Qualms of petroleum professionals in Uganda

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ABSTRACT

Although the profession of petroleum engineering appeared lucrative at the turn of the 21st century in Uganda, today, employment prospects of these professionals are not good, as the majority of graduates are stranded after graduating with flying colors, others engaged in low paying part-time jobs, others have gone back to school for different courses, yet others are still pacing on the streets. Given the demand for a skilled workforce in the oil and gas industry, the introduction of related courses in higher education institutions (HEIs) was indispensable, with almost every excelling science student aspiring to enroll in the petroleum engineering course. It is revealed that the profession of petroleum was complex and demanded superior experience and practical skills to perform the required tasks. Therefore, as a young and highly technical profession, petroleum engineering had limited openings, hence limited jobs to absorb all qualified professionals. The study concluded that Uganda had the requisite capacity to develop human power with requisite competencies and work skills, although it had limited job openings as a new field. Secondly, most oil and gas companies in Uganda prefer to employ professionals that have worked in similar jobs before instead of fresh graduates. The study recommends that: (1) HEIs should conduct situational analyses for new programs to match the supply with the demand, (2) students’ internships should be extended to twelve months for deeper grounding and skills’ enrichment to enable these professionals to leverage a competitive edge in the world of work; and (3) universities should strengthen linkages and partnerships with existing companies where petroleum scholars can be placed to gain superior work experience.

Key words: Employment prospects, practical competencies, petroleum professionals, skills development.

INTRODUCTION

The past two decades have witnessed high employment prospects for petroleum professionals, as many oil and gas companies are emerging with new technologies in deepwater oils rigs and more petroleum companies have opened shops in Uganda (Langer et al., 2020). Like every business, the increased demand for a skilled workforce in the oil and gas industry led to the introduction of related courses in higher education institutions, including petroleum engineering, petroleum geology and other geosciences (Kamukama, 2018; Guma et al., 2019). Other than Kigumba Petroleum Institute (KPI) and the Institute of Petroleum Studies, Kampala (IPS), which lead the drive in training of the oil and gas courses, Makerere University has already run a geoscience course under the Department of Geology that handles some content in ‘mineral exploration’ (Barifaijo and Kabanda, 2001). Other institutions such as the International University of East Africa, Bishop Bahamas and Victoria Universities embraced the drive-in training petroleum professionals (Kamukama, 2018). These efforts were prompted due to the discoveries of oil and gas in different parts of Uganda, the promotion of science-based programs and BTVET initiatives, and human
capital development. Similarly, various and new classes and types of oil and gas companies and services are emerging in Uganda that include ‘oil exploration’, ‘oil marketing’, ‘oil distribution’; UNOC (an integrated oil and gas company that operates across the petroleum value chain with projects in the upstream, midstream, and downstream), CNOOC (one of the largest oil and gas international companies in Uganda’s energy sector and owns one-third interests in each of the Exploration Areas (EA), Tullow E and P (Uganda’s National Oil Company), Oranto Petroleum, Armour Energy and GIZ (Armour Energy, 2018) add excitement as employment presumptions soar. Other potential petroleum service companies include Total M and S Uganda, Vivo Energy Uganda, Stabex International Limited, Ola Energy Uganda, Hass Petroleum Uganda Limited, Maestro Oil and Gas Solutions (MOGAS), Harel Petroleum Company Limited, Rubis Energy Uganda Limited, etc. (Kamukama, 2018). All these great employment prospects offer hope to the country and HEIs and parents and students, leading to more and more establishment of petroleum training programs in Uganda. The above-indicated companies notwithstanding, the ‘Industrial Base Line Survey’ further reveal thousands of potential direct jobs of Lake Albert basin development projects which are expected to generate about 13,000 jobs in the construction phase and 3,000 jobs in the operation phase (Mwakali and Byaruhanga, 2018).

