Application of robots, AI and automation technologies:

- *Smart-looking and attentive robotic students!*

Source: Ulrike Gretzel

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Key terms

Key terms

Artificial intelligence (AI):

- Coined by John McCarthy in 1956 (Russell & Norvig, 2016: 17)
- The term Artificial intelligence is defined as a computer "system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation" (Kaplan and Haenlein, 2019: 15).
- Computer programmes do not actually have human intelligence but exhibit intelligent behavior.

Key terms

Types of AI (based on Kaplan and Haenlein, 2019):

- Artificial Narrow Intelligence (weak AI) is AI applied in a specific field where it performs much better than humans (e.g. to identify tumours on magnetic resonance imaging scans of human brain, or to play chess), but it cannot be used in other fields (e.g. to identify patterns in booking data of a hotel or to translate text) because it does not possess the algorithms to successfully cope in the other field. This is the current stage of development of AI.

Key terms

- Artificial General Intelligence (strong AI) is (close to) human level intelligence. It can successfully outperform humans in several fields.
- Artificial Superintelligence is a conscious, self-aware AI that is better than humans in all fields. For the moment, this type of AI is within the realm of science fiction rather than reality.

Key terms

- AI is used for:
  - Image and face recognition at border control
  - Video surveillance
  - Autonomous vehicles
  - Service robots
  - Speech recognition in digital assistants
  - Chatbots
  - Automated pricing decisions and revenue management
  - Sentiment analysis of customer reviews, etc.

Key terms

Robots:

- A robot is an "actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment, to perform intended tasks" (International Organization for Standardization, 2012: n.p.).
- The term 'robot' was firstly introduced in 1920 by Karel Čapek in his play R.U.R—Rossum's Universal Robots

Photo credit: Stanislav Ivanov
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Key terms

- Industrial vs. Service robots
- The first industrial robot ('Unimate') was installed in 1961 by its manufacturer Unimation at General Motors' plant in Trenton, New Jersey, where it unloaded high temperature parts from a die casting machine (Stone, 2005)

Source: https://upload.wikimedia.org/wikipedia/commons/7/7d/Industrial-robots.jpg

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Key terms

- Areas of application of service robots:
  - Information provision (e.g. receptionists, concierges, hosts, curators, guides)
  - Cleaning (e.g. floors, swimming pools)
  - Transporting items (e.g. room service delivery)
  - Entertainment (e.g. dancing for guests in restaurants)
  - Disinfection of premises (e.g. robots with ultraviolet light against COVID-19)
  - Waiters in restaurants
  - Cooks (e.g. for making pizza, pancakes or burgers)
  - Guards
  - Cutting grass in gardens, etc.

Key terms

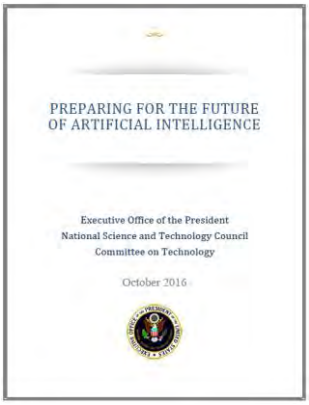
Service automation:

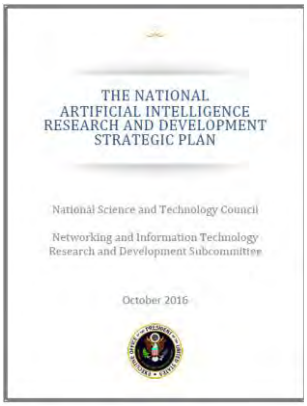
- Service automation includes a wide variety of self-service technologies (SST) defined by Meuter et al. (2000: 50) as “technological interfaces that enable customers to produce a service independent of direct service employee involvement”.

