Analysis of Required Skills in the Labor Market of the Republic of Armenia

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Հայաստանի Հանրապետության աշխատանքային շուկայում պահանջվող հմտությունների վերլուծություն

Պետրոսյան Ռաֆայել Մ.
տնտեսագիտության թեկնածու, վիճակագրության և տվյալագիտության ամբիոնի դասախոս
Հայաստանի պետական տնտեսագիտական համալսարան (Երևան, ՀՀ)

Ամփոփագիր. Սույն ուսումնասիրության նպատակն է վերլուծել Հայաստանի Հանրապետության աշխատաշուկայում գործատուների կողմից պահանջվող հմտությունները՝ հիմնվելով staff.am կայքից հավաքագրված 1313 առցանց հայտարարությունների վրա: Արհեստական բանականության գործիքների կիրառմամբ իրականացված վերլուծության միջոցով հմտությունները դասակարգվել են երեք հիմնական խմբի՝ ծրագրային, լեզվական և սերտիֆիկացիոն: Վերլուծության արդյունքները ցույց են տալիս, որ ընդամենը 4.5 % հայտարարություններում է հստակ նշված օտար լեզվի իմացության պահանջը, մինչդեռ ծրագրային հմտությունների և մասնագիտական սերտիֆիկատների պահանջարկը զգալիորեն բարձր է: Սա վկայում է տնտեսության թվայնացման ուժեղ միտումների մասին: Վերլուծությունն ընդգրկում է նաև պահանջվող վկայականների դասակարգման կառուցվածքը և ծրագրային գործիքների լայն բազմազանությունը, ինչը վկայում է տեխնոլոգիական արագ փոփոխությունների և շարունակական ուսուցման անհրաժեշտության մասին: Kaggle հարթակում հրապարակված բաց հասանելիությամբ տվյալների բազան ներկայացնում է առցանց աշխատանքային հայտարարությունների արժեքը՝ որպես աշխատաշուկայի օպերատիվ վերլուծության աղբյուր, որը կարող է որպես հիմք ծառայել կրթական ու աշխատուժի վերաբերյալ քաղաքականությունների մշակման համար՝ համաձայնեցնելով դրանք ՀՀ աշխատաշուկայում փոփոխվող պահանջների հետ:
Հանգուցաբառեր և բառակապակցություններ՝ ՀՀ աշխատաշուկա, պահանջվող հմտություններ, առցանց աշխատանքային հայտարարություններ, թվայնացում, արհեստական բանականություն, հմտությունների արտահանում, ծրագրային գործիքներ, մասնագիտական վկայականներ, լեզվական հմտություններ, աշխատուժի զարգացում

Анализ необходимых навыков на рынке труда Республики Армения

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Аннотация. В исследовании анализируются навыки, требуемые работодателями на рынке труда Армении, на основе 1313 онлайн-вакансий, собранных с портала staff.am. С помощью ИИ-поддерживаемого извлечения текста навыки были классифицированы по трём основным группам: программные, языковые и сертификационные. Результаты показывают, что лишь 4,5 % вакансий явно требуют знания иностранных языков, тогда как спрос на программные инструменты и профессиональные сертификаты значительно выше, что указывает на активную цифровизацию экономики. Анализ также выявил фрагментированную структуру профессиональных сертификатов и высокое разнообразие используемого программного обеспечения, отражая быстрые технологические изменения и необходимость непрерывного обучения. Открытый набор данных, опубликованный на платформе Kaggle, демонстрирует ценность онлайн-вакансий как источника актуальной информации о рынке труда и служит основой для согласования образовательной и кадровой политики с меняющимися требованиями к навыкам в Армении.

Ключевые слова и словосочетания: рынок труда Армении, требуемые навыки, онлайн-вакансии, цифровизация, искусственный интеллект, извлечение навыков, программные инструменты, профессиональные сертификаты, языковые навыки, развитие рабочей силы

Introduction

The labor market of the Republic of Armenia has been undergoing substantial transformation in recent years, shaped by processes of digitalization, globalization, and economic restructuring. These shifts have altered the composition of labor demand, with employers increasingly emphasizing proficiency in foreign languages, digital literacy, and specialized technological competencies. As Armenia's economy continues to integrate into global value chains and expand its information and communication technology (ICT) sector, the ability of the workforce to adapt to new skill requirements has become a critical determinant of competetiveness and productivity [**1**].