The baseline survey indicates an estimated demand of about 15% engineers and managers, 60% technicians and craftsmen and 25% jobs for unskilled persons (Mwakali and Byaruhanga, 2018). Hence, beyond direct jobs created on-site, oil and gas activities were estimated to generate 100,000 to 150,000 indirect and induced jobs by 2020 where out of the newly created jobs, 80% would be short-term for the peak of construction and would have to be transferred to other sectors of the industry or to the neighboring countries to remain sustainable. These opportunities prompted HEIs to develop more programs for the oil and gas industry to provide the workforce for all these openings (Bukenya and Nakayiza, 2020). This situation also leads to the decision to revamp Uganda Petroleum Institute Kigumba (UPIK) as a benchmark for other technical colleges two fold; (i) the promotion of BTVET systems and (ii) to train a sufficient workforce for the oil and gas industry in Uganda (Mwakali and Byaruhanga, 2020; Kimenyi and Lewis, 2016; Kwisiga, 2014; Magona and Angom, 2017). Petroleum engineering students may access entry through various avenues at different levels of education for undergraduate programs (e.g. direct, certificate and diploma). At the graduate level, engineering, mathematics, or applied sciences scholars may also enter the field (Golombok and Jones, 2015). However, as Uganda is in oil production, more petroleum or oil and gas training programs exist since a degree in any of these programs is presumed a definitive way to secure a job in the most sought-after industry (Barifaio and Kabanda, 2001). However, while most oil and gas industries have continuously sought more experienced persons, most petroleum professionals aspire to work first. Hence, it may not be easy to get absorbed in the industry as a first-time employee.

Statement of problem

Approximately two decades ago, public and private universities opened doors to undergraduate and graduate petroleum engineering courses and hiked the cut-off points for petroleum courses. Admission into petroleum programs became extremely competitive (Mbazi and Muhangi, 2020; Wakali and Byaruhanga, 2020). Whereas the majority of institutions focused on training future managers and engineers in civil construction, electrical and mechanical fields, which comprised only 15%, and the majority of the available jobs (85%) did not require a degree, making petroleum graduates aground (Magona and Angom, 2017; NCHE, 2014; USAID, 2013). For any new program to be developed, situational analyses and/or feasibility studies are mandatory, while program development is done in consultation with key stakeholders (Barifaio, 2016). Further, during implementation and after that, strategies including presence of human capacity are guaranteed, including guest speakers, students’ internships, module/program evaluation and tracer studies are a must (Kimenyi and Lewis, 2016; Yirdaw, 2016). Unfortunately, current analysis has revealed how Uganda requires more skilled plumbers and welders than degree holders, causing qualms among petroleum professionals in terms of employment prospects, which Sekika (2014) called manipulation to unsuspecting Ugandans with degrees that are barely relevant to the sector, given that petroleum graduates seem over-qualified for the existing jobs yet, there are insufficient jobs at the strategic level for all the qualifying graduates. This predicament has led to the lack of return of investment (ROI), as the majority of these professionals have remained under-employed, unemployed and/or engaged in unrelated jobs. Three objectives were formulated to interrogate this mystery:

1. To examine the typical functions of petroleum professionals.
2. To determine the readiness of training institutions of petroleum courses.
3. To explore employment challenges of petroleum professionals despite abundant opportunities.

Literature review

With the discovery of oil and gas and upstream and
midstream projects under the front-end at the beginning of 2000 in Uganda, many relevant petroleum programs were developed to meet the demand and came with unmatched excitement (Maweje, 2019). The international oil and gas companies progressively occupied the central positions in terms of winning oil exploration, management contracts and production licenses for six exploration blocks in Albertine Graben (located in the western arm of the Great East African Rift), which they operated under the terms of a joint venture following a Joint Operating Agreement (Bukenya and Nakayiza, 2020; Kimenyi and Lewis, 2016). These companies were granted production licenses to develop Uganda’s oil reserves for export, with various classes of oil companies, including the oil exploration companies, the oil marketing companies, the oil distribution companies, and many more companies in the space than the ones mentioned (Bukenya and Nakayiza, 2020; Kwaresiga, 2014). This section presents historical, theoretical, conceptual exploration, and related petroleum engineering literature.

The history of the petroleum industry

True offshore drilling began in the 1950s, and the first deepwater oil rigs opened their taps in the Gulf of Mexico (Ma et al., 2018). Although the field was perceived to deal only in drilling, petroleum engineering does much more than just drill optimization; designing, developing, and operating whole oil fields. Before the 1950s, geologists worked to keep water zones excluded from oil-producing zones in California around the 1890s (Ma et al., 2018; Owen, 1975; Mbabazi and Muhangi, 2020). By 1898, petroleum courses and related fields were introduced in the college of education at Stanford University. In 1914, the American Institute of Mining and Metallurgical Engineers (AIME) established a Technical Committee on Petroleum, and the University of Pittsburgh graduated the first generation of “Petroleum Engineers” in 1915 (Ma et al., 2018). Until the 1920s, the field only focused on drilling problems and improving mechanical operations (Golombok and Jones, 2015; Hyne, 2001). With the fear that the rapid expansion in consumption could not keep up with the production, petroleum professionals improved the design of the wells to include various methods of production including the oil pump, which is a famous section in any oil production region (Armour Energy, 2018; MEMD, 2017). At the turn of 2000, Uganda Petroleum Institute, Kigumba (UPIK) was revamped to support other BTVET institutes to deliver basic-level training in the oil and gas disciplines (Kashambuzi, 2010). The Norwegian Petroleum Academy (NPA) launched training programs in Makerere University to beef up services to support the oil and gas industry that targeted the production phase (Mbabazi and Muhangi, 2020; MEMD, 2017).

