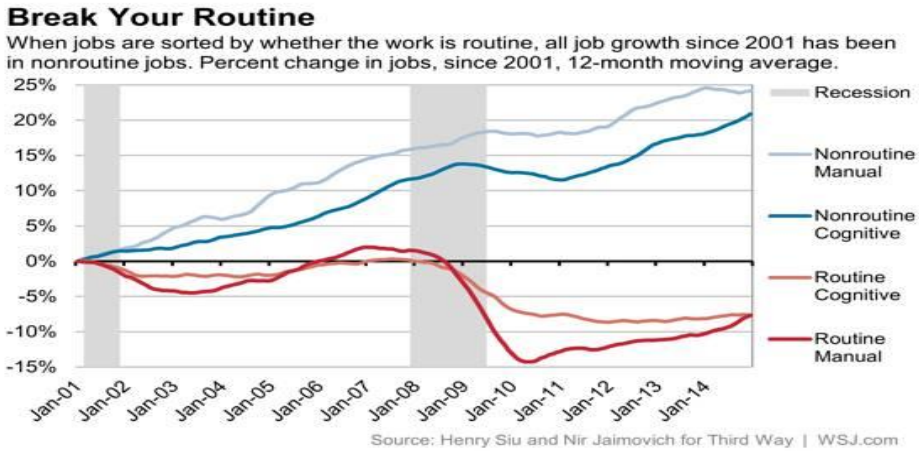
Routine vs. creativity



Source: WSJ.com



- In particular, occupations with a medium level of qualification and a medium level of income are exposed to a higher risk of replacement.
- Loose of jobs in the middle income category may lead to deeper economic inequalities in society.

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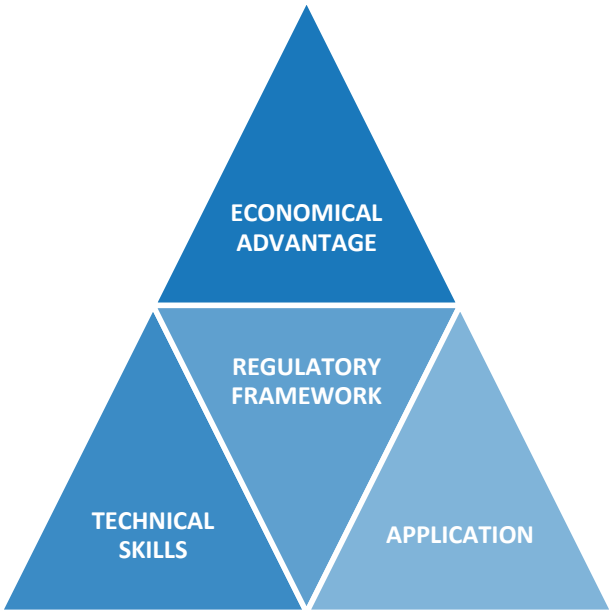
What else will affect the rate of replacement of human skills?

- Achieving skills at the required level
- Finding a technical solution applicable in practice
- Economical advantage of technical solution (costs of application of technology vs. costs of labour)
- Regulatory framework and social acceptance (including ethical issues)



