European Training Foundation

PHASE 2: FEASIBILITY STUDY FOR TUNISIA AND MOROCCO TO IDENTIFY, VALIDATE AND RANK WEB JOB VACANCY SOURCES – PRACTICAL GUIDANCE

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EXECUTIVE SUMMARY

This report aims to identify the most relevant job vacancy web sources for Tunisia and Morocco, extracting both website and vacancy characteristics for each source identified, and building up a reproducible and transparent ranking model of these sources. The goal of the ranking model provided is to guide labour market experts in selecting sources of information to be used for collecting vacancies, with the aim of further building a fully fledged real-time labour market intelligence (LMI) system, as discussed in the ETF report 'Big data for labour market intelligence: an introductory guide' (ETF, 2019).

To this end, this report first surveys the labour market dynamics and usage of the internet for the two countries by means of official statistics (where available), previous ETF reports, and web sources. It then summarises the process used for identifying the websites to be evaluated and the characteristics (i.e. variables) used to rank each source, and provides a ranking model that scores each source according to the model defined, where each criterion (variable) has the same importance, namely a flat model. Notably, to allow for reproducibility, the variables' values for each source are detailed, along with the mapping table defined to transform textual values into numeric values.

The report proposes a further ranking model by exploiting multicriteria decision-making techniques that allow ETF experts to express preferences over criteria. This, as a result, can ideally change the ranking model by promoting (or demoting) those websites with better (or worse) values for the variables that are weighted higher or lower in the ETF's preferences.

Finally, the report provides some advice – which can be taken into account while using these websites – for the realisation of a real-time LMI system.

CONTENTS

REVIEW OF LABOUR MARKET DYNAMICS IN TUNISIA AND MOROCCO

In this section we present an overview of the labour market dynamics for Tunisia and Morocco, focusing on their main statistical employment-related indicators: population, labour supply and key sectors of employment.

Morocco

FIGURE 1: SOCIOECONOMIC INDICATORS – MOROCCO

Socio-economic indicators

Total population (in thousands)	35,740
Annual population growth (%)	1.30
Population 15-24 years (in thousands)	5,947
Population aged 14 years and younger (in thousands)	9,791
Rural population (% of total population)	38
Total fertility rate (births per woman)	2.50
Infant mortality rate (per 1,000 live births)	20
Life expectancy at birth (years)	76
Prevalence of HIV (% of population aged 15-49 years)	0.10
Poverty headcount ratio at $1.90 a day (PPP) (% of population)	1
GDP per capita - PPP$	8,217
Annual GDP growth (%)	4.10
Total debt service (% of GNI)	3.70
GDP in billions - PPP$	298

Source: http://uis.unesco.org/en/country/ma?theme=education-and-literacy

Population characteristics

The total population of Morocco reached 35.5 million in 2019. The population growth rate, which continues to decline, was only 1.25% per year over the past 10 years and 1.23% in 2019 (Table 1: **POPULATION**). The fertility rate decreased from an average of 7 children per woman in 1962 to 2.5 children per woman in 2004 and 2.19 in 2014. As mentioned in the ETF report on skills mismatch measurements (Kriechel and Vetter, 2019), Morocco has entered an advanced phase of demographic transition characterised by a decrease in both fertility and mortality rates.

TABLE 1: POPULATION – MOROCCO

	1982	1994	2004	2014	2019
Total population (millions)	20.4	26.0	29.7	33.8	35.5
Average annual increase (%)	-	2.06	1.38	1.25	1.23

Source: https://www.hcp.ma/

The working-age population (15–59 years) as a share of the total population increased from 42.1% in 1982 to 63.75% in 2012. The share of young people under the age of 15 declined by over 5 percentage points between 2004 and 2012, from 31.3% to 26.2% (Table 15:). This demographic transition will put strong pressure on the labour market in the coming years. It will also affect the social security and pension systems, according to the ETF report on skills mismatch measurements (Kriechel and Vetter, 2019).

TABLE 2: TOTAL POPULATION STRUCTURE BY AGE GROUP (%) – MOROCCO

Age	1982	1994	2004	2012	2014	2017
0–14	42.1	37.0	31.3	26.2	28.0	27.3
15–59	51.5	56.0	60.6	63.8	62.4	62.7
60 or over	6.4	7.0	8.1	10.1	9.6	10.1

Source: https://www.hcp.ma/

Labour supply characteristics

According to the results of the 2018 national survey on employment, the population aged 15 years or over reached 25 950 000 in 2018, with 11 979 000 active (10 811 000 employed and 1 168 000 unemployed) and 13 970 000 outside the labour market. The participation rate reached 46.2%; it was 41.8% in urban areas and 53.9% in rural areas, 70.9% among men and 22.2% among women. This rate varies from 45.7% among those with no degree and 42.9% among those with a medium-level diploma, to 55.9% among those with a higher education degree (Table).

Of the 10 811 000 people who are employed people, 44.8% are rural and 23.2% are female. The participation rate for women in Morocco is one of the lowest female participation rates in the MENA region. A low female participation rate can be explained by a number of factors, including women's role in households and the lengthening of the duration of schooling. Young people aged 15–34 are more active in the labour market, representing 37.8% of total employment (11.1% for the 15–24 age group and 26.7% for those aged 25–34).

In 2018 the employment rate reached 41.7% at the national level (35.9% in urban areas and 52.0% in rural areas), 65% among men and 19% among women. It was 57.8% for the 35–44 age group and 20.2% for the 15–24 age group.

TABLE 3: LABOUR FORCE PARTICIPATION BY AGE GROUP (%) – MOROCCO

Age	2010	2016	2018
15–24	36.2	28.5	20.2
25–34	61.8	60.3	51.0
35–44	61.6	60.2	57.8
45–59	58.1	ND	41.3
60 or over	25.1	ND	
15 or over	49.6	46.4	46.2

Source: https://www.hcp.ma/

TABLE 4: LABOUR FORCE PARTICIPATION RATE (15 YEARS OR OVER) BY SEX (%) – MOROCCO

Age	2010	2016	2018
Men	74.7	70.8	-
Women	25.9	23.6	-
Total	49.6	46.4	46.2

Source: https://www.hcp.ma/

According to the results of the 2018 national survey on employment, the highest employment rates were observed in the Eddakhla-Oued Eddahab (64.3%), Marrakech-Safi (45.2%) and Casablanca-Settat (44.5%) regions. Meanwhile, the regions of Guelmim-Oued Noun, Laayoune-Sakia El Hamra and Oriental recorded the lowest rates, with 34.4%, 35.9% and 36.9%, respectively.

The labour supply in Morocco is predominantly low qualified. In 2016 almost 57% of the working population (15 years or over) had no diploma, 28.8% had a medium-level diploma and 14.4% had a higher-level diploma (Figure).

FIGURE 2: LABOUR SUPPLY STRUCTURE IN 2018 (15 YEARS OR OVER), ACCORDING TO DIPLOMA (HIGH, MEDIUM AND NO COMPLETED EDUCATION) (%) – MOROCCO

Source: https://www.hcp.ma/

Nearly 6 out of 10 active workers (57.8%) have no degree or completed education (6 248 000), while 28.6% (3 091 000) have a medium-level and 13.6% (1 469 000) a higher-level diploma. According to professional status, nearly three-quarters (72.2%) of self-employed individuals have no degree, about a quarter (23.6%) have a medium-level diploma and only 4.2% have a higher-level degree. For employees, these proportions are 44.2%, 32.9% and 22.8%, respectively.

Focusing on employment, in 2018 the unemployment rate was 26.0% among young people aged 15–24 and 43.2% among urban individuals in this age group. Unemployment affects women more than men, with rates of 14.0% and 8.4%, respectively. This is more noticeable in urban areas, where the unemployment rate is 24.3% among women compared to 11.4% among men. About two-thirds of unemployed people (67.6%) have been looking for a job for a year or more (63.5% among men and 75.4% among women).

More than 7 out of 10 unemployed aged 15–34 (71.1%) have been unemployed for a year or more. This share increases with the educational level, from 46.1% for non-graduates to 77.7% for higher-level graduates. The unemployment rate increases with the level of qualification, from 3.4% among those with no degree to 17.2% for graduates (14.0% for medium-level graduates and 23.0% for those with a higher-level diploma).

The unemployment rate remains relatively higher among certain categories of graduates, particularly those with higher degrees (25.9%), certificates in vocational specialisation (24.2%), technician diplomas (23.0%) and vocational qualification diplomas (21.4%).

Key sectors of employment

The volume of employment in the services sector increased by 38 000 national posts (0.9%), of which about 29 000 are in personal and household services and 8 000 in retail out of store, following an average of 109 000 posts annually in the years 2011–2013 and 37 000 annually in the years 2014–2015. After having lost an average of 22 000 jobs during the period 2009–2014, the industry sector also experienced a recovery in 2015 with the creation of 15 000 positions, followed by a further 8 000 in 2016, representing 0.6% of employment in the sector. An especially large number of posts has been created in the 'woodworking and manufacturing of wood products' subsector, which created 6 000 jobs in 2016 (75% of the total), benefiting from the recovery in the construction sector (BTP).

Meanwhile, after creating 58 000 jobs in 2013 and 16 000 jobs in 2014, the 'agriculture, forestry and fishing' sector has experienced, as a result of agricultural campaigns, the loss of 32 000 jobs in 2015, and 119 000 in 2016, corresponding to a decrease of 2.9% in employment in the sector.

