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# Evaluation of Factors Influencing University Graduates' Unemployment in Developing Country: A Multi-Criteria Decision-Making Perspective

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**ABSTRACT**

Unemployment remains a significant challenge in Tanzania and many other sub-Saharan African (SSA) countries, particularly among university graduates in these developing countries. Through a combination of expert opinions and a thorough literature review, our study identifies six key factors contributing to graduate unemployment in Tanzania. Using the Stepwise Weight Assessment Ratio Analysis (SWARA) method within an interval-valued spherical fuzzy (IVSF) framework, we pinpoint the most critical factors. The study's findings reveal that job-skills mismatch, inadequate career guidance and counseling services, and an ineffective labor market information system are the primary drivers of high graduate unemployment rates in Tanzania. Based on these insights, the research offers actionable recommendations for governments seeking to reduce unemployment among university graduates effectively.

## 1. Introduction

Graduate unemployment remains a significant issue in sub-Saharan Africa (SSA), despite the growing graduate workforce, with countries like Tanzania facing a widening skills gap between graduates and job market demands. Higher education plays a vital role in driving Africa's transition to knowledge-based economies, contributing to socio-economic progress through teaching, research, and knowledge dissemination [1]. To tackle rising graduate unemployment, African universities must align their academic programs with both socio-economic needs and labor market demands.

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Tanzania has faced unemployment challenges since the 1970s, worsened by an economic downturn that reduced gross domestic product (GDP) growth to 2.6% by the 1980s [2]. The labor force grew by 4.1% annually, reaching 18.8 million in 2007, with most employed in rural small-scale farming or self-employment [3]. By 2012, employment rose to 98% of the active population (18.3 million), while formal sector jobs doubled between 2005 and 2014 [4]. In Tanzania, males comprise 60% and females 40% of formal sector employees. By 2014, 66.9% of workers were in the private sector, overtaking the public sector's 33.1% [3]. From 2005 to 2014, the labor market shifted significantly, with the private sector becoming the leading employer.

Employment involves lawful activities that provide a livelihood [5], with 91% of Tanzanians engaged in small-scale agriculture, contributing 50% of GDP [2]. Unemployment, defined by the International Labour Organization (ILO) as joblessness despite actively seeking work, varies by location. From 2006 to 2014, rural unemployment rose from 7% to 8.4%, while urban rates dropped from 22.6% to 13.4%. Dar es Salaam saw a decline from 31.5% to 21.5%, and the national rate fell from 11.7% to 10.3% [6]. Between 2005 and 2014, Tanzania's annual employment surveys reported the creation of 2,854,237 jobs, averaging 280,000 jobs per year. However, this was far below the estimated 8 million jobs needed, resulting in a deficit of 5.2 million jobs. This highlights the urgent need for targeted policies to address unemployment.

Unemployment remains a global concern, especially in SSA, where it hinders poverty reduction and development. Despite extensive research on unemployment rates [2,4], the underlying factors, particularly Tanzania, remain underexplored.

### *1.1 Objectives, contributions, and motivations*

Our study seeks to address this issue by analyzing the factors contributing to graduate unemployment in Tanzania. Through a comprehensive managerial framework, we aim to identify the most significant factors driving the high unemployment rate, utilizing multi-criteria decision-making (MCDM) techniques to support informed and effective decision-making [7,8].

This research makes two key contributions: (a) it prioritizes the major factors contributing to the high unemployment rate in Tanzania through an MCDM approach utilizing interval-valued spherical fuzzy sets (IVSFs), and (b) it offers actionable insights for mitigating these challenges.

Fuzzy sets (FSs) have become a vital tool in research, with spherical fuzzy sets (SFSs) and interval-valued fuzzy sets (IVFSs) offering advanced methods for addressing ambiguity [9,10]. IVSFSs build on these advancements, providing superior capabilities for managing uncertainty and enhancing decision-making compared to traditional FSs [11]. They are particularly effective in complex uncertainty modeling and integrating diverse evaluation techniques. Keršuliene *et al.,* [12] introduced the SWARA method for determining criterion weights. Because of the SWARA method's straightforward application and reliability, our study adopted it within the IVSF context. This paper is organized into six main sections.

