KU LEUVEN HIVA

RESEARCH INSTITUTE FOR WORK AND SOCIETY

Technology and organizational design for motivational work

Ezra Dessers

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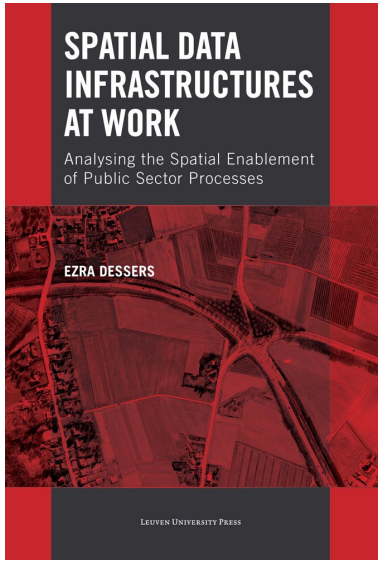
Ezra Dessers, PhD

Research Manager
‘Work, Organisation and Technology’
HIVA, KU Leuven



PARADIGMS 4.0

SEAD

‘New technologies’

- Measurement technologies
  - Sensors, tracking, monitoring, registration…
- Automation technologies
  - Robots, AGVs, M2M, 3D printing, image recognition…
- Interaction technologies
  - Cobots, AR, VR, exoskeletons, speech recognition…

Meylemans L., Ramioul M., Vanderstukken A., Vereycken Y. (2020). Industrie 4.0 binnen de metaal- en textielsector in België. Aanwezigheid, impact en werknemersbeleving van nieuwe technologieën binnen de sectoren van ACV-CSC METEA. Leuven: HIVA,

