Pre-Conference Engagement Day
6 FEBRUARY 2024
Data on TVET and skills development

CONFERENCE ON
EDUCATION DATA
AND STATISTICS

CONFERENCIA SOBRE
DATOS Y ESTADÍSTICAS
DE EDUCACIÓN

CONFÉRENCE SUR LES
DONNÉES ET STATISTIQUES
DE L'ÉDUCATION

7 - 9 FEBRUARY 2024
UNESCO HEADQUARTERS, PARIS, FRANCE
Data on TVET and skills development: Current state and options for future development

Monitoring TVET in the SDG 4 agenda and beyond

Friedrich Huebler
UNESCO-UNEVOC International Centre for TVET
6 February 2024
Why are TVET data important?

• **Technical and vocational education and training (TVET)** is an essential component of lifelong learning and skills development.

• TVET can contribute solutions to many of today’s global challenges, including climate change, hunger and poverty, skills shortages, unemployment.

• **TVET contributes to the achievement of the SDGs**: education (SDG 4), gender equality (SDG 5), decent work and economic growth (SDG 8), climate action (SDG 13).

• UNESCO Strategy for TVET 2022-2029 emphasises role of TVET for equitable, sustainable and peaceful individual, social and economic development.

• For policy design, monitoring and evaluation, we need current, comprehensive and reliable data on TVET and skills development.
SDG indicator 4.3.3: Definition

TVET only monitored by one thematic indicator: SDG indicator 4.3.3
“Participation rate in technical-vocational programmes (15- to 24-year-olds) by sex”

The number of young people aged 15-24 years participating in technical and vocational education at secondary, post-secondary non-tertiary or tertiary levels of education is expressed as a percentage of the population of the same age group.

\[
PR_{V,15t24} = \frac{E_{V,15t24}}{P_{15t24}}
\]

where:

- \( PR_{V,15t24} \) = participation rate of young people aged 15-24 years in technical and vocational education and training.
- \( E_{V,15t24} \) = enrolment in technical and vocational education and training of young people aged 15-24 years.
- \( P_{15t24} \) = population aged 15-24 years.

Last technical discussion happened in 2018 at the fifth meeting of the Technical Cooperation Group on SDG 4 indicators (Mexico City).
SDG indicator 4.3.3: Data sources

Data to calculate the indicator comes from the **UIS annual Survey of Formal Education**.

**Numerator:** Data on enrollment in secondary (ISCED 2 and 3), post-secondary non-tertiary (ISCED 4), and short-cycle tertiary education (ISCED 5).

**Denominator:** Population from national sources or UNPD.
SDG indicator 4.3.3: Availability

Typically, around half of Member States have an indicator value in any given year.

Europe and North America: 9 out of 10 countries have reported data on indicator 4.3.3.

Sub-Saharan Africa: less than one third of countries have data since 2017.

Availability in recent years is decreasing.
SDG indicator 4.3.3: Interpretation

How relevant is the indicator for policy recommendations?

- Interpretation not straightforward.
- In many countries most 15- to 24-year-olds are outside of the formal education system.
- At the moment, there is no distinction between general/academic and vocational/professional education beyond ISCED level 5. This could make a difference in countries where large proportion of 15- to 24-year-olds are considered enrolled in general/academic tertiary education.
TVET data beyond SDG indicator 4.3.3

- **TVET policy reviews** by UNESCO Headquarters and Field Offices (Grenada, Jordan, Mauritania)
- **Survey of UNESCO-UNEVOC community** in November 2023 and January 2024:
  - Usage of TVET country profiles and importance of statistical data
  - Satisfaction with the available information
  - Overall use of TVET-related statistics
  - Key international indicators on TVET
  - Key data sources for international indicators on TVET
  - Key challenges/needs with data user
Key findings of UNESCO-UNEVOC survey

• Users of UNEVOC TVET country profiles mostly need data for **cross-country comparisons** (disaggregated time series)

• **Main domains** of interest:
  • TVET participation (SDG indicator 4.3.3), enrollment
  • TVET financing
  • Employment outcomes (employment, placement, income) and other labour market data (e.g. skills supply and demand)
  • Other: quality/relevance, teachers/trainers, drop-out, etc.

• **Main challenges:**
  • Variety of sources: UIS, ILO, World Bank, OECD, Eurostat, ADB, others
  • Difficulties identifying relevant data
The path towards better TVET data

• **SDG indicator 4.3.3:**
  - Encourage and support Member States to respond to [UIS Survey of Formal Education](https://uis.unesco.org/uis-questionnaires).
  - Improve ISCED to better distinguish between population 15-24 years enrolled in general/academic and vocational/professional tertiary education (ISCED levels 6, 7, 8).
  - Improve collection and reporting of data on non-formal TVET.

• **UNESCO Strategy for TVET:**
  - Collect and analyse data from different sources, on various aspects of TVET to better capture the linkages between TVET and the labour market: access and participation; qualifications, skills and competencies; school-to-work transition; employment; teachers and trainers; financing.
  - Develop framework of key TVET indicators for monitoring of skills development; develop tools such as a global skills tracker.
  - Support ethical and effective use of TVET data by Member States for governance, management and delivery of education.
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The status and frontiers of TVET monitoring

UNESCO conference on Education Data and Statistics
2024.02.06, Paris

Mantas Sekmokas, Expert
The evolution of TVET monitoring from European perspective

- The concept covers both initial (formal) and continuous (non-formal) VET
- Extended history of VET data collection and analysis the in EU
- Dedicated statistics as of early 1990s (CVTS, VET data collection, AES…)
- A key development - implementation of ISCED 2011 from mid-2010s
- Further mainstreaming of variables capturing VET as of 2020s
- Adoption of formal monitoring framework (indicators and targets) within the “Council Recommendation of the 24 November 2020 on vocational education and training”
  - the share of employed graduates from VET should be at least 82 %
  - 60 % of recent graduates from VET benefit from exposure to work-based learning <…>
  - 8 % of learners in VET benefit from a learning mobility abroad
- Multiple monitoring instruments deployed by CEDEFOP (see Appendix)
Current data availability in the key domains of TVET monitoring