## 2. Literature

Many studies have explored graduate unemployment globally. For instance, Broecke [13] studied Tunisia's stage d'initiation à la vie professionnelle (SVIP), an employment subsidy for graduates, and found that participants were less likely to be unemployed and more likely to work in the private sector. However, this may be due to selective participation in the program. Graham *et al.,* [14] highlighted barriers to graduate employment, including absence of relevant experience, inadequate job search knowledge, restricted social connections, and high job-seeking costs. They emphasized the need for better integration of qualifications with practical experience and accessible support for job seekers. Nason [15] explored the causes of youth unemployment, their awareness of skill-based

courses, and programs that could boost employment rates. Demissie *et al.,* [16] identified factors linked to graduate unemployment in Ethiopia, including institutional features, demographics, economic conditions, and curriculum. Their findings suggest that higher education institutions and policymakers should reassess strategies to improve graduate employability. Njifen and Meungwe [17] analyzed human capital investment's impact on youth unemployment in 44 SSA countries from 1991-2020 using cross-sectional augmented autoregressive distributed Lag (CS-ARDL) modeling. Their findings revealed that higher primary and tertiary school enrolments reduce youth unemployment, while secondary school enrolment has a positive association with it, regardless of gender. Olubusoye *et al.,* [18] provided a comprehensive analysis of the nature and causes of youth unemployment in Nigeria, offering valuable insights for developing holistic solutions. Ilori and Ayedun [19] examined how entrepreneurship education and skills can reduce unemployment in Nigeria. Their study of self-employed graduates found a strong positive link between entrepreneurship education and the skills needed for self-employment. Algül [20] analyzed the link between higher education levels (undergraduate, master's, and PhD) and unemployment in Turkey using data from 26 provinces (2008-2021). Applying the Dumitrescu and Hurlin panel causality test, the study found a potential causal relationship from higher education attainment to unemployment rate. Oliveira-Silva *et al.*, [21] surveyed over 100 unemployed foreign graduates, including 47 with Portuguese nationality, about their education, employment history, and strategies to address unemployment. The study revealed that the majority opted to pursue further studies, continue their job search, or migrate once again. Baldry [22] studied how demographic and educational factors affect South African graduates' employment status. Using a survey of graduates from 2006-2012, his analysis found that race, socio-economic status, and graduation year were the strongest predictors of unemployment.

MCDM techniques have proven to be successful in various areas [23,24]. Xie *et al.,* [25] introduced an innovative interval multi-objective optimization based on ratio analysis plus full multiplicative form (MULTIMOORA) method with combined weighting to assess college graduates' employment quality. Mao *et al.,* [26] introduced a new method for evaluating college graduates' employment quality using probabilistic linguistic multi-attribute group decision-making. Kittiyankajon [27] introduced a hybrid MCDM method to assess employer satisfaction with graduates from higher education institutions (HEIs), prioritizing various aspects of graduate quality. Setiawan *et al.*, [28] designed a model to reduce competency mismatches by comparing job qualifications with the skills of Industrial Engineering graduates from the University of Surabaya. Nguyen *et al.,* [29] proposed three models to improve unemployment rate forecasting in Vietnam despite limited data. Their findings support policymakers in shaping labor and economic policies and offer insights into future unemployment research. Ch'ng and Phang [30] explored and examined the factors influencing job preferences among undergraduate students specializing in quantitative science disciplines. Huang *et al.*, [31] proposed a highly effective strategy for developing a series of interdisciplinary curricula aimed at significantly improving the employment rate of higher education graduates while simultaneously enhancing student enrollment rates. Mesaeli and Alroaia [32] investigated the connection between the growth of small and medium-sized enterprises and the employment opportunities for university graduates in Iran.

## 3. Methodology

Since its inception, the IVSF -SWARA has been applied in various fields such as marble manufacturing facility research [33], farmers' perception to agriculture 4.0 technology [34], metaverse collaborative system design application [35], carbon credit market strategies [36], carbon markets for renewable energy [37], and public transportation planning [38].The methodology

involves two steps: collecting data from experts and previous studies, followed by evaluating six factors driving the high unemployment rate in Tanzania using the SWARA method within an IVSF framework. Figure 1 shows the study's flowchart.