Understanding the dynamics of required skills is essential for effective labor market policy, vocational education planning, and human capital development. In Armenia, persistent mismatches between the skills supplied by job seekers and those demanded by employers have been noted across several studies [**2**]. However, empirical research that provides systematic, data-driven insights into employer requirements remains limited. Traditional analyses based on surveys and administrative data often fail to capture the rapid evolution of demand for specific software, technical, or linguistic competences-especially in fast-growing digital and service sectors [**3**].

The rise of online job platforms such as staff.am offers new opportunities for real-time labor market intelligence. Job advertisements contain rich textual information that reflects employers' expectations, required qualifications, and preferred skill sets [**4**]. Advances in natural language processing (NLP) and machine learning now allow researchers to extract and classify these requirements at scale, enabling continuous monitoring of emerging trends in skill demand [**5**].

Building on these methodological developments, the present study conducts a data-driven analysis of required skills in the Armenian labor market, using job postings collected from job portals as the primary data source. The research employs web scraping and LLM-based text extraction techniques to identify and categorize skills mentioned in job descriptions. The analysis focuses particularly on three groups of competencies that play an increasingly central role in Armenia's economy:

- Language skills
- Software and technology skills
- Certifications and professional qualifications

To ensure conceptual consistency, in the future the extracted skills can be normalized through mapping to the European Skills, Competences, Qualifications and Occupations (ESCO) framework, which facilitates international comparability and policy relevance (European Commission, 2022).

The main objectives of this study is to build an open-source dataset for skills required in Armenian labor market, identify the most frequently required skills across Armenian industries, to explore sectoral variations in the demand for language, software, and certification competencies, and to discuss the implications of these findings for workforce development and education policy. By integrating artificial intelligence–based text analytics with labor market data, this paper contributes both empirically and methodologically to the understanding of skill demand in a small open economy context. The object of the article is the analysis of skills in the labor market of the Republic of Armenia. The subject of the article is Armenian labor market.

Literature Review

Modern labor-economics frames skill demand with the task-based approach: technologies substitute for routine tasks and complement non-routine ones, reshaping employers' skill needs. The canonical synthesis by Acemoglu and Autor (2011) remains the standard reference for how technical change reassigns workers across tasks and raises the premium on certain competencies [**6**]. A complementary strand documents the rising payoff to social/interaction skills, showing strong employment and wage growth for jobs intensive in social tasks. This matters for interpreting postings that jointly request technical and interaction capabilities [**7**]. Methodologically, OJAs enable near–real-time observation of employer demand. Large-scale text mining of postings has been used to track shifts in skill content and task requirements; for example, vacancy-based evidence has linked cyclical shocks to faster adoption of routine-biased technologies and changing skill mixes [**4**]. Beyond single-country studies, European skills intelligence has matured through multi-country OJA systems (e.g., Cedefop's Skills-OVATE), paired with explicit cautions about sources and ontology quality-useful for benchmarking our methods and interpreting biases. Recent computational work continues to refine skill extraction and matching from postings and related

documents, underscoring the value-and limits-of OJAs for skills analytics [**8**].

Armenia's labor market has been studied extensively-covering unemployment dynamics, returns to education, and skill/education mismatch. However most of the articles in the sphere focus on high level overview of the labor market. Labor market developments has been analyzed by Galstyan A. taking into consideration that functioning of the labor market is one of the keys to sustainable development and economic growth. The author explains the situation in the labor market of the Republic of Armenia, by investigating main indicators and the reasons for the tense situation, as well as presenting recommendation on improving it. In particular, the author recommends tightening collaboration among universities and businesses, by creating specialized training programs, by improving technical and vocational education (TVE), by developing labor market institutions and by implementing appropriate policy [**9**]. AUA survey-based study by Baghdasaryan V. and Alaverdyan S. shows how English and computer skills raise employment odds and wages; also documents horizontal/vertical mismatch patterns [**10**]. Khachatryan K. and Grigoryan A. explore the multidimensional deprivation from labor market opportunities in Armenia by constructing a Quality of Employment measure. Using Labor Force Survey datasets for the years 2018 and 2020 the authors conduct a comparative analysis for a group of job-separated individuals. The identified dimensions of deprivation from labor market opportunities prior to and after the onset of COVID-19 are reasons for separating from a job, reasons for not looking for a job, and main obstacles in finding a job [**11**]. Melkumyan A. and Sahakyan M. examine digitalization and labor-market development in RA; discusses competences employers seek amid tech adoption based on market indicators, government policy in the IT sector [**12**].