Super-Strength Operator

Augmented Operator

Virtual Operator

Healthy Operator

Smarter Operator

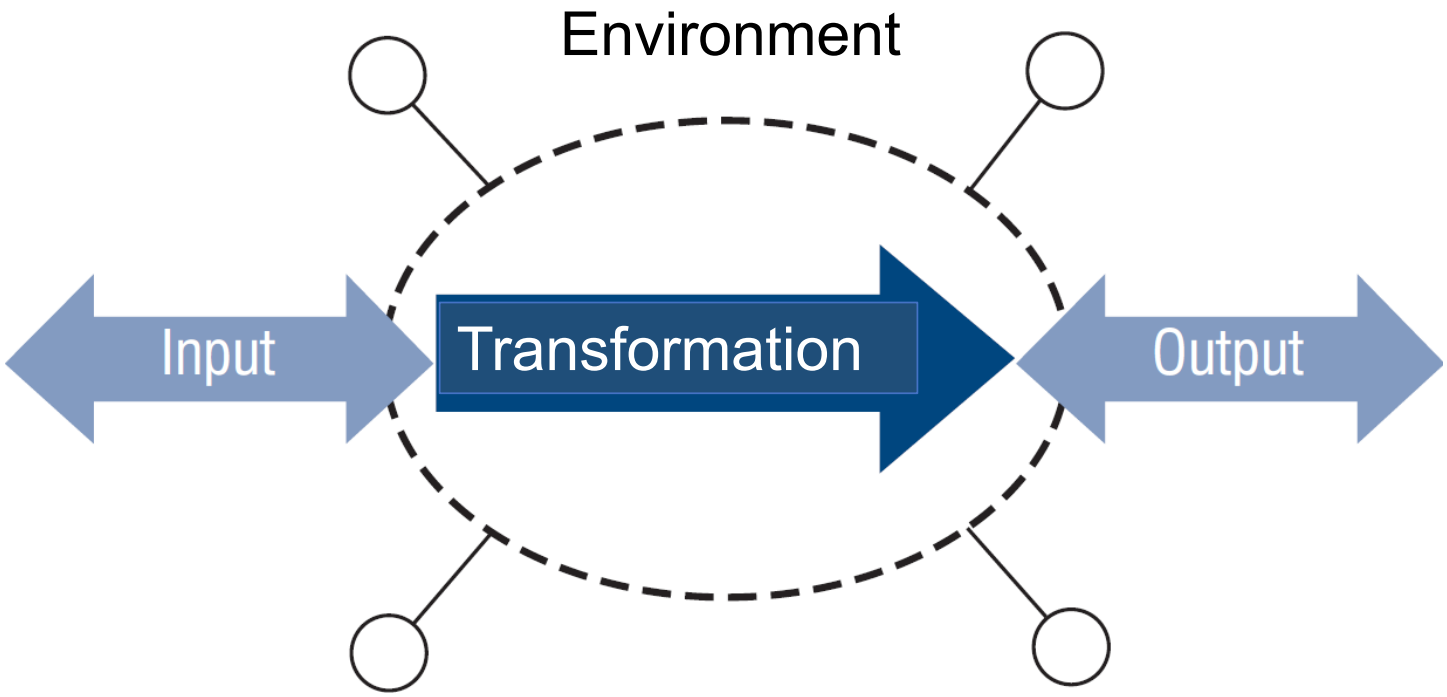
Collaborative Operator

Social Operator

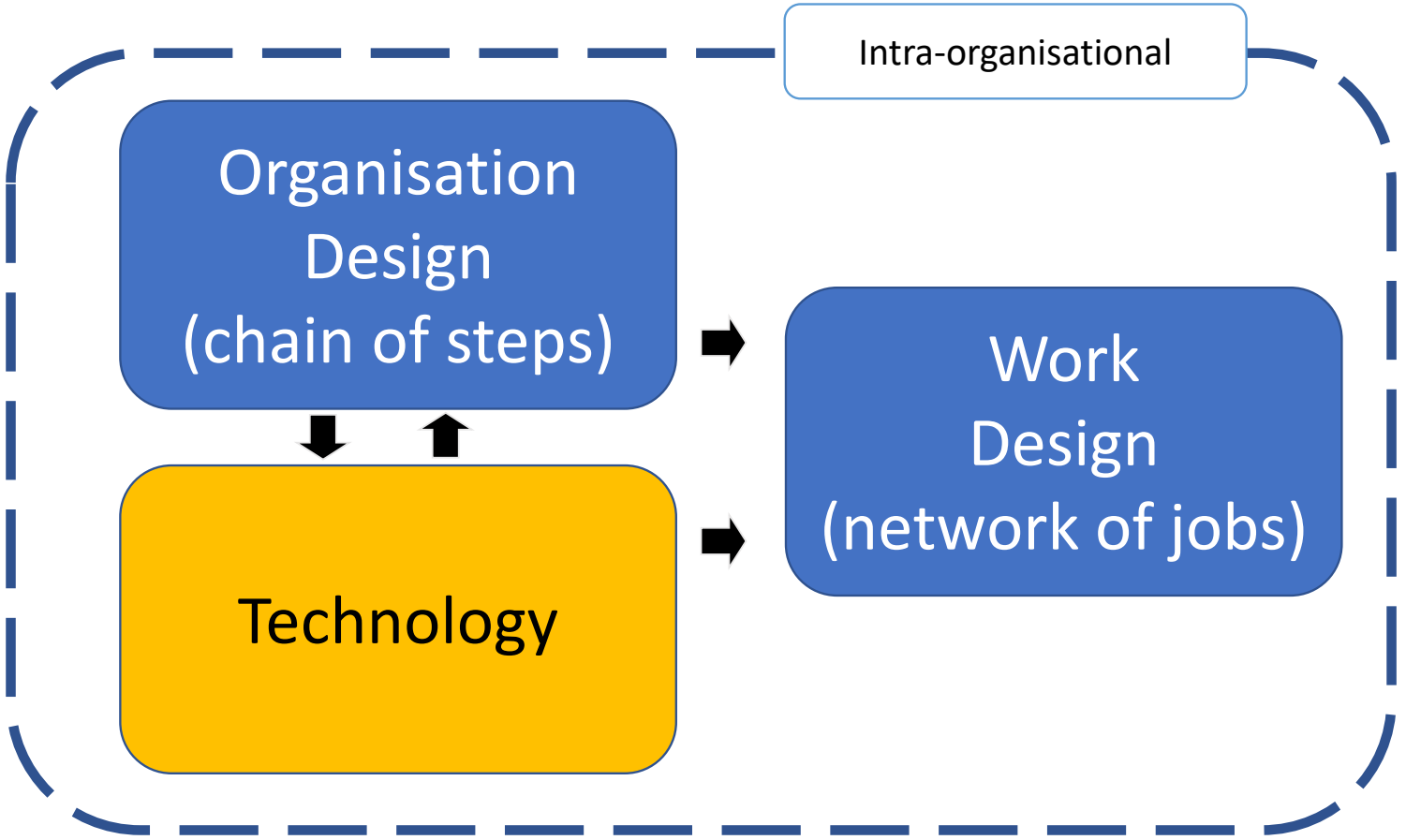
Analytical Operator

Technostress…

Or technopower?