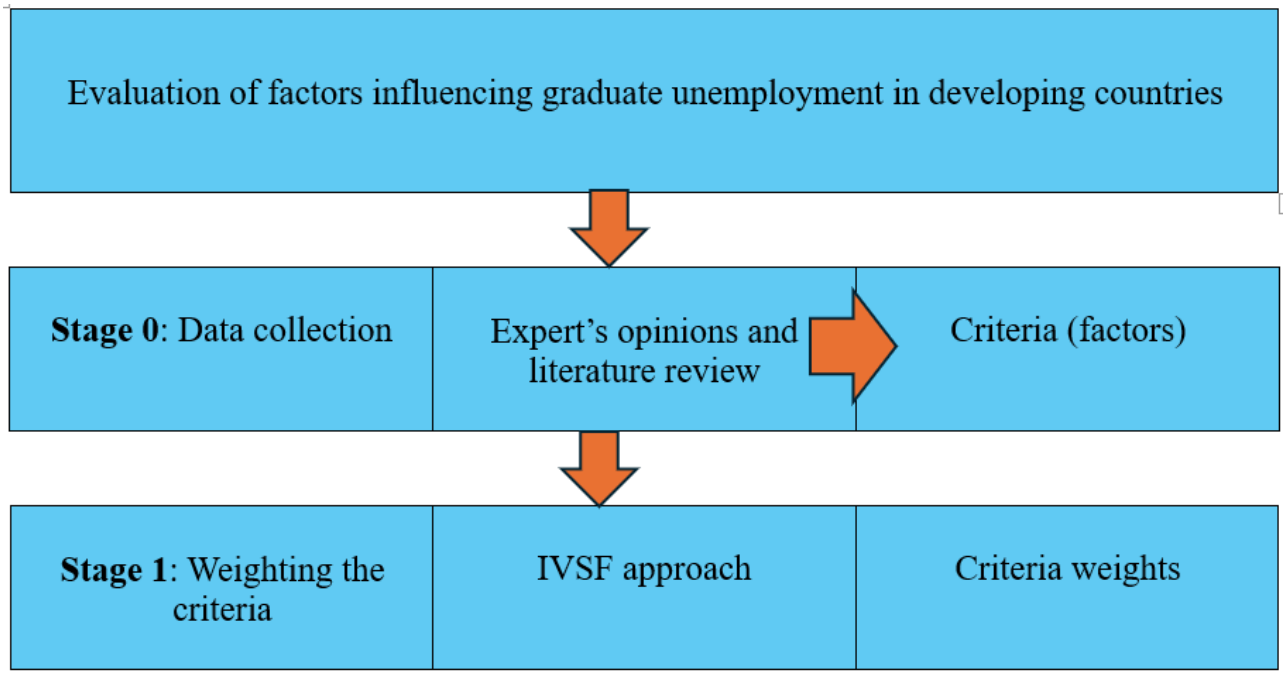


**Fig.1.** Flowchart of our study approach

Nine steps have characterized the IVSF-SWARA approach.

Step 1. Problem evaluation via various factors.

Step 2. Using the IVSF linguistic scale (refer to Table A1 in the appendix), experts prioritize criteria in descending order, enabling adaptable solutions to uncertain challenges.

Eq. (1) indicates the weight matrix establishment.

$$\widetilde{W} = \begin{bmatrix} \tilde{\mu}_{11} & \tilde{\mu}_{12} & \cdots & \tilde{\mu}_{1t} \\ \tilde{\mu}_{21} & \ddots & \ddots & \vdots \\ \vdots & \ddots & \ddots & \vdots \\ \tilde{\mu}_{n1} & \cdots & \cdots & \tilde{\mu}_{nt} \end{bmatrix} \quad (1)$$

where $n$ –criteria numbers, $t$-experts (p=1, 2……, t).

Step 3. Once experts assign significance scores, the scores are averaged using the arithmetic mean, and the experts' weights are then determined using interval valued spherical weighted arithmetic mean (IVSWAM).