FIGURE 3: EMPLOYMENT STRUCTURE (AGE GROUP 15 YEARS OR OVER) BY SECTOR OF ACTIVITY (%) – MOROCCO
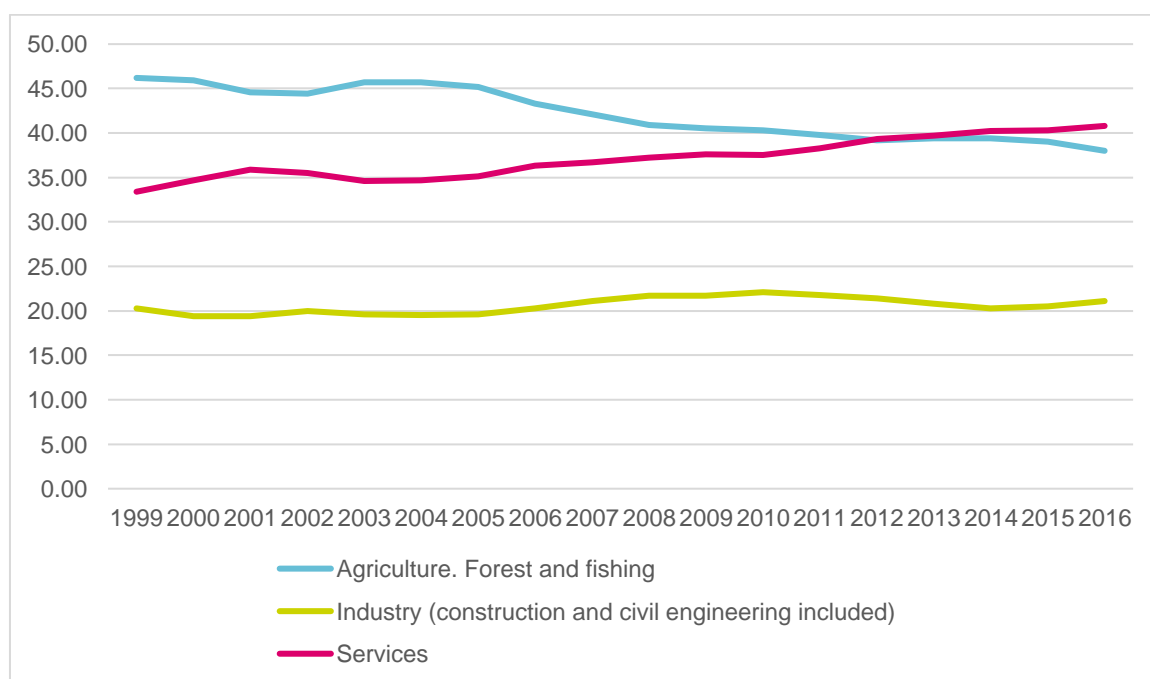
Source: https://www.hcp.ma/Emploi-par-branche-d-activite-de-la-population-active-occupee-au-niveau-national_a155.html

Tunisia

Figure 7: summarises some of the general statistical information for Tunisia in 2017.

FIGURE 4: SOCIOECONOMIC INDICATORS – TUNISIA

Socio-economic indicators

Total population (in thousands)	11,532
Annual population growth (%)	1.10
Population 15-24 years (in thousands)	1,678
Population aged 14 years and younger (in thousands)	2,768
Rural population (% of total population)	31
Total fertility rate (births per woman)	2.20
Infant mortality rate (per 1,000 live births)	11
Life expectancy at birth (years)	76
Prevalence of HIV (% of population aged 15-49 years)	0.10
Poverty headcount ratio at $1.90 a day (PPP) (% of population)	2
GDP per capita - PPP$	11,911
Annual GDP growth (%)	2
Total debt service (% of GNI)	4.60
GDP in billions - PPP$	137

Source: http://uis.unesco.org/en/country/tn

## Population characteristics

According to the 2014 census, the population of Tunisia was 10 982 500 people, against 9 910 900 at the 2004 census.

The population has grown at a rate of around 1.03% over the past decade (2004–2014). This trend reveals that Tunisia has entered an advanced phase of demographic transition characterised by a decrease in both fertility and mortality rates (as in Morocco).

FIGURE 5: POPULATION GROWTH BETWEEN 1966 AND 2014 (THOUSANDS) – TUNISIA
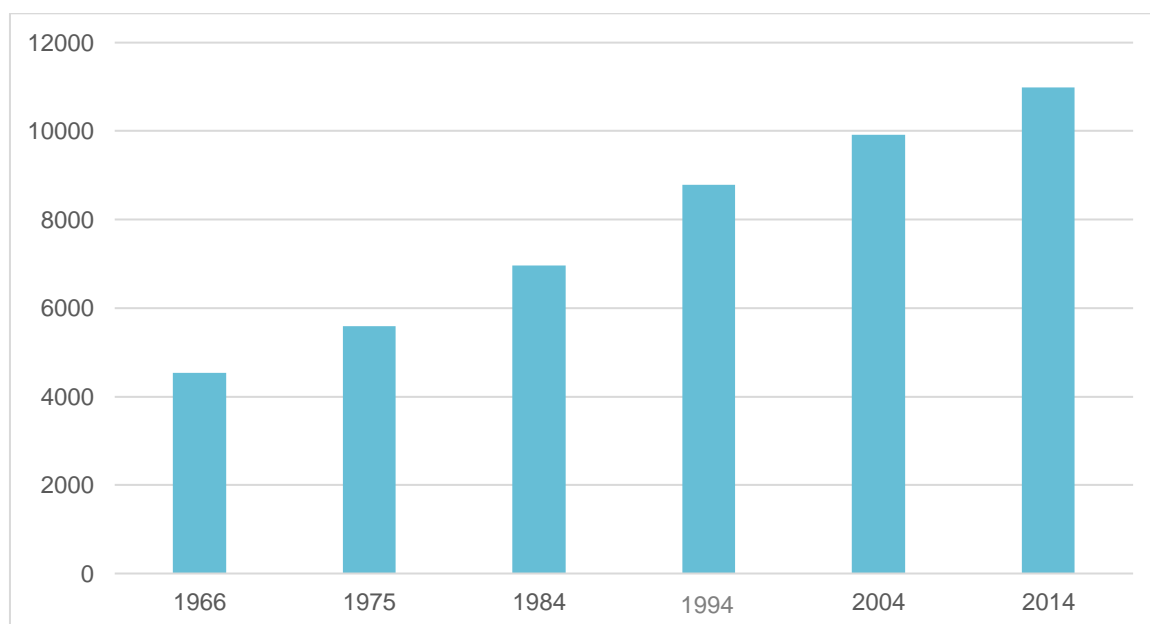
The age structure has changed dramatically since the mid-1980s: there has been a decline in the proportion of children and adolescents on the one hand and an increase in the proportion of young people, adults and senior citizens on the other hand. Table 5 summarises the evolution of the distribution of the population of Tunisia since 1966 by age group, distinguishing young children (0–4 years), adolescents (5–14 years old), young people and adults (15–59 years old) and senior citizens (60 years old or over).

TABLE 5: TOTAL POPULATION STRUCTURE BY AGE GROUP (%) – TUNISIA

Age	1966	1975	1994	2004	2014
0–4	18.6	16.0	11.0	8.1	11.4
5–14	27.9	27.8	23.8	18.6	15.1
15–59	48.0	50.4	56.9	64.0	64.3
60 or over	5.5	5.8	8.3	9.3	9.2

The proportion of the working-age population (15–59 years) increased by approximately 16 percentage points, from 48.0% in 1966 to 64.3% in 2014. Meanwhile, the proportion of the population of retirement

age (60 years or over) doubled from 5.5% in 1966 to 11.4% in 2014. This confirms that the Tunisian population is moving towards an ageing trend, but this phenomenon is only just beginning, as the proportion of the population aged 60 or over remains much lower than the corresponding proportion in industrialised countries.

Although the demographic transition in the country has progressed rapidly during recent decades, the population of Tunisia still remains a young population. Almost one-third of the population (32.1%) is under the age of 20, and almost half (49.3%) under 30 years old.

Labour supply characteristics

Labour market participation in Tunisia was 4 069 200 in the fourth quarter of 2016; this figure comprised 2 899 600 men and 1 169 600 women, representing 71.2% and 28.8%, respectively, of the labour supply population. Hence, participation remains weak, with an activity rate of only 47.2% and a particularly wide gender gap.

Unemployment has been decreasing over recent years (15.3% in 2017 versus 17.6% in 2012). This positive change is registered for both men (12.4% in 2017 versus 14.6% in 2012) and women (22.6% in 2017 versus 25.5% in 2012). A significant difference exists between the regions: the unemployment rate ranges from 9.9% in the centre and east of the country to 26.2% in the southwest.

TABLE 6: UNEMPLOYMENT RATE (15 YEARS OR OVER) BY SEX (%) – TUNISIA

Age	2012	2016	2017
Women	25.5	23.1	22.6
Men	14.6	12.5	12.4
Total	17.6	15.5	15.3

Source: http://www.ins.tn

According to the ETF report (ETF, 2019), in 2015 the unemployment rate for the age group 15–24 was 34%, with equal difficulties accessing the labour market for men (33.5%) and women (35.5%). The phenomenon of NEETs (young people not in employment, education or training) is worsening every year and reached 29.1% in 2015.

Graduate unemployment is a prominent feature of the Tunisian labour market. In 2016, 28.6% of Tunisians with high educational attainment were unemployed versus only 8.6% of those with low educational attainment.

FIGURE 6: UNEMPLOYMENT RATES BY EDUCATIONAL ATTAINMENT (LOW, MEDIUM, HIGH) (AGED 15+) (%) – TUNISIA
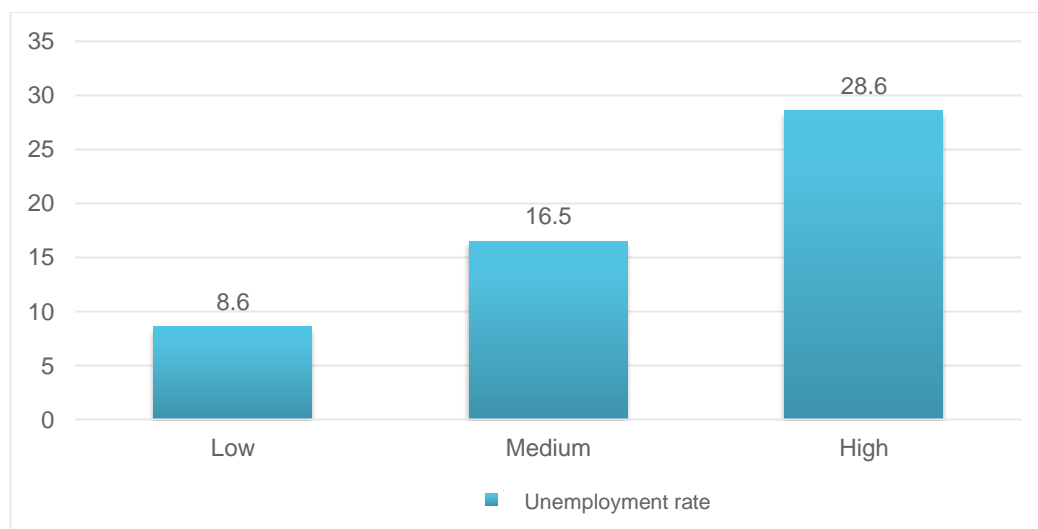
Key sectors of employment

Services account for the largest share of employment (51.7% in 2017) and the highest productivity, followed by industry (33.1%) and agriculture (14.7%) with the lowest productivity. While the tourism sector, following years of decline, currently represents only an estimated 7% of the country's gross domestic product (GDP), it does provide a substantial number of jobs, with some sources indicating that it accounts for 13–14% of direct and indirect jobs.