Environment
Input
Transformation
Output

Division of labour

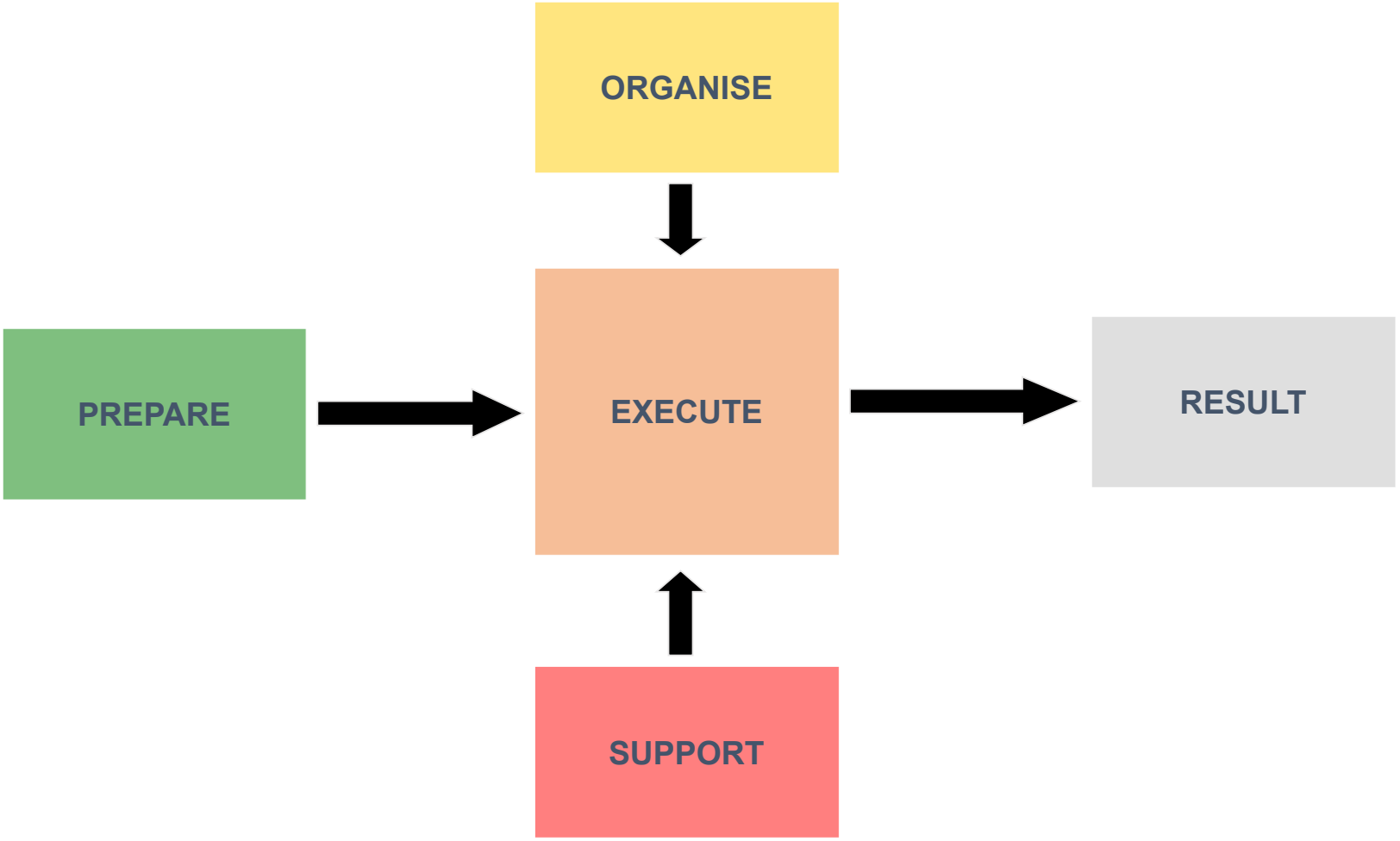


B2B

Value chains

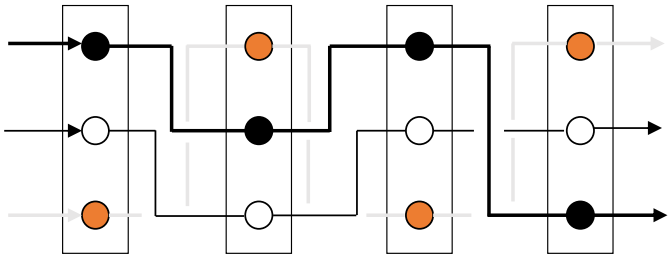
Ecosystems

Organisation Design

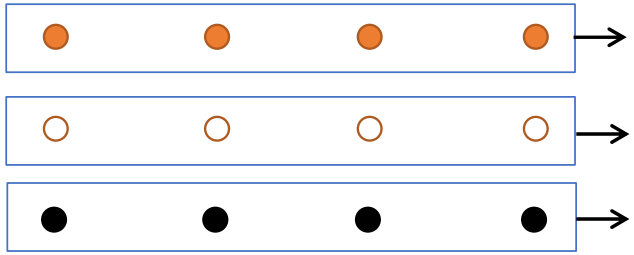


Two basic forms

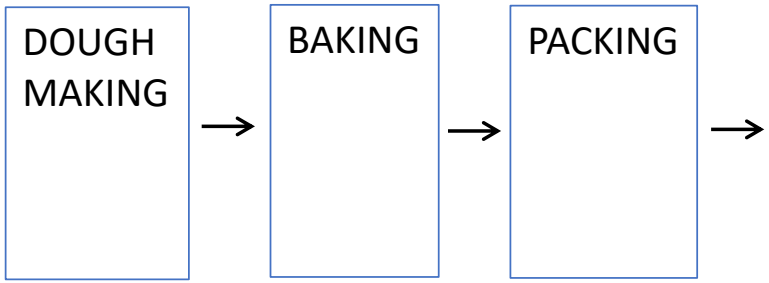
Functional



Order-based (flow)



Cookies factory



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For which of the four functions do you employ technology?

Execution, preparation, support, organizing

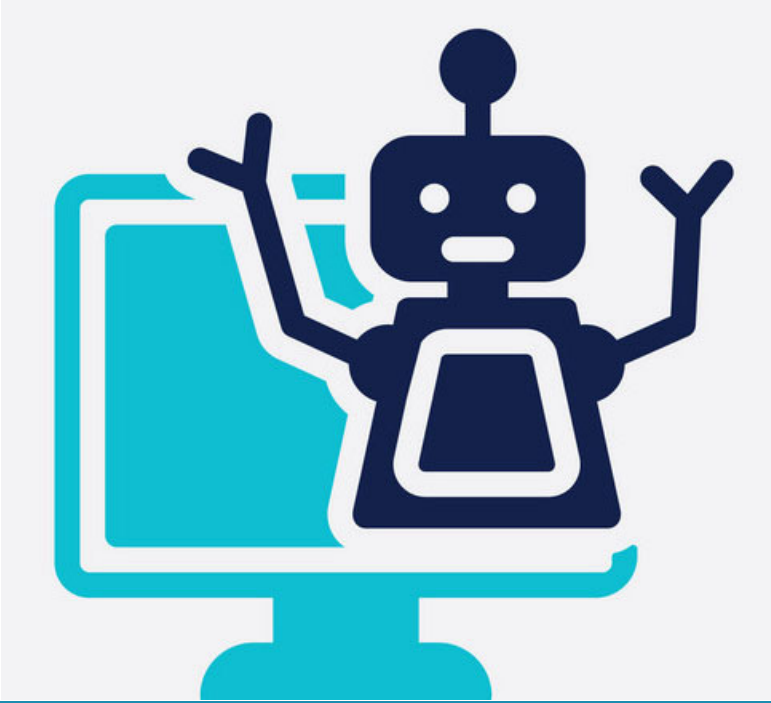
What degree of technology?