Step 4. The score function from Eq. (2) is used to calculate positive score values in the aggregated matrix $\tilde{A}$ for IVSF weights.

$$s_j = \text{Score}\left(\tilde{\beta}_j\right) + 1 \quad (2)$$

Step 5. Criteria are organized according to their practical scores.

Step 6. The importance of each criterion $\left(c_j\right)$ is determined by analyzing the scores $s_j$.

Step 7. Computation of $k_j$.

$$k_j = \begin{cases} 1 & j = 1 \\ c_j + 1 & j > 1 \end{cases} \quad (3)$$

Step 8. Determination of unscaled weights $q_j$.

$$q_j = \begin{cases} 1 & j = 1 \\ \frac{\mathrm{x}_{j-1}}{\mathrm{k}_j} & j > 1 \end{cases} \quad (4)$$

Step 9. Determination of corresponding weights through the normalization of criteria weights.

$$\mathrm{w}_j = \frac{q_j}{\sum_{j=1}^{n} q_k} \quad (5)$$

## 4. Application

The study utilized the IVSF-SWARA method to evaluate and rank six key factors identified through literature and expert input. A panel of four experts with different backgrounds (Table A2) provided data, which was used to assess the factors detailed in Table A3.

### *4.1 Prioritizing the factors*

*Step 1*. Assessment of six factors driving the high unemployment rate in Tanzania.

*Step 2*. Determination of criteria weights by four experts based on evaluation of factors from Table 1.

**Table 1**
Factors evaluation

| Criteria | E-1 | E-2 | E-3 | E-4 |
|---|---|---|---|---|
| C1 | HI | HI | SMI | EI |
| C2 | AMI | VHI | AMI | VHI |
| C3 | VHI | HI | HI | AMI |
| C4 | EI | EI | SLI | SLI |
| C5 | HI | HI | HI | SMI |
| C6 | HI | SMI | SMI | SLI |

Note: E: Expert.

*Step 3*. Mathematical formulas were first applied to translate linguistic variables from Table A1, and the experts' inputs were then aggregated in Table 2 with equal weights.

**Table 2**
Aggregated evaluations of criteria

| Criteria | a | b | c | d | e | f |
|---|---|---|---|---|---|---|
| C1 | 0.5947 | 0.6878 | 0.2590 | 0.3187 | 0.0564 | 0.0888 |
| C2 | 0.8072 | 0.9141 | 0.1225 | 0.1732 | 0.0106 | 0.0310 |
| C3 | 0.7426 | 0.8554 | 0.1565 | 0.2081 | 0.0225 | 0.0445 |
| C4 | 0.4018 | 0.4509 | 0.4975 | 0.5979 | 0.0786 | 0.1328 |
| C5 | 0.6282 | 0.7287 | 0.2115 | 0.2617 | 0.0450 | 0.0685 |
| C6 | 0.5325 | 0.6296 | 0.2880 | 0.3478 | 0.0565 | 0.0837 |

*Step 4*. Provision of the computation of results for criteria in Table 3.

**Table 3**
Positive scores of criteria

| | C1 | C2 | C3 | C4 | C5 | C6 |
|---|---|---|---|---|---|---|
| $s_j$ | 1.3277 | 1.7209 | 1.6074 | 0.8769 | 1.4054 | 1.2368 |

*Step 5*. The rank of criteria is $C2 > C3 > C5 > C1 > C6 > C4$.

*Step 6*. Calculation of comparative importance of criteria in Table 4.

**Table 4**
Comparative significances of criteria

| | C2 | C3 | C5 | C1 | C6 | C4 |
|---|---|---|---|---|---|---|
| $c_j$ | - | 0.041 | 0.073 | 0.040 | 0.220 | 0.034 |

*Step 7*. Provision of coefficients calculation in Table 5.

**Table 5**
Coefficients for criteria

| | C2 | C3 | C5 | C1 | C6 | C4 |
|---|---|---|---|---|---|---|
| $k_j$ | 1 | 1.041 | 1.073 | 1.040 | 1.220 | 1.034 |

*Step 8*. Presentation of disorganized criteria weights in Table 6.

