

# Modelling Construction Skills Supply for the Zambian Economy

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## Abstract

The development of requisite skills in the right numbers to match the sector demands in construction within Zambia forms an essential aspect of the ability of construction companies to deliver projects efficiently. The availability of these skills is influenced by a number of factors including the training provision which governs the supply of the skills, sector and sub-sector volume capacity which drives the demand for the skills, and other socio-cultural as well as public sector policy on skills development. The nature of the interaction between the two principal factors of demand and supply for a developing country such as Zambia is particularly relevant as these two factors are self-reinforcing and also impact on the other socio-political cultural factors. The paper explores the interaction the two factors by examining the supply pattern of selected construction skills and how they reflect current skills needs (demand) of construction companies in Zambia. The scope of the analysis is craft-based and technician grade skills. The benefits of the analysis derives not only from the potential to identify possible skills shortfalls to inform public policy, but also highlight any change in the composition of the skills base that the supply organisations (construction sector training providers) may have to address.

**Keywords:** construction, skills, training, policy, demand, supply, Zambia.

## 1. Introduction

The construction industry in Zambia, as in many developing economies, is dominated by labour-intensive methods of production (Muya et al., 2003; Edum-Fotwe, 2003). This orientation for the production activity within construction means that the availability of requisite skills to the industry impact heavily on its capacity to deliver demanded outputs. The development of requisite skills in the right numbers to match the sector demands in construction within Zambia forms an essential aspect of the ability of construction companies to deliver projects efficiently (GRZ, 1996). The availability of these skills is influenced by a number of factors including the

training provision which governs the supply of the skills, sector and sub-sector volume capacity which drives the demand for the skills, and other socio-cultural as well as public sector policy on skills development (World Bank, 2003). The nature of the interaction between the two principal factors of demand and supply for a developing country such as Zambia is particularly relevant as these two factors are self-reinforcing and also impact on the other socio-political cultural factors. The research forms part of a much larger study funded by the DFID and administered by the British Council in Zambia. The objectives of the main study are to undertake the following activities in Zambia:

- examine current government policy and expenditure with reference to training and retraining of the workforce in the construction industry;
- investigate trends in outputs of institutions involved in training and retraining of the construction industry workforce;
- audit construction industry skills deficit through a survey of construction industry employers;
- explore levels of private sector participation in training and retraining programmes;
- identify constraints to implementation of appropriate training programmes; and
- assess current levels of skills possessed by construction craft workers

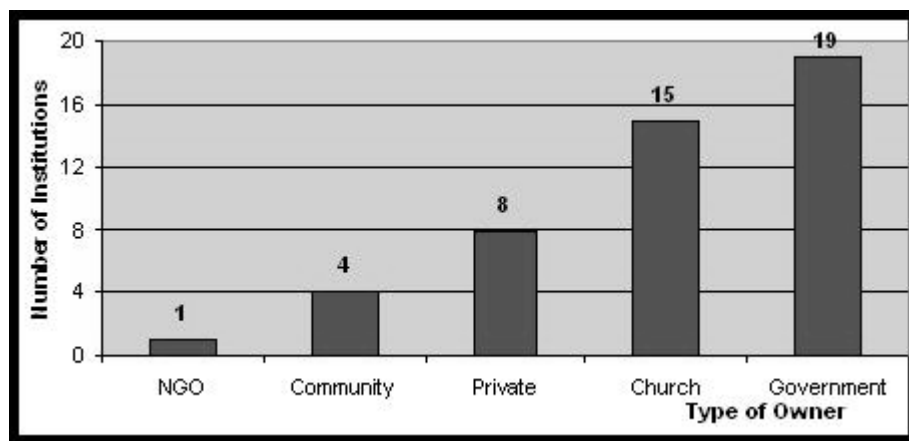
This paper explores the interaction the two factors by examining the supply pattern of selected construction skills and how they reflect current skills needs (demand) of construction companies in Zambia. The analysis is focused at the craft-based and technician grade skill levels as this presents a critical area for strengthening construction in most developing economies. The benefits of the analysis derives not only from the potential to identify possible skills shortfalls to inform public policy, but also highlight any change in the composition of the skills base that the supply organisations (construction sector training providers) may have to address.