- **Formal TVET**
  - Stock of learners (e.g. enrolment) – available globally
  - Inflows and outflows of learners – mostly restricted to EU/OECD datasets
  - Finance – available globally, but with multiple gaps

- **Non-formal TVET, including training in public & private companies**
  - General participation covered in SDG indicator, but no formal/non-formal breakdown (?)
  - Other data mostly limited to EU datasets, with gaps (e.g. excluding public sector training)

- **TVET on the labour market**
  - Number of TVET graduates at all ages – mostly restricted to EU datasets
  - Employment situation of TVET graduates – mostly restricted to EU datasets
  - Only general employment, educational and occupational data available globally (ILOSTAT)

- **TVET within demographic (census) and economic (national account) data (?)**
Frontiers for TVET monitoring

- **Standard-setting**
  - Developing concepts and measurement of TVET at higher levels (ISCED5+)
  - Classifying non-formal education/TVET (ref. 2022 G7 communiqué) – ISCED, CLA…
  - More precision in measuring the purpose and occupational linkage of TVET programmes
  - Developing statistically sound international skills classification (ref. 2023 G20 declaration)

- **Exploiting and improving data availability**
  - Capturing TVET in the labour market, government finance (i.e. COFOG) statistics
  - Education and training statistics (with TVET breakdown) aligned with national accounts

- **More focus on the demand side (including TVET - industry/employers links)**
  - Quantifying supply and demand imbalances (*still largely not feasible?*)

- **Monitoring data use & users’ needs, esp. in developing economies**
  - International reference point/support service for TVET data/statistics…
Appendix:

Key references:

- G7 Elmau communiqué, 2022: https://www.g7germany.de/g7-en/g7-documents

CEDEFOP VET monitoring tools:

Workbased learning and apprenticeships in international TVET statistics

Contribution to the UNESCO conference on Education Data and Statistics, Tuesday, 6 February, Paris
Workbased learning and apprenticeships in international TVET statistics

- Clearly established need for better comparative TVET statistics
- VET policy arena needs better data for mutual learning and in order to draw conclusions for future actions and priorities
- New challenge: modern TVET concepts overcome the boundaries between education and the world of work
- Apprenticeships, WBL and Informal sector
- Spanning different responsibilities and also SDGs
Example indicators desired on an international scale

• Amount/share of companies offering workbased learning
• Amount/share of learners (apprentices) among workers
• Occupations/Programmes according to their popularity (schoolbased – workbased)
• Figures/Data on work as the context of learning – quality
• Development over time, share of different types of companies…
• ….
Training rate (AQint)

number of people in employment (denominator). The information on the employed comes from the ILO (International Labor Organization 2020)

company-based apprenticeships (numerator) is based on national training statistics

apprenticeships mentioned conceal very different specific regulations and arrangements regarding content and form but are all based on contractual relationships between the learner and the company

Source: BIBB 2021 (adapted)

• (International) Apprenticeship Training Rate
Example Challenge: company size and apprenticeships

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1-9 employees</td>
<td>15.5%</td>
<td>15.1%</td>
<td>66%</td>
<td>Size not known</td>
</tr>
<tr>
<td>10-49 employees</td>
<td>26.8%</td>
<td>22.8%</td>
<td>11%</td>
<td>1-99 employees</td>
</tr>
<tr>
<td>50-249 employees</td>
<td>19.3%</td>
<td>27.9%</td>
<td>11%</td>
<td>100-499 employees</td>
</tr>
<tr>
<td>SMEs in total (1-249 employees)</td>
<td>61.6%</td>
<td>69.8%</td>
<td>77%</td>
<td>SMEs in total (1-499 employees)</td>
</tr>
<tr>
<td>250 and more employees</td>
<td>38.4%</td>
<td>30.2%</td>
<td>23%</td>
<td>500 and more employees</td>
</tr>
</tbody>
</table>

Sources: BIBB 2021; Dommayer 2021; Ministère du Travail, de l’Emploi et de l’Insertion 2022; NCVER 2022
Outlook

- Emerging international convergence of concepts and structures of TVET
- Increasingly including WBL
- Requires better statistical indicators
- Existing national and international data (workers and company statistics) could be explored in their potential to inform TVET reporting
- Could draw on recent work of ILO and OECD (informal economies, VET statistics)

Some model indicators could be developed
UNESCO Unevoc would be an excellent address for this work, since it can integrate conceptual and statistical expertise

Interdisciplinary and intersectoral co-operation will be required
Thank you for your attention

philipp.grollmann@tu-dortmund.de
www.tu-dortmund.de
• Work as a context for learning – Example PIAAC 2012 Data, Job requirements approach

<table>
<thead>
<tr>
<th>Country</th>
<th>Not at all</th>
<th>Very little</th>
<th>To some extent</th>
<th>To a high extent</th>
<th>To a very high extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>8.97</td>
<td>10.14</td>
<td>30.84</td>
<td>11.97</td>
<td>22.83</td>
</tr>
<tr>
<td>Germany</td>
<td>10.11</td>
<td>10.61</td>
<td>22.19</td>
<td>27.41</td>
<td>29.68</td>
</tr>
<tr>
<td>Italy</td>
<td>8.56</td>
<td>9.17</td>
<td>21.07</td>
<td>29.96</td>
<td>30.84</td>
</tr>
<tr>
<td>Japan</td>
<td>22.12</td>
<td>14.48</td>
<td>18.1</td>
<td>19.7</td>
<td>25.96</td>
</tr>
<tr>
<td>Korea</td>
<td>12.07</td>
<td>16.5</td>
<td>18.62</td>
<td>32.78</td>
<td>30.84</td>
</tr>
<tr>
<td>Spain</td>
<td>15.49</td>
<td>14.27</td>
<td>18.84</td>
<td>32.07</td>
<td>29.68</td>
</tr>
<tr>
<td>UK</td>
<td>26.18</td>
<td>15.78</td>
<td>20.03</td>
<td>30.81</td>
<td>22.12</td>
</tr>
<tr>
<td>USA</td>
<td>12.79</td>
<td>18.72</td>
<td>16.5</td>
<td>32.78</td>
<td>30.81</td>
</tr>
<tr>
<td>Average</td>
<td>12.79</td>
<td>18.72</td>
<td>16.5</td>
<td>32.78</td>
<td>30.81</td>
</tr>
</tbody>
</table>