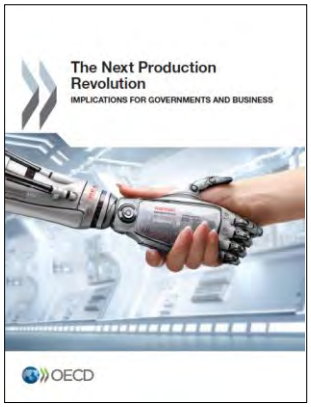
Key terms

- Service automation includes technologies such as:
  - Check-in or information kiosks
  - Mobile check-in applications
  - Ticket machines at train and bus stations and at theme parks
  - Vending machines for food and drinks
  - Baggage drop-off counters and automated biometric fingerprint scanners at airports
  - Self-ordering kiosks
  - Conveyor belts in restaurants, etc.

In robots we trust!







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Drivers of automation

Drivers of automation

Drivers of automation: *Macroenvironmental factors*

- Technology:
  - Advances in RAISA technologies
- Politics:
  - Governmental control on populations
- Legal framework:
  - Antidiscrimination laws
  - Labour laws
  - Taxation
  - Hygiene regulations
  - Safety and security laws

Normative pressure

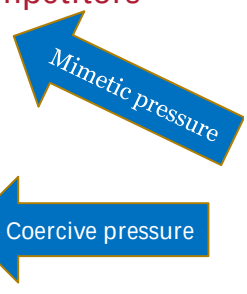
Institutional theory by DiMaggio & Powell (1983)

Drivers of automation: *Macroenvironmental factors*

- Culture and society:
  - Attitudes towards RAISA technologies
- Demography:
  - Aging population > disruptions in the labour market
- Biosecurity:
  - Pandemics

Drivers of automation: *Microenvironmental factors*

- Labour market:
  - Lack of sufficient and qualified human employees
- Competitive pressure:
  - Adoption of RAISA technologies by competitors
- RAISA markets:
  - Prices of RAISA technologies
- Customers:
  - Acceptance of RAISA technologies
- Partners:
  - RAISA in hotel chains' standards



Institutional theory by DiMaggio & Powell (1983)

Drivers of automation: *Corporate level factors*

- Economic efficiency:
  - Cost efficiency
  - Productivity
  - Improving operations management

https://pixabay.com/illustrations/web-network-industry-gears-5205175/

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Drivers of automation: *Psychological factors*

- Preferences:
  - Managers' preferences towards the use of RAISA technologies instead of human employees

https://news.elearninginside.com/new-study-finds-most-managers-prefer-robots-to-human-employees/

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Demography

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Drivers of automation: *Demography*

Number of children per woman

https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?end=2016&start=1960&view=chart&year=2016

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Drivers of automation: *Demography*

Number of children per woman

Country	Number of children per woman in 2018
South Korea	0.98
Italy	1.29
Portugal	1.42
Japan	1.42
Bulgaria	1.56
Russian Federation	1.57
EU	1.54
China	1.69
OECD	1.69
USA	1.73
World	**2.41**

Drivers of automation: *Demography*

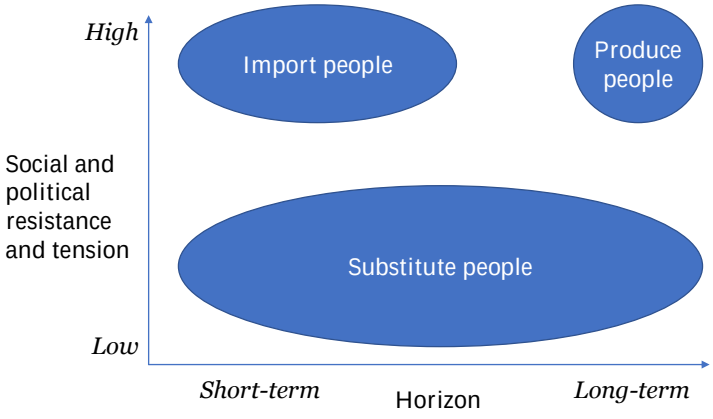
Number of children per woman

Country	Number of children per woman in 2018
Malaysia	2.00
Bangladesh	2.04
India	2.22
Indonesia	2.31
Philippines	2.58
Egypt	3.33
Nigeria	5.39
Somalia	6.07
Niger	6.91
World	**2.41**

Source: https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?end=2018

Why RAISA technologies?