Fully automated, subtasks, …

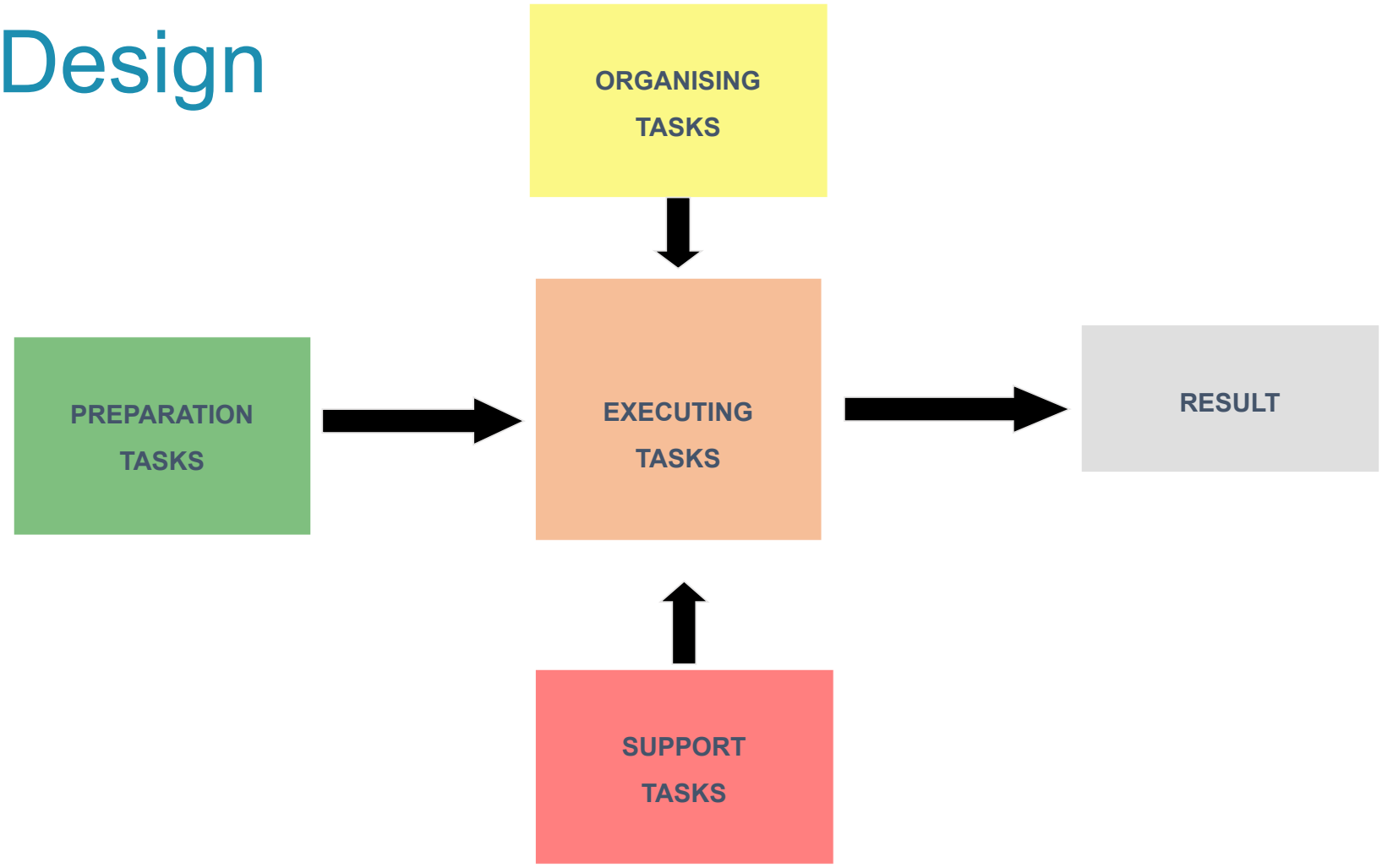
What kind of applications?