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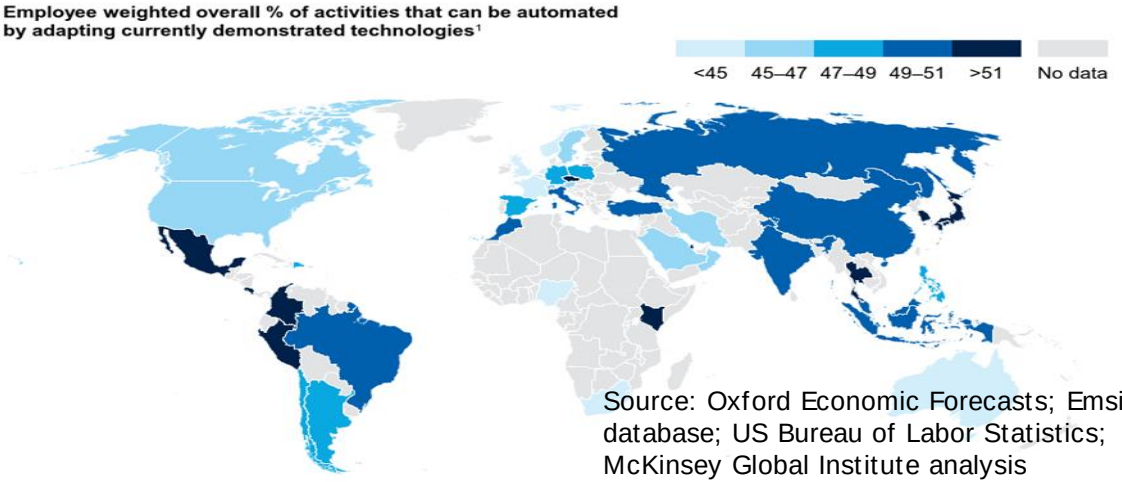
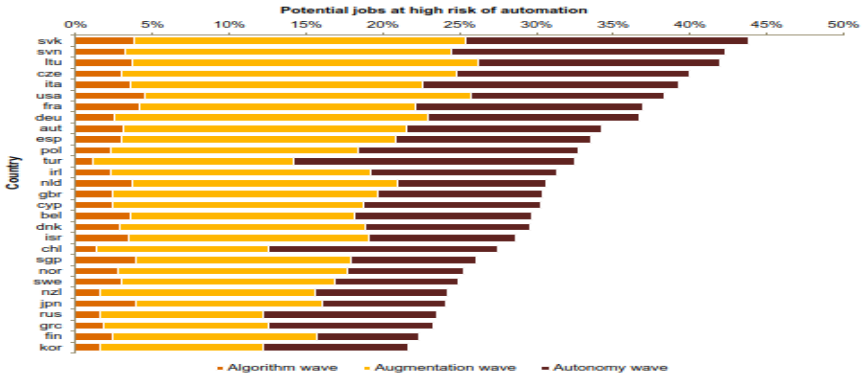
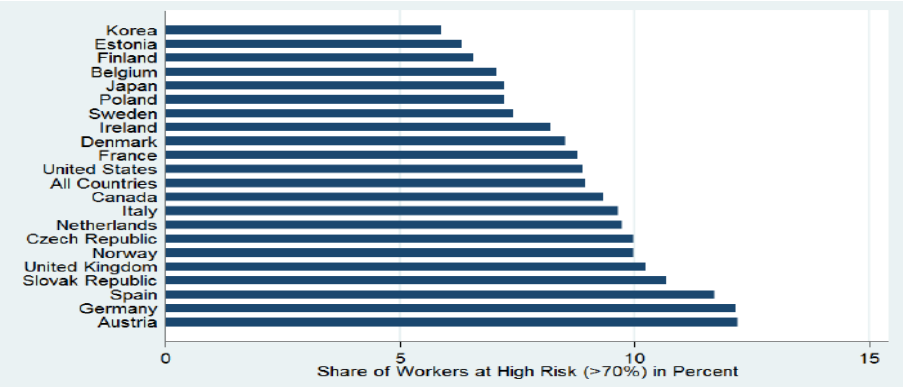
Position of Czechia in terms of the threat to human labour



Source: Oxford Economic Forecasts; Emsi database; US Bureau of Labor Statistics; McKinsey Global Institute analysis



Source: PwC



Source: OECD

Expected changes associated with AI adoption

- AI will bring less work, not necessarily fewer jobs.
- AI will replace some human skills - individual skills will be replaced by technologies gradually.
- AI will gradually replace manual and cognitive skills at increasing level.
- AI will trigger structural changes in the labour market following the required skills.
- AI will arouse structural changes in the organization of work in companies.
- The development of skills such as logical thinking, problem solving ability, creativity and social and emotional skills will be crucial.