Solutions to plummeting populations



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Automation technologies compensate for the unborn children!

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The economics of RAISA technologies in services

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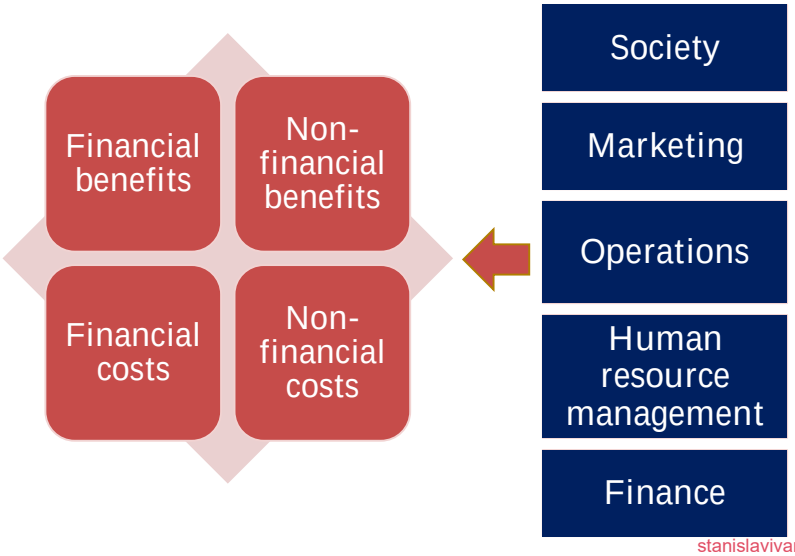
Cost-Benefit Analysis

Cost-benefit analysis



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BENEFITS:

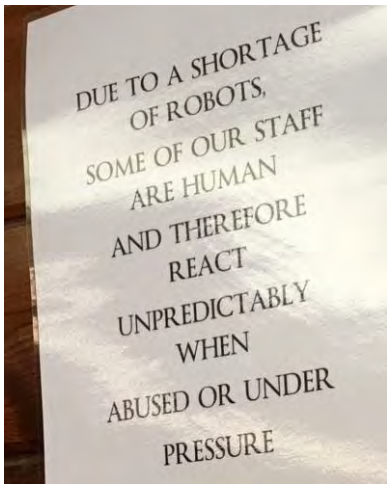
Why should RAISA technologies be adopted?

Advantages of RAISA technologies

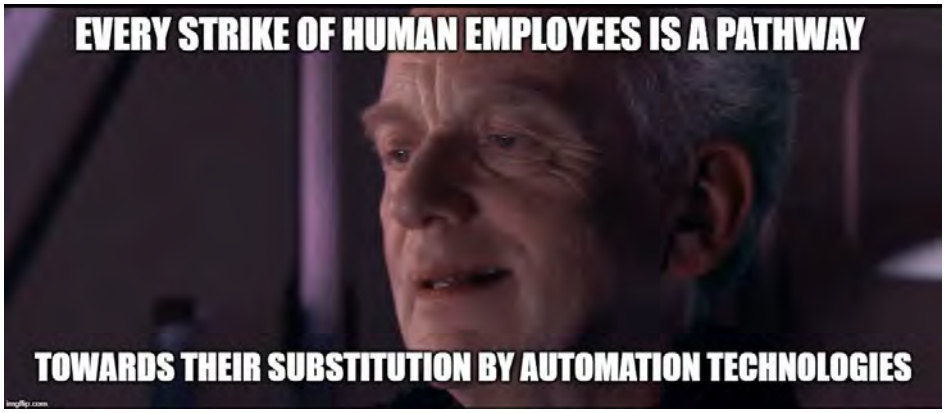
- RAISA technologies could *work 24/7*
- RAISA technologies could *implement various tasks* and expand their scope with software and hardware upgrades
- RAISA technologies could provide *constant or improving quality* of their work
- RAISA technologies could fulfil their work *correctly and in a timely manner*
- RAISA technologies could *do routine work* repeatedly

Advantages of RAISA technologies

- RAISA technologies *do not complain*, get ill, go on strikes, spread rumors, discriminate, quit their job without notice, show negative emotions, shirk from work.