In 2015, Makerere University, in association with New College at Nottingham University, United Kingdom, established the Cormac Vocational Training Institute to produce as many as 2,000 artisans and craftsmen annually (MEMD, 2017). Similarly, Mbarara University of Science and Technology (MUST), under its Faculty of Applied Sciences and Technology, established the Department of Energy, Mineral and Petroleum Studies to offer Bachelor of Chemical Engineering, Bachelor of Petroleum Engineering, Bachelor of Energy in Petroleum Studies and Bachelor of Mineral and Mining Engineering courses (MEMD, 2017). Further, Ndeje University offered basic engineering skills. In contrast, Makerere University Business School (MUBS) under the BTVET Department, offered certificate, diploma and degree programs in oil and gas studies. However, Uganda deemed practical skills vital and more preferred than degrees that did not impart work skills (Muhumuza, 2017). Nonetheless, Ugandan universities continued to run degree courses alongside certificates and diplomas offered by BTVET. The following section examines two theories to answer three questions; the stakeholders and the social cognitive theories.

The stakeholder theory

The stakeholder theory developed by Freeman (1984), emerged as a response to the growing dynamism and complexity of the environment in which organizations operate. Specifically, the theory was adopted to explain how the education sector has multiple stakeholders who should closely follow an institution's operations, ventures, projects, or innovations (Crane, 2020). The theory explains how all the concerned stakeholders should be considered in the strategic planning and management to create value for customers, suppliers, owners, employees and local communities (Freeman et al., 2020). Similarly, the theory is very relevant to the operations of HEIs, as it plays a critical role in their educational purpose as well as its obligation for scientific investigation and the transfer of knowledge to develop the broader community via its stakeholder relationships (Freeman et al., 2010; Cho, 2017; Crane, 2020; Chakhbar and Saad, 2014). Particularly, higher education (HE) has multiple internal and external stakeholders that influence their objectives, including the type and philosophy of the institution, as well as the programs offered, quality of instructors and teaching, partnership and linkages, along with research projects (Bilodeau et al., 2014; Chakhbar and Saad, 2014). Due to their complex sets of stakeholders and unique nature, institutions should promote collaboration and active engagement for their success and value creation that needs to be maintained (Garcia-Castro and Aguilera, 2015). The theory also promotes decision-making processes, transparency in exchanging information, mutual trust and inclusion in
strategic planning processes (Freeman et al. 2020). Given their multiple stakeholders, leaders should simultaneously satisfy all the stakeholders as the strategic means of approaching institutional actions geared toward social issues (Freeman et al., 2020).

Two classifications of stakeholders exist; internal and external stakeholders (Freeman et al., 2010). While the internal stakeholders act within the institution, the external stakeholders interact directly with the organization. Therefore, value creation is embedded in the relationship between the organization and its stakeholders (Harrison and Wicks, 2013). Considering that the theory deals with broad and complex aspects that include processes and procedures to promote justice in the creation, procedure and distribution of resources, it is critical to enable the players to understand what is valuable for each stakeholder group (Freeman et al., 2020). Whereas new perspectives on education have pushed for an increased opening of HEIs activities to society and all those around them, identifying different stakeholders and meeting their needs should become an essential requirement for institutional performance in the education context (Ferrero et al., 2018). Specifically, critical stakeholders in HEIs include the government, the regulatory bodies/technical-administrative body, faculty, labor market, alumni, community, the industry, ministry of education (MoES), parents/guardians and students (Hayter and Cahoy, 2018).

Hence, the theory becomes handy in explaining the participation of all stakeholders in the operations of higher education institutions to mitigate potential challenges in order to prevent wastage. Whereas the stakeholders’ theory explains the critical importance of synergies formed to address every stakeholder’s interest, it did not explore how the imparted theory in schools translates into practices. Therefore, the social cognitive theory was adopted.

