scale of NL Energy Transition

• NL approx. 13,000 districts/neighborhoods;
• NL 7* mio houses/buildings need energy supply conversion
  • till 2050: 433 districts or 260,000 houses per year (on average)
  • suppose district conversion takes 4 years: 2100 in focus(yr in yr out)
  • peak approx. 4000 districts in conversion process simult.
• additional Fte labour (EIB/TNO): NL ca 70,000 fte
• new technologies → substantive re-skilling required
• demographics predict decline of labour force
scale of NL Energy Transition

also ....

construction industry struggles with labor shortage
NL governemnt aims to build 1 mio extra homes
about 2 mio charging points for electric vehicles
cost are pink elephant in the room

demographics predict decline of labour force

scale of NL Energy Transition

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how to lower cost of the transition while ..... the process is labour intensive, labour force will be the bottleneck, and wages will not get lower
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the energy transition conundrum
requires a massive leap in productivity. new ways of work, new tools, push in learning, education and training
a big role to play for ‘educators’

eduction silos prepared for future challenges (?)
- integrated living lab approaches are essential -

edited version of a recent talk for MBO teachers in the domain architecture & infrastructure

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Education silos prepared for future challenges (?)

- integrated living lab approaches are essential -

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UNIVERSITY OF TWENTE
November - ERASMUS EXPECT meeting Dec 2, 2020
from experience MBO cooperation

- regional innovation fund
- national MBO for machine operators
  - professional excavation project
- regional MBO Twente
  - advanced technologies in road construction
  - utility surveyors
  - field lab digitalization energy transition

why would such cooperation between university and MBO work?
what would you gain from such cooperation?
why would this university-mbo work?

they seem not connected .... however....

societal challenges & changes

in common ...
all educators need to respond to the societal challenges and changes

- Urbanisation
- Energy transition
- Climate adaptation
- Circular economy
- Greening
- Livable
- Inequality
- Life cycle perspectives
- Maintenance
- Digitalisation/data explosion
- Automation/Robotisation
- Learning: experience methodic based
- Socio-economic changes
- Jobs, professions & vocations change
- Mix of jobs changes
- Demographics change
- Labour market unbalanced
societal challenges & changes

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all these challenges & changes .... at such speed...

already force us ‘educators’ to rethink and adapt our roles ....
building blocks of my talk

• progress: ladder of spiral?
• a pyramid and two triangles:
  • the ‘pyramide’ of the organisation
  • time and uncertainty
  • MBO-HBO-WO (the educators)
  • governement – companies – educutors
• the spiral and living labs
• implications ?!
paradigm: lineair knowledge production

- science for discovery
- R&D turns the new insights into innovations
- business turns these in new products
- sales & production create a new practice/market
- this new practice crystalizes in professions & skills
- industry ‘orders’ new education to fit the crystalised practice
a ladder or the spiral?

The Triple Helix
- Tri-lateral network interaction model between university, business and government
- The aim is to ‘innovate the innovation’

universities are aware of this changing role ....

why should this helix only apply for universities?
can’t we extent this to HBO and MBO?
the pyramid and the time
the pyramid and the time

In an organisation top as well as ‘workfloor’… all work in the same structure of purpose.

Their tasks serve the same goal, are interconnected, but vary in time perspective from long term to immediate.
the pyramid and the time

hierarchy reflects the time horizon of decisions ... and uncertainty

workfloor decisions are immediate in action and impact
- thinking is tacit -

skills translate contextual awareness, knowledge and technology into action sequence

refers to: Elliott Jaques “time span of discretion”
Us educators

perceive our relationships mainly linear (as a ladder):

- pragmatic, fits organisation/function/education paradigm
- logical from perspective of students climbing MBO → HBO → University
- aligns with the linearity assumption of the TRL paradigm
- aligns with linear knowledge production paradigm
Us educators

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this perception reinforces...
- education is end of pipeline
- common practice
- vested interest
- education is lagging behind

thus reactive...
slow to act on challenges and changes

Us educators

accept triangular connectedness:
- proactive: dialogue about long term visions and daily practices
- speeds up innovation cycle and learning curves
- integral response to organisations in change
- more rapid adoption technologies and progress
- universities use MBO’s shielded practice as test bed

an alternative view
the energy transition conundrum

how to lower cost of the transition while

the process is labour intensive, labour force will be the bottleneck, and wages will not get lower

---

diagram showing the pyramide, time & educators revisited

- HBO
- WO
- MBO

---

The Triple Helix:
- Tri-national network interaction between business and government
- The aim is to innovate the innovation

<table>
<thead>
<tr>
<th>Level</th>
<th>Time span</th>
<th>Type</th>
<th>Description</th>
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<tr>
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<td>3-5 years</td>
<td>Development</td>
<td>Senior Executives, PhDs</td>
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<td>Weekly</td>
<td>Staff</td>
<td>Value</td>
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<td>3-6 years</td>
<td>Manager</td>
<td>Group CEO, Vice-President</td>
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<tr>
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<td>Corporate Officers, professionals</td>
<td>Value</td>
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<tr>
<td>8</td>
<td>10-15 years</td>
<td>CEO</td>
<td>Corporate Officers</td>
<td>Value</td>
</tr>
</tbody>
</table>
the pyramid, time & educators revisited

when the pyramids of organisations are met by a triangle of education, change can be accelerated proactively

enhance innovation and learning
raise productivity
reduce cost
meet the challenges and changes

Q: How?
A: Living labs !!!

- regional living labs
- PPP’s for cooperation of MBO, HBO, Univ and practice
- combining learning, innovation and practice delivery
- thematic networks of teachers, researchers & practitioners
- intertwined development of technologies, processes and skills
- exploration of new practices, selection of best practices, towards codification, education and certification
- courses and programs from shared resources and road maps
- Teach the teacher trajecten
REDUCE

*reduction excavation damages in utility construction*

- univ. developed sensors on the excavators
- tested and improved on SOMA college
- digital models of students progress
  - teacher and student can evaluate the performance
  - machine color changes with unsafe behavior
  - path ribbon to visualise smoothness
  - color to signal energy use
- datafeed for training simulators
- test bed for experimentation: new inputs --> behaviour changes?
Pilot Projects: Feedback Support System

Virtual construction sites are environments for
new ways of learning (students)
for new education tools (teachers)
for simulation & experimentation (researchers)

Utility Surveyor

- cooperation MBO Twente
- land surveying declined (GPS/LIDAR)
- energy transition required earthwork
- location of buried utilities and objects highly uncertain
- univ. creates research lab for soil scanning technologies/methods
- Univ, HBO en MBO co-create practices, job descriptions & courses
- research lab co-use for education and training
- together we create a resource essential for the energy transition
Field lab digitalisation

• Univ Twente, Saxion & ROC Twente
• team op with municipality & housing cooperation
• linked to one of the energy transition ‘pilot’ burrows
• involve all stakeholders
• create a platform digital exchange information between stakeholders
• to streamline communication and decisions
• students as learners & co-developers (challenge based education)
• identify technology gaps and new vocations
• develop tools and courses, programs & certificate stucture
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**scale of NL Energy Transition**

*the energy transition conundrum*

can be addressed by...... ‘helix together’
accepting the helix paradigm and work together in field labs, so researchers & educators can take a proactive role in creating the resources needed for the energy transition (human capital and technology linked)
The scale of NL Energy Transition

Some concerns (the uphill battle):
- Policies/budgets are still based on TRL linear thinking
- Research, innovation, and education funding separated
- Force Univ., HBO and MBO in their own lane
- No instruments that support the ‘helix’ approach (YET)

Demographics predict a further decline of the labour force.