## **2. Construction skills in Zambia**

The development of construction skills in Zambia occurs both through formal and informal routes. The former is achieved through training and education with appropriate accreditation structures established. The latter involves hands-on apprenticeship often without any formal evaluation of proficiency. At present, the country's construction training institutions are in dire need of investment after accumulated years of under-funding and brain-drain. The continued reliance on central government to finance education and training in the country has led to the fall in standards, and the mass exodus of teaching staff due to poor conditions of service. Although the government has introduced user fees through the Technical Educational, Vocational and Entrepreneurship Training Authority (TEVETA), in almost all its institutions, the portion paid by government through budget grants remains unsatisfactory. Mashamba (2002) discuss the efforts of the Zambian government to address the current funding situation through a levy scheme.

With the liberalisation of the economy, a number of private training institutes have emerged to fill the vacuum created by the need to acquire skills in the construction industry. The Thorn-Park Construction School and the Nzelu Institute are two such private sector led construction institutions in the country. There are a number of other private schools run by individuals, NGOs, Community Based Organisations (CBOs) and churches in the country. While it may be said that Zambia is now a private sector-led economy, the government, by and large, still funds construction training at government funded institutions (Mashamba, 2002).

Since 1991, there has been a proliferation of a number of training institutions in various construction related trades. Table 1 shows that of the 47 institutes offering construction courses, only 19 representing 40 per cent are government owned. Therefore, about 60 per cent of the trade schools are either in the hands of churches, the private sector or CBOs. Outside government, churches are the main provider of construction skills training, especially in rural and peri-urban areas. Although the private sector may provide an avenue for earning a qualification and living in the construction industry, there is need to monitor the sector to avoid poor quality training.



(Source: Technical Education, Vocational and Entrepreneurship Training Authority - TEVETA 2003)

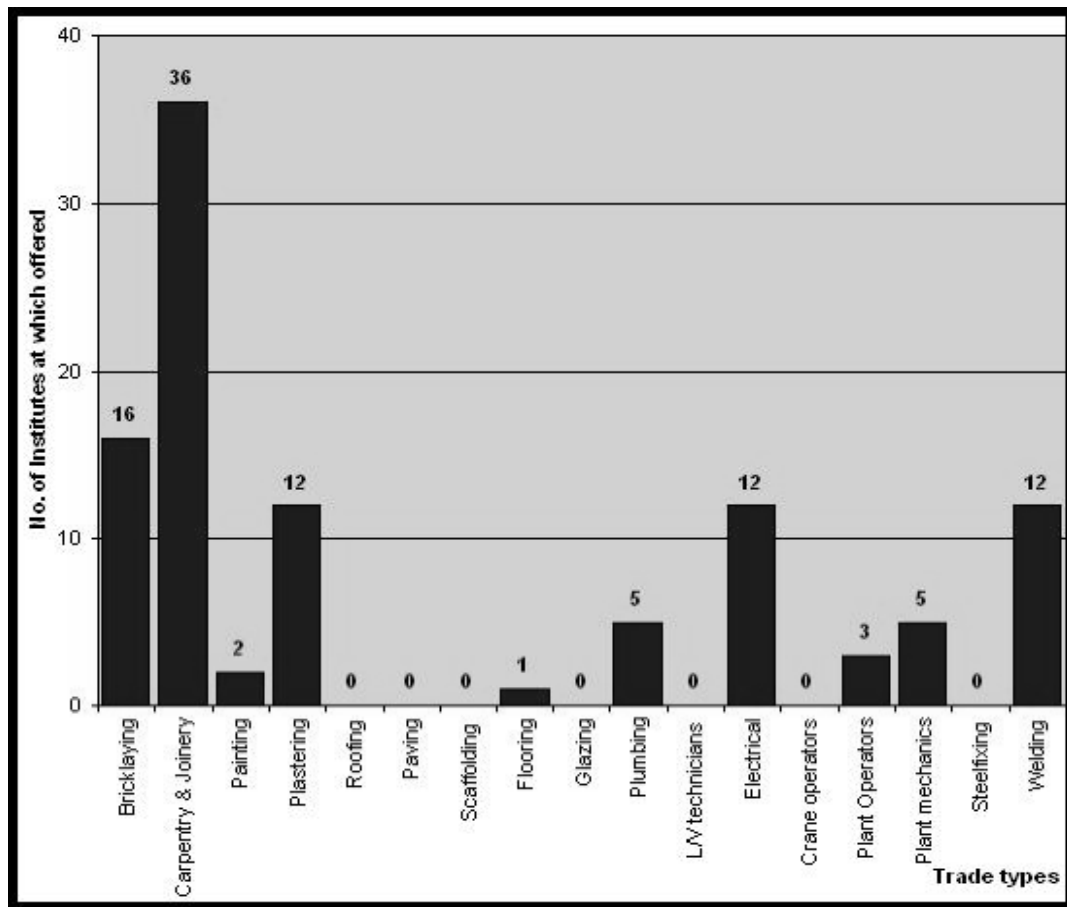
*Figure 1: Ownership of construction trade schools*