The social cognitive theory

The social cognitive theory by Bandura (1989) on the other hand, proposes that skills’ acquisition and employment opportunities are very much associated, considering that the theory upholds that students should translate what is learned at school to the world of work. This theory was adopted to explain that unemployment could result from inadequate competencies to perform tasks in the oil and gas industry due to lack of exposure and adequate internship time. Similarly, the theory holds that portions of an individual’s knowledge acquisition are directly related to observing how others do things. Bandura argues that when people observe a model performing a behavior or practicing it successfully, they remember the sequence of events and use this information to guide their subsequent behaviors (Horsburgh and Ippolito, 2018; Bosse and Coughlan, 2016). Therefore, people learn new behaviors by trying them and succeeding or failing. It explains how the survival of humanity is dependent upon the replication of actions, which is correlated with a person’s perceived self-efficacy and behavioural change, which presumably stems from four sources: (a) performance accomplishments, (b) vicarious experience, (c) verbal persuasion and demonstration (d) physiological states. Each behavior witnessed can change a person’s way of understanding phenomena (Bandura, 2012a). Similarly, Horsburgh and Ippolito (2018) and Şahan and Tarhan (2015) explained how the theory revolves around knowledge acquisition or learning directly by observing models. Linking the argument to petroleum engineering students, while the field demands real-life practical skills, the limited interaction with practitioners may hinder the learners from developing work skills. Importantly, self-efficacy is the optimistic self-belief in one’s competence or chances of accomplishing a task and producing a favorable outcome which is certainly worth having (Bandura, 2012b).

Henry Ford indicated that whether you believe you can or you cannot, you are right. Gandhi perfectly understood the pivotal role that self-belief plays in our lives, thus, “Your beliefs become your thoughts - Your thoughts become your words -Your words become your actions - Your actions become your habits - Your habits become your values - therefore, your values become your destiny” (Horsburgh and Ippolito, 2018). It is important therefore, to believe in oneself (self-efficacy) in order to perform the task at hand competently. The combined two theories attempt to explain (a) the competencies that students acquire while in college that enable them to perform various petroleum engineering tasks, and (b) the contribution of stakeholders in making the right decision regarding program establishment, enrolment regulation, and establishing value addition. This is because diminishing employment opportunities for these professionals have led to fewer and fewer students opting for petroleum programs. Yet, the oil and gas industry has become an issue of strategic importance, given its influence on economic development (Kamukama, 2018). Considering the hectic nature of petroleum engineering, it should be in the interest of governments, training institutions, and the community to ensure that these professionals are placed in responsible positions to realize the return of investment (ROI). This is because these professionals possess analytical, conceptual and theoretical skills and prowess in determining how hydrocarbons behave at high pressure, estimating the recoverable volume of the hydrocarbons and maximizing the recovery of the resources from subsurface reservoirs (Varvel, 2013). Hence, this kind of intellectual prowess should not go to waste.

METHODOLOGY

This study used a qualitative inquiry that Creswell (2011,
2013) considers effective, especially when collecting data from a cross-section sample of subjects demanding verbatim responses. Respondents included a sample of purposively selected instructors, snowball to identify petroleum engineering graduates and two companies that engaged students on internship and employed a few petroleum engineering graduates. Given the prevailing situation of the Covid-19 pandemic, only two institutions represented universities and BTWET that is, Makerere University and Uganda Petroleum Institute, Kigumba (UPIK). Although other institutions offered petroleum courses such as Petroleum Exploration and Production Department (PEDP), Uganda Technical College Kicwamba and the Norwegian Petroleum Academy are fully certified and members of the Energy Institute, UK and the International Association of Drilling Contractors (IADC), they were not part of the study. The snowball sampling technique was preferred so the graduates known by the authors could identify others. Unstructured prompt questions were designed and used to collect data from officials in those two institutions. Kothari (2008) recommends this method in similar situations. An integrative synthesis was adopted to provide more evidence that made comparison possible. Kothari (2008) recommends an integrative synthesis because of its suitability in investigating patterns across primary and secondary research studies and its potential to compensate for single-study weaknesses. Documents reviewed included academic programs in learning institutions, job descriptions from petroleum companies, resumes of petroleum instructors, and procedures followed in developing new programs. Thematic, content and narrative analyses were employed to generate rejoinders, which Creswell (2013) recommend for its ability to triangulate information for quality purposes.