**Table 6**
Disorganized criteria weights

| | C2 | C3 | C5 | C1 | C6 | C4 |
|---|---|---|---|---|---|---|
| $q_j$ | 1 | 0.961 | 0.895 | 0.860 | 0.705 | 0.682 |

*Step 9*. Figure 2 indicated the final weights of criteria.

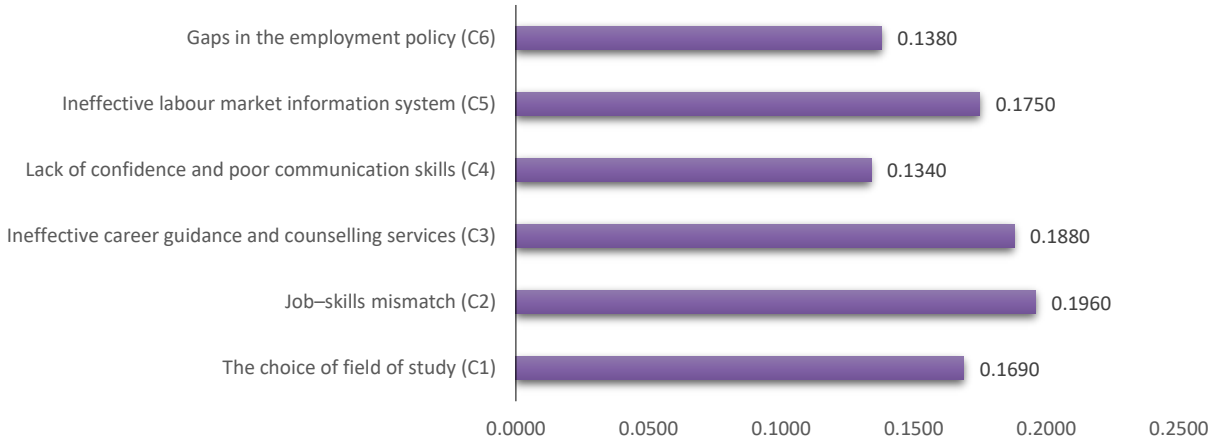


**Fig. 2.** Final criteria weights

## 5. Findings and Discussions

Our study, applying the IVSF-SWARA method, highlights that job-skills mismatch (C2) is the leading factor behind Tanzania's high unemployment rates. This observation is consistent with Salahuddin *et al.,* [39] study, who found that graduates often face difficulties securing jobs that align with their qualifications, while employers struggle to find candidates suited to their business needs. They identified employability skills gaps and job mismatches as significant contributors to graduate unemployment. Similarly, Bandara [40] underscored a severe disconnect between job expectations and skills across various occupations. His research showed that relying solely on education as a hiring criterion results in only 10% of jobs being appropriately matched, with 55% of workers being underqualified and 34% overqualified for their roles. To address this, they recommended that graduates focus on developing essential industry-specific skills, such as leadership, communication, and interpersonal abilities, to improve their job prospects.

Ineffective career guidance and counseling services (C3) rank as the second most significant contributor to unemployment in Tanzania. Mvungi [41] and Mbilinyi [42] found that many students face challenges in selecting appropriate career paths due to a lack of structured guidance, despite its importance in shaping future employment prospects. This gap restricts their understanding of

personal strengths and the broader job market. Creed *et al.,* [43] emphasized that insufficient career guidance hinders individuals from aligning their skills with market demands, preventing them from achieving better career outcomes. Similarly, Biswalo [44] observed that inadequate counseling services in Tanzania prevent youth from making informed career decisions, ultimately contributing to higher unemployment levels. To address these challenges, strategies such as incorporating career guidance into school programs, providing advanced training for counselors, creating mentorship opportunities through industry collaborations, utilizing digital tools for job placement, and increasing awareness of informed career planning are essential for improving career guidance systems and reducing unemployment in Tanzania.

The third major challenge is the lack of an effective labor market information system (C5). Nangale [2] highlighted that graduates often lack access to reliable sources of occupational information, leaving them unaware of available job opportunities. Amani [4] stressed that a well-functioning labor market information system is essential to support effective planning and decision-making. Unfortunately, the current system is severely inadequate, limiting graduates' understanding of labor market trends and employer needs [2]. To address this issue, the government, particularly the Ministry of Work, along with educators at all levels, should focus on strengthening the labor market information system. This includes ensuring the dissemination of accurate, up-to-date information about job prospects, industry demands, and potential employers to better equip graduates for the workforce.