Advantages of RAISA technologies



Positive impacts of the implementation of RAISA technologies

Finance:

- *Labour costs savings* – automation technologies work 24/7 and may serve numerous customers simultaneously.
- *Increased sales* – customers' curiosity in seeing the robots, 24/7 availability

Positive impacts of the implementation of RAISA technologies

Operations:

- *Easier scheduling and planning of operations* – they work 24/7, they do not get ill, complain, shirk from work, etc.
- They would *save employees' time* from performing 3-D (dirty, dull, dangerous) and repetitive tasks, which they could use for other more creative and revenue generating activities.
- *Improved environmental sustainability* of operations – reduced use of resources, reduced waste, elimination of unnecessary activities, etc.

Positive impacts of the implementation of RAISA technologies

Marketing:

- *RAISA technologies lead to increased role of the customer in the service delivery* > prosumer (="producer" + "consumer")> co-creation of value
- RAISA technologies allow for *automated pricing, personalised pricing* (perfect price discrimination), *marketing automation*, *predictive analytics and better forecasts*
- The company would boast *positive word-of-mouth* due to its *image of an innovative high-tech company*.

Positive impacts of the implementation of RAISA technologies

Marketing:

- Automation technologies could *enhance the perceived service quality* through new attractive and interactive ways of service delivery, communicating and engaging with customers:
  - Robots, chatbots, service kiosks could *communicate in different languages and do this 24/7*
  - RAISA can *create value for the customers* by making the service delivery process *funny and entertaining*

Source: https://www.youtube.com/watch?v=v2GjQ_vzXI0

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Positive impacts of the implementation of RAISA technologies

Human resource management:

- Currently *enhancing*, rather than replacing the employees.
- They *solve some the problems with hiring and firing of employees*, especially the seasonal ones.
- RAISA technologies help create *decent work* (environment)

Annals of Tourism Research 84 (2020) 102978

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Annals of Tourism Research

journal homepage: www.elsevier.com/locate/atoures

x = (tourism_work) y = (sdg8) while y = true: automate(x)

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Positive impacts of the implementation of RAISA technologies

Human resource management:

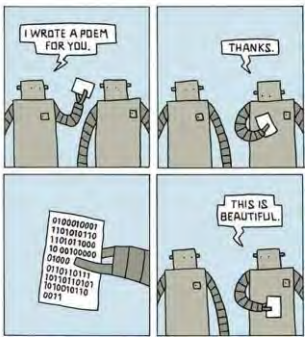
- Sometimes RAISA would require *reorganisation of companies* – new departments, job positions, communication links between them.

COST:

Why should RAISA technologies be avoided?

Disadvantages of RAISA technologies

- They *lack personal approach*
- Robots can *orientate in structured situations* (at least for the moment)
- They *lack creativity*



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Negative impacts of the implementation of RAISA technologies

Finance:

- *Huge financial costs* for acquisition, installation, maintenance, software update, for creating robot-friendly facilities, for up-skilling human resources, insurance costs for damages caused by and on robots
- Potential *vendor lock-in* effect > high *switching costs*
- *Lease* as a way to offset high costs:
  - Technology-as-a-Service (TaaS) > Robot-as-a-Service (RaaS), Kiosk-as-a-Service (KaaS), Software-as-a-Service (SaaS), etc.