Backoffice, interactive tools, robots…

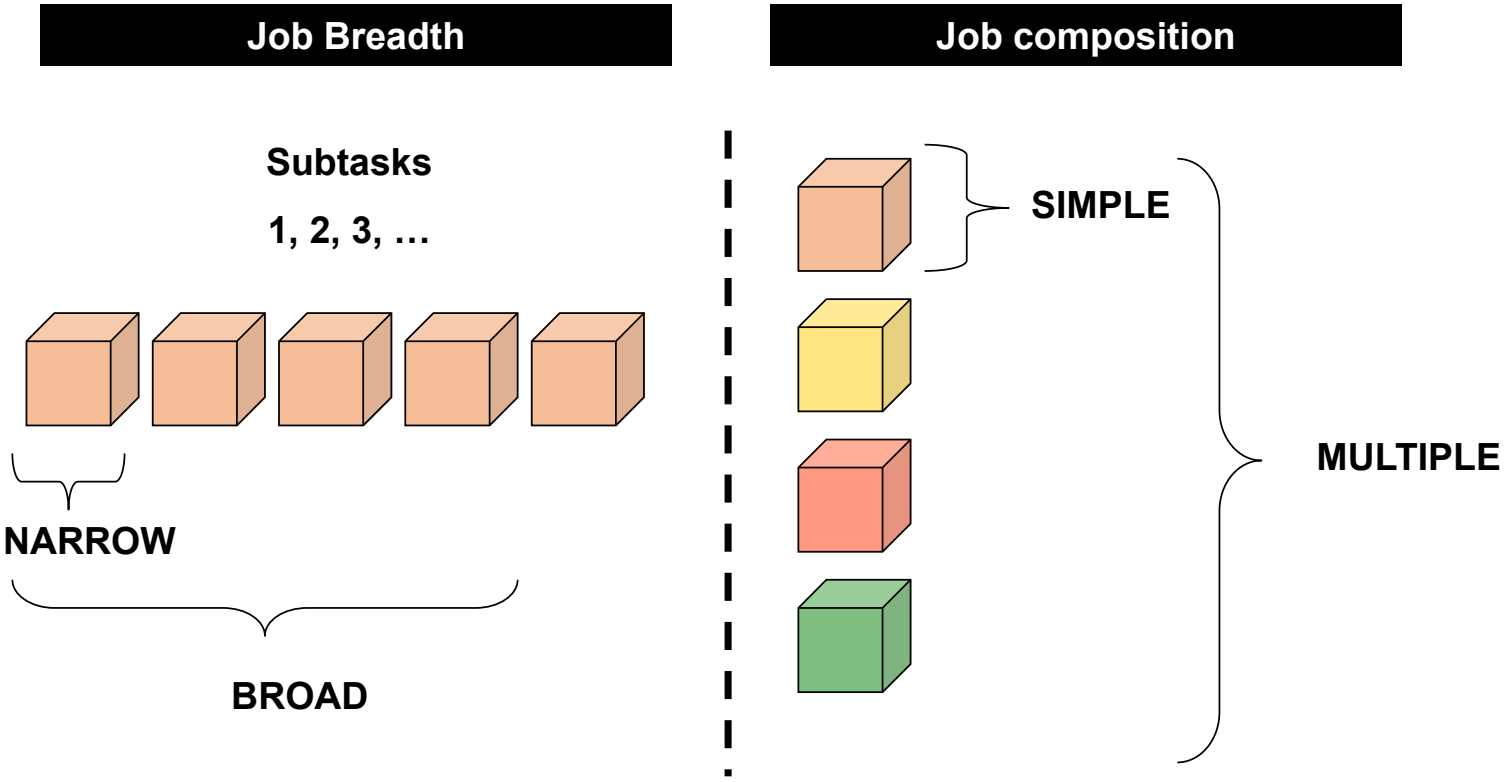
Division of labour human-machine



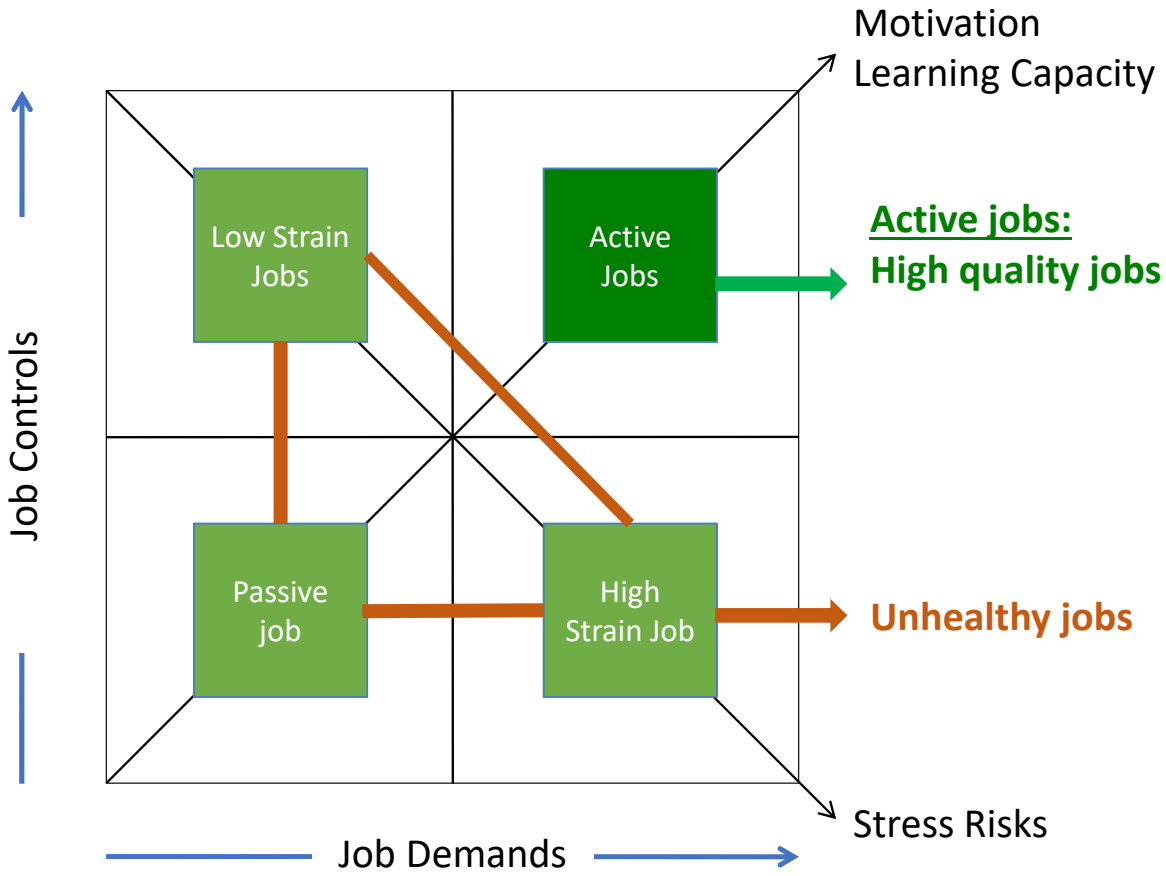
Work Design


ORGANISING TASKS
PREPARATION TASKS
EXECUTING TASKS
RESULT
SUPPORT TASKS

Job Breadth and Job Composition

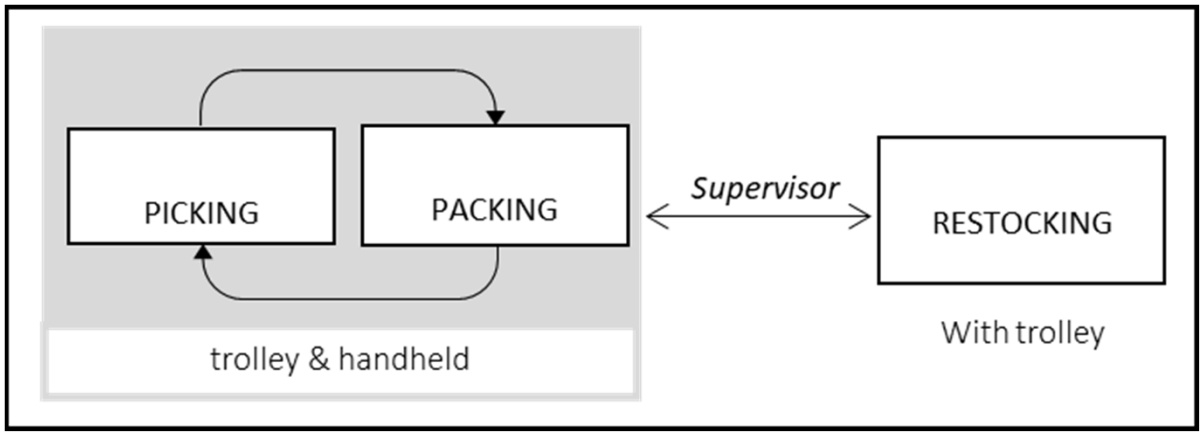


Job Demand / Control model