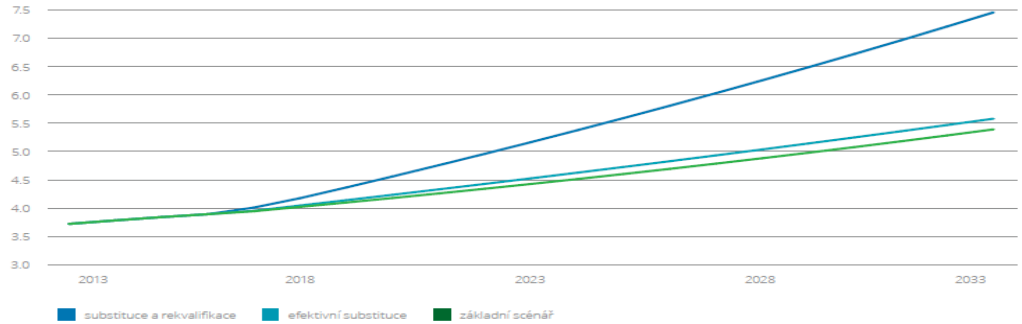
The key factor for success: education, lifelong learning and retraining

The most important is a new approach to education:

- technical skills (STEM) and digital literacy,
- so-called "soft" skills for the 21st century (creativity, critical thinking, cooperation, problem solving),
- informatics thinking.

Strengthening the principle of lifelong learning and effective retraining of vulnerable employees in cooperation of companies, employees and the state. Various concepts should be considered, such as:

- allowing education during a part of working hours, acceptation of retraining as work,
- utilization of AI tools for effective retraining - professional diagnostics of skills and design of a tailor-made training program for a specific person.



The fundamental importance of retraining:

Potential output of the Czech economy (constant prices in 2010; trillions of CZK) depending on the substitution scenario of human labor

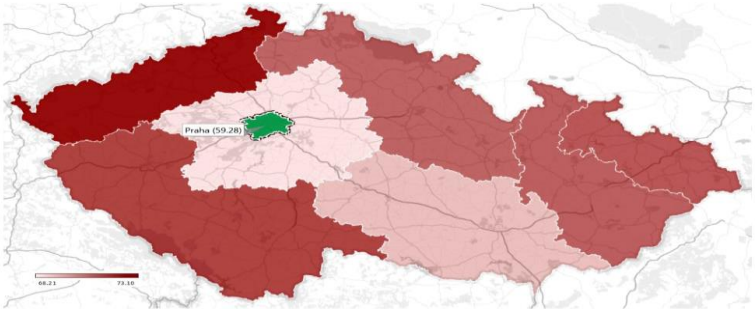
- substitution and retraining scenario
- effective substitution scenario (without emphasis on retraining)
- baseline scenario (status quo)

Source: Deloitte 2017

Social security system and public policy system requirements

Social security and social safety net:

- adaptation of the remuneration and social security system to new forms of work (higher outsourcing and freer working relationships) and new forms of work organization in companies (flexible networking instead of rigid hierarchical structure, higher demands on time flexibility of work),
- need for experimental verification of suitable forms of support for personal development and retraining (universal basic income, universal basic services, possibility of shortening working hours, etc.),
- support for the development of job opportunities in the more affected regions of Czechia (in particular the Karlovy Vary Region and North Bohemian Region).



Source: Model OSTEU 2015

Public policy system:

- development of structural policy that effectively supports entrepreneurship and innovation,
- development of competition and regulation policies
- response to increasing international dependence in the spread of innovation and knowledge
- development of tax policy

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Conclusion

AI is changing society.

This opportunity must not be wasted.

Close cooperation between the private, public and academic spheres is strongly required.

The complete study “Analysis on the development potential of AI in the Czech Republic” is freely available on the website of the Czech Government in the section of European Affairs.

Thank you for your attention.