FINDINGS AND DISCUSSION

In approximately two decades, petroleum engineering gained prominence, and Makerere University joined other institutions to introduce the Degree of Bachelor of Science in Petroleum Geosciences and Production under the College of Natural Sciences (Kashambuzi, 2010). When commercial petroleum reserves were discovered in the Albertine Graben, the Geology and Petroleum Studies department started offering higher degrees in Geology by coursework and thesis. Following this, Makerere University introduced the Master of Science degree in petroleum geosciences by coursework and thesis with the emphasis on petroleum geology, the aim of which was to train geoscientists in Uganda to work in the emerging petroleum sector, taking into consideration the current global challenges (Ministry of Energy and Mineral Development, 2015). To determine whether courses offered in Uganda enabled graduates to leverage and a competitive edge, the first objective sought to establish typical functions of petroleum professionals. It was revealed that the institutions under study had comprehensive curricula to enable them to perform the day-to-day functions and tasks required of petroleum professionals. In particular, the two institutions surveyed had well-qualified instructors, most of whom were senior and accomplished scholars to execute the teaching functions. Hence, the content was rich to enable graduates to compete in the market of oil and gas. Remarkably, these professionals were unique as (a) completion engineers, (b) the reservoir engineers, (c) the drilling engineers and (d) the production engineers (Mbahazi, 2013). While petroleum geology and geophysics focus on the static description of the hydrocarbon reservoir rock, petroleum engineering focuses on estimation of the recoverable volume of this resource using a detailed understanding of the physical behavior of oil, water and gas within the porous rock (Guma et al., 2019; Egasah et al., 2014). Nonetheless, professionals from these two programs complement each other and can aptly handle same tasks.

Markedly, geologists and petroleum engineers require a great deal of knowledge about rocks and the physical make-up of the surface of the Earth. The respondents affirmed this complexity during one of the sessions: “it’s very painful that we are languishing with no hope at all after studying so hard, but also having gone through hectic training that included experiments, field excursions and internships that were heavily loaded with practical activities some of which were outside our original jurisdiction as interns” (K2). On the other hand, while petroleum engineers study the Earth’s crust to create methods of extracting oil and gas, geologists also study areas that comprise the planet, from minerals to magnetic fields (Owor et al., 2019). Hence, the two professions demand superior competencies, and field excursion which is mandatory in both programs. These were complicated tasks that required particularly strategic, critical and analytical thinking skills, which a university degree holder possesses. Similarly, BTWET institutions such as UPIK train technicians to work in the sector and graduates from these institutions are encouraged to acquire internationally recognized certifications (MEMD, 2015, 2016). Specific functions for these graduates include analyzing well-logging results, meeting with reservoir and production engineers and other experts, forecasting production potential, selecting equipment to be used within the well, creating pumps and other systems that help the well to flow, making recommendations on ways to enhance well flow, liaising with contractors to discuss issues related to health, safety and environmental performance, and supervising the team and operations at the well site (Guma et al., 2019). Surprisingly, most professionals at this level had some part-time jobs, but in their jurisdiction. Completing engineers on the other hand, decide the optimal way to construct wells to operate for a long duration; the
reservoir engineers take charge of tasks related to good placement, while oil recovery and production engineers improve the production of oil and gas (Barifaijo and Kabanda, 2001; Golombok and Jones, 2015; Kiiza et al., 2011). Hence, these professionals were the go-to person on sites, and most of the time, they not only work in labs doing research, but they also go to sites in moments of notice and sometimes for months, if the site is an offshore oil rig (Guma, Owor and Muwanga, 2019).

Similarly, the reservoir engineers explore how oil and gas flow through rocks and the forces involved to forecasts the performance of reservoirs, set up well-drainage patterns, and improve the overall production efficiency. It was further noted that drilling engineers deal with the technical tasks of drilling production and injection wells, design drilling techniques, choose safety and casing equipment, and decide on the operation direction. Also, it has been confirmed that the production engineers evaluate lift methods, choose the equipment used to separate oil, water, and natural gas, and charged with managing the interface between the reservoir and the well (Kashambuzi, 2010; Kamukama, 2018; Golombok and Jones, 2015). Particularly, the job of production engineers typically was found to begin after completing the well, and they manage and measure the fluids, design storage systems, and supply pipelines to oil and gas companies. Contrary to the preceding professionals, petroleum geologists analyze subsurface structures to find hydrocarbons, as confirmed by Kimenyi and Lewis (2016). Other specialized areas include stratigraphy, structural geology, geophysics, geochemistry, sedimentology, environmental geology and fieldwork. Evidence indicates that Makerere University and UPIK had comprehensive syllabi covering content to enable graduates to execute these critical and strategic roles. It has been discovered that petroleum professionals gain practical experience since they work alongside geologists and other related fields to pool sufficient knowledge of geology, geophysics and civil engineering, which are considered extremely critical and favorable for the industry, but more importantly, skills gained from field excursions and placements, which was alluded to by some respondents (K2).

