

## Built Environment throughput advisory report on the skills pipeline (supply and demand)

### Abstract

The Built Environment (BE) is much more than just bricks and mortar. It is an essential contributor to development, economic growth, job creation and poverty alleviation. The sustainability of the BE sector relies heavily on the availability of an appropriate, capable and skilled workforce that can adequately handle the demands of a constantly changing and evolving building industry. In pursuance of its mandate of promoting ongoing human-resource development within relevant professions, the CBE conducted research on the throughput rates of BE professionals (supply and demand) in the period 2014/15 to 2020/21 financial years. This research is geared towards uncovering the throughput rates of science, technology, engineering and mathematics learners exiting high school and progressing through tertiary options in the BE skills pipeline. The study utilised a mixed method approach in collecting data. The findings indicate that the supply and demand of BE professionals are heavily reliant on the schooling systems, the uptake of BE qualifications by students at tertiary institutions and the willingness of graduates to take up candidacy. Furthermore, the findings acknowledge that despite sufficient supply, the supply pipeline needs to improve from the schooling system to tertiary institutions, and onto the route of professional registration. To ensure a sufficient supply of BE professionals, the study recommends a candidacy mentorship programme urgently in the municipalities.

### Introduction

The National Development Plan, National Infrastructure Plan, as well as the South African Reconstruction and Recovery Plan prioritise building a capable state, which will play a developmental role in improving the quality of education, skills development and innovation to raise employment opportunities.

In pursuance of its mandate of promoting ongoing human resource development, the CBE conducted this research on the throughput rates of BE professionals in the period 2014/15 to 2020/21.

The research was geared towards establishing the throughput rates of science, technology, engineering and maths learners exiting high school and progressing through tertiary options in the BE skills pipeline. For this report, statistical data was collected on:

- The number of students who wrote and completed grade 12 majoring in maths and physical science as entry subjects
- The number of students who enrolled for and fulfilled requirements for BE qualifications
- The number of registered candidates and professionals in the BE

The research aimed to uncover how BEPs progress through tertiary training programmes, internships and candidacy to eventual professional registration and employment status in the various BE professions in South Africa.

The CBE found it relevant to include Geomatics (land surveyor and geographic information systems (GIS)) and the planning professions in the study as they fall under the ambit of BE professions. According to literature, developed countries such as Germany, UK, USA, Canada and several others have all engaged in various activities over the years to promote higher education activities. Developing

nations such as South Africa need to embrace this paradigm progressively.

In recent times, industry employers have expressed their discontent regarding the disparity between the qualities of the educational outcomes of graduates and the increasing needs of both workplace and society. The assumption is that present-day graduates lack the employability skills to function effectively in the construction industry after graduation and therefore need re-training by employers.

It is against this backdrop that the CBE conducted this study to determine if the current supply of BE professionals meets the demand to deliver on the country's infrastructure needs.

To achieve this aim, the objectives are to:

1. Develop a database over seven years on the supply side trends and patterns (school, tertiary and candidacy levels) and the professional level, thus determining the current supply of BE professionals
2. Estimate the current demand side, i.e. the demand for BE professionals based on infrastructure needs of the country
3. Identify bottleneck areas that affect the supply and demand for BE professionals and recommend interventions

## Methodology

To achieve the aim of the study, a mixed method i.e. qualitative and quantitative approach was adopted. Sampling techniques were used to identify Maths & Science students as entry subjects to BE qualifications, tertiary students enrolled for and fulfilled requirements for BE qualifications, and registered candidates and professionals in the BE, to acquire data on the throughput rate of BE professionals (supply and demand) in the seven-year period 2014/15 to 2020/21. An exploratory mixed method design was adopted for the study. Through a desktop study, qualitative data was collected from various departments such as the Department of Basic Education (DBE), Department of Higher Education, Training and Innovation (DHETI), and Councils for the Built Environment Professions (CBEP). In a quantitative context, probability sampling was used by Gauteng metropolitan municipalities of Tshwane and Ekurhuleni to acquire data through headcounts.