Sample size (n) = 5.983
Unlocking Insights: Leveraging Web Job Postings Data for Skills Intelligence in TVET
Motivations
Labour market changes

Constantly changing labour market:
- Skills Evolution
- New Emerging Occupations
- Job Automatisation
- Mobility
- Remote Working
- Artificial Intelligence

Improving skills needs analysis: the foundation of skills development:
- Up-to-date information
- Information aligned with market demands
- Prediction can be done to anticipate trends
What a Billion Jobs Can Tell Us
vs. Traditional Labour Market Information

Greater speed, granularity compared to survey-based instruments

Because of that speed and detail, the data are more actionable

In addition, job postings provide insight into real-world skill demands
Junior Data Scientist & Analyst Placement

London • Hybrid remote
Internship

As a rapidly developing data team, you will join other business professionals who are responsible for measurement solutions and modelling expertise. Help a diverse client-set understand the true value of their media investment, create compelling data stories on how to drive growth, and automate the insights into the planning cycle through the capabilities and tech stack.

As a media agency that's made differently. We're purpose-led, data-driven and proudly independent. Our independence means we can focus 100% on doing the right thing to secure success for our clients and our brilliant people. We are trusted to deliver that success for some of the UK’s most ambitious and complex organisations, including SunLife, Guide Dogs, RNLI, Laithwaites and National Trust.

**What you'll be doing**

- Work closely with business to identify issues that can be resolved using data solutions effectively for decision making
- Machine learning tools and statistical methods to solve complex problems
- Build algorithms and design experiments to merge, manage, interrogate, and extract data to supply tailored reports to colleagues, clients and wider areas in the company
- Support the account management and planning teams across all facets of campaign measurement across media channels
- Develop automated data processes using Python/R
- Ability to organise a variety of large data sets
- Undertake regular analysis and reporting for retained clients
- Maintain clear and coherent communication, both verbal and written, to understand data needs and report results
- Working with the Datalab team and other senior business stakeholders to develop analytical propositions

**The skills you will bring**

- Highly numerate undergraduate studying a relevant degree in mathematics, statistics, econometrics or computer science
- Pre-requisite skills: Strong Excel and MS Office usage
- Experience of coding in Python, R or SQL
- Experience of data visualisation tools like Tableau/Qlik/Power BI/Google Data Studio would be useful but not essential
- Theoretical understanding of statistical techniques such as regression and developing confidence measures.
- Strong data manipulation skills and a keen eye for detail.
Challenges

High interest
- Observe micro-level labour demand (with some caveats)

Retrieval and analytics
- High volume
- High frequency velocity
- Many formats variety, noise
- Duplications
- No control over reference population veracity
How draw meaningful insights

Turning big noisy data on job postings into clear and actionable data points

**Sourcing and scraping**
Machines trawl across 1000s of websites looking for things that look like job postings, and then taking the data – we avoid aggregators and seek original sources.

**Parsing**
Broken down into what machines identify as likely important information elements – job title, salary, company, location, body text – to give a structure to each posting.

**Quality filtering**
Some of the things that look like postings just aren’t (e.g. they’re training courses), and so we apply filters to take them out of our source.

**Deduplication**
Websites repeat the same postings! We deduplicate daily across whole database – using job title, skills, period, employer name, location.

**Final dataset**
One unique posting for each opening, and key information such as job title, occupation, location, employer, skills, pay extracted.
Identifying reliable online job boards
A data-driven approach of more relevant job posting sources

A Landscaping activity is performed to produce a list of sources (web portals) that are relevant for the Web Labour Market in a given country.

International Labour Market Experts validate this list, that will become the initial step of the LMI System.

Conventional and New data: speaking the same language

Data classification using AI and Taxonomy

- **Occupations**: ISCO - International Standard Classification of Occupations
- **Skills**: ESCO - European Skills, Competences, Qualifications and Occupation
- **Location**: NUTS and ISO
- **Educational Level**: ISCED 2011 - International Standard Classification of Education
- **Sector**: NACE - Statistical classification of economic activities
Inform decision makers and practitioners

Use billion job postings to inform on VET and skills development

**Research**
- Understand how students (to look for a job) and employers (to hire) are using internet
- Analyse coverage of the country\region

**Develop ideas and plans**
- Identify **dimensions, metrics and clusters**
- Identify **new emerging occupations and skills needs**

**Test ideas and plans**
- Obtain **feedback** from employers, training providers, students
- Improve the data navigation paths

**Action**
- Apply metrics to decode billions of job postings in **synthetic key indicators**
### Possible use cases

<table>
<thead>
<tr>
<th>Education and Training / Human Capital development</th>
<th>The trends help decision makers to identify potential areas early and make the right decision in education and training of their populations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better Planning and Policy formulation</td>
<td>The LMI therein work as management information and informs economic planning for the future and policy formulation in education, labour, trade and social services</td>
</tr>
<tr>
<td>Benchmarking and Comparisons</td>
<td>Job postings provide common parameters between countries/regions. This makes it easier to compare the labour markets in different countries and create opportunities for learning and benchmarking.</td>
</tr>
</tbody>
</table>
Skills Intelligence & Talent Manifesto