FIGURE 7: EMPLOYMENT BY SECTOR (%) – TUNISIA
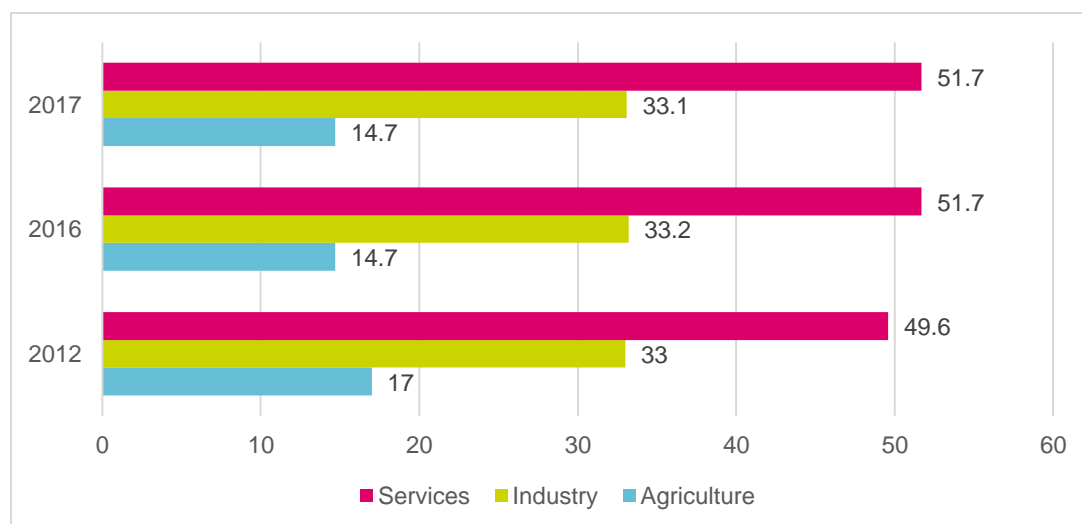
Source: ETF (2019)

GENERAL AND EMPLOYMENT-RELATED USE OF THE WEB IN TUNISIA AND MOROCCO

In this section, we introduce indicators that estimate the population's use of the internet for employment purposes using Google tools such as Google Ads and Google Analytics. We describe first the general use of the web in Morocco and Tunisia and then the employment-related use of the web.

General use of the web in Tunisia and Morocco

Table 7 shows population and internet user statistics for Tunisia and Morocco for 2000 and 2017. The internet penetration rates in the two countries are almost equal (62.4% in Morocco and 67.7% in Tunisia). Compared to those in African countries and the rest of the world, these rates are relatively high.

According to Google Ads, in April 2019 the average number of Moroccans accessing Google per day was 9 700 000. In Tunisia, the number of Google users is 3 470 000 (**Error! Reference source not found.**8**Error! Reference source not found.**).

Figure 8: Average number of Google users per day in Morocco, April 2019

Figure 9: Average number of Google users per day in Tunisia, April 2019

Employment-related use of the web in Tunisia and Morocco

To monitor the employment-related use of the web in Tunisia and Morocco, we tried different queries that a user might type into a search engine to look for a job using the Google Ads tool. This latter generates the number of use for each query.

Figure **11: Average number of searches in Google for a given keyword per day – Tunisia**

 shows that 'emploi maroc' is the most popular query when looking for a job in Morocco, and, similarly, Figure 11 shows 'emploi tunisie' to be the most popular query when looking for a job in Tunisia.

Figure 10: Average number of searches in Google for a given keyword per day – Morocco
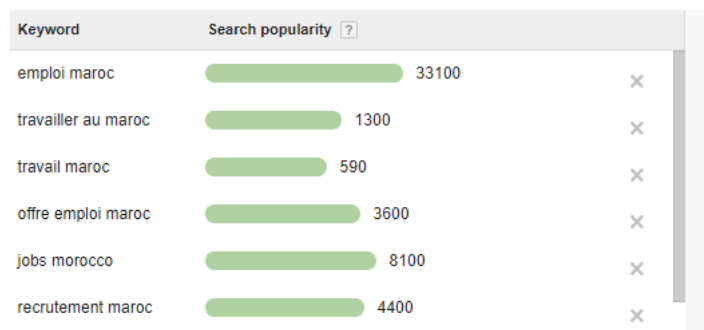
Figure 11: Average number of searches in Google for a given keyword per day – Tunisia
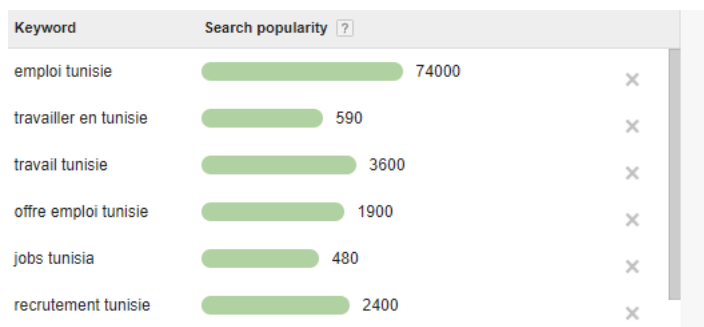
We also used Google Trends to measure the popularity of queries relating to job hunting from 2016 to 2019. Google Trends provides analysis on the popularity of top search queries in Google searches across various regions. Figure 12 and

Figure 23 show the analysis of the topic trend 'job hunting' in Morocco and Tunisia from 2016 and the distribution across each country.

Figure 12: Google Trends results for 'job hunting', June 2016 to June 2019 – Morocco
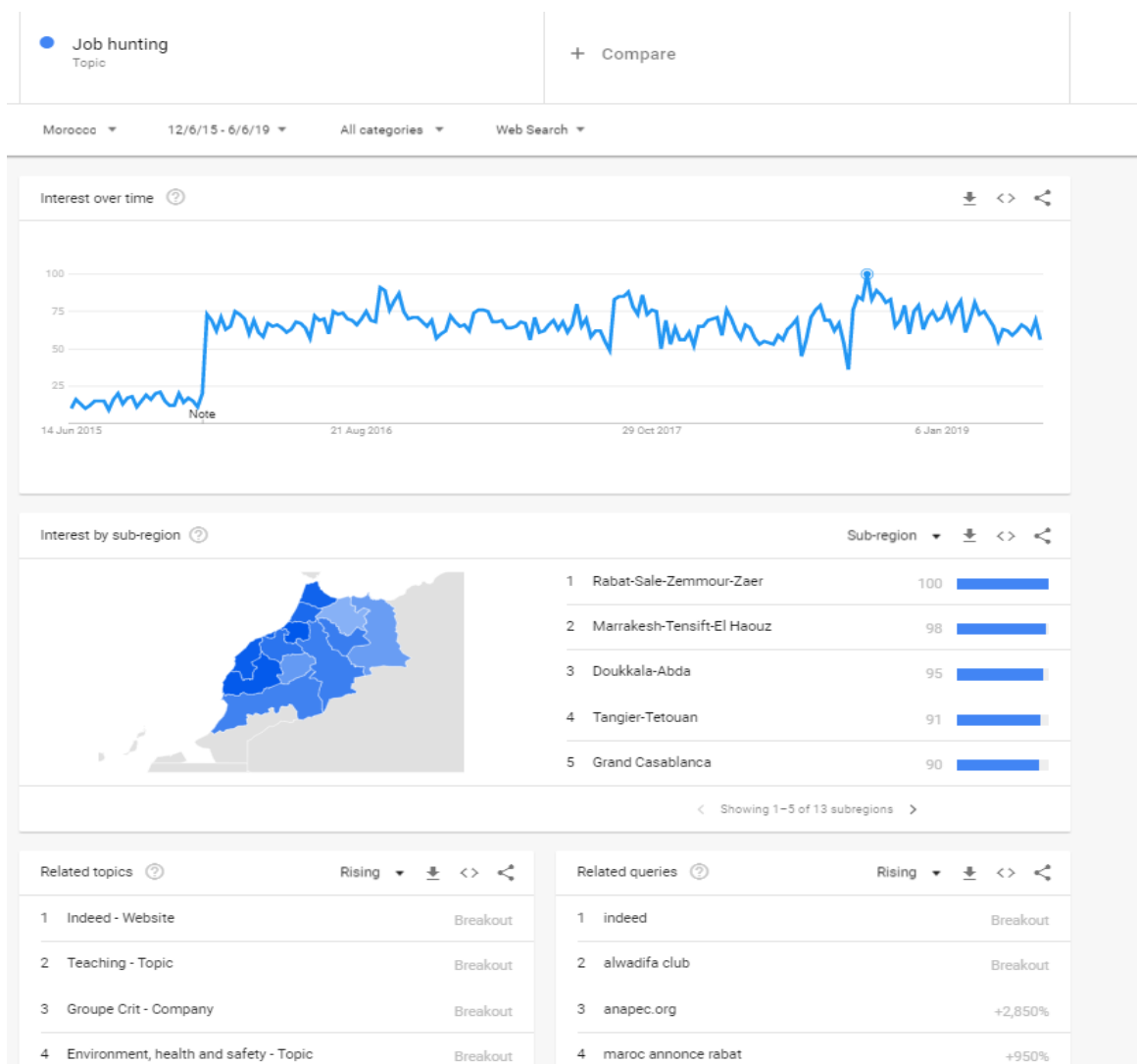
Figure 23: Google Trends results for 'job hunting', June 2016 to June 2019 – Tunisia