Qualitative data gathered through desktop study (secondary data) was analysed using content analysis, and quantitative data was analysed using statistical analysis. The research methodology employed to achieve the above objectives are as follows:

### Data sources

The report accessed data from sources including the DBE, DHETI, CBEP and two metropolitan municipalities.

### Supply-side data

The DBE's data indicated the number of students who passed the National Senior Certificate with Mathematics and Physical Science as core subjects for studying BE courses at tertiary institutions. The data from DHETI indicated the number of students enrolled for BE courses at higher education institutions and, likewise, the throughput of those who completed their BE qualifications for 2014 to 2022. Lastly, the data from the CBEP indicated the number of registered BE graduates at candidacy and professional levels.

### Demand-side data

This objective was achieved using the BE professional headcount at the municipalities of Tshwane and Ekurhuleni on their infrastructure development needs. Analysis of the data from the CBEP computed the BE professionals' ration to the South African population, thus forecasting the demand for BE professionals based on the infrastructure needs of the country.

## Research Findings

The supply and demand for BE professionals are heavily reliant on the schooling systems, uptake of BE qualifications by students at tertiary institutions and the willingness of graduates to take up a candidacy.

### National Senior Certificate (NSC) data analysis

The NSC enables learners to access a variety of post-school opportunities depending on their performance in grade 12. For the review period, (2014 – 2020), an average of 30% of students who wrote the NSC examination achieved a bachelor's admission. Although most tertiary institutions require a minimum of a bachelor's pass rate to be admitted in BE qualifications, it should also be accompanied by a 60% pass in mathematics and physical science. Hence, it is important that the BE sector should be introduced to learners at a young age; this will increase the number of students who achieve NSC to select a BE qualification.

### BE University enrolment and completion data analysis

The supply of BE professionals commences when a student enrolls for and completes a BE qualification with a higher education institution.

### BE University enrolments

The number of learners who achieve bachelor's admission at NSC is steadily increasing; so is the number of students who enrol for BE qualifications annually. The 2014 – 2019 statistics indicate an increase from 60 490 in 2014 to 68 502 in 2019. If

the planning and geomatics' numbers are also included, this number will rise to 82 987.

If these figures are further disseminated, it shows that engineering qualifications (67,7%) had the highest enrolment, while landscape architects had the lowest enrolment (0,4%).

#### BE University completions

University completion is an important statistic as they determine the number of graduates ready to enter the job market in any country. The findings of the study indicate that, on average, 20% of the BE registered students completed their qualifications. The study further revealed that there is a steady rise in the throughput of BE graduates from 2014 to 2019 (10 851 in 2014 to 13 629 in 2019). However, many factors count for the despondent findings in the BE graduate throughput such as lack of funding for the growing percentage of dropouts at tertiary institutions.

Further analysis revealed that most of the students who completed their qualifications between 2014 and 2019 were in the engineering disciplines (60,14%), preceded by construction/project management, quantity surveying and architectural qualifications. Overall, the BE graduate throughput for all BE qualifications does not correlate with the BE enrolment numbers for the same period.

#### Candidates in the BE professions

BE graduates are among the most sought-after graduates as their skills are a "must-have" to develop infrastructure in a country. It is a practical prerequisite that for a graduate to be registered as a candidate professional in the BE they should be employed in the BE sector and assigned to a registered mentor. However, BE professional registration is not mandatory, but subject to employer requirements. As a result, not all graduates are registered as candidates. It was found that the number of candidates is increasing by approximately 6% annually, emphasising that most BE graduates do not take up the candidacy programme.

In correlation with previous data, majority of candidates are in the engineering profession (70,4%), followed by construction project management (11%) and architecture (8,2%) respectively. The number of BE graduates registered as candidates does not correlate with the total number of graduates, as the matter of professional registration is a personal choice.