- New models for **skills projections** and **difficulty to fill occupations**

- The **future skill gaps** in the local market

- Talent Manifesto, a **public policy**, to attract talented individuals

- Enhance the **region's workforce** by bridging the gap between demand and supply of skills

[ISCO08 Occupations](#) | Recall% | Difficulty to Fill | ESCO Occupations | Recall% |
---|---|---|---|---|
Mechanical technicians | 6.81% | MEDIUM | Mechanical technician | 7.37% |
Production technician | 3.31% | MEDIUM | Mechatronic engineer technician | 1.96% |
Mechatronic engineer technician | 1.96% | MEDIUM | Quality engineer | 8.23% |
Production technician | 3.31% | MEDIUM | Test engineer | 5.17% |
Mechanical engineers | 5.82% | MEDIUM | Project engineer | 3.74% |

[Skills Analysis - Specialised Engineers](#)

- Decision Making
- Time management
- Quality control
- Complex problem solving
- Collaborative robotic
- Computer aided design
- Analytics tools

[https://emiliaromagnainnodata.art-er.it/skills-intelligence-emilia-romagna/](https://emiliaromagnainnodata.art-er.it/skills-intelligence-emilia-romagna/)
Big Data adding value to Skills Intelligence

Online Job Vacancy Analysis

Occupations, Skills, Green and Digital Skills

Eduarda Castel-Branco
Coordinator ETF Big Data LMIS project

ecb@etf.europa.eu
Large volumes of data from employers’ job vacancies online: new source for Labour Market and Skills Intelligence
THE GOAL OF Online Job Vacancy ANALYSIS IS...

To transform this...

...into value
1. Data from OJV Complements statistics
2. AI-aided data system
3. International Classifications ESCO, ISCO, NACE...
4. Visualisation Dashboard - variables
5. Let the data speak
6. Volume, Velocity, Variety, Veracity, Value

OJV analysis system: building blocks
Big Data for LMI - OJV DATA

- Experimental project – data production system based on internet data
- Started: 2019 (Handbook)
- Data science expertise: Lightcast.
- Data: constant inflow; updates: monthly
- 12.5 million OJV collected in the Database

Countries in ETF Database & dashboards:
- Ukraine
- Tunisia
- Georgia
- Kenya
- Egypt
- Morocco

All country Dashboards at: https://solutions.lightcast.io/?pc=x fhADtD cu$ BjY9


Standard variables on ETF dashboards - Analysis by:
- Occupation
- Occupation – education
- Occupation – industry
- Industry
- Occupation to skill (ESCO)
- Occupation to skill (O*Net)
- Location – language
- Professional dashboard
- New: green skills, digital skills

UNESCO Education Data Conference 6/Feb 2024
DATA FLOW

Ingestion
- Data Ingestion

Processing
- Pre-Processing
- Information Extraction
- ETL

Front end
- Presentation Area

Landscaping and assessing OJV sources in given labour market
Interactive presentation of results – classified OJV data

All country Dashboards at:

https://solutions.lightcast.io/?pc=x$fhADtD*cu$BjY9

Examples
UNESCO Education Data Conference 6/Feb 2024

**Professional dashboard - Egypt**

### Select the Occupation that you want to Analyze (then select it again to reset your choice)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software developers</td>
<td>43,307</td>
</tr>
<tr>
<td>Engineering professionals not elsewhere</td>
<td>35,690</td>
</tr>
<tr>
<td>Advertising and marketing professionals</td>
<td>34,695</td>
</tr>
<tr>
<td>Accountants</td>
<td>28,771</td>
</tr>
</tbody>
</table>

### Distribution by Release Date (date of publication of the OJVs)

- December 2020: 69,165
- December 2021: 5,050
- December 2022: 10,000
- December 2023: 5,050

### Knowledge
- Personal skills and development
- Management and administration
- Computer use
- Wholesale and retail sales
- Database and network development
- Marketing and advertising
- Work skills
- Software and applications

### Skills
- Using digital tools for collaboration
- Accessing and analysing data
- Coordinating activities
- Developing solutions
- Planning and scheduling
- Managing and analysing
- Performing general clerical work
- Providing general assistance
- Developing professional skills

### Experience
- No experience: 6.50%
- Up to 1 year: 30.46%
- From 1 to 2 years: 19.33%
- From 2 to 4 years: 11.75%
- From 4 to 6 years: 11.75%
- From 6 to 8 years: 3.94%
- From 8 to 10 years: 3.94%
- Over 10 years: 14.61%
- Not defined: 0.00%

### Education
- Primary education: 6.50%
- Lower secondary education: 32.78%
- Upper secondary education: 11.75%
- Post-secondary non-tertiary education: 11.75%
- Short-cycle tertiary education: 3.94%
- Bachelor or equivalent: 14.61%
- Master or equivalent: 14.61%
- Doctoral or equivalent: 14.61%
- Not defined: 0.00%

### Transversal Skills and Competences
- Demonstrating willingness to work efficiently, collaborating in teams an...
Remote work - Ukraine

Remote Work Share: 5.41%
Number of remote work OJV: 161,210

Select the Occupation that you want to Analyze (then select it again to reset your choice):
- Mathematicians, actuaries
- Trade brokers
- Data entry clerks
- Contact centre information
- Enquiry clerks
- Information and communic.
- Visual artists
- Database and network pr.
- Information and commun.
- Software developers
- Managing directors and c.
- Film, stage and related dir.
- Mining engineers, metallu.
- Web and multimedia deve.
- Journalists
- Authors and related write.
- Applications programmers
- Information technology tr.
- Contact centre salesperso.
- Well drillers and borers an.
- Medical and pathology lab.
- Clearing and forwarding a.
- Travel consultants and cle.
- Typists and word process.
- Electrical engineers