Job hunting
Topic

+ Compare

Tunisia ▼   06/12/2015 - 06/06/2019 ▼   All categories ▼   Web Search ▼

Interest over time ⑦   ⬇ <> ⤴

100
75
50
25
Note
6 Dec 2015   25 Dec 2016   14 Jan 2018   3 Feb 2019

Interest by sub-region ⑦   Sub-region ▼ ⬇ <> ⤴

1	Zaghouan	100
2	Ben Arous	84
3	Ariana	79
4	Sousse	76
5	Bizerte	76

‹ Showing 1–5 of 23 subregions ›

Related topics ⑦   Rising ▼ ⬇ <> ⤴

1	Interior design - Project role	Breakout
2	Pharmacy technician - Occupation	Breakout
3	Grombalia - City in Tunisia	Breakout
4	Hospitality industry - Topic	Breakout
5	Chemist - Topic	Breakout

Related queries ⑦   Rising ▼ ⬇ <> ⤴

1	concours 2016	Breakout
2	concours 2017	Breakout
3	optioncarriere	Breakout
4	concours tunisie 2016	Breakout
5	emploi nat tn	Breakout

TABLE 7: POPULATION AND INTERNET USER STATISTICS, 2020

Country/region	Population (2020 est.)	Internet users 31 December 2000	Internet users 31 December 2019	Penetration (% population)	Internet growth 2000–2020 (%)	Facebook subscribers 31 December 2019
Morocco	36 910 560	100 000	23 739 581	64.3%	23 639%	18 330 000
Tunisia	11 818 619	100 000	7 898 534	66.8%	7 798%	7 445 000
TOTAL AFRICA	1 340 598 447	4 514 400	526 710 313	39.3%	11 567%	212 911 701
Rest of World	6 456 017 263	82.8%	4 058 868 405	62.9%	88.5%	2 011 815 020
WORLD TOTAL	7 796 615 710	100.0%	4 585 578 718	58.8%	100.0 %	2 224 762 721

Source: https://www.internetworldstats.com/stats1.html

NOTES: Africa Internet Statistics for Dec 31, 2019, updated as of March 21, 2020. Africa Facebook subscribers are estimated for December 31, 2019.

COLLECTION AND CHARACTERISATION OF DATA

In this section we describe the collection and characterisation of web sources on job vacancies. We compiled a list of websites for Tunisia and Morocco with the goal of addressing the following main questions.

- **What is the quality of these websites?**
- **What information can be collected from these websites, and how?**
- **How should these sources be ranked in terms of providing credible LMI?**

As discussed in the ETF report 'Big data for labour market intelligence – an introductory guide' (Mezzanzanica and Mercorio, 2019), the web source ranking represents a crucial step in assessing the quality of LMI and guaranteeing the credibility of the labour market insights resulting from the processing of job vacancies through AI algorithms. Roughly, this represents 'step 1' of the knowledge discovery in databases (KDD) process for LMI discussed in the report cited above. Step 1 consists of the following activities: (i) identifying the job vacancy sources and their characteristics; (ii) building up the ranking model; (iii) ranking the sources and validating.

Identifying the job vacancy sources and their characteristics

Job vacancy sources were gathered using different queries in the Google search engine: 'emploi + name of country', 'job + name of country', 'offre d'emploi + name of country', 'job vacancy + name of country'. The results from the first three pages were then collected.

We defined the following attributes to characterise the job vacancy sources. They are divided into two categories: website characteristics and vacancy characteristics. The website characteristics are: rough position in the Google ranking, online job vacancy (OJV) volume, type of job portal, type of operator, geographical scope, sectoral scope, publication date of OJV, update frequency. The vacancy characteristics are occupation, type of contract, working time, sector, city, district, region, qualification level, wage.

1. **Rough position in the Google ranking:** the rough position of the website in the Google ranking list resulting from the queries 'emploi + name of country' and 'job + name of country'. The value can be either first (or second) page, which means the website appears on the first (or second) page of the Google ranking, or 'other', to indicate that the web page is listed from the third page onwards.
2. **Type of job portal:** defines whether the website is a primary job portal, a secondary job portal or a combination of job portal and secondary functions.
3. **Type of operator:** the typology of the website, i.e. whether the website relates to a recruitment agency (e.g. Gi Group) or to a national newspaper (e.g. the job section of the *Guardian* website), whether it is a specialist website (e.g. Monster), a public, sectoral or company website, or a classified ad portal.

4. **OJV volume (approximate number of OJVs):** number of vacancies included on the website at the moment of the analysis.
5. **Geographical scope:** defines whether the source is only national (e.g. the Czech portal) or whether it has a regional or international dimension (e.g. Monster is almost worldwide).
6. **Sectoral scope:** defines whether the website refers to only one sector or to the whole labour market (defined as 'one industry' vs 'all industries').
7. **Publication date of OJV:** indicates whether or not the publication date of the vacancy is present.
8. **Update frequency:** frequency with which the source is updated ('daily' or 'not daily').
9. **Language:** the language used on the website.
10. **Occupation:** defines whether the vacancy title is structured or textual.
11. **Type of contract:** defines whether the type of contract in the vacancy description text is structured, textual or not available.
12. **Working time:** defines whether the working time in the vacancy description text is structured, textual or not available.
13. **Sector:** defines whether the sector in the vacancy description text is structured, textual or not available.
14. **City:** defines whether the city in the vacancy description text is structured, textual or not available.
15. **District:** defines whether the district in the vacancy description text is structured, textual or not available.
16. **Region:** defines whether the region in the vacancy description text is structured, textual or not available.
17. **Qualification level:** defines whether the qualification level in the vacancy description text is structured, textual or not available.
18. **Wage:** defines whether the wage in the vacancy description text is structured, textual or not available.

Figure 14 shows the website and job vacancy variables and their possible values.

Figure 34: Website and job vacancy characteristics and their possible values
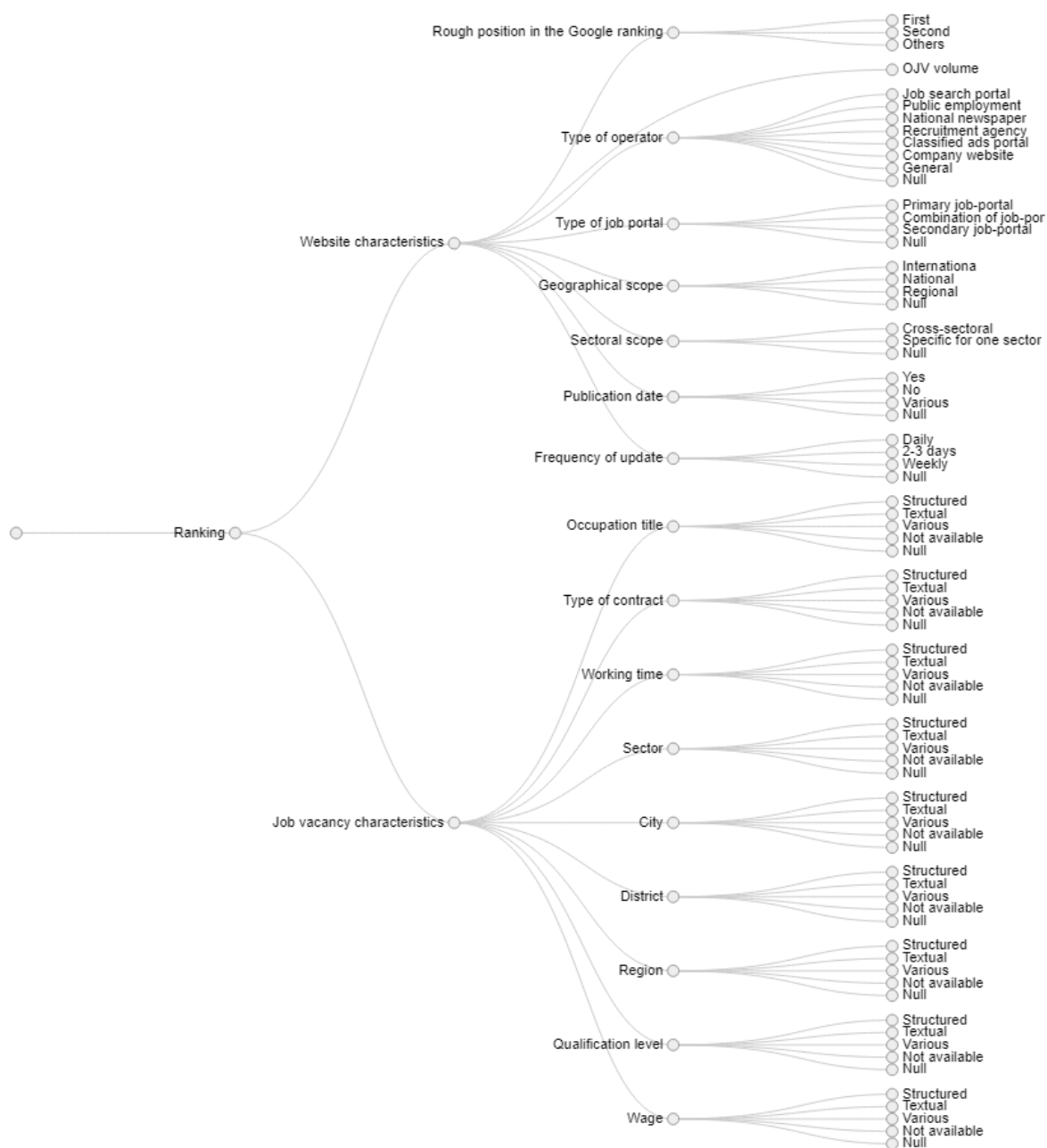
List of job vacancy sources identified