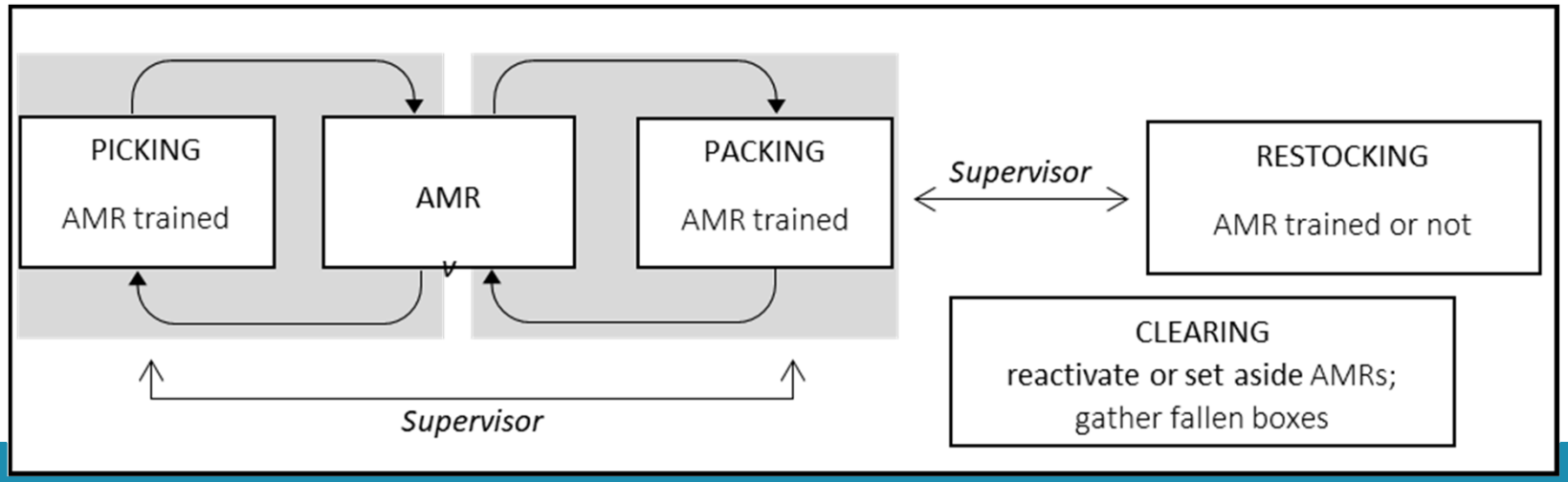


* Case 1 * Overlooking organisational factors can result in unexpected outcomes

Before AMRs



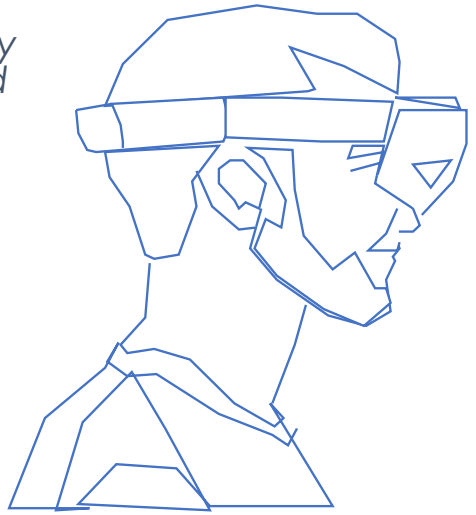
With AMRs



Habraken, M., Dessers, E., Berx, N., Pintelon, L. (2022). Samenwerken met cobots: goed nieuws voor de kwaliteit van arbeid? Over.Werk - Tijdschrift van het Steunpunt Werk, 32 (2), 113-121.