From the Literature review we can conclude that, although Armenia's labor market has been studied extensively-covering unemployment dynamics, returns to education, and skill/education mismatch-the micro-level, skills-centric evidence base remains limited in several ways:

1. **Data source limitations:** Existing studies rely predominantly on surveys, administrative statistics, or policy diagnostics; online job advertisements (OJAs) are rarely used as a systematic, high-frequency source of employer demand.

2. **Lack of taxonomy alignment:** Skills mentioned in Armenian studies are seldom normalized to international ontologies (e.g., ESCO), limiting cross-country comparability and consistent aggregation across occupations and sectors.

3. **Narrow skill granularity**: Prior work typically aggregates skills into broad categories (e.g., "ICT skills"), with limited granular analysis.

4. **Methodological constraints:** Few studies apply modern NLP pipelines for skill extraction (entity recognition, de-duplication, clustering), nor do they report validation metrics (precision/recall, inter-annotator agreement) to assess extraction quality.

5. **Insufficient sectoral and regional disaggregation:** Demand is often examined at the national level, with limited sector-specific (ICT, finance, customer service, manufacturing) or regional breakdowns that would highlight heterogeneity within RA.

6. **Limited temporal tracking:** There is little longitudinal analysis of how skill demand evolves over time (e.g., pre-/post-policy changes, shocks), constraining evidence for proactive workforce planning.

7. **Weak linkage to credentials and outcomes:** The role of certifications in postings is underexplored, and there is limited linkage between credential requirements and observed outcomes (e.g., wage offers, seniority levels, career ladders).

8. **Reproducibility and open science:** Datasets, code, and taxonomies are rarely shared, making it difficult to replicate findings or build cumulative evidence.

This study addresses these gaps by constructing an OJA-based dataset, applying a transparent LLM-assisted extraction workflow, normalizing skills, and producing granular, sector-aware, and time-sensitive evidence on three policy-relevant categories.

Scientific Novelty

This study offers the first taxonomy-aligned, posting-level mapping of employer-required language skills, software/technology skills, and professional certifications in the Republic of Armenia by mining domestic online job advertisements. Methodologically, it introduces a transparent LLM-assisted NLP pipeline that extracts fine-grained skill entities from unstructured vacancy text, normalizes them, and reports validation metrics (precision/recall and inter-annotator agreement) to document extraction quality – features largely absent from the Armenian literature. Substantively, it delivers granular sectoral and temporal evidence on skill demand, uncovers co-occurring skill bundles and credential – skill complementarities, and constructs policy-ready indicators (e.g., intensity and concentration of language/tech/certification requirements), thereby filling documented gaps between traditional survey-

based analyses and real-time employer demand intelligence in Armenia. In addition, the study shares skills extraction dataset which can be the basis for future studies.

Methodology

We conduct a quantitative, posting-level analysis of employer-required skills using online job advertisements (OJAs) from Armenia's leading job portal (staff.am). The unit of analysis is a unique vacancy. Results are reported for the full sample and sectoral slices based on the portal's industry tags. The initial dataset is created by using data scraping techniques and libraries. OJAs were collected from staff.am over a continuous window (daily pulls). Each record includes posting ID/URL, title, industry category, posting date, and the full job description (requirements/responsibilities). Below is the scraping protocol:

- Tooling: Python (Scrapy/Requests), rotating user-agents, polite delays.
- Compliance: Respect for robots.txt, no login-gated content, and bounded request rates.
- Parsing: HTML is normalized (UTF-8), boilerplate removed, and visible text extracted.
- Versioning: Each crawl is timestamped; raw HTML snapshots are archived for auditability.

Initial dataset included 1313 job postings. After gathering the dataset we applied a constrained extraction prompt to a frontier LLM (GPT-class) with appropriate specifications to extract the skills required from the job descriptions. Extracted skills have been further annotated by us. The new dataset was created based on extracted skills, which includes job id, description, extracted skills. Extracted skills were further analyzed using LLM and annotated by us classifying skills into 4 categories: Software skills, Languages skills, Certifications required, other. Our focus in this article will be software, language skills and certifications required.

Analysis

To support transparency and reuse, the dataset constructed for this study has been openly released on Kaggle (repository title: Armenia: Job Postings in Armenian Labor Market; latest version at the time of publication).

Overall, from more than 1300 job postings only 58 (4.5 %) explicitly required knowledge of specific language. This is striking observation, that challenges the common assumption that language skills are routinely demanded in the labor market. The number of job postings requiring specific language knowledge is depicted in the chart below.