Tunisian websites

We collected details of 16 Tunisian websites, as follows 2019):

Keejob
Rough position in the Google ranking: First page

Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 1 521
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Structured
Sector: Structured
City: Not available
District: Not available
Region: Structured
Qualification level: Textual
Wage: Not available
Language: French

Tanitjobs
Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 3 369
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Structured
Working time: Structured
Sector: Structured
City: Structured
District: Structured
Region: Structured
Qualification level: Structured
Wage: Not available
Language: French

Tunisie Travail
Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 36 549

Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Textual
Sector: Structured
City: Not available
District: Not available
Region: Structured
Qualification level: Textual
Wage: Not available
Language: French and Arabic

Tunisiemploi
Rough position in the Google ranking: First page
Type of job portal: Public employment service
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 628
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Textual
Sector: Structured
City: Various
District: Various
Region: Various
Qualification level: Structured
Wage: Not available
Language: French

ReKrute
Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 75
Geographical scope: International
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes

Update frequency: Not daily
Occupation: Textual
Type of contract: Structured
Working time: Textual
Sector: Structured
City: Various
District: Structured
Region: Structured
Qualification level: Structured
Wage: Not available
Language: French

Farojob
Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 11 061
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Textual
Sector: Structured
City: Not available
District: Not available
Region: Structured
Qualification level: Textual
Wage: Not available
Language: French

Jora
Rough position in the Google ranking: First page
Type of job portal: Secondary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 10 036
Geographical scope: International
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual

Working time: Various
Sector: Various
City: Various
District: Various
Region: Various
Qualification level: Textual
Wage: Not available
Language: French + English

Offre-Emploi

Rough position in the Google ranking: Second page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 5 140
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Textual
Sector: Structured
City: Not available
District: Not available
Region: Structured
Qualification level: Textual
Wage: Textual
Language: French

Jobi

Rough position in the Google ranking: From third page onwards
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 546
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Textual
Sector: Structured
City: Structured

District: Structured
Region: Structured
Qualification level: Textual
Wage: Textual
Language: French

Tunisie Annonce

Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 3 143
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Textual
Sector: Structured
City: Structured
District: Structured
Region: Structured
Qualification level: Textual
Wage: Various
Language: French

Emploi.nat.tn

Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 4 458
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Structured
Type of contract: Various
Working time: Not available
Sector: Structured
City: Not available
District: Not available
Region: Structured
Qualification level: Structured

Wage: Not available
Language: French

Bayt
Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 113
Geographical scope: International
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Structured
Sector: Structured
City: Structured
District: Structured
Region: Structured
Qualification level: Textual
Wage: Not available
Language: French + English

Ballouchi
Rough position in the Google ranking: From third page onwards
Type of job portal: Combination of job portal and secondary functions
Type of operator: Classified ads portal
OJV volume (approximate number of OJVs): 4 114
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Structured
Working time: Textual
Sector: Not available
City: Structured
District: Structured
Region: Structured
Qualification level: Textual
Wage: Not available
Language: French

Opensooq
Rough position in the Google ranking: From third page onwards
Type of job portal: Combination of job portal and secondary functions
Type of operator: Classified ads portal
OJV volume (approximate number of OJVs): 33
Geographical scope: International
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Not daily
Occupation: Textual
Type of contract: Structured
Working time: Not available
Sector: Not available
City: Not available
District: Not available
Region: Structured
Qualification level: Structured
Wage: Not available
Language: Arabic

Wzayef
Rough position in the Google ranking: From third page onwards
Type of job portal: Primary job portal (jobs abroad)
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 60
Geographical scope: International
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Not daily
Occupation: Textual
Type of contract: Not available
Working time: Not available
Sector: Structured
City: Not available
District: Not available
Region: Structured
Qualification level: Not available
Wage: Structured
Language: Arabic + English

Tanqeeb Tunisia
Rough position in the Google ranking: From third page onwards
Type of job portal: Primary job portal

Type of operator: Job search portal
OJV volume (approximate number of OJVs): 650
Geographical scope: International
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Not daily
Occupation: Textual
Type of contract: Not available
Working time: Structured
Sector: Structured
City: Not available
District: Not available
Region: Structured
Qualification level: Various
Wage: Structured
Language: Arabic + English + French

Moroccan websites

We collected details of 15 Moroccan websites, as follows.

Marocemploi
Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 1 000
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Structured
Sector: Structured
City: Not available
District: Not available
Region: Structured
Qualification level: Textual
Wage: Not available
Language: French

Emploi-Public (public organisation)

Rough position in the Google ranking: Second page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 1 000
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Structured
Type of contract: Not available
Working time: Not available
Sector: Not available
City: Not available
District: Not available
Region: Not available
Qualification level: Not available
Wage: Not available
Language: Arabic

Menara Job
Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 500
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Structured
Working time: Textual
Sector: Textual
City: Not available
District: Not available
Region: Structured
Qualification level: Textual
Wage: Structured
Language: French

Emploi.ma
Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal

OJV volume (approximate number of OJVs): 1 002
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Structured
Working time: Not available
Sector: Structured
City: Not available
District: Structured
Region: Structured
Qualification level: Various
Wage: Not available
Language: French

ReKrute
Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 1 051
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Structured
Working time: Not available
Sector: Structured
City: Not available
District: Not available
Region: Textual
Qualification level: Textual
Wage: Not available
Language: French

Tanmia
Rough position in the Google ranking: First page
Type of job portal: non-governmental organisations' (NGOs) jobs portal
Type of operator: Secondary job portal
OJV volume (approximate number of OJVs): 1 254
Geographical scope: National
Sectoral scope: Cross-sectoral (jobs in NGOs)

Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Structured
Working time: Textual
Sector: Textual
City: Various
District: Not available
Region: Textual
Qualification level: Textual
Wage: Not available
Language: French

Dreamjob
Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): - information not provided
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Not available
Sector: Not available
City: Not available
District: Textual
Region: Textual
Qualification level: Textual
Wage: Textual
Language: French + English + Arabic

Novojob
Rough position in the Google ranking: Second page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 398
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: No
Update frequency: - information not provided
Occupation: Textual

Type of contract: Structured
Working time: Not available
Sector: Structured
City: Not available
District: Structured
Region: Structured
Qualification level: Structured
Wage: Textual
Language: French

<u>**Amaljob**</u>
Rough position in the Google ranking: Second page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 182
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Structured
Working time: Not available
Sector: Textual
City: Not available
District: Not available
Region: Structured
Qualification level: Structured
Wage: Structured
Language: French

<u>**Tectra**</u>
Rough position in the Google ranking: Second page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 2 500
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Not daily
Occupation: Structured
Type of contract: Structured
Working time: Not available

Sector: Not available
City: Not available
District: Not available
Region: Structured
Qualification level: Structured
Wage: Not available
Language: French

Toutaumaroc
Rough position in the Google ranking: Second page
Type of job portal: Secondary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 714
Geographical scope: National
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Textual
Sector: Textual
City: Not available
District: Textual
Region: Textual
Qualification level: Textual
Wage: Not available
Language: Arabic + French

Indeed
Rough position in the Google ranking: First page
Type of job portal: Secondary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 7 765
Geographical scope: International
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Textual
Sector: Textual
City: Textual
District: Textual

Region: Structured
Qualification level: Textual
Wage: Textual
Language: French + English

<u>Bayt</u>
Rough position in the Google ranking: First page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 562
Geographical scope: International
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Structured
Working time: Structured
Sector: Structured
City: Not available
District: Not available
Region: Structured
Qualification level: Structured
Wage: Textual
Language: English

<u>Wzayef</u>
Rough position in the Google ranking: Secondary job portal
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): - information not provided
Geographical scope: International
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Textual
Working time: Textual
Sector: Structured
City: Not available
District: Not available
Region: Structured
Qualification level: Textual
Wage: Structured

Language: Arabic + English

Tanqeeb
Rough position in the Google ranking: Second page
Type of job portal: Primary job portal
Type of operator: Job search portal
OJV volume (approximate number of OJVs): 185 179
Geographical scope: International
Sectoral scope: Cross-sectoral
Publication date of OJV: Yes
Update frequency: Daily
Occupation: Textual
Type of contract: Not available
Working time: Textual
Sector: Structured
City: Not available
District: Not available
Region: Structured
Qualification level: Textual
Wage: Not available
Language: English

Transforming variables to numeric values

A score between 0 and 1 was assigned to each variable, with intermediate values depending on the values of the variable. The minimum value indicates a strong negative valuation of the source: we consider as zero the value for those variables that are not (or cannot be) identified in the website being analysed, despite the relevance of the variable in the ranking model. Intermediate values show that the variable presents some unfavourable features. Null values in basic indexes fundamentally invalidate the rank index (see 'About completeness' section).

Each criterion might have different values for different sources, as showed in the table. 8 To differentiate each value, we manually analysed each job portal, focusing on each variable to assign a value, as discussed in this section.

Below we report the distribution of values by variable.