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Negative impacts of the implementation of RAISA technologies

Operations:

- RAISA technologies lead to *decreased flexibility of the service delivery system*
- *Privacy and security* concerns
- They *will not be soon completely independent of human supervision*

Negative impacts of the implementation of RAISA technologies

Marketing:

- The company may suffer *negative publicity* - it may be perceived as a company that puts profits before humans
- *Low willingness-to-pay* for fully robotised services – customers request price discounts if they were to be served only by robots (Webster & Ivanov, 2020)

Negative impacts of the implementation of RAISA technologies

Marketing:

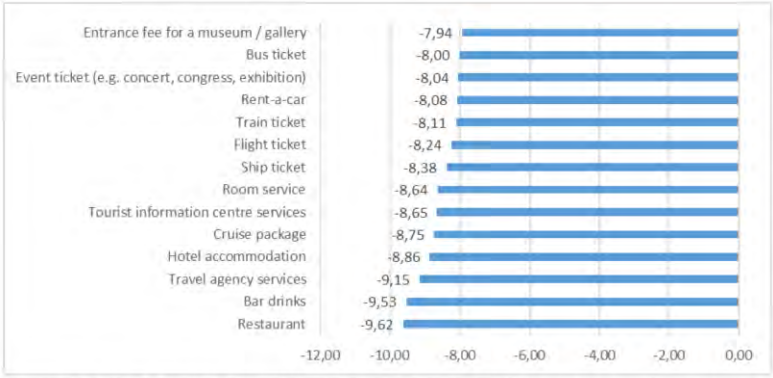

Figure 5.1. *If you were to be served entirely by robots in the following industries, instead of human employees, how much would you be willing to pay for a fully robotised service compared to a service fully delivered by human employees?* (Webster & Ivanov, 2020)

Negative impacts of the implementation of RAISA technologies

Social impacts:

- RAISA technologies may (will) be perceived as *threat by human employees* (e.g. Neo-Luddism movement) and may face *resistance by customers and society*


THE NEW YORK TIMES, SUNDAY, FEBRUARY 26, 1928.

MARCH OF THE MACHINE MAKES IDLE HANDS

Prevalence of Unemployment With Greatly Increased Industrial Output Points to the Influence of Labor-Saving Devices as an Underlying Cause

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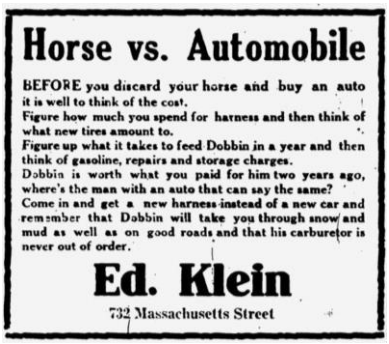
Negative impacts of the implementation of RAISA technologies

Social impacts:

- RAISA technologies (will) lead to *disappearance of whole industries* with significant business and social implications



Horse vs. Automobile

BEFORE you discard your horse and buy an auto it is well to think of the cost.
Figure how much you spend for harness and then think of what new tires amount to.
Figure up what it takes to feed Dobbin in a year and then think of gasoline, repairs and storage charges.
Dobbin is worth what you paid for him two years ago, where's the man with an auto that can say the same?
Come in and get a new harness instead of a new car and remember that Dobbin will take you through snow and mud as well as on good roads and that his carburetor is never out of order.

Ed. Klein

732 Massachusetts Street

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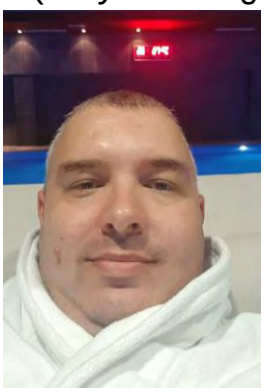
Negative impacts of the implementation of RAISA technologies

Social impacts:

- Robots and AI technologies *do not spend* salaries for consumption (they do not go to spa centres!)



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Striking the right balance

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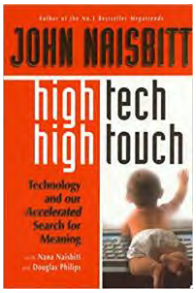
Striking the right balance

- Company characteristics / culture
- Relative labour and technology costs, relative labour and RAISA productivity
- Degree of technological complexity / Technological characteristics of RAISA solutions
- Customers' readiness and willingness to be served by a robot
- Cultural characteristics of both customers and service providers
- Safety characteristics of RAISA

Striking the right balance

- The adoption of automation technologies would ultimately lead to division of service companies into two main large groups – *'high-tech' vs 'high-touch'* companies with various shades of gray in between them.



