



# The skills tool

Developing a tool Using AI methods to measure employers demand for skills in online job posting

**Danish Agency for Labour Market and Recruitment**

# Purpose of the tool – a value driven approach

- The project consists of **two separate parts**:
  1. Developing a technically advanced automatic datamodel
  2. Creating a meaningful tool that's intuitive and creates the value needed for the end users
- The project (2018-2021) is a **political initiative** from a tripartite agreement, between government, main trade union confederation and employers' confederation.
- **Generate better knowledge** of which skills companies look for when recruiting
- Use the knowledge when planning **re-education of unemployed** (Active labour market policy)
- Develop the tool for the **two main target groups**:
  - 1) The Public Employment Systems
  - 2) The educational system and Life Long learning-coordinators



# Main questions that guided the project

- What problem are we trying to solve with this project?
- How can we develop a tool that has a very complex datamodel and still make it understandable (self explanatory) for counsellors?
- How can we make sure the counsellors use the data provided?

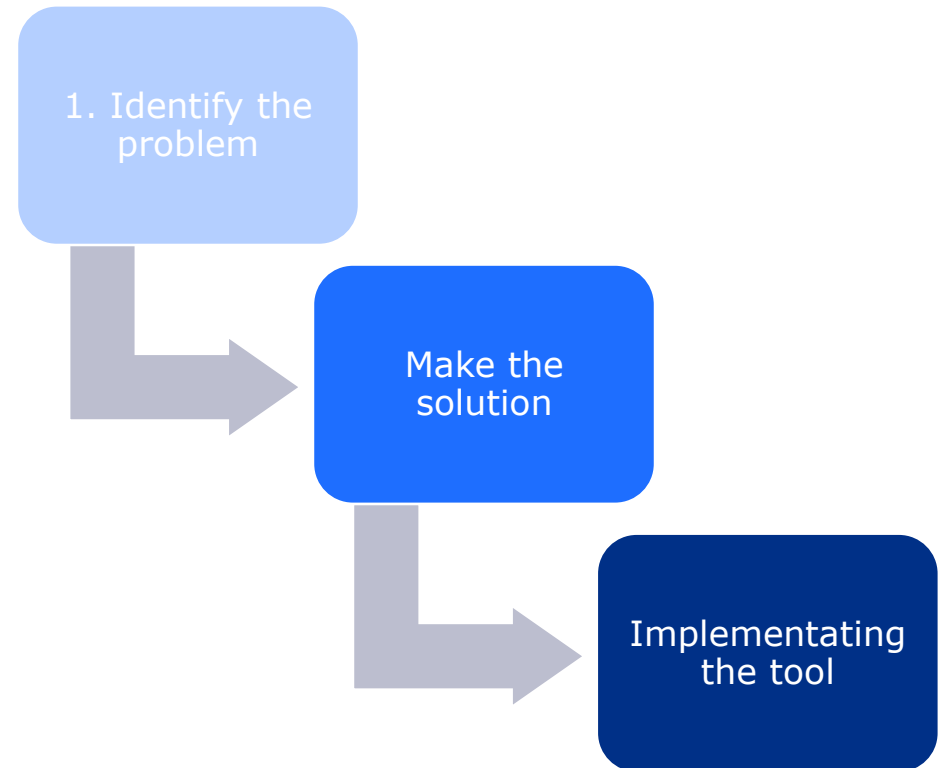
→ focus on the MVP and thereafter continues development together with end users (early adopters of our solution)



# Main focus and proces: from idea to intelligens tool

Cooperation with external consultants, who has developed the tool together with Danish Agency for Labour Market and Recruitment

1. Interviews/workshops to get a better understanding of competences vs. occupations – how can it be used at what output is needed.
2. Interviews/workshops to define “jobs to be done”. In what circumstances (as is) could competences be used today.
3. Working group/workshop to test the tool – did we provide the information needed?
4. Implementing by “online approach” during Covid-19. Presentations, videos, linked-in, newsletters



# User involvement and testing

# Involving the users

- identifying the problem and keeping focus on how they work today

1. Workshops with Life Long learning-coordinators og caseworkes in order to identify "jobs to be done" and user stories for the development of the model and tool
2. User stories where validated and prioritised, and development was planned after what had the highest value for the different groups
3. Approx. 20 digital user tests of ½ hour was conducted. We observed as they navigated in the tool and they gave their first impressions (both management and case workers).
4. Surveys was conducted after the digital tests.