TABLE 8: NUMERIC VALUES OF 'ROUGH POSITION IN THE GOOGLE RANKING' VARIABLE

Rough position in the Google ranking	Value
First page	1
Second page	0.8

From third page onwards	0.5

TABLE 9: NUMERIC VALUES OF 'TYPE OF OPERATOR' VARIABLE

Type of operator	Value
Job search portal	1
Public employment service	1
National newspaper	0.5
Recruitment agency	1
Classified ads portal	1
Company website	1
General	1
Null	0

TABLE 10: NUMERIC VALUES OF 'GEOGRAPHICAL SCOPE' VARIABLE

Geographical scope	Value
International	1
National	1
Regional	0.5
Null	0

TABLE 11: NUMERIC VALUES OF 'TYPE OF JOB PORTAL' VARIABLE

Type of job portal	Value
Primary job portal	1
Combination of job portal and secondary functions	0.8

Secondary job portal	0.5
Null	0

TABLE 12: NUMERIC VALUES OF 'SECTORAL SCOPE' VARIABLE

Sectoral scope	Value
Cross-sectoral	1
Specific for one sector	0.5
Null	0

TABLE 13: NUMERIC VALUES OF 'PUBLICATION DATE' VARIABLE

Publication date	Value
Yes	1
No	0
Various	0.5
Null	0

TABLE 14: NUMERIC VALUES OF 'FREQUENCY OF UPDATE' VARIABLE

Frequency of update	Value
Daily	1
2–3 days	0.8
Weekly	0.5
Null	0

TABLE 15: NUMERIC VALUES OF 'STRUCTURED' VARIABLE

Structured variables	Value
Structured	1
Textual	0.5
Various	0.5
Not available	0
Null	0

TABLE 16: TUNISIAN WEB SOURCES

Name of job portal	Rough position in the Google ranking	Type of operator	Type of job portal	OJV volume (approximate number of OJVs)	Geographical scope	Sectoral scope	Publication date of OJV	Update frequency	Occupation	Type of contract	Working time	Sector	City	District	Region	Qualification level	Wage	Normalised size	Media	Final ranking
Keejob	1	1	1	1 521	1	1	1	1	0.5	1	1	1	1	1	1	1	0	0.040749261	0.85	2
Tanitjobs	1	1	1	3 369	1	1	1	1	0.5	1	0.5	1	0	1	1	0.5	0	0.091357213	0.72	4
Tunisie Travail	1	1	1	36 549	1	1	1	1	0.5	0.5	0.5	1	0	0	1	0.5	0	1	0.69	8
Tunisiemploi	1	1	1	628	1	1	1	1	0.5	0.5	0.5	1	0.5	0.5	0.5	1	0	0.016294227	0.69	7
ReKrute	1	1	1	75	1	1	1	0	0.5	1	0.5	1	0.5	1	1	1	0	0.001150181	0.72	6
Farojob	1	1	1	11 061	1	1	1	1	0.5	0.5	0.5	1	0	0	1	0.5	0	0.302004601	0.64	12
Jora	1	1	0.5	10 036	1	1	1	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0	0.273934714	0.61	13
Offre-Emploi	0.8	1	1	5 140	1	1	1	1	0.5	0.5	0.5	1	0	0	1	0.5	0.5	0.139856501	0.65	11
Jobi	0.5	1	1	546	1	1	1	1	0.5	1	1	1	1	1	1	1	1	0.014048636	0.88	1
Tunisie Annonce	0.5	1	0.8	3 143	1	1	1	1	0.5	0.5	0.5	1	1	1	1	0.5	0.5	0.085168145	0.74	3
Emploi.nat.tn	1	1	1	4 458	1	1	1	1	1	0.5	0	1	0	0	1	1	0	0.121179757	0.66	10
Bayt	1	1	1	113	1	1	1	0	0.5	0.5	1	1	1	1	1	0.5	0	0.00219082	0.72	5
Ballouchi	0.5	1	0.8	4 114	1	1	1	1	0.5	1	0.5	0	1	1	1	0.5	0	0.111759229	0.68	9
Opensooq	0.5	1	0.8	33	1	1	1	0	0.5	1	0	0	0	0	1	1	0	0	0.49	16
Wzayef	0.5	1	1	60	1	1	1	0	0.5	0	0	1	0	0	1	0	1	0.000739402	0.50	15
Tanqeeb Tunisia	0.5	1	1	650	1	1	1	0	0.5	0	1	1	0	0	1	0.5	0	0.016896703	0.53	14

TABLE 17: MOROCCAN WEB SOURCES

Name of job portal	Rough position in the Google ranking	Type of operator	Type of job portal	OJV volume (approximate number of OJVs)	Geographical scope	Sectoral scope	Publication date of OJV	Update frequency	Occupation	Type of contract	Working time	Sector	City	District	Region	Qualification level	Wage	Normalised size	Media	Final ranking
Marocemploi	1	1	1	1 000	1	1	1	1	0.5	0.5	1	1	0	0	1	0.5	0	0.00540018	0.6840460589	7
Emploi-Public (public organisation)	0.8	1	1	1 000	1	1	1	1	1	0	0	0	0	0	0	0	0	0.00540018	0.466399	15
Menara Job	1	1	1	500	1	1	1	1	0.5	1	0.5	0.5	0	0	1	0.5	1	0.00270009	0.7096700883	4
Emploi.ma	1	1	1	1 002	1	1	1	1	0.5	1	0	1	0	1	1	0.5	0	0.005410981	0.7134729745	3
ReKrute	1	1	1	1 051	1	1	1	1	0.5	1	0	1	0	0	0.5	0.5	0	0.00567559	0.6256088785	11
Tanmia (ONG)	1	1	0.5	1 254	1	1	1	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.006771826	0.6565584637	8
Dreamjob	1	1	1	0	1	1	1	1	0.5	0.5	0	0	0	0.5	0.5	0.5	0.5	0	0.5882352941	13
Novojob	0.8	1	1	398	1	1	0	0	0.5	1	0	1	0	1	1	1	0.5	0.002149272	0.638309155	9
Amaljob	0.8	1	1	182	1	1	1	1	0.5	1	0	0.5	0	0	1	1	1	0.000982833	0.6954963827	5

Tectra	0.8	1	1	2 500	1	1	1	0.5	1	1	0	0	0	0	1	1	0	0.013500451	0.6248210295	12
Toutaumaroc	0.8	1	0.5	714	1	1	1	1	0.5	0.5	0.5	0.5	0	0.5	0.5	0.5	0	0.003855729	0.5818794743	14
Indeed	1	1	0.5	7 765	1	1	1	1	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.041932401	0.7352941176	2
Bayt	1	1	1	562	1	1	1	1	0.5	1	1	1	0	0	1	1	0.5	0.003034901	0.7689632968	1
Wzayef	0.8	1	1	0	1	1	1	1	0.5	0.5	0.5	1	0	0	1	0.5	1	0	0.6941176471	6
Tanqeeb	0.8	1	1	185 179	1	1	1	1	0.5	0	0.5	1	0	0	1	0.5	0	1	0.6289193591	10

RANKING MODEL

In this section we present the two ranking models for the selected web sources listed in the previous section:

1. flat model, which considers all web source criteria to have equal importance (without weighting);

2. Analytic Hierarchy Process (AHP) model, which allows us to set the criteria priorities and calculate the ranking score with weighted attributes.

The use of an AHP model and user settings guarantees a level of trust and explainability of the model results.

Flat model

In this first scenario, the ranking model is computed as the mean of the website variables (criteria) presented above. In Tables 18 and 19 we present the results of the flat model.

TABLE 18: RANKING OF JOB PORTALS ACCORDING TO THE FLAT MODEL – TUNISIA

Name of the job portal	Score	Final ranking
Jobi	0.88	1
Keejob	0.85	2
Tunisie Annonce	0.74	3
Tanitjobs	0.72	4
Bayt	0.72	5
ReKrute	0.72	6
Tunisiemploi	0.69	7
Tunisie Travail	0.69	8
Ballouchi	0.68	9
Emploi.nat.tn	0.66	10
Offre-Emploi	0.65	11
Farojob	0.64	12
Jora	0.61	13
Tanqeeb Tunisia	0.53	14

Wzayef	0.5	15
Opensooq	0.49	16

TABLE 19: RANKING OF JOB PORTALS ACCORDING TO THE FLAT MODEL – MOROCCO

Name of the job portal	Score	Final ranking
Bayt	0.76	1
Emploi.ma	0.73	2
Menara Job	0.71	3
Amaljob	0.709	4
Wzayef	0.695	5
Indeed	0.694	6
Marocemploi	0.68	7
Tanqeeb	0.65	8
Tanmia	0.63	9
Novojob	0.628	10
ReKrute	0.625	11
Tectra	0.624	12
Dreamjob	0.588	13
Toutaumaroc	0.581	14
Emploi-Public (public organisation)	0.46	15

In order to guarantee the credibility of the results collected from these websites, we include in the selection only those websites that have a score in a percentile above the 50%, and hence discard those below that value (highlighted in red in Tables 18 and 19), as the latter do not reach a satisfactory quality ranking. This clearly applies for both Tunisia and Morocco, using the respective percentile in the ranking distribution (i.e. 0.5 and 0.46, respectively).

AHP model

The flat model considers all variables to have the same priorities when calculating the ranking score. This means that each criterion has the same importance and contributes in the same way in constructing

the final ranking. Hence, there is no way for the decision maker to prefer one criterion over another, even if the decision maker considers one job portal attribute to be more important than another. For instance, a website crawler might prefer to have more instances of job vacancies (preferring the attribute size) rather than having all the attribute values of the job vacancy (quantity in favour of quality). To handle such a scenario, and to allow decision makers to express preferences for these criteria, we propose a further ranking model generated by applying the AHP model (LaValle and Bard, 1991), as described in the following section.

Informal description

The AHP is an effective technique for dealing with multicriteria decision-making problems that allows decision makers to set priorities of variables to make decisions that fit their variable preferences. By reducing complex decisions to a series of pairwise comparisons, and then synthesising the results, the AHP helps to capture both subjective and objective aspects of a decision. The AHP is a very flexible and powerful tool because the scores, and therefore the final ranking, are obtained on the basis of the pairwise relative evaluations of both the criteria and the options provided by the user. The computations made by the AHP are always guided by the decision maker's experience, and the AHP can thus be considered as a tool that is able to translate the evaluations (both qualitative and quantitative) made by the decision maker into a multicriteria ranking. (CONTENT: Much of the text in this section is copied from or based on this document: (https://www3.diism.unisi.it/~mocenni/Note_AHP.pdf)

AHP model definition

The AHP model definition includes three steps.

Step1 Computing the vector of criteria (website attributes) weights

In this step, each decision maker is asked to express their preferences through a pairwise comparison of criteria using a linguistic scale (i.e. the Saaty Scale[1]). For example, given three criteria A, B and C, the decision maker has to decide whether, and to what extent, (i) A is preferable to B, (ii) B is preferable to C, and (iii) A is preferable to C. Clearly, if A is better than B and B is better than C, then the model expects that the transitivity is satisfied by declaring that A is preferred to C, otherwise the judgement might be inconsistent. The AHP handles inconsistency and returns the consistency ratio, which is expected to stay within 10%.