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Human employees and RAISA technologies – substitution vs enhancement

Human employees and RAISA technologies – substitution vs enhancement

Tom was the first guy losing his job because of Artificial intelligence

Human employees and RAISA technologies – substitution vs enhancement

- RAISA technologies have always both substitution and enhancement effects simultaneously.
- The balance between the two effects depends on:
  - Automation of tasks vs automation of jobs
  - Relative productivity of RAISA and human employees
  - Service capacity of the company

Human employees and RAISA technologies – substitution vs enhancement

- Automation of tasks vs automation of jobs
  - Frey & Osborne (2017) (cited 7554 times in Google Scholar as of 24.02.2021) report that 47% of US jobs are susceptible to computerization but their approach is questionable because it is not the jobs that are automated but tasks (e.g. inputting data in a reservation system, cleaning the floor, delivering a pizza, producing a sales forecast, etc.).

Human employees and RAISA technologies – substitution vs enhancement

- Automation of tasks vs automation of jobs
  - Each jobs is a set of tasks.
  - If some tasks are automated and the set of tasks human employees need to perform decreases > '*deskilling of jobs*'. A job position is eliminated if most of the tasks that constitute it are automated; hence the *substitution* effect prevails.
  - If some tasks are automated but this allows employees to increase their productivity and they have to upgrade their skill to use the new technology > '*upskilling of jobs*'; hence, the *enhancement* effect prevails.

Human employees and RAISA technologies – substitution vs enhancement

- Relative productivity of RAISA and human employees
  - If the *revenue per euro costs for RAISA technologies* is greater than the revenue per dollar of labour costs, RAISA technologies are more productive, meaning that the service company would have economic stimuli to use them instead of human employees.
  - While it is relatively easy to measure the RAISA-related and labour costs, the challenge is to clearly identify which revenues come from RAISA, and which – from human employees.

Human employees and RAISA technologies – substitution vs enhancement

- Service capacity of the company
  - If RAISA technologies can *expand the service capacity* (e.g. online bookings of tours and hotel accommodation via travel agency chatbots) or its *utilisation* (e.g. a robot for room service delivery), without the need to hire additional staff, or when the *marginal revenue RAISA generate outweigh the marginal costs for additional human employees*, RAISA will decrease the overall average costs to serve one customer. In that situation, the *enhancement effect will prevail*.

Human employees and RAISA technologies – substitution vs enhancement

- Service capacity of the company
  - When a service or a task has a *fixed and well-utilised capacity* that cannot be increased by RAISA technology (e.g. a hotel with a very high occupancy rate), or the *maximum demand is limited* by that fixed capacity (e.g. concierge services in a hotel), the use of kiosk, robots or chatbots may not attract much additional number of customers. Hence, the focus of RAISA adoption would be to make the service process more efficient (e.g. by use of self-check-in kiosk instead of check-in by a receptionist) – hence *the substitution effect might be stronger*.