Finally, it was established that these professionals were charged with organizing and overseeing the machinery and materials used in drilling operations. Hence, management and negotiation skills were a definite career advantage in the long term. Petroleum engineers therefore, showed soft skills such as good teamwork, communications skills, problem solving and analytical skills, as well as the ability to think creatively and solve complex problems, which are considered key to career success and all are crucial for senior-level managers. This finding was overwhelmingly supported by numerous scholars, including Kimenyi and Lewis (2016), Armour Energy (2018), Langer et al. (EDS) (2020) and Admiraal (2013). Therefore, the findings contradict Ssekika’s (2014) assertion that the oil and gas industry require mostly plumbers ready to dress for the dirty work. Yet, the functions of these professionals were strategic, and the courses taught in these institutions fulfilled the demanded expertise. Hence, given the multi-disciplinary nature of petroleum engineers, it is a mystery that unemployment continued to soar with such multiple skills. The second objective and perhaps extremely critical for our training institutions sought to determine the availability of sufficient expertise and/or preparedness of institutions to train petroleum professionals, which had been presumed to be potentially responsible for competency development in Uganda. It was revealed that the two institutions surveyed had superior expertise critical for preparing and grounding petroleum professionals and capacity building models such as partnerships and collaborations that were adopted by the two institutions, which heavily contributed to developing and shaping these professionals. The bottom line is in the special knowledge, abilities, skills and personal qualities that are necessary for these professionals, to allow them to operate in professional activities effectively, to be guided in work situations correctly, to adapt to changing industry and other emerging conditions as the labor market cannot thrive without an adequately skilled workforce (Dugagjin and Koren, 2017; Ghazi, 2013).

One of the professors proudly affirmed that “more than ever before, we have had abundant expertise in this university since the introduction of petroleum courses, but we also use international and accredited content to enable our graduates to become competitive globally”. Another professor indicated “actually, we have never run short of expertise because, since its inception, petroleum engineering programs have continuously benefited from other departments such as physics, civil engineering, MUIENR, etc.” Notably, Makerere University also used visiting professors, guest speakers and other celebrated scholars in the field such as; from the Directorate of Petroleum, the Ministry of Energy and Mineral Development, Petroleum Authority of Uganda and expatriates from other Universities such as Bergen in Norway, as well as officials from related ministries and industries who were time and again invited to share practical experience. In addition to these strategies, many academic and technical staff often traveled to Norway for refresher courses to enhance their ability to offer some of the courses in the program as part of the EnPe project. Undoubtedly therefore, there was evidence of sufficient expertise in the sampled institutions to develop the required competencies of these professionals. Given such exposure, therefore, by graduation, these professionals already possess the requisite competencies for the oil and gas industries in Uganda and elsewhere. One of the graduates of petroleum engineering said, “there is no excuse whatsoever because all our professors are very
knowledgeable. We were exposed to the best training strategies, including guest speakers, visiting professors, field excursions, supervised internships, etc. This can be evidenced by our credible field and internship reports, where the majority of us scored highly". In this regard, petroleum engineering graduates confirmed how the mix of professionals acted as models that simplified the complexity of the course. Although Barifaijo (2016) found inconsistencies in the usefulness of students’ internships; majority of petroleum engineering graduates revealed many benefits from internships. Nevertheless, not all graduates considered internship ‘rosy’, as a few revealed how skills acquisition during internships was abstract and unstructured, making it difficult to link theory and practice since most mentors lacked theoretical competencies. It was further revealed that partnerships and collaborations enhanced learners’ work experience.

Some respondents from UPIK made this revelation on how they benefitted from such partnership and said, “several were sent to Kenson School of Production Technology in Trinidad and Tobago after graduation to undertake an additional six-month apprenticeship program to provide these graduates with practical skills including City and Guilds of London international vocational qualifications in electrical installation, instrumentation, welding and pipefitting and fabrication”. Although not all students benefited from this collaboration, those who did were all absorbed in various oil and gas industries. Another petroleum graduate said, "because of the focus on skills development at UPIK, I work under minimum supervision". This finding was also confirmed by Mawejje (2019) on how internships and collaborations were important especially for heavily practical courses. It was therefore revealed that UPIK graduates had higher employment chances because of the acquired practical skills, technical abilities, as well as personal qualities instilled through numerous collaborations, which were found to be critical to adapt to changing industries and other emerging conditions since the labor market cannot thrive without an adequately skilled workforce (Armour, 2018; Kettunen, 2015; Admiraal, 2013). In support of partnerships, the Ministry of Energy and Minerals Development (MEMD) (2016) explained how the three major international oil companies in Uganda, that is, Tullow Oil, Total E and P and CNOOC, in partnership with the governments unceasingly provided scholarships to Ugandans from all backgrounds for training locally and abroad to build the capacity of relevant government departments to handle oil and gas issues. This finding was also supported by Muhumuza (2017) who emphasized centralizing the co-ordination and monitoring of oil and gas companies’ contribution, especially to BTVET training following the Skilling Uganda programme, production sharing agreements (PSAs), and the Petroleum Act supervised by the Petroleum Authority of Uganda (PAU). Given the multi-disciplinary nature of petroleum engineering, there is no doubt that petroleum professionals have been exposed to a multitude of key practical skills especially through partnerships and collaborations, to compete favorably for the scarce jobs on the market. In addition, the energy and petroleum (EnPe) scholarships fund supported by the Norwegian Agency for Development Cooperation (NORAD) provided start-up (seed) funds to sponsor, equip laboratories and libraries, and provide expatriate staff (Kimenyi and Lewis, 2016; Guma, 2019).