## Timeline



# User stories / Jobs to be done: User testing

User testing was divided in two. First we wanted to know how important the user stories were for the case workers. This helped us prioritise the development of the dashboard. Second we wanted the same persons to validate if the solution was meaningful and intuitive.

| JOB TO BE DONE   | Score |
|--|-------|
| 2. In my work i need to <b>cover the labourmarket needs</b> and I need a clear picture of what competences are in demand for a specific occupation. That way I can quickly find out what competences companies demand most often | 8     |
| 3. In my work i need to <b>cover the labourmarket needs</b> and I need a relevant background information about an occupation in order to know how "important" a specific occupation is local, regional, national.                | 8     |
| 4. In my work i need to <b>use supporting knowledge</b> in order to guide unemployed to choose between courses and education. Therefore I need to have the demand for specific competences structured in a meaning full way.     | 8     |

# User testing

## Main results

### Overordnede resultater

- ✓ Users were excited and happy with the knowledge the tool provided. In particular they saw value in the meetings with the unemployed and companies.
- ✓ The overview of which competences are needed was very useful. It gives a quick understanding of the demand for competences, which provided value in the dialogue with both unemployed and companies.
- ✓ Particularly they found value in the solution where occupations are compared to other occupations, giving a quick view of the possibilities for substitution and jobturnovers.
- ✓ A need for other ways to group competences and occupations eg. "green jobs" and "green competences".
- ✓ Some thought the competences were not detailed enough.





# How can the tool be used by practitioners?

## Case workers

Uses the competence tool to:

- ✓ make the citizen relate more realistically to the notion of an industry and its need for labor or employment opportunities.
- ✓ expand the citizens' perspective in relation to job search and talk **ABC jobs**.
- ✓ Talk about substitution with the companies when the PES does not have any vacancies on the shelves within the requested job category.
- ✓ provide guidance on the educational opportunities based on facts and information about the employment opportunities and the companies' competence needs according to any finished education.
- ✓ It can put a broader perspective on the conversation.

It can help both me and the citizen to relate more realistically to the notion of an industry and its need for labor or employment opportunities.

It will be of significant importance for my guidance on the educational opportunities that I can take as a starting point facts and info about the employment opportunities after any finished education. It can put a broader perspective on the conversation.

It can help to broaden the citizens' perspective in relation to job search and ABC jobs. It is also relevant in the dialogue with the companies when the job center does not have any vacancies on the shelves within the requested job category. Often companies demand specific competencies and not a specific profile in relation to job title ”.

# How can the tool be used by practitioners?

## Adult and continuing education-coordinators

Uses the competence tool to:

- ✓ Assess which courses are most relevant in order to qualify an unemployed to a specific occupation
- ✓ Discuss course content and whether the learning objectives are in line with companies' demand for competencies
- ✓ Assess whether one can qualify for a specific occupation via short courses, or whether it requires longer-term education. And which courses, if any, may be relevant
- ✓ Assess whether there is a connection between course offerings and the companies' demand for competencies

“The tool provides an overview of which competencies are most in demand within the individual job title. That knowledge must be used to assess which courses are most relevant for qualifying for a job title.

“The tool provides a good and quick overview as background knowledge to assess whether you can qualify for a job title via short courses, or whether it requires longer-term education. And which courses may be relevant in that case ”.