The mechanism of substitution and enhancement of jobs

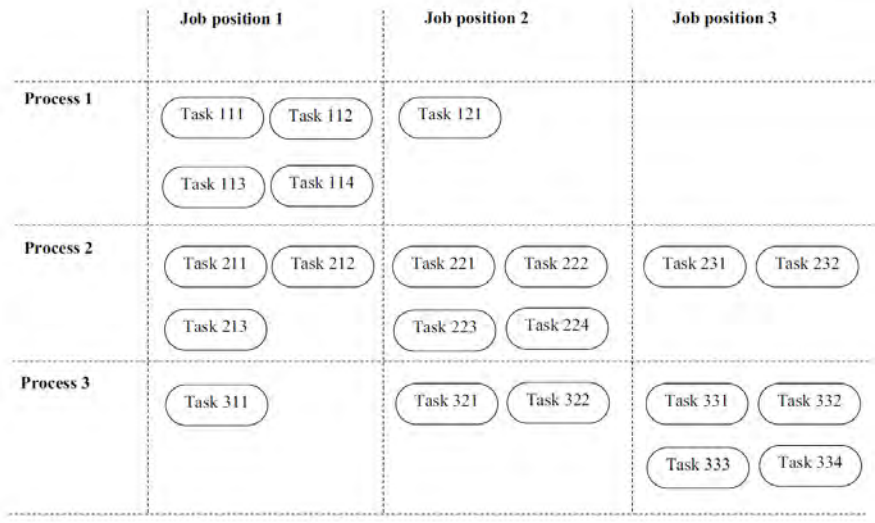

Fig. 1 Processes, tasks and job positions for human employees before automation

Source: Ivanov, S. (2020). The impact of automation on tourism and hospitality jobs. *Information Technology & Tourism* 22(2), 205-215. https://doi.org/10.1007/s40558-020-00175-1.

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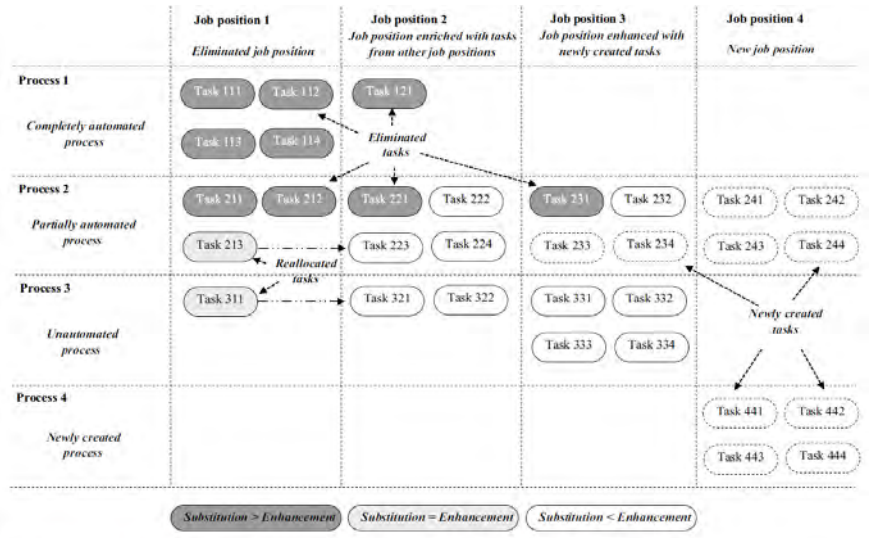

Fig. 2 Impact of automation on processes, tasks and job positions for human employees

Source: Ivanov, S. (2020). The impact of automation on tourism and hospitality jobs. *Information Technology & Tourism* 22(2), 205-215. https://doi.org/10.1007/s40558-020-00175-1.

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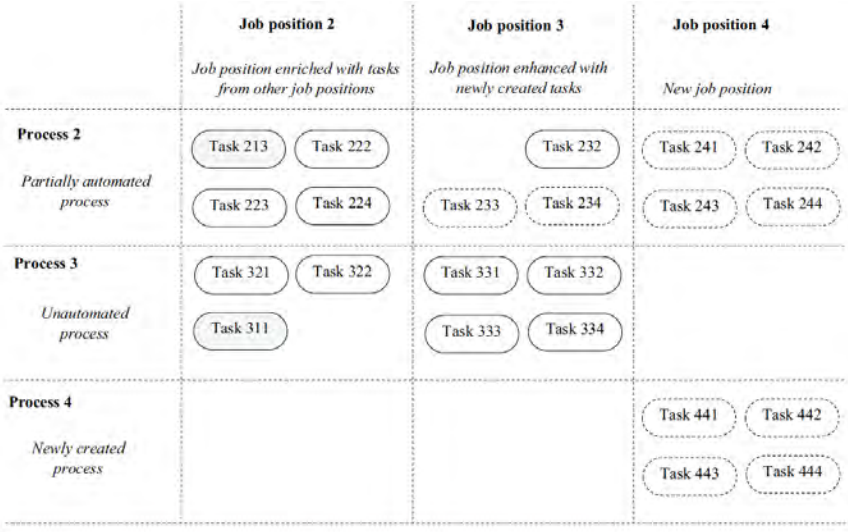