Indisputably therefore, petroleum engineering is a lucrative field because of the demand and increased cost of oil, which presumably led to higher employment opportunities (Horsburgh and Ippolito, 2018). This study's third focus was why petroleum professionals had limited employment opportunities, yet Uganda had large oil and gas companies. It was revealed that unemployment of petroleum professionals was due to limited openings at senior level management in these employing companies and urged the training institutions to regulate enrolment rates, as well as to ensure to develop functional skills in order to enable these professionals to prosper as it was essential to everyone's future prosperity (Mwakali and Byaruhanga, 2018; Muhumuza, 2017; Langer et al., 2020). Although most graduates were not employed, Uganda's oil and gas industry steadily grew, with several jobs slowly but surely rising to the top of the public discourse (Armour, 2018; Kamukama, 2018; Kimenyi and Lewis, 2016). Paradoxically however, Hughes (2017) argued that 'the country’s biggest challenge was not 'academics of oil' but diploma and certificate-holding technicians', as indicated earlier by Sekika (2014). Therefore, it is not true that as often claimed by oil companies that Uganda lacks qualified petroleum professions and that's why they were always turned down during job interviews (Tumusiime, 2018).

Paradoxically, although technology was known for its numerous benefits, with its newer data analysis technologies that recently emerged in the petroleum industry, it was revealed that they have to a certain extent, contributed to unemployment in the industries since they are handy in creating behavior models of reservoirs to automation of oilfields (Wakali and Byaruhanga, 2020).

Predominantly, all of the oil and gas industry today speak of fracking which is the process of using pressurized water in the wells to crack the oil reservoir and release oil from the well but previously were unrecoverable sources which are now recoverable (Magona and Angom, 2017). Remarkably, although Hughes (2018) reiterated how oil and gas jobs did not necessarily require white-collar workers and cautioned Ugandan engineers not to expect much through their sophisticated degrees, it was revealed that petroleum engineering was undoubtedly the right profession for the oil and gas industries, but, employers preferred broader disciplines in the oil and gas industry, including chemical engineering, earth engineering, astrophysics, civil engineering, mechanical engineering...
professionals (Orsk and Geoffrey, 2010; Rusco, 2009). On the contrary, Wakali and Byaruhanga (2020) explained how most oil and gas industries required professionals with superior knowledge of different types of rocks and their behavior under pressure and the machines used for oil extraction and mining. Yet, the majority does not get to this stage to determine possession of this knowledge. On the other hand, a tracer study conducted by Egesah et al. (2014), found that although training graduates seemed longer, it was revealed that instead, training a technician, welder, or even a plumber to satisfactory standards in Uganda lasted roughly five (5) years, which was the reason foreign investors imported workers from elsewhere or get married to Ugandans to become citizens and take over the available jobs completely. This is why Ferrero-Ferrero et al. (2018) recommend institutions to aggressively involve all stakeholders in all training decisions, considering that a wrong decision affects multiple individuals because relationships based on the principles of stakeholder management can create more value for both the organization and its stakeholders. Hence, the more HEIs involved their stakeholders the more competitive advantage for these professionals. Consequently, the involvement of stakeholders in determining the type and length of programs may be used to assess the level of alignment between stakeholders' interests and the institution's objectives. Similarly, in the higher education context, it is vital to seek stakeholders' guidance for the strategic objectives of an institution (Hayter and Cahoy, 2018; Harrison and Wicks, 2013; Garcia-Castro and Aguileria, 2015). On the question of why oil and gas companies do not hire university graduates, one of the operations managers said: “securing a job in this company is extremely competitive, and Ugandan graduates stand very little chance as most training providers do not refine their students to the required current and future skills needs, especially at degree level, where theories rather than practical skills are emphasized. This is because the degree curriculum comprises intense theory and too little hands-on experience; therefore, there is a need for education system reforms in consultation with the stakeholders to rethink and refocus the existing curriculum”. Consequently, this perception has led to excessive levels of unemployed graduates in general and petroleum engineers in particular, slowing down the economy, small formal labour markets, and a high population growth rate. This finding was in tandem with Oloka-Onyango's (2020) assertion that most graduates were unemployable and unable to apply skills acquired from universities to be problem solvers, innovative and initiators. He argued that most graduates required strict supervision and constant reminders and lacked critical thinking skills, which is very important for performing 21st-century tasks. Lastly, although often overlooked, Ugandan petroleum professionals’ “soft skills” required good teamwork, communication skills, problem-solving and analytical skills, the ability to think creatively and solve complex problems, etc. which were found wanting (Wakali and Byaruhanga, 2020). Yet, all these combined have the potential to create more value and opportunities for petroleum professionals.