### 3. Skills modelling

Agapiou et al (1995) identified the craft skills required by the construction industry to include: bricklayers, carpenters, painters, plasterers, roofers, pavers, scaffolders, floorers, glaziers, plumbers, light/ventilation technicians, electricians, crane operators, plant operators, plant mechanics and steel-fixers. Figure 2 shows the construction related trades being offered at craft schools in Zambia. While the majority of the trade schools offer courses in bricklaying, carpentry and joinery, plastering, electrical and welding, there are no programmes for roofing,

paving, scaffolding, glazing, light/ventilation technicians, crane operators and steel-fixers in any of the trade schools.

There is evidence in every city and town in Zambia of high-rise buildings and other types of concrete structures that would have used scaffolding and steel-fixing expertise in their construction. It is also evident that there is wide usage of construction plant such as tower and mobile cranes in many construction operations countrywide. There is anecdotal evidence to support a view that steel-fixers and other such specialist skills acquire their training on the job in a rather informal and unconscious apprenticeship. Without training programmes in roofing, paving, scaffolding, glazing and crane operations, it may also be argued that craft-persons with skills in these areas may also have acquired their trades on the job in a similar informal and unconscious manner. This foretells an industry in limbo. No construction industry that stands to be competitive in the era of globalisation can depend on a workforce that has no formal training in key skills such as crane operations, scaffolding and steel-fixing. Other than being inefficient and uncompetitive, the health and safety practices in such an industry raise many questions. To be able to plan and make such a provision, it is essential to have a clear appreciation of the current capacity both from a demand and supply perspective. Such evidence can then help to qualify the nature and extent of skills constraints within the industry, and form the basis for any future industry strategy on improvement and development.



(Source: Technical Education, Vocational and Entrepreneurship Training Authority - TEVETA 2003)

Figure 2: Construction craft skills training offered at trade schools

## 4. Method of Investigation

The principal method adopted for explicating the nature of the demand and supply relationship of construction skills in Zambia is a time series approach. There are two main goals of such a time series analysis. First, it is aimed at identifying the nature of the phenomenon represented by the sequence of observations on skills provisions and availability. Second, the method of time series provides a means for forecasting for predicting future values of the demand and supply of skills variables. Both of these goals require that the pattern of observed time series data is identified and more or less formally described. Once the pattern is established, they can be interpreted and integrated with other strategic data for planning the construction industry as a whole. In this paper, the authors address the first aspect of the investigation to by providing a profile of the demand and supply of the construction skills. The predictive aspect of the investigation forms the subject of a different academic output. The provision of trained places represented by the numbers offered for final examinations is adopted as proxy for the demand of skills, and the graduation of skills as proxy for the supply of skills.