Fig. 3 Processes, tasks and job positions for human employees after automation

Source: Ivanov, S. (2020). The impact of automation on tourism and hospitality jobs. *Information Technology & Tourism* 22(2), 205-215. https://doi.org/10.1007/s40558-020-00175-1.

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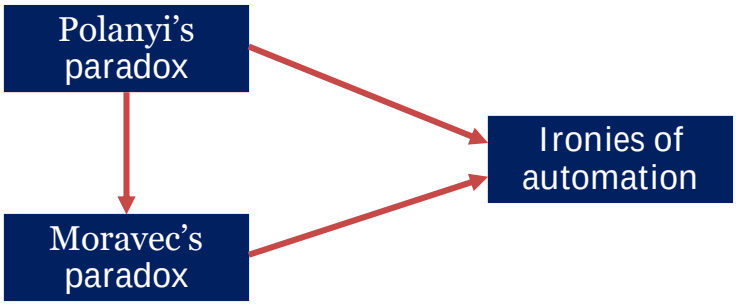
RAISA technologies eliminate tasks for some human jobs, help reallocate tasks to other jobs, and create new tasks for existing or new job positions.

Hence, for some jobs the substitution effect predominates while for others – the enhancement effect.

The mechanism of substitution and enhancement of jobs

Limits to automation



The mechanism of substitution and enhancement of jobs

Polanyi's paradox

- Coined by David Autor (2015) based on Michael Polanyi's (1966: 4) observation that, "We know more than we can tell." > tacit knowledge
- Automation requires explicit knowledge that can be codified for algorithms to be developed and programmed. Autor (2015: 135): "Engineers cannot program a computer to simulate a process that they (or the scientific community at large) do not explicitly understand."
- Tacit knowledge puts limits to automation.

The mechanism of substitution and enhancement of jobs

Moravec's paradox

- Moravec (1988: 15) – "... it is comparatively easy to make computers exhibit adult-level performance in solving problems on intelligence tests or playing checkers, and difficult or impossible to give them the skills of a one-year-old when it comes to perception and mobility."

The mechanism of substitution and enhancement of jobs

Ironies of automation (Bainbridge, 1983):

- Automation may expand rather than eliminate problems with the human operator due to two main reasons:
  - designer errors
  - the human operators are left with an arbitrary collection of tasks which the system designer could not automate

Programme on the successful adoption of RAISA

Programme on the successful adoption of RAISA (1)

- Analyse the current operations of the company
- Identify potential tasks that may be automated through RAISA technologies
- Select RAISA solutions that may be used in the automation of processes and best fit company's profile
- Implement a comprehensive Cost-benefit analysis of the use RAISA technologies, including relevant financial calculations

Programme on the successful adoption of RAISA (2)

- Reengineer the service process to reflect the automation of specific service tasks
- Update the service operations manuals and inform all concerned staff on the changes
- Train staff to utilise the maximum of the new technology, address their fears and resistance to change. Emphasise on technology enhancement of employees, rather than the technology substitution of employees and cost cutting.

Programme on the successful adoption of RAISA (3)

- Develop marketing communications programme to inform customers, suppliers and other stakeholders on the changes
- Educate customers to use the new technology
- Monitor and evaluate the effectiveness and efficiency of RAISA implementation

https://pixabay.com/photos/ai-monitoring-desktop-business-man-3262759/

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Technology is a tool, not a goal!

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Robots have arrived and are here to stay.

Prepare ...

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THANK YOU FOR THE ATTENTION!

QUESTIONS?