A ROBOTICISING LABOUR MARKET: IMPLICATIONS FOR WORKERS & VOCATIONAL EXPERTS

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AGENDA OF TODAY’S PRESENTATION

› Aim: project commissioned by AKC
› Introduction: robotisation, broad definition and typology, used in project
› Method: Case studies and ALERT
› Case: ‘pick-to-light’ system
› Findings
› Implications: disbalances
› Conclusions and Future directions: knowledge gaps and needs
AIM: PROJECT COMMISSIONED BY AKC

Commissioned by the Dutch Vocational Expertise Agency (in Dutch: AKC), TNO and VUmc investigated:

- different types of robotisation, and the implication of the changed human-robot relation: consequences, opportunities and disbalances for
  - job demands,
  - workers without and with disabilities, and
- the practice of vocational experts (f.i., rehabilitation specialists).

- knowledge gaps and development needs for practice of vocational experts
INTRODUCTION: ROBOTISATION
BROAD DEFINITION AND TYPOLOGY

› Technological developments [robotisation] affect job demands and labour market (Brynjolfsson & McAfee, 2014; Frey & Osborne; 2013):
  › challenges and/or opportunities for (impaired) workers

› Definition: developments of programmable or self-learning hard- and software (e.g. cobots, vision-technology, cognitive support systems, workflow software.
  › systems take over, entirely or partly, physical, cognitive-perceptual and/or physical tasks from humans.

› Applications in full spectrum of field of work:
  digitised administrative processes in banks - to industrial manufacturing robots.
## MATRIX: ROBOTISATION TYPOLOGY

<table>
<thead>
<tr>
<th>Physical support</th>
<th>Cognitive-perceptual support</th>
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<tbody>
<tr>
<td><strong>Robot</strong> supports <em>physical</em> task performance <em>to a large extent</em>. For <strong>humans</strong>, only some physical tasks are left and/or other tasks.</td>
<td><strong>Robot</strong> supports <em>cognitive-perceptual</em> task performance <em>to a large extent</em>. For <strong>humans</strong>, some cognitive-perceptual tasks left and/or other tasks.</td>
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<td><em>E.g.</em>: cleaning robot</td>
<td><em>E.g.</em>: digitised administrative process</td>
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<td><strong>Humans</strong> remain closely involved with <em>physical</em> task performance. <strong>Robot</strong> supports physical task performance <em>to some extent</em>.</td>
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<td><em>E.g.</em>: surgery robot</td>
<td><em>E.g.</em>: automated instructions: cf. ‘pick-to-light’</td>
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METHOD: INDICATORS, CASE-STUDY

- Several case-studies on different types of robots and support: mainly cognitive-perceptual-cognitive support, or mainly physical

- Changes in job demands assessed comparing job tasks before and after robotisation, retrospectively (structured interview format: ALERT method: Age & Load Experttool).

- Potential effects assessed on job demands, namely:
  - psychosocial demands (task load; job autonomy; social support);
  - cognitive-perceptual (information processing; concentration; information absorption and acting);
  - physical demands and ambient risks (out of scope of today’s presentation).
CASE: ‘PICK-TO-LIGHT’ SYSTEM

- Pick-to-light system for cognitive-perceptual support in assembly task at supplier company in automotive industry
- The studied task: assembly of part of a shock absorber, two operators.
- *Old situation:*
  - operator read from drawing how the product was to be assembled;
  - the parts lay in separate compartments in a large box on the table in front of them.
  - The employees assembled the entire product themselves (and still do so, since the pick-to-light system).

- *In the new situation* - pick-to-light system combined with screen
  - screen provides the cognitive-perceptual support: replaces reading the drawings,
  - prescribes task order
CASE FINDINGS PICK-TO-LIGHT

- *Psychosocial changes* involved, mainly:
  - Task simplification and less variation
  - Method autonomy decreased because the system fully prescribes the assembly order and method.
  - Dependency between operators increased due to splitting of tasks.

- *Cognitive-perceptual demands* were reduced:
  - lights indicate what, and where to pick.
  - Also, a screen provides written and visual instructions at the right moment, which traditionally had to be derived from drawings.
GENERAL FINDINGS, FROM CASES AND LITERATURE

- Robotisation influences organisation of work:
  - changing job profiles and job demands

- Robotisation influences physical, psychosocial and cognitive-perceptual demands, and can influence ambient risks.
  - → opportunities and threats to workers without and with disabilities

- Opportunities for human-robot collaboration:
  - if robot adapted to humans, threats may be reversed into opportunities
    - → inclusive work and labour market
IMPLICATIONS: DISBALANCES IMPAIRED WORKERS

Potential disbalances for impaired workers:

- Cognitive
- Psychosocial
- Communicative
- Motoric
- Visual
- Auditive
- Energetic
- Organic
**EXAMPLE: COGNITIVE DISBALANCE**

Example: employee with brain damage

Opportunity by cognitive-perceptual support system:

- task instruction can be offered
- in a individually adapted manner,
- with the right timing,
- as often as needed, et cetera,
by sensors at the work station.

‘Pick the second part out of the box.’
IMPLICATIONS FOR VOCATIONAL EXPERTS

he/she should be able, for prevention, and reintegration/inclusion of workers, to:
1. recognise changes by robotisation;
2. have insight into opportunities and threats;
3. avail opportunities and take away threats.

And should have access to more knowledge:
1. on (expected) effects of robot types on job demands, and (impaired) workers;
2. opportunities of new technology, e.g., programming;
3. at operational level: databases, roadmap, best practices

By means of:
education and training,
tools.
BIBLIOGRAPHY


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THANK YOU FOR YOUR ATTENTION