Share of remote work by region

Share of remote work by industry

Share of remote work by release date
ETF project: Online job vacancy – Big data for LMI

Green skills share = share of online job vacancies that required at least 1 green skill

Kenya: highest green skills share, Ukraine – the lowest

Used green skills taxonomy: ETF (225 terms)

<table>
<thead>
<tr>
<th>Country</th>
<th>Green skills share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ukraine</td>
<td>0.19%</td>
</tr>
<tr>
<td>Tunisia</td>
<td>0.89%</td>
</tr>
<tr>
<td>Georgia</td>
<td>0.45%</td>
</tr>
<tr>
<td>Egypt</td>
<td>0.79%</td>
</tr>
<tr>
<td>Kenya</td>
<td>2.59%</td>
</tr>
<tr>
<td>Morocco</td>
<td>0.28%</td>
</tr>
<tr>
<td>Skills / skill set</td>
<td>% (from 20)</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>renewable energy</td>
<td>22.95%</td>
</tr>
<tr>
<td>agroforestry</td>
<td>9.08%</td>
</tr>
<tr>
<td>clean energy</td>
<td>6.54%</td>
</tr>
<tr>
<td>sustainable business</td>
<td>6.47%</td>
</tr>
<tr>
<td>solar energy</td>
<td>6.27%</td>
</tr>
<tr>
<td>circular economy</td>
<td>5.64%</td>
</tr>
<tr>
<td>environmental sustainability</td>
<td>5.48%</td>
</tr>
<tr>
<td>development economics</td>
<td>5.05%</td>
</tr>
<tr>
<td>biomass</td>
<td>4.22%</td>
</tr>
<tr>
<td>solar systems</td>
<td>3.45%</td>
</tr>
<tr>
<td>environmental protection</td>
<td>3.41%</td>
</tr>
<tr>
<td>energy efficiency</td>
<td>3.41%</td>
</tr>
<tr>
<td>sustainable energy</td>
<td>3.38%</td>
</tr>
<tr>
<td>sustainable agriculture</td>
<td>2.99%</td>
</tr>
<tr>
<td>climate smart agriculture</td>
<td>2.54%</td>
</tr>
<tr>
<td>green energy</td>
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</tr>
<tr>
<td>iso 14001</td>
<td>2.19%</td>
</tr>
<tr>
<td>agroecology</td>
<td>1.80%</td>
</tr>
<tr>
<td>solar products</td>
<td>1.63%</td>
</tr>
<tr>
<td>electric vehicle</td>
<td>1.18%</td>
</tr>
<tr>
<td>Occupation</td>
<td>Green skill</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Electronics mechanics and servicers</td>
<td>solar panels</td>
</tr>
<tr>
<td></td>
<td>solar energy</td>
</tr>
<tr>
<td></td>
<td>environmental protection</td>
</tr>
<tr>
<td>Environmental engineers</td>
<td>environmental sustainability</td>
</tr>
<tr>
<td></td>
<td>environmental protection</td>
</tr>
<tr>
<td></td>
<td>sustainable procurement</td>
</tr>
<tr>
<td></td>
<td>renewable energy</td>
</tr>
<tr>
<td></td>
<td>sustainable business</td>
</tr>
<tr>
<td></td>
<td>energy efficiency</td>
</tr>
<tr>
<td></td>
<td>sustainable energy</td>
</tr>
<tr>
<td></td>
<td>circular economy</td>
</tr>
<tr>
<td></td>
<td>development economics</td>
</tr>
<tr>
<td></td>
<td>climate smart agriculture</td>
</tr>
<tr>
<td></td>
<td>green energy</td>
</tr>
<tr>
<td></td>
<td>ecotourism</td>
</tr>
<tr>
<td></td>
<td>clean energy</td>
</tr>
<tr>
<td></td>
<td>carbon footprint reduction</td>
</tr>
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<td></td>
<td>sustainable agriculture</td>
</tr>
<tr>
<td></td>
<td>sustainability performance</td>
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<td>iso 14001</td>
</tr>
<tr>
<td></td>
<td>hydroponics</td>
</tr>
<tr>
<td></td>
<td>clean technology</td>
</tr>
<tr>
<td></td>
<td>agroforestry</td>
</tr>
<tr>
<td>Metal production process controllers</td>
<td>iso 14001</td>
</tr>
<tr>
<td>Statistical, mathematical and related</td>
<td>environmental protection</td>
</tr>
<tr>
<td>associate professionals</td>
<td>clean energy</td>
</tr>
<tr>
<td></td>
<td>energy efficiency</td>
</tr>
<tr>
<td></td>
<td>green building</td>
</tr>
<tr>
<td></td>
<td>sustainable materials</td>
</tr>
<tr>
<td></td>
<td>sustainable building</td>
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<td></td>
<td>sustainable agriculture</td>
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<td></td>
<td>renewable energy</td>
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<td></td>
<td>circular economy</td>
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<tr>
<td></td>
<td>biomass</td>
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<td></td>
<td>agroforestry</td>
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<tr>
<td></td>
<td>sustainable energy</td>
</tr>
<tr>
<td></td>
<td>hydropower</td>
</tr>
<tr>
<td></td>
<td>biofuels</td>
</tr>
</tbody>
</table>
Digital skills – overview of some features of demand