We asked a group of users to add their preferences to the AHP model using an online tool that implements this model[2]. The results relating to the priority settings and the final results of ranking when comparing the job portals of each country are given below.

Figure 15 shows the results of the vector criteria weights calculation made by ETF experts. As noted, the experts decided to give much more importance to 'qualification level' (14.8%), 'sectoral scope'

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[1] A linguistic scale that assigns numeric values to linguistic labels. The scale is usually organised as follows: 1 – Equal Importance; 3 – Moderate Importance; 5 – Strong Importance; 7 – Very Strong Importance; 9 – Extreme Importance (2,4,6,8 values in between).
[2] https://bpmsg.com/ahp/

(12.7%), 'publication date' (9.8%) and 'date' (9%) than to the other criteria. This also has effects on the final ranking, which now reflects the preferences of the ETF experts. For the sake of simplicity, only the top 10 websites of the flat model are used in the AHP model. The results are shown in Figure 16 (Tunisian websites) and Figure 17 (Moroccan websites).

FIGURE 45: WEIGHTED ATTRIBUTES AFTER THE USER SETTINGS

Step 2 Computing the matrix of option scores (job portal scores)

Once the criteria have been weighted according to the decision maker's preferences, each 'alternative' (i.e. job portal) is evaluated against the criteria. That is, given the model consisting of three criteria A, B and C, as above, each website $W_1, W_2, ..., W_n$ is pairwise compared to measure how good it fulfils each criterion (e.g. 'With respect to criterion A, which alternative fits better or is more preferable?' $<W_1, W_2>$,

<W$_1$,W$_3$>,…,<W$_1$,W$_n$>, <W$_2$,W$_3$>,…<W$_2$,W$_n$>,<W$_3$,W$_n$>). As one might anticipate, this step is error-prone and time-consuming. For these reasons, we used the *score value* generated for Tunisia and Morocco to automatically derive these evaluations from the ranking. In other words, the ranking between sources synthesised above is used to evaluate alternatives that, in turn, will be ranked by the AHP to fit the decision maker's preferences of criteria. These results are provided below for Tunisia and Morocco.

Tunisia

FIGURE 56: COMPARISON RESULTS BETWEEN 10 SELECTED TUNISIAN JOB PORTALS WITH THE CORRESPONDING ATTRIBUTE WEIGHTS

				Decision Hierarchy									
el 0	Level 1	Level 2	Glb Prio.	Jobi	keejob	Tunisie Annonces	tanitjobs	bayt	rekrute	tunisie-emploi	tunisietravail	ballouchi	emploi.nat.tn
king	Website charcteristics 0.500	Rough position in the google ranking 0.049	2.4%	0.040	0.135	0.038	0.127	0.127	0.127	0.127	0.127	0.027	0.119
		Size 0.131	6.5%	0.070	0.074	0.074	0.074	0.050	0.044	0.049	0.446	0.059	0.059
		Type of operator 0.106	5.3%	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
		Type of job portal 0.084	4.2%	0.122	0.122	0.081	0.106	0.106	0.106	0.106	0.106	0.047	0.097
		Geographical scope 0.089	4.5%	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
		Sectoral scope 0.255	12.7%	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
		Publication date 0.196	9.8%	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
		Frequency of update 0.091	4.5%	0.126	0.126	0.126	0.093	0.022	0.022	0.122	0.122	0.122	0.122
	Job vacancy characteristics 0.500	Occupation title 0.147	7.3%	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.250
		Type of contract 0.041	2.1%	0.181	0.181	0.038	0.170	0.047	0.156	0.032	0.032	0.137	0.026
		Working time 0.041	2.1%	0.243	0.243	0.050	0.050	0.215	0.046	0.046	0.046	0.046	0.013
		Sector 0.179	9.0%	0.460	0.044	0.210	0.041	0.041	0.041	0.041	0.041	0.041	0.041
		City 0.075	3.7%	0.178	0.178	0.178	0.017	0.176	0.048	0.048	0.015	0.147	0.015
		District 0.075	3.7%	0.136	0.136	0.136	0.136	0.136	0.136	0.036	0.013	0.124	0.013
		Region 0.061	3.0%	0.111	0.111	0.111	0.111	0.111	0.111	0.024	0.104	0.104	0.104
		Qualification Level 0.296	14.8%	0.188	0.188	0.039	0.039	0.039	0.154	0.154	0.034	0.034	0.134
		Wage 0.085	4.3%	0.460	0.044	0.210	0.041	0.041	0.041	0.041	0.041	0.041	0.041
			1.0	16.7%	11.5%	10.4%	8.0%	8.2%	9.2%	8.8%	9.7%	7.8%	9.7%

FIGURE 67: AHP RANKING RESULTS OF THE TUNISIAN WEBSITES

Consolidated Result
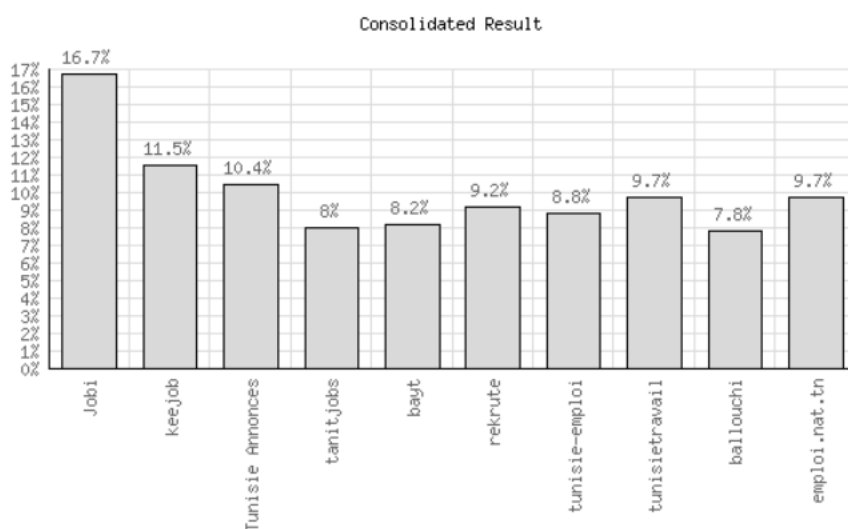
TABLE 20: RANKING OF JOB PORTALS ACCORDING TO THE AHP MODEL – TUNISIA

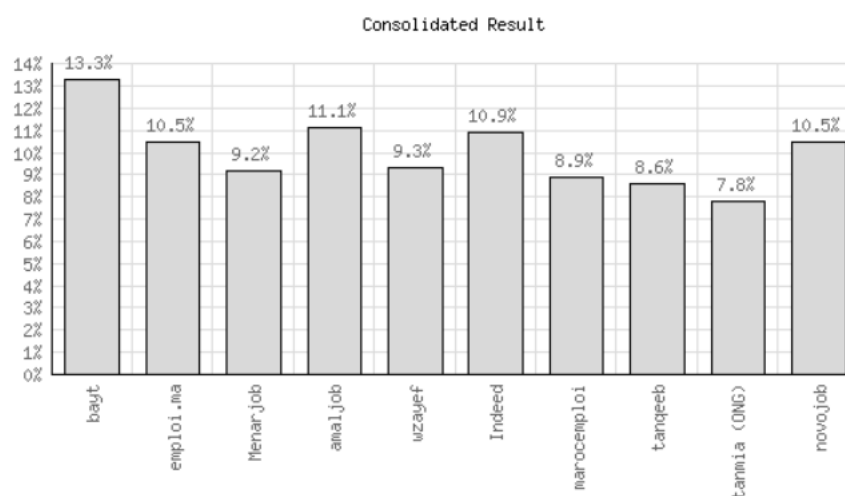| Name of the job portal	Score (%)	Final ranking
Jobi	16.7	1
Keejob	11.5	2
Tunisie Annonce	10.4	3
Tunisie Travail	9.7	4
Emploi.nat.tn	9.7	5
ReKrute	9.2	6
Tunisiemploi	8.8	7
Bayt	8.2	8
Tanitjobs	8	9
Ballouchi	7.8	10

According the final AHP model consolidated results (Figure 17 and Table 20), the top three job portals are: Jobi, Keejob and Tunisie Annonce.

Morocco

FIGURE 78 COMPARISON RESULTS BETWEEN 10 MOROCCAN JOB PORTALS WITH THE CORRESPONDING ATTRIBUTE WEIGHTS

Level 1	Level 2	Glb Prio.	bayt	emploi.ma	Menarjob	amaljob	wzayef	Indeed	marocemploi	tanqeeb	tanmia (ONG)	novojob
												Decision Hierarchy
Website charcteristics 0.500	Rough position in the google ranking 0.049	2.4%	0.142	0.131	0.142	0.063	0.069	0.116	0.116	0.062	0.104	0.047
	Size 0.131	6.5%	0.077	0.078	0.063	0.047	0.040	0.436	0.063	0.098	0.054	0.043
	Type of operator 0.106	5.3%	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
	Type of job portal 0.084	4.2%	0.123	0.123	0.123	0.123	0.123	0.026	0.115	0.115	0.022	0.108
	Geographical scope 0.089	4.5%	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
	Sectoral scope 0.255	12.7%	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
	Publication date 0.196	9.8%	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
	Frequency of update 0.091	4.5%	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.012
Job vacancy characteristics 0.500	Occupation title 0.147	7.3%	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
	Type of contract 0.041	2.1%	0.177	0.177	0.177	0.177	0.039	0.031	0.039	0.016	0.034	0.134
	Working time 0.041	2.1%	0.319	0.024	0.081	0.023	0.063	0.074	0.252	0.070	0.070	0.023
	Sector 0.179	9.0%	0.165	0.165	0.036	0.036	0.143	0.034	0.133	0.133	0.029	0.125
	City 0.075	3.7%	0.067	0.067	0.067	0.067	0.067	0.257	0.063	0.063	0.220	0.060
	District 0.075	3.7%	0.033	0.343	0.032	0.032	0.032	0.108	0.031	0.031	0.090	0.269
	Region 0.061	3.0%	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.026	0.097
	Qualification Level 0.296	14.8%	0.264	0.060	0.062	0.218	0.047	0.047	0.047	0.047	0.047	0.163
	Wage 0.085	4.3%	0.079	0.020	0.233	0.233	0.233	0.062	0.019	0.019	0.051	0.051
bmit for group eval or alternative eval. atives		1.0	13.3%	10.5%	9.2%	11.1%	9.3%	10.9%	8.9%	8.6%	7.8%	10.5%

FIGURE 8 AHP RANKING RESULTS OF THE MOROCCAN WEBSITES

Consolidated Result

TABLE 21: RANKING OF JOB PORTALS ACCORDING TO THE AHP MODEL – MOROCCO

Name of the job portal	Score (%)	Final ranking
Bayt	13.3	1
Amaljob	11.1	2
Indeed	10.9	3
Emploi.ma	10.5	4
Novojob	10.5	5
Wzayef	9.3	6
Menara Job	9.2	7
Marocemploi	8.9	8
Tanqeeb	8.6	9
Tanmia (ONG)	7.8	10

According the final AHP model results (Figure 19 and Table 21), the top three Moroccan job portals are: Bayt, Amaljob and Indeed.