CONCLUSIONS

Petroleum professionals at the graduate level fit well into existing jobs that demand strategic leadership and operations. However, there is a need to domesticate international skills, competencies, and certifications through a coordinated approach by forming partnerships and collaborations with internationally-recognized institutions, just like Kigumba has done with City and Guilds of London and the American Welding Society. Specifically, partnership with the private sector and all education beneficiaries should improve the identification of training needs, prioritize program levels, and above all, achieve optimum utilization of qualified personnel. There is an abundant skilled human resource in Uganda to meet the demands of the fledgling oil and gas industry. Nonetheless, institutions have increasingly been influenced by a competitive logic based on creating sustainable competitive advantages, which involves attracting and retaining more talented faculty and students, developing better research and teaching structures and improving the corporate image. Therefore, as a developing oil nation, the education system in Uganda should be strengthened in terms of on-the-job practical training beyond classroom training to match the oil industries' requirements. Emphasis should be put on the training of skilled people and supporting the educational system by reinforcing the best academic institutions already in place and founding training centre to develop superior competencies among qualified engineers and technicians.

The government of Uganda and the oil and gas industries should support the educational system to the best existing institutions in Uganda since most training institutions were found to be far from international O and G standards in terms of skills required. Similarly, HE instructors are challenged to develop critical skills among petroleum professionals to survive. Since the quality of education and training depends greatly on the ability of institutions to adjust the content of training to meet changing skills’ needs. This is especially important in training for strategic
occupations rapidly changing under new job requirements. Therefore, a multi-disciplinary approach involving professional groups and industry and general educators' representatives is necessary. It is also important for institutions to practically integrate business and entrepreneurship skills into technical and vocational education to build their capacity for skills development. Particularly, a relationship of trust with stakeholders can lead to increased employment opportunities since their involvement is critical, as processes for identifying and evaluating the participation of stakeholders in the institution's activities may generate organizational change that leads to new opportunities and prevent a lack of return of investment. Notably, the different implications for internal and external stakeholders present a more direct relationship with HEIs, since their activities are more connected to the institution's purpose. In contrast, external stakeholders present a very diverse and complex set of needs, including divergent and competitive ones in some situations. Since HEIs, directly and indirectly, influence both types of stakeholders, including the communities in which they operate, represented by local entities, student associations, religious institutions and others, all stakeholders should be involved in all decisions that concern issues of national and societal interests. More importantly, since the very existence of universities heavily depends on students, it is crucial to implement specific processes and practices to manage this relationship, such as tracer studies and satisfaction surveys.

Similarly, although students are considered prominent stakeholders in the higher education context, their participation in decision-making processes is often limited, making employment opportunities next to impossible. In this context, HEIs face the challenge of implementing innovative practices and policies to satisfy social demands better and create more value for their stakeholders, including engagement and communication with various stakeholders and their potential impact on organizational outcomes to create value addition for their graduates. A more pertinent but rarely explored area is the legal framework to regulate the employment of foreign investors, coupled with the influx of the foreigners often flown into the country yet may not leverage competitive advantage. Secondly, university curricula for petroleum engineering should be reviewed to focus more on practical skills such as more time for field trips and internships rather than a heavy concentration of theoretical-oriented programs to enable students to develop superior skills in preparation for the world of work, since the academic content has deprived not only students of mastery skills required to effectively and equitably compete for these lucrative jobs but also limited social networks, given the short period with the companies, which calls for competency-based approaches. Similarly, HEIs should utilize results from situational analyses and tracer studies to increase the competitive advantage of petroleum professionals in Uganda. Lastly, the education system in Uganda should be strong on-the-job practical training, specifically focusing on technicians, as Uganda is still lagging way behind when it comes to students' preferences for vocational and technical courses.

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