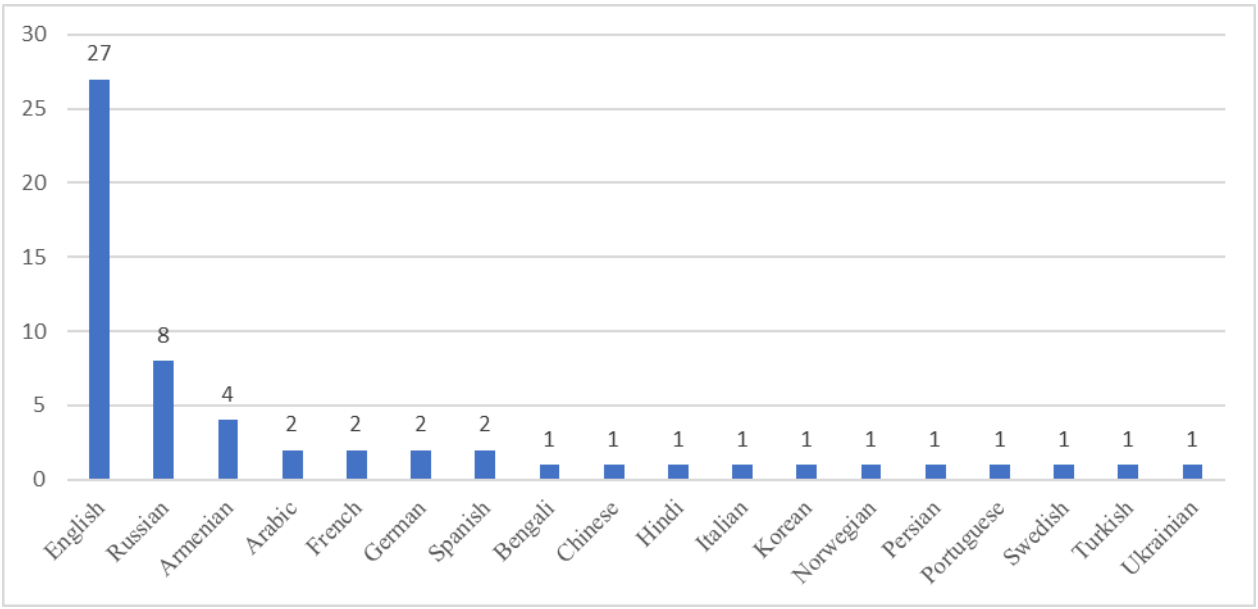

Figure 1. *Language skills required in Armenian Labor Market*

As we can see the English language remains the highest priority in Armenian Labor market.

Overall, from more than 1300 job descriptions 113 instances were discovered where the Employer required professional certification from the applicant. 81 different professional certifications were identified, which have been required in Armenian labor market. The certifications required are listed in Table 1.

Table 1. *Professional Certificates Required in Armenian Labor Market*

Professional Certifications required in Armenian labor Market			
ACAMS	Compliance	IMC (Investment	PEF Accountant-7

	certification	Management Certificate)	
ACCA	CompTIA Linux+	ISACA certification	PMI-ACP
ACI Dealing	CompTIA Network+	ISC2 certification	PMP
AML/CTF	CPA	ISO 27001	Pre-Qualification Program (Ardshinbank)
AS9100	CPR certification	ISO 45001 Implementer	PRM
ASWA	CTP (Certified Treasury Professional)	ISO 45001 Lead Auditor	Process development certification
Auditor qualification	Data Analytics certification	ISO certification	Professional Accountant Certificate
Banking conditions certification	Dell certification	ISTQB	PM certification
BI certification	Driving license	ITIL	Public Trust Security Clearance
Cabin crew certificate	Drone certification	Lawyers license	Red Hat Certified Engineer (RHCE)
CAMS	EC-Council certification	Lead Auditor	Red Hat Certified System Administrator (RHCSA)
CCNP	EFPA	Lead Implementer	Safety certification
CBPP	Electrical Safety Group Certificate	LPIC-1	Sanitary certification
CIA	Flight attendant certificate	LPIC-2	TOGAF
CMA	FRM	Makeup diploma	TOPIK Level 2
CSM	GCE Russian	Medical certificate	Union of Banks certificate
CFA	GCSE Russian	Microsoft Certified: Windows Server Hybrid Administrator Associate	UPS certification
Cisco CCNA	Google Professional Cloud Architect	MV/HV electrical certification	Vendor certifications
Cisco certification	HPE certification	NEBOSH International General Certificate	VMware certification
Clinical diagnostic laboratory qualification	ICA	OHS certification	Work permit (Armenia)

Overall, from more than 1300 job descriptions 621 software tools required by employers were identified and normalized. The full list of software tools is presented in the Kaggle dataset. Additionally in Figure 2 top 10 software tools required by employers are depicted.