* Case 2 * Organisation design influences technology adoption and results **in industry**

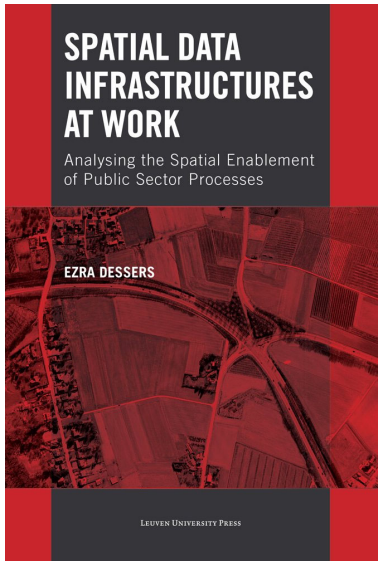
1. **Job controls:**
   - ***4***↑ *In our study, employees felt more comfortable making decisions because they could gather information from several sources with the S.G. themselves. It helped monitoring operations continuously from a distance.* (more autonomy)
   - ***3***↓ *In three studies on manual assembly, employees stated that there was no need for decision-making. Less concentration and thinking is required as instructions are easily shown to operators; it guides their ways of working.* (less autonomy)



2. **Job demands:**
   - **7**↑ Lower cognitive and mental demands due to working with a S.G." (mental relief)
   - **11**↓ In a manual assembly context, three studies reported significantly higher cognitive strain compared to working with tablet instructions and paper-based "*although headaches were no longer mentioned, participants still experienced a faster increase in mental fatigue while working with a S.G.*" (mental strain)

Bal, M., Benders, J., Dhondt, S., Vermeerbergen, L. (2021). Head-worn displays and job content: A systematic literature review. Applied Ergonomics, 91.
Bal, M., Vermeerbergen, L., & Benders, J. (2022). Putting head-worn displays to use for order picking: a most-similar comparative case study. International Journal of Logistics Management. https://doi.org/10.1108/IJLM-12-2021-0570

* Case 3 * Organisation design influences technology adoption and results **in services**

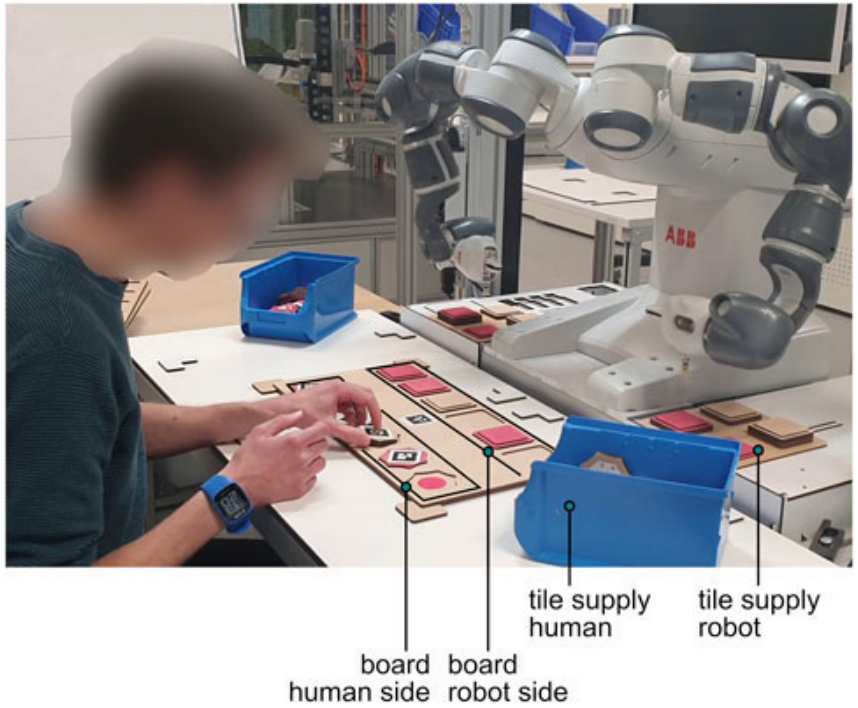


- Geographic information use and exchange in public sector processes
- Multidisciplinary teams, GI-skills present, 'whole process', low number of hierarchical layers… performed better
- Eg: spatial planning (RUP) in provincial administrations

Dessers, E. (2012) Spatial Data Infrastructures at Work. Leuven University Press.

* Case 4 * Technology design impacts job characteristics

- Experiment
- Tech Design
  - Human autonomy
  - Work pace
- Impacts perceived workload