Step 3 Ranking the options (ranking the job portals)

In this step, the ranking of web sources is provided along with the ranking values and the comparison between the flat ranking and the AHP ranking.

Comparison of the two ranking models

As discussed above, we provide two distinct ranking models for both Tunisia and Morocco. The first, the flat model, ranks all the web sources identified, with each criterion having the same importance; the second, the weighted model, considers the ETF experts' preferences, allowing more importance to be given to some criteria than to others. As a result, the final ranking will reflect these preferences.

A comparison of the ranking of these two models is provided in Tables 22 and 23 for Tunisia and Morocco, respectively. It is worth noting that both ranking models are valid, though the weighted model better fits the ETF's preferences, by enhancing those websites in which the 'qualification level', 'sectoral scope' and 'publication date' have higher values in relation to the others.

Tunisia

TABLE 22: COMPARISON BETWEEN FLAT MODEL RANKING AND AHP MODEL RANKING FOR TUNISIAN WEBSITES

Web sources	Flat model	Ranking comparison
Jobi	1	=
Keejob	2	=
Tunisie Annonce	3	=
Tanitjobs	4	8(↓4)
Bayt	5	9(↓4)
ReKrute	6	=
Tunisiemploi	7	=
Tunisie Travail	8	4(↑4)
Ballouchi	9	10(↓1)
Emploi.nat.tn	10	5(↑5)

Morocco

TABLE 23: COMPARISON BETWEEN FLAT MODEL RANKING AND AHP MODEL RANKING FOR MOROCCAN WEBSITES

Web sources	Flat model	Ranking comparison
Bayt	1	=
Emploi.ma	2	4(↓2)
Menara Job	3	7(↓4)
Amaljob	4	2(↑2)
Wzayef	5	6(↓4)
Indeed	6	3(↑3)
Marocemploi	7	8(↓1)
Tanqeeb	8	9(↓1)
Tanmia	9	10(↓1)
Novojob	10	5(↑5)

Comments and advice to conceive and put in place a real-time LMI system

In this report we have mainly summarised the labour market dynamics for Tunisia and Morocco; selected a number of LMI web sources; and presented a ranking model to identify the most reliable and qualitative sources that could be included in a real-time LMI system that collects vacancies from these websites. To allow for reproducibility, we also discussed how the ranking model was built in terms of criteria, values and a technique to generate a flat model (where each criterion has the same importance) and a weighted model (where the end users, selected ETF experts in this case, specified preferences over criteria to generate a ranking model accordingly).

The next steps should focus on the realisation of **a system that collects vacancies from these selected sources, classifies these vacancies and the skills involved using a standard taxonomy of occupations and skills (e.g. European Skills/Competences, qualifications and Occupations (ESCO), and presents the resulting knowledge, analysis and indicators in a visual way to ease access.**

To present our advice and expertise on the realisation of such a system, we have organised this section following a classical Q&A approach, which should clarify the matter even to non-technical readers.

Questions Block 1: On the final results

1. **Which actions or steps are needed to continue towards the realisation of a real-time system for Tunisia and Morocco?**

   The ETF should initiate a process or project with experts in LMI and computer science to implement the next KDD steps. Such a project should include the following stages: (i) design and implement a data pipeline that collects data periodically; (ii) exploit machine learning and ontology matching algorithms to classify vacancies and skills over ESCO; (iii) build up LMI knowledge according to the analysis purposes defined by the ETF (e.g. identifying skill rates; calculating the pervasiveness of digital/hard/soft skills; designing indicators and analyses to compare the labour markets of Tunisia and Morocco in terms of skill gaps and skill similarities; identifying potential new occupations; identifying trends in terms of skills and their impacts on traditional jobs; terms coming from the labour market, etc.).

2. **Would the final system be presented in a graphical and interactive way so that anyone can easily navigate through pre-defined analyses?**

   Yes. To this end, the final analyses and key performance indicators (KPIs) could be presented using visual analytics tools such as Tableau dashboards. These tools can be then embedded within your own website. It is then simply a matter of taking care of the layout and texts within pages, as the data and analyses come from an external web server. In this respect, this solution is useful as it might allow the ETF to include pre-defined analyses and indicators within its own website, thus creating a 'web LMI portal' from the system with no additional effort.

3. **In such a scenario, who will host the presentation area? Would this be the ETF, or will it be an external website?**

   Focusing on the case above, the organisation hosts the website while the dashboards are provided externally as a service, with no effort from the ETF side as dashboards are provided as a service, and then embedded into the website. This represents a good service model that is easy to implement and that will scale out well.

4. **What are the technical requirements (even approximate) to have the presentation area under ETF ownership?**

   You might decide either to publish the dashboards as they are (in which case the technical effort is zero) or to embed the dashboards within your website. In the latter case, the technical effort is just in creating the web page and in managing the access control (if any).

5. **Can the maintenance and further data feeds and updates be done by the service provider (experts) if the presentation area is hosted by the ETF website?**

Yes – that is the ideal workflow. LM Analytics flow is a service within dashboards that automatically updates. The maintenance could be moved to experts if needed.

6. **Once such a system has been realised, could it act as a sort of 'hub' to host the results of web job vacancies and analyses from other ETF partner countries? Can this scalable 'hub' presentation area be gradually augmented with data from other countries (data and analysis funded from other EU budgets, such as the Eastern Partnership)?**

Yes. This solution allows such a 'hub' to be realised in scalable way as it would be a part of such a platform. Indeed, the product is provided as a service, so it can be scaled out with very little effort.

Questions Block 2: Data ingestion

1. **How can the websites ranked be used to realise the system?**

Starting from the web sources ranked here, the ETF should be in charge of signing agreements with the source owners to guarantee that the system will be able to collect data from those sources in a reliable way. This step is crucial for guaranteeing the effectiveness of the project over time.

2. **Based on the experience of Phase 2, what might be the main difficulties and challenges and what might be the likely technique (API[3], scraping or crawling – or a mix)?**

As we also discussed in the ETF 'Big data for labour market intelligence – an introductory guide' (Mezzanzanica and Mercorio, 2019), having API is preferred to scraping or crawling as the former allows more reliable and stable results to be obtained, although scraping and crawling can also be carried out. However, in spite of the data access policy, the crucial aspect is that the ETF should have agreements with data owners to gain access to the data. This does not usually represent a challenge as the analytical purposes of the ETF strongly differ from the business purposes of these websites.

Questions Block 3: Classification taxonomy

1. **Would it be appropriate to refer to ESCO for cases such as Tunisia and Morocco?**

To date, ESCO represents the richest and most updated taxonomy of occupations and skills in Europe that allows the resulting knowledge to be expressed in 32 EU languages. We think

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[3] API: the application programming interface (API) is a computing interface which defines interactions between multiple software intermediaries. It defines the kinds of calls or requests that can be made, how to make them, the data formats that should be used, the conventions to follow, etc

ESCO represents a good starting point, which the project can enrich with additional data-driven insights (e.g. soft/hard/digital skills rates, novel occupations, additional skills, etc.).

2. **Which variables and their combinations can be visualised with some interactivity (e.g. occupations x skills / most demanded – by region (city); occupations x level of qualification)? Which variables are technically more difficult to analyse and visualise, for various reasons (e.g. missing data or difficulties with classification or use of taxonomy)?**

The variable dimensions might include occupations (ESCO IV digit + novel occupations), skills (ESCO + novel skills), territory (NUTS 3), sector (NACE II digit), wage (if present).

TABLE OF ABBREVIATIONS

AHP	Analytic Hierarchy Process
API	Application Programming Interface
ESCO	European Skills/Competences, qualifications and Occupations
GDP	Gross domestic product
KDD	Knowledge discovery in databases
KPI	Key performance indicator
LMI	Labour market information
MENA	Middle East and North Africa
NEET	Not in employment, education or training
NGO	Non-governmental organisation
OJV	Online job vacancy
Q&A	Question and answer

REFERENCES

European Training Foundation (ETF), 'Tunisia: education, training and employment developments 2018', ETF, 2019: https://www.etf.europa.eu/sites/default/files/2019-03/Tunisia%202018.pdf

Kriechel, B. and Vetter, T, European Training Foundation, 'Report of ETF: Skills mismatch measurements in the partner countries', ETF, Turin, 2019: https://www.etf.europa.eu/en/publications-and-resources/publications/skills-mismatch-measurement-etf-partner-countries

LaValle, I. H. and Bard, J. F., Review of Golden, B.L., Wasil, E.A. and Harker, P.T., *The analytic hierarchy process: applications and studies*, reviewed in *Interfaces*, Vol. 21, No. 2, 1991, 94–98.

Mezzanzanica, M. and Mercorio, F., European Training Foundation, 'Big data for labour market intelligence - an introductory guide', ETF, Turin, 2019: https://www.etf.europa.eu/en/publications-and-resources/publications/big-data-labour-market-intelligence-introductory-guide