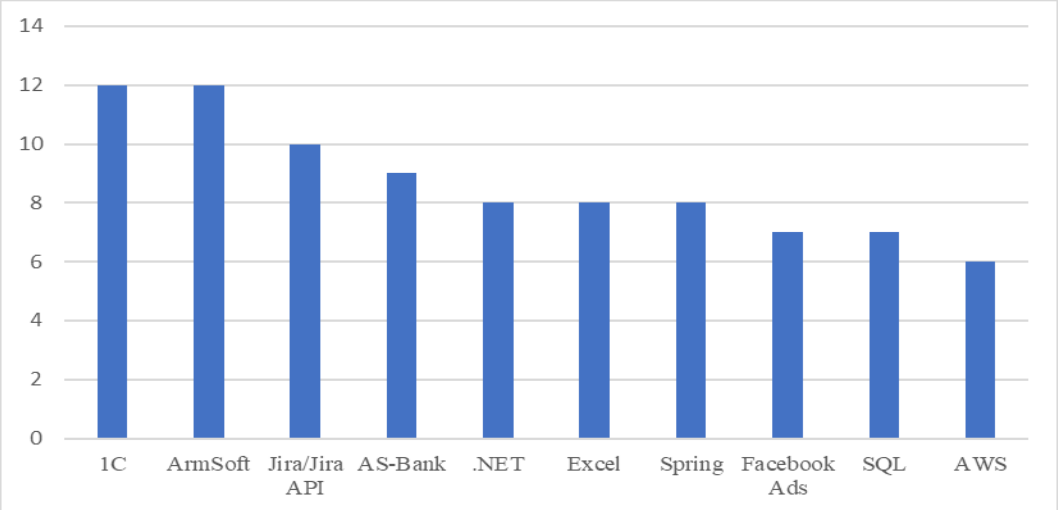

Figure 2. *Top 10 required software tools in Armenian labor market*

Conclusion

The analysis of more than 1,300 online job postings from the Armenian labour market reveals several key insights about the current structure of employer skill demand. Despite growing globalization and digital integration, explicit references to language proficiency remain relatively limited, appearing in only about 4.5 % of vacancies. This finding challenges the widespread perception that multilingualism is a universal requirement and suggests that, for many roles, language competence may be implicitly assumed or secondary to technical expertise. At the same time, the data highlight a significant emphasis on software-related skills, underscoring the continuing digitalization of the Armenian economy. The identification of over 600 distinct software tools points to a rapidly diversifying technological environment where adaptability and ongoing upskilling are essential. Similarly, the presence of 81 different professional certifications indicates an emerging recognition of formal credentials and international standards as markers of professional competence and employability.

From a methodological perspective, this research demonstrates the analytical value of online job advertisements as a high-frequency, data-rich source for labour market intelligence. The use of AI-assisted text extraction not only enables systematic categorization of skill requirements but also opens new opportunities for longitudinal monitoring and comparative analysis across sectors and regions. The resulting open-source dataset can serve as a foundation for future empirical studies, supporting evidence-based policy and curriculum design. Based on the findings, several policy and practical recommendations emerge:

- Integration of Real-Time Skills Data into Education Policy: Policymakers and educational institutions should incorporate insights from OJA analytics into the design of vocational and higher education programs, ensuring closer alignment between training content and labour market needs.
- Promotion of Continuous and Lifelong Learning: Given the fast-paced evolution of software and technology requirements, reskilling and upskilling initiatives-particularly in ICT, data analysis, and business software-should be prioritized within both public and private training systems.
- Strengthening Certification and Accreditation Systems: The growing importance of professsional credentials suggests the need to harmonize Armenian certification systems with international frameworks, facilitating labour mobility and employer recognition.
- Encouraging Language Competence in Strategic Sectors: While explicit demand for language skills appears limited, sectors with international exposure-such as finance, ICT, and customer support-would benefit from targeted language training programs to enhance competitiveness.
- Institutionalizing Open Data Practices: Continued publication and expansion of open, machine-readable labour market datasets (e.g., on Kaggle or similar platforms) should be encouraged to foster transparency, academic collaboration, and innovation in labour market analytics.

In conclusion, this study provides the first comprehensive, AI-assisted mapping of skill demand in Armenia's online labour market. By bridging methodological innovation with policy relevance, it contributes to building a more adaptive, skills-oriented, and evidence-driven labour market ecosystem in the Republic of Armenia.

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