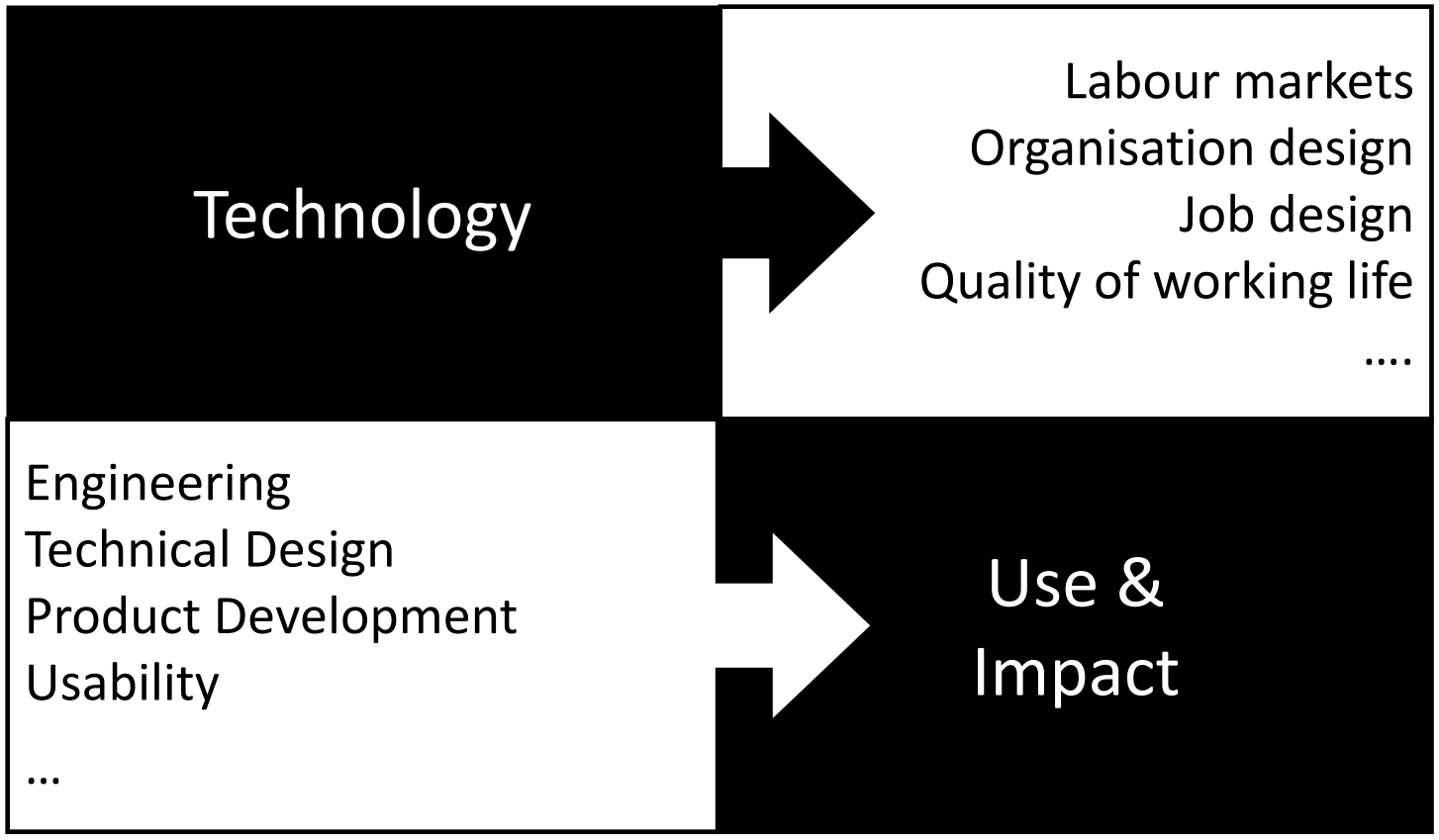


Van Dijk W, Baltrusch S, Dessers E, de Looze M, The effect of human autonomy and robot work pace on perceived workload in human-robot collaborative assembly work. Front. Robot. AI, 03 November 2023, Sec. Human-Robot Interaction, Volume 10 - 2023 | https://doi.org/10.3389/frobt.2023.1244656

Black boxes

Work and organisation science and practice

Technology development and engineering



VLAANDEREN INDUSTRIE 4.0

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

Living Lab: Technology for Workable Work

- Tech developers and engineers work together with sociotechnical work and organisation design experts
- How to design and implement technology and work organisation for improving quality of working life?

Technologie voor Werkbaar werk

Proeftuin Industrie 4.0

FLANDERS MAKE · imec · sirris · KU LEUVEN

VLAANDEREN INDUSTRIE 4.0 · AGENTSCHAP INNOVEREN & ONDERNEMEN

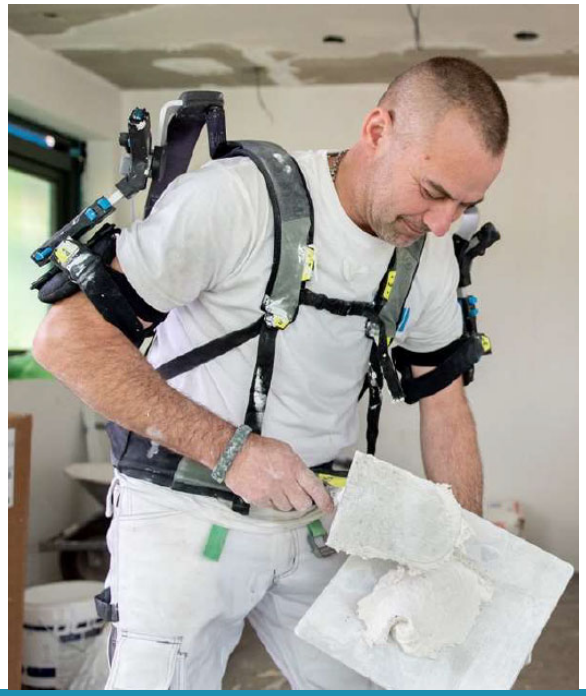
Employees are more than technology users

Acceptance, user friendliness, safety
→ Necessary but insufficient

Not just looking at (moment of) use

Keep focus on the entire job

Chain effects
- Other departments (e.g. support)
- Role of line manager
- Teamwork, planning…



“Sociocentred” technology

Human-technology interaction takes places within jobs, work processes, organisations, networks and ecosystems

Let’s develop technology and design work organisations together for creating motivational work

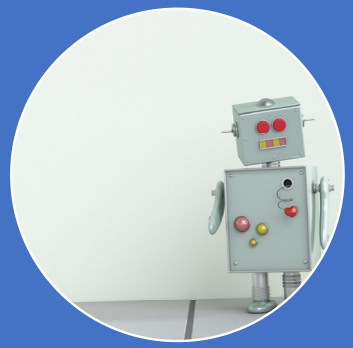
Conclusion

At a minimum: when introducing technology

- Assessment impact on work process
- Assessment impact on job characteristics (task shifting / enlargement…)

Even better: technology for motivational work

- Technology as an enabler → develop together with organisation of work
- In function of needs and risks
- Involve employees (co-creation) & give them control over technology



Technological Determinism

- Optimistic
- Dystopian

Sociotechnical Approach

Social Determinism

No fundamental changes

?
ezra.dessers@kuleuven.be