Analysis based on ETF data OJV - Egypt
ESCO: 1,100 digital skills terms

Other sources of digital skills terms: Stackoverflow and Git-Hub – to ease classification
<table>
<thead>
<tr>
<th>Digital skill</th>
<th>Unique Job postings (Oct 22-Jul 23)</th>
</tr>
</thead>
<tbody>
<tr>
<td>use microsoft office</td>
<td>21.2%</td>
</tr>
<tr>
<td>have computer literacy</td>
<td>19.2%</td>
</tr>
<tr>
<td>office software</td>
<td>7.6%</td>
</tr>
<tr>
<td>database</td>
<td>5.7%</td>
</tr>
<tr>
<td>use spreadsheets software</td>
<td>5.4%</td>
</tr>
<tr>
<td>computer programming</td>
<td>5.4%</td>
</tr>
<tr>
<td>business ICT systems</td>
<td>4.0%</td>
</tr>
<tr>
<td>perform data analysis</td>
<td>3.8%</td>
</tr>
<tr>
<td>online analytical processing</td>
<td>3.5%</td>
</tr>
<tr>
<td>process data</td>
<td>3.2%</td>
</tr>
<tr>
<td>social media marketing techniques</td>
<td>3.0%</td>
</tr>
<tr>
<td>use communication and collaboration software</td>
<td>2.9%</td>
</tr>
<tr>
<td>use word processing software</td>
<td>2.6%</td>
</tr>
<tr>
<td>analyse software specifications</td>
<td>2.3%</td>
</tr>
<tr>
<td>digital marketing techniques</td>
<td>2.0%</td>
</tr>
<tr>
<td>use creative suite software</td>
<td>1.9%</td>
</tr>
<tr>
<td>use software design patterns</td>
<td>1.7%</td>
</tr>
<tr>
<td>computer science</td>
<td>1.7%</td>
</tr>
<tr>
<td>use object-oriented programming</td>
<td>1.5%</td>
</tr>
<tr>
<td>administer ICT system</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

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Egypt: DIGITAL SKILLS: TOP 20

- have computer literacy: 16.06%
- use Microsoft Office: 14.51%
- use office systems: 7.18%
- Enterprise Resource Planning: 6.63%
- computer programming: 6.43%
- use spreadsheets software: 5.58%
- database: 5.56%
- business ICT systems: 5.08%
- analyse software specifications: 3.14%
- process data: 3.05%
- use communication and collaboration software: 2.66%
- SQL: 2.37%
- Java (computer programming): 2.29%
- use object-oriented programming: 2.08%
- social media marketing techniques: 2.04%
- use creative suite software: 2.03%
- analytics: 2.01%
- unified modelling language: 1.87%
- web programming: 1.87%
- use word processing software: 1.87%
AI SKILLS: UNIQUE JOB POSTINGS

Source: ETF Job Postings – Egypt – Lightcast AI Skills list

UNESCO Education Data Conference 6/Feb 2024
AI SKILLS: TOP SKILLS IN OJV

Machine Learning
Artificial Intelligence
Computer Vision
Deep Learning
Chatbot
Image Processing
Recommender Systems
Machine Learning Algorithms
Path Analysis
Machine Translation

Source: ETF Job Postings – Egypt – Lightcast AI Skills list

UNESCO Education Data Conference 6/Feb 2024
## Digital Skills: In Digital and Non-Digital Occupations

### Table: Digital Skills Rate, Soft Skills Rate, and Occupational-Specific Non-Digital Skills Rate

<table>
<thead>
<tr>
<th>Occupation (ISCO 08)</th>
<th>Unique OJV 2022</th>
<th>Digital skills rate</th>
<th>Soft skills rate</th>
<th>Occupational-specific non digital skills rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database designers and administrators</td>
<td>158</td>
<td>54.00%</td>
<td>20.00%</td>
<td>26.00%</td>
</tr>
<tr>
<td>Web and multimedia developers</td>
<td>5418</td>
<td>48.00%</td>
<td>23.00%</td>
<td>29.00%</td>
</tr>
<tr>
<td>Systems administrators</td>
<td>1366</td>
<td>47.00%</td>
<td>25.00%</td>
<td>28.00%</td>
</tr>
<tr>
<td>Applications programmers</td>
<td>1343</td>
<td>44.00%</td>
<td>24.00%</td>
<td>32.00%</td>
</tr>
<tr>
<td>Software developers</td>
<td>14752</td>
<td>40.95%</td>
<td>26.32%</td>
<td>32.73%</td>
</tr>
<tr>
<td>Data entry clerks</td>
<td>351</td>
<td>40.13%</td>
<td>30.64%</td>
<td>29.23%</td>
</tr>
<tr>
<td>Mathematicians, actuaries and statisticians</td>
<td>174</td>
<td>39.08%</td>
<td>28.53%</td>
<td>32.38%</td>
</tr>
<tr>
<td>Database and network professionals</td>
<td>1780</td>
<td>38.77%</td>
<td>26.57%</td>
<td>34.66%</td>
</tr>
<tr>
<td>Computer network professionals</td>
<td>397</td>
<td>38.29%</td>
<td>29.08%</td>
<td>32.63%</td>
</tr>
<tr>
<td>Systems analysts</td>
<td>6593</td>
<td>28.64%</td>
<td>33.62%</td>
<td>37.74%</td>
</tr>
<tr>
<td>Graphic and multimedia designers</td>
<td>3686</td>
<td>25.39%</td>
<td>25.93%</td>
<td>48.69%</td>
</tr>
<tr>
<td>General office clerks</td>
<td>2022</td>
<td>21.92%</td>
<td>44.19%</td>
<td>33.89%</td>
</tr>
<tr>
<td>Environmental engineers</td>
<td>58</td>
<td>19.53%</td>
<td>36.15%</td>
<td>44.31%</td>
</tr>
<tr>
<td>Business services and administration managers</td>
<td>1785</td>
<td>15.78%</td>
<td>40.38%</td>
<td>43.84%</td>
</tr>
<tr>
<td>Personnel and careers professionals</td>
<td>4122</td>
<td>15.77%</td>
<td>39.97%</td>
<td>44.26%</td>
</tr>
<tr>
<td>Accounting and bookkeeping clerks</td>
<td>240</td>
<td>11.88%</td>
<td>33.99%</td>
<td>54.13%</td>
</tr>
<tr>
<td>Handicraft workers in textile, leather and related materials</td>
<td>2022</td>
<td>19.75%</td>
<td>31.85%</td>
<td>48.41%</td>
</tr>
</tbody>
</table>