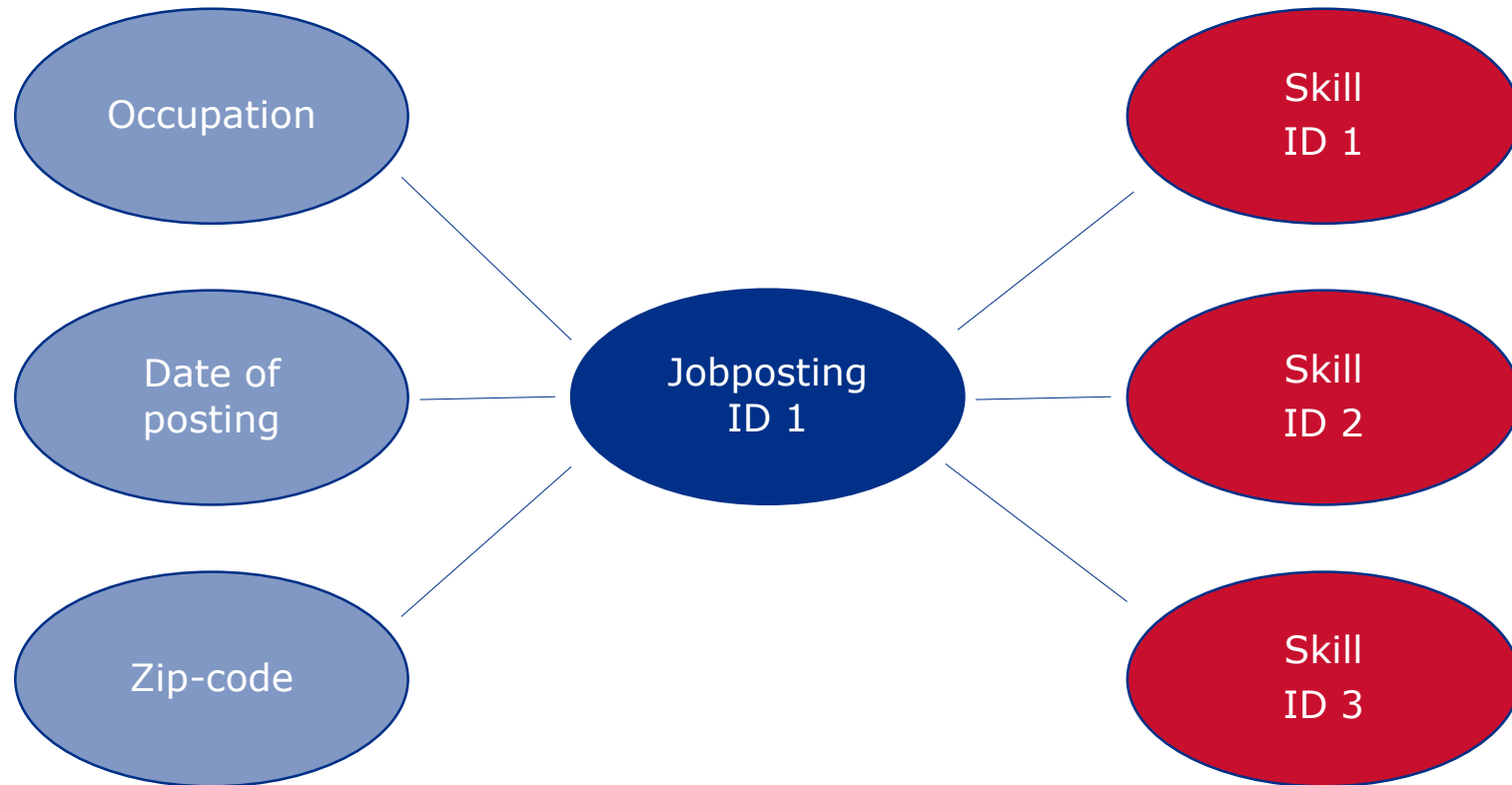
”Værktøjet kan anvendes til vurdering om der sammenhæng mellem kursusudbud og virksomhedernes efterspørgsel efter kompetencer”

# **A quick glimpse at the competence tool**

# Generate structured data of skills

**Have:** Structured data already attached to jobpostings

**Want:** Skills per jobposting



# Have

- Screenshot from the public job portal "jobnet".

The image consists of two side-by-side screenshots from the jobnet portal. The left screenshot shows the search results page for 'Kørekort B'. A blue arrow points to the search bar containing 'Kørekort B' with the text 'Search for B Driver Licence'. The right screenshot shows a job listing for 'Virksomhed i Holstebro/Herning-Rengøringsmedhjælpere til privat og erhverv'. A blue arrow points to the requirements list, which includes 'Have B kørekort (kørekort til alm. bil)'. The requirements list is circled in red.