## 6. Managerial Implications

This study provides practical recommendations for the Tanzanian government to tackle key factors contributing to the high unemployment rate among graduates. It identifies three major issues: job-skills mismatch, ineffective career guidance and counseling services, and the ineffective labor market information system. To address these challenges, graduates should prioritize developing essential industry-specific skills such as leadership, communication, and interpersonal abilities to enhance their employability. The Tanzanian government should implement strategies like integrating career guidance into school curricula, enhancing counselor training, fostering mentorship opportunities through industry partnerships, utilizing digital platforms for job placement, and raising awareness about career planning to strengthen career guidance services and reduce unemployment. Moreover, the government, particularly the Ministry of Work, along with educators, should work to improve the labor market information system by ensuring the availability of accurate, up-to-date information about job opportunities, industry needs, and potential employers, helping graduates make better-informed decisions as they enter the workforce.

## 7. Conclusions and Future Recommendations

This study employs the IVSF-SWARA technique to identify the key factors contributing to the high unemployment rate in Tanzania, providing valuable insights for the Tanzanian government. By incorporating expert perspectives, the research assesses these factors and lays the foundation for well-informed policy decisions. Using Tanzania as a case study, the study demonstrates the practical application of this method in pinpointing critical issues. It highlights three major factors: job-skills mismatch, ineffective career guidance and counseling services, and ineffective labor market information system. While the study offers valuable contributions, it has certain limitations. Conducted at a national level, it does not capture the diverse contexts of other African countries or regions. Future studies should include comparative analyses with other nations or regions to gain a deeper understanding. Additionally, the research relied on feedback from a limited group of experts.

Expanding the expert pool in future work and developing a consensus-based approach, including a consensus coefficient, would strengthen the reliability of the results.

## Appendix

**Table A1**
Linguistic terms

| Linguistic terms | IVSF number | Score index |
|---|---|---|
| Absolutely more important (AMI) | ([0.85, 0.95], [0.10, 0.15], [0.05, 0.15]) | 9,00 |
| Very high important (VHI) | ([0.75, 0.85], [0.15, 0.20], [0.15, 0.20]) | 7,00 |
| High important (HI) | ([0.65, 0.75], [0.20, 0.25], [0.20, 0.25]) | 5,00 |
| Slightly more important (SMI) | ([0.55, 0.65], [0.25, 0.30], [0.25, 0.30]) | 3,00 |
| Equally important (EI) | ([0.50, 0.55], [0.45, 0.55], [0.30, 0.40]) | 1,00 |
| Slightly low important (SLI) | ([0.25, 0.30], [0.55, 0.65], [0.25, 0.30]) | 0,33 |
| Low important (LI) | ([0.20, 0.25], [0.65, 0.75], [0.20, 0.25]) | 0,20 |
| Very low important (VLI) | ([0.15, 0.20], [0.75, 0.85], [0.15, 0.20]) | 0,14 |
| Absolutely low important (ALI) | ([0.10, 0.15], [0.85, 0.95], [0.05, 0.15]) | 0,11 |

**Table A2**
Expert characteristics

| Experts (Es) | Gender | Occupation | Degree | Experience |
|---|---|---|---|---|
| $E_1$ | Female | Academia | Ph.D. | 8 |
| $E_2$ | Male | Academia | M.Sc. | 15 |
| $E_3$ | Female | Academia | B.Sc. | 17 |
| $E_4$ | Male | Academia | M.Sc. | 10 |

**Table A3**
Factors affecting the implementation of the carbon credit concept

| Criteria | References |
|---|---|
| The choice of field of study (C1) | |
| Job-skills mismatch (C2) | |
| Ineffective career guidance and counselling services (C3) | [4, 15, 16, 22] |
| Lack of confidence and poor communication skills (C4) | |
| Ineffective labour market information system (C5) | |
| Gaps in employment policy (C6) | |

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## Conflicts of Interest
The authors declare no conflicts of interest.

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