UNESCO Education Data Conference 6/Feb 2024
Source: ETF Job Postings – Egypt 2022
Big Data LMIS ETF project

New initiatives using our database, other data sources and ESCO - 2024

- Occupational profiles – data driven, ESCO-based (ACQF-II – for common profiles of qualifications)
- Demand for green skills – data driven, ESCO-based - report
- Demand for digital skills - report
- Supply side – social profiles (ESCO Skills)
- Combination of data (OJV, conventional statistics, administrative)
1. Value of OJV data

- **Near real-time data**

- **Volume:** allows different angles of analysis on skills and occupations; granularity

- **Finder** Early spotting of new skills / new patterns of skills mix (digital, soft, technical, green…). For further analysis in combination with conventional statistical and other data sources

- **Green and digital transition:** Identification of demanded skills; quantitative trends over time – by occupations and sectors; green and digital skills profiles of occupations; AI skills and occupations; and setting up international benchmarking / comparisons.
  
  - Identification of **green jobs** in high demand; lead industries and regions in green job creation; qualifications for green jobs
  
  - The evolution of the **digital skills** and new emerging occupations; growth in jobs requiring new knowledge & skills.

- **Value-added to LMI and skills development policies and practices:** emerging trends in LM and skills; inform policy responses;

2. Limitations

- Over-representation of certain occupational groups (professionals – 55%); underrepresentation (in general occupations requiring lower level of skills and qualifications).

- Classification of OJV data: robust techniques, constant evolution, taxonomies in transformation.
Thank you

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ecb@etf.europa.eu
ANNEX: for reference and further reading (not presentation)
ETF project

Big Data for LMI 2018-2024


- **2019:** First application: Feasibility analysis – Landscaping of Web Labour Markets Tunisia and Morocco

- **2019-2021:** 3 main training programmes for experts of the partner countries and other regions (Asia, Africa)

- **2020:** Creation of the complete OJV analysis system and dashboards: Tunisia and Ukraine
  - Analytical reports: LM and skills Ukraine and Tunisia

- **2021:**
  - New country – Georgia;
  - **Green dashboard 3 countries**

- The data system is based exclusively on demand – based on job vacancies (OJV) posted on web portals

- Full comparability with the Real-Time data system of the EU-27 (same methodology)

- ETF works with the data analytics specialists of University Milano-Bicocca and LightCast

**2022:** expansion new countries, new themes analysis: Egypt, Kenya; **2023:** Morocco. Selection – based on results of landscaping study.

New themes: Supply side analysis.

- Training and capacity development programme: materials, PPTs, videos – all accessible online for free use and sharing
Online job advertisements (OJAs) refer to advertisements published on the internet. Volume of OJAs is growing. OJAs usually include data on the characteristics of the job (e.g. occupation and location), characteristics of the employer (e.g. economic activity) and requirements (e.g. education/skills). Part of this information is available only as natural language textual data.

This type of big data requires specific methodologies for processing and analysis but also provides much more detailed information (compared to alternative data sources) and avoids pre-conceived classifications (important to identify emerging skills).
BIG DATA LMI: FOCUS ON OJV
KEY FEATURES

• Data collected from the web, based on feasibility analysis (landscaping)
• 5 Vs of Big Data
• Data management flow: landscaping, ingestion, processing, extraction, ETL, presentation
• Several data quality steps and tools
• Data classification: a) AI-aided – with human in the loop; b) International classifications & taxonomies
• ISCED, ISCO, ESCO, NACE; CEN-CENELEC, Stackoverflow, GitHub; ETF green skills
• Big Data: complements conventional statistics ("Trusted Smart Statistics") – points topics and issues for further / wider analysis
Digital skills

Ability to use digital technologies confidently, critically and responsibly and engage with them for learning, at work and for participation in society.

It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including coding), security (including digital wellbeing and cybersecurity-related skills), intellectual property issues, problem-solving and critical thinking.
Green skills – an important area of debate and policy action and which has become a priority in research (quantitative and qualitative) and social communication. Several international organisations are working on the analysis and taxonomies related to green competences.

Cedefop defines green skills as "the knowledge, skills, values and attitudes needed to live, work and act in economies and societies that seek to reduce the impact of human activity on the environment".

Skills for the green economy consist of:

- **Transversal skills**, linked to sustainable thinking and acting, relevant to all economic sectors and professions;
- **Specific skills** needed to adapt or implement standards, processes and services to protect ecosystems and biodiversity and reduce energy, materials and water consumption;
- **Highly specialised skills** needed to develop and implement green technologies such as renewable energy, wastewater treatment or recycling;

Skills for the green economy are also referred to as skills for green jobs, skills for the green transition or green skills.
ETF green skills list
• 225 terms (data-driven identification) – now integrated in ESCO
• 7 clusters of sustainable activity (inspired by the European Green Deal)
THANK YOU

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PISA-Vocational Education and Training (VET)

The first international large-scale assessment of VET

6th February 2024
What is the VET problem that needs to be solved?