**Search for B Driver Licence**

**'Kørekort' AND 'B'**

# Natural Language Understanding

- Group expressions of same meaning into one unit.
- Even simple expressions of skills as B Driver Licence is spelled in many different ways.

- kørekort
- kørekort til personbil
- kørekort b
- kørekort kategori b
- gyldigt kørekort
- kørekort til kategori b
- kørekort til bil
- b - kørekort
- almindeligt kørekort
- kørekort til almindelig bil
- kørekort til alm . bil
- kørekort , kategori b
- kørekort til almindelig personbil
- kørekort ( b )
- alm . kørekort
- kørekort til personbil kategori b
- almindeligt b kørekort
- alm . b - kørekort
- gyldigt b - kørekort
- b kørekort
- kørekort til personbil (ukendt ord)

- kørekort B

# To create this

Vælg stilling:

specialarbejder, byggeri

Se statistik for alle kompetencer eller

Vælg kompetence:

Betjene maskiner, køretøjer og...



ARBEJDSMARKED

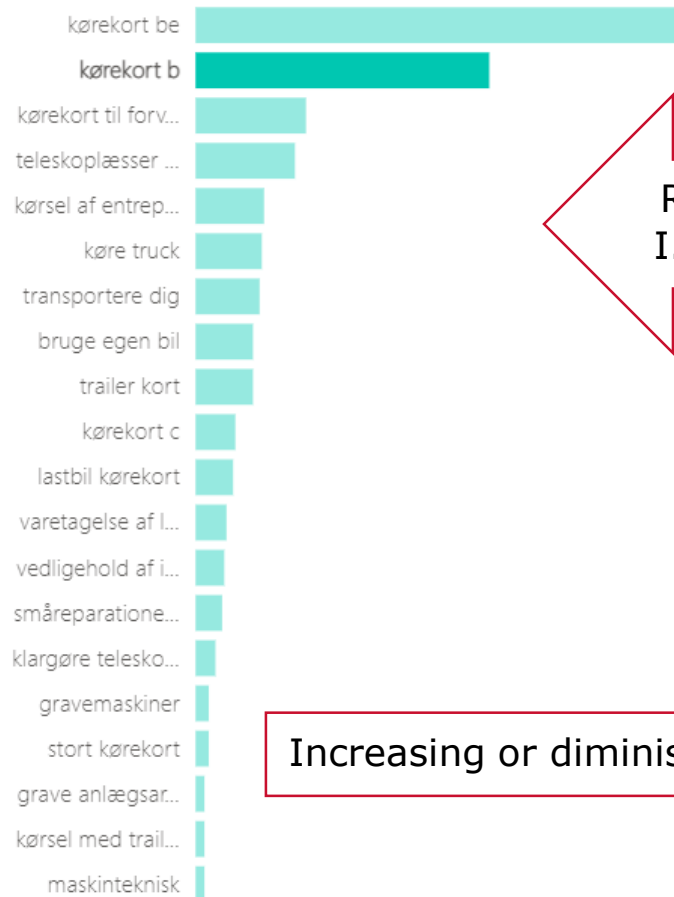
KOMPETENCER

KOMPETENCER OVER TID

BYG KOMPETENCEKORT

SAMMENLIGN STILLINGER

Mest efterspurgte kompetencer for stillingen



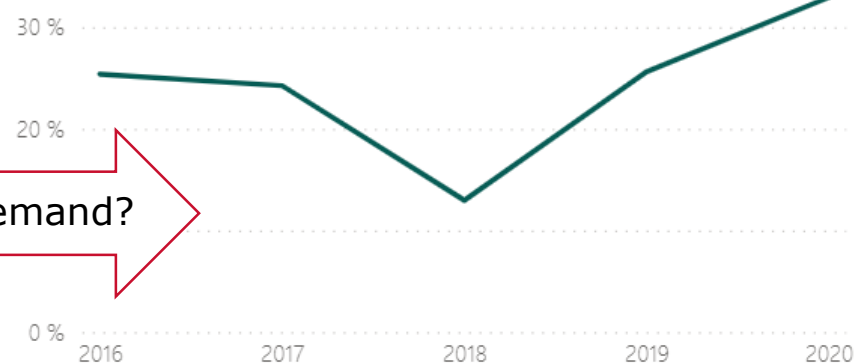
Her har du mulighed for at se nærmere på hvordan den enkelte kompetence har udviklet sig over tid. Dette kan give et indblik i om efterspørgslen er faldene eller stigende.