#### Professionals in BE professions

Upon completion of their candidacy, candidates are eligible for a peer review examination or interview. Professionals in the BE hold a peer-reviewed skill set and are entrusted with millions in infrastructure budgets. The 2014 - 2020 statistics indicates a slow growth of  $\pm 0,5\%$  per annum. Reports that monitor candidacy programmes validate that most

candidates have challenges in completing their candidacy due to factors such as:

- Lack of registered mentors in the workplace
- Lack of projects that expose candidates to all work stages as required
- Lack of willingness by candidates

Most professionals are in the engineering profession (59,0%), architectural profession (14,4%) construction project management (11,7%) and town and regional planning (5,1%).

#### Demand for BE professions

It is difficult to quantify the skills demand for BE professions. The BE professional: Population ratio for the 2014 - 2020 period is 1:1300. There is not enough literature on the professional population ratio to validate this number as good or bad. If, however, one regards the engineering profession, South Africa had in 2005 one engineer per 3166 population. This ranks well behind countries such as Brazil, the UK, Australia and Chile, but is well ahead African countries such as Tanzania and Zimbabwe.

The core mandate of a municipality is to deliver services to its residents. For this reason, a municipality should have sufficient artisans, BE graduates, BE registered candidates and BE professionals to develop its infrastructure.

Research that has been carried out on the above availability in the cities of Tshwane and Ekurhuleni, by using the city's population as percentage of the country's population, revealed that in all the above categories, there is a severe shortage in BE personnel.

#### **Recommendations**

The following recommendations emerged from the study:

- Most municipalities in South Africa do not have registered professional capacity to oversee the work of service providers. To ensure a sufficient supply of BE professionals, there is an urgent need to have a candidacy mentorship programme in the municipalities.
- The BE should be popularised as a career of choice for high school learners. This will enable students to choose mathematics and physical science as their core subjects and ultimately increase the number of students who write the NSC with these subjects as gateway subjects to BE professions

#### **Conclusion**

The study aimed to determine the supply and demand for BE professionals. The findings point out that although there is sufficient supply, the supply pipeline needs to be improved from the schooling system to tertiary institutions, and onto the route of professional registration. The study further indicated that the skills deficit appears to be on the path where demand will continue to outstrip supply due to the substantial growth in infrastructure investment and the limited throughput of enrolled BE graduates.

Conference. 2 – 4 August 2015, Durban, South Africa

### Areas of Future Research

- Longitudinal studies on the supply of Built Environment skills in South Africa.
- Forecasting of Built Environment skills in South Africa.
- Female students' perceptions of the Built Environment professions.

### References

Akampurira, E & Windapo, A (2018). Factors influencing the quality of design documentation on South African civil engineering projects. Titles are never italicized, only journal/books etc *Journal of the South African Institution of Civil Engineering*, 60 (3): 41 - 48

Business Leadership South Africa. (2021). Infrastructure for South Africa: an assessment of the obstacles and solutions for greater infrastructure investment. (Accessed 22 December 2021)

COGTA. (2020). City of Ekurhuleni profile analysis. [https://www.cogta.gov.za/ddm/wpcontent/uploads/2020/08/Take2\\_DistrictProfile\\_EKURHULENI-2.pdf](https://www.cogta.gov.za/ddm/wpcontent/uploads/2020/08/Take2_DistrictProfile_EKURHULENI-2.pdf)

Department of Higher Education and Training (2013). White paper for Post-School Education and Training, Pretoria.

Haupt, T & Harinarain, N. (2016). *The image of the construction and its attractiveness*. Research articles. 23 (2). 79 – 108

Lawless, A. (2007). *Numbers & Needs in local government: addressing civil engineering – the critical profession for service delivery*. SAICE, Midrand

Potgieter, A & Davidowitz, B. (2010). *Gr 12 achievement rating scales in the new National Senior Certificate as indication of preparedness for tertiary chemistry*. South African Journal of Chemistry, (6) 63, 75 – 82

Tramontin, V., Wanda, M., Loggia, C., Haupt, T. (2015). *Higher education for future built environment professionals: barriers experienced by property development students in KwaZulu-Natal, South Africa*. Proceedings of the 9<sup>th</sup> Built Environment

This research brief draws its origins from the CBE Built Environment throughput advisory report on the skills pipeline (supply and demand) developed in 2022/2023. Available on the CBE Knowledge Hub.