VET has fueled phenomenal economic growth in some countries and fallen short of expectations in others. Yet, currently, it is impossible to compare the achievements of VET programmes in one country with those in another. Moreover, the digital and green transition asks many countries to modernise their VET provision in a competitive environment.
## Why PISA-VET? The data gap it is designed to fill

<table>
<thead>
<tr>
<th>Current VET data</th>
<th>PISA-VET fills the data gap</th>
<th>Benefits for policymakers</th>
<th>Benefits for employers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enrolments</strong></td>
<td>Compare skill levels in VET programmes across countries</td>
<td>Gain insights for improving initial VET programs, making these more attractive to potential students and informing the practice of VET teachers and trainers</td>
<td>Improve alignment between education and employer needs and promote participation in VET</td>
</tr>
<tr>
<td><strong>Qualifications</strong></td>
<td>Analyze differences in learner characteristics</td>
<td>Analyze differences between countries and programs, considering design and learner backgrounds</td>
<td>Provide data for employer planning and investments</td>
</tr>
<tr>
<td><strong>Labour market outcomes</strong></td>
<td>Explore VET program features and contexts and their impact on outcomes to identify characteristics of successful VET provision</td>
<td>Facilitate peer learning through outcome analysis and promote participation in VET</td>
<td>Evaluate national vocational programs against international standards and assess skill evaluation methods</td>
</tr>
</tbody>
</table>
Assessment design

A computer-based and practical skills test taken by groups of learners on the premises of their VET institution or in their work-based learning environment.

The assessment is designed to take place within a three-to-four-hour test window.

Assessment of professional skills and employability skills.

Background questionnaire for student.

Background questionnaires for teachers, trainers, institutions and work-based learning trainers.
Not a paper and pencil test of knowledge

Building on the experiences of ASCOT and ASCOT + in Germany and WorldSkills International, PISA-VET will measure applied skills in realistic workplace environments.

WHERE THERE IS A SKILL
10 - 12 SEPT. 2024
Three assessment types to demonstrate professional skills

Type #1
Knowledge assessment

Type #2
Interactive simulations of workplace tasks

Type #3
Demonstration tasks to efficiently generate insights about learners’ practical skills

Data on comparative skill levels of learners across countries within specific VET programmes.
A 10-year+ project implemented in three phases

- **Development Phase**
  - 2023-2026
  - Methodological study in four countries
  - Data analysis and report
  - Prepare for pilot phase
  - Feasibility and affordability of the assessment confirmed

- **Pilot Phase**
  - 2026-2030
  - Field Trial in 10-15 countries
  - Main Survey in 10-15 countries
  - Data analysis and international comparisons
  - Plan for International Large Scale Assessment Phase

- **Large Scale Assessment Phase**
  - 2030-2034
  - Instrument development for additional occupational areas
  - Field Trial in 15-25 countries
  - Main Survey in 15-25 countries
  - Data analysis and results of international comparisons
  - On-going International Large-Scale Assessment in 3-4-year cycles
### Core Team & Key Partners

<table>
<thead>
<tr>
<th>Participating countries</th>
<th>Working Party on International VET Assessment</th>
<th>Expert Group and sub-groups with lead experts</th>
<th>Social Partners</th>
<th>Partners</th>
<th>Employers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Chair Luis Santos (Portugal) and 26 members</td>
<td>Chair Erik Hess (Germany) and more than 100 experts, including many from countries that have apprenticeship systems, such as Germany, Luxembourg and Switzerland</td>
<td>TUAC Trade unions Associations BIAC Employer federations</td>
<td>ASCOT+ WorldSkills UNESCO ILO World Bank ESCO Cedefop Foundations</td>
<td>Corporations Industries Businesses &amp; enterprises</td>
</tr>
</tbody>
</table>
Intended to guide the work of the instrument developers, help policy makers understand the purpose and the appropriate use of the International VET Assessment results, and inform researchers and educators about methodological choices.
Criteria for selecting occupational areas

- The occupational area is important in VET and in the labour market.
- The occupational area comprises a student population which is large enough to come to reliable and valid judgments on important parts of VET and the labour market.
- The occupational area is of significant economic and societal importance and is likely to remain so.
- The occupational area requires mainly professional (VET) skills.
- The occupational area is sufficiently comparable at the international level.
- Resources are available to support measurement of skills in the occupational area (e.g. internationally validated task inventories and simulation environments).
- The occupational area has strategic importance in relation to the digital and/or green transformation.
- The occupational area represents both male and female learners.
For each occupational area, the framework:

**Defines** the domain/occupation for the assessment *in broad and holistic terms*

**Describes** the context for the occupation.

**Presents** the processes involved in the occupation from the *first contact with the client to the delivery of the product*.

**Sets out** the underlying *capabilities, skills and competences* required to complete the processes for the occupation.

**Elaborates** the *knowledge content* required for the occupation.

---

**Target Population**

Students, apprentices and trainees training to be:

- Automotive technicians
- Electricians
- Healthcare/nursing assistants
- Business administrators
- Hotel receptionists

In the last six months of their initial VET programmes corresponding to *ISCED levels 3-4 and EQF levels 3-4, or equivalents.*
Example: Automotive Technicians
Framework & Reporting Results

<table>
<thead>
<tr>
<th>Definition</th>
<th>Servicing, overhauling and troubleshooting light vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>Workshop</td>
</tr>
<tr>
<td>Processes</td>
<td>Investigate and rectify – from first contact with the client to delivery of the product</td>
</tr>
<tr>
<td>Underlying capabilities</td>
<td>Investigation capability and skills and rectification capability and skills</td>
</tr>
<tr>
<td>Knowledge Content</td>
<td>Light vehicles systems</td>
</tr>
</tbody>
</table>

Reporting Results

Three proficiency levels that will be based on a numeric scale.
In addition to occupational-specific skills, VET graduates also need employability skills that are relevant for all occupations.

PISA-VET will measure key transversal employability skills using existing OECD frameworks and instruments.
Reporting of results - employability skills

**Literacy** proficiency scales used to report the OECD’s PIAAC Literacy results.

**Adaptive problem-solving** scales used to report results in the OECD’s PIAAC Cycle 2.

**Task performance (conscientiousness) and collaboration with others** based on reporting scales used in Round 1 of the OECD’s Survey on Social and Emotional Skills (SSES)
PISA-VET becomes the world’s premier yardstick for comparing quality, equity, and efficiency in VET learning outcomes across countries.
Thank you!