De største kompetencer er illustreret i figuren. Klik på en af søjlerne og se hvordan udviklingen har været fra 2016 til 2020.

Relative share of skill in jobposting.  
I.E. which skills are most in demand

Udvikling i andel jobopslag med kompetencen

Kompetence ● kørekort b



Increasing or diminishing demand?

# To create this

Vælg stilling:

specialarbejder, byggeri

Se statistik for alle kompetencer eller

Vælg kompetence:

Betjene maskiner, køretøjer og...



- ARBEJDSMARKED
- KOMPETENCER
- KOMPETENCER OVER TID**
- BYG KOMPETENCEKORT
- SAMMENLIGN STILLINGER

Mest efterspurgte kompetencer for stillingen ⓘ

koplæsser ...

kørsel af entrep...

bruge egen bil

trailer kort

kørekort c

lastbil kørekort

varetagelse af i...

vedligehold af i...

småreparatione...

klargøre telesko...

gravemaskiner

stort kørekort

grave anlægsar...

kørsel med trail...

maskinteknisk

Her har du mulighed for at se nærmere på hvordan den enkelte kompetence har udviklet sig over tid. Dette kan give et indblik i

Translation:

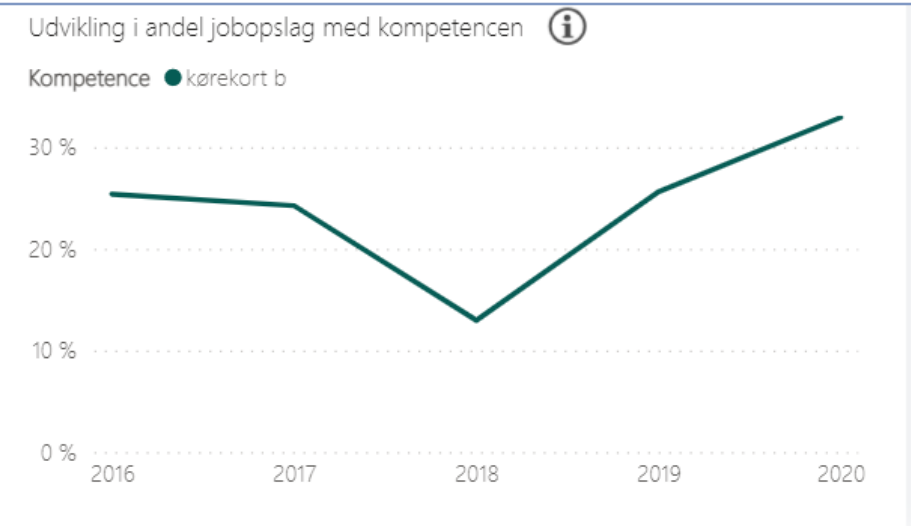
Vælg stilling = Choose occupation

Specialarbejder, byggeri = unskilled building construction labourer

Vælg kompetence = Choose skill (group) Skills are grouped in ESCO Taxonomy

Betjene maskiner, køretøjer og... = ESCO S8 'working with machinery and specialised equipment'

<https://ec.europa.eu/esco/portal/skill>



<https://ec.europa.eu/esco/portal/skill>



# Where is a skill in demand

Types of occupations that most frequent demand 'Excel'

## Sammenlign forskellige stillinger

Vælg kompetence:

Flere markeringer ^

excel

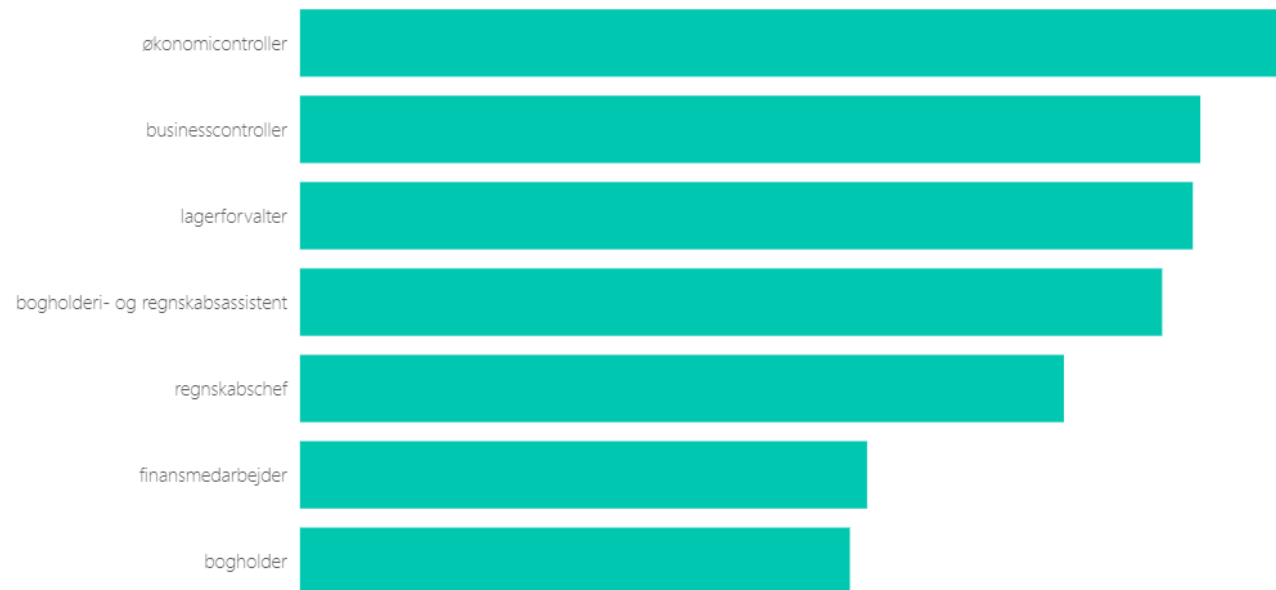
- arbejde i excel
- brug af excel
- bruge excel
- excel
- kodning i excel
- superbruger af excel



- ARBEJDSMARKED
- KOMPETENCER
- KOMPETENCER OVER TID
- BYG KOMPETENCEKORT
- SAMMENLIGN STILLINGER**

Her er det muligt at sammenligne stillingsbetegnelser. Vælg en gruppe af kompetencer til venstre og se for hvilke stillingsbetegnelser der oftest efterspørges den valgte kompetence.

Stillinger, som kompetencen er mest efterspurgt inden for: ⓘ



# Plus and minus

## A machine learning approach to structure natural language

- Measures employers actual demand
  - Low maintenance of taxonomy
  - New skills can be incorporated automatic into a skill taxonomy
  - The models can process all historic and future jobpostings, according to current taxonomy
- Jobpostings are written with a different purpose in mind than input for a skill database. Eg. required skills implicitly written in the education.
  - Jobpostings are biased. Some areas of occupation use jobpostings in a lesser degree for recruitment.
  - Systematic errors in the models are close to impossible to eradicate.
  - Semantic meaning cannot perfectly be structured into a 2D table.

# A bottom up approach

- The tool is not mandatory – valuecreation should carry it forward
- Our regional offices have been coordinators/advocates. They have introduced the tool to the job centers/case workers of the tool in employment offices and training them
- We have raised awareness about the competence tool by linked-in, newsletters, ERFA meetings ect.
- We have provided online sessions and recorded them. This way case workers and interested can see what and how if the need training.
- We have since the launch monitored the usage. Both the ones using the tool and the ones that do not. We have already and will continue to send out newsletters and questioners in order to continue to improve the tool.

# Some thoughts and going forward

Main findings for a successful adoption of a digital tool

- The need to have management involved (our tool is not mandatory) and interested users
- Having the end users of the tool involved closely in the development phase
- Identifying the processes today in order to fit and adapt the tool
- Making the tool intuitive is very important

Going forward the focus will be on:

- Raising awareness among users and expand the core group to other areas
- Putting data directly in the PES systems
- Integrating the tool/data in the unemployed CVs
- Improving the data model, making the solution more intuitive and continuing to get feedback

**Thanks for listening**

**Daniel & Esben**