## 4.1 Nature and source of data

The nature of time series values are the realisations of random variables observed from real life phenomena or observations and reflect the following series detailed in equation [1].  $y_t$  is the observed or returned value at any time  $t$ .

$$y_1, y_2, y_3, \dots \dots \dots y_t \quad [1]$$

These random values can be represented as a part of the larger stochastic process depicted by equation [2].

$$\{y_t : t \in Z\} \quad [2]$$

Equation [2] defines the set of all possible returns or observations of the series under investigation, in this case the demand and supply of construction skills in Zambia. It is this underlying process that will be the focus for subsequent theoretical modelling and development.

The data set was generated by reference to aggregate statistics compiled by the Examinations board responsible for technical training and education in Zambia. Current data on skills capture six principal categories. These comprise: Plumbing and Sheet-metal; Carpentry and Joinery; Bricklaying and Plastering; Painting, Decorating and Sign-writing; and Electrical. Figure 3 presents the aggregate demand and supply of the six skills in Zambia over the period 1987-2001. This illustrates the disparity between the demand and supply of skills for the construction industry in Zambia.

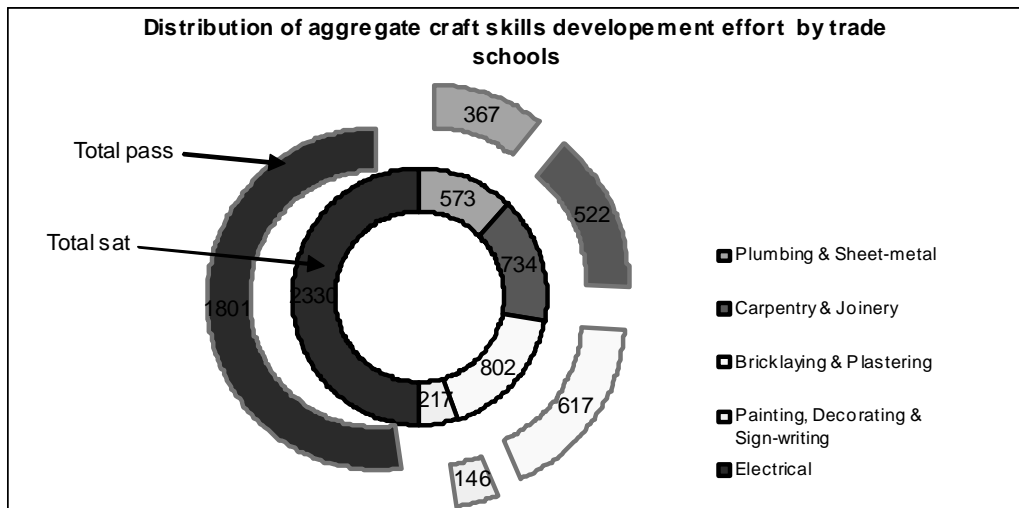


Figure 3. Number of craft skilled graduates in the construction industry: 1987-2001 (ECZ, 5-11-02)

## 5. Analysis and Results

Figures 3, 4 and 5 present the plots of the time series for the demand for trained skills, supply of trained skills, and the ratio of supply to demand in respective order. The demand supply ratio provides an indication of the skills capacity deficit that exists within the construction industry.

The analysis presented in this paper addresses the capacity for skills supply to the construction industry. This is represented as a skills capacity index. Skills capacity index is defined by the ratio of skill of the skills supply to the skills demand as outlined in equation [3].

$$SCI_t = \left( \frac{SS_t}{SD_t} \right) \quad [3]$$

where for any period defined by  $t$ :

$SCI_t$  is the skills capacity index in the period

$SS_t$  is the skills supply in the period

$SD_t$  is the skills demand in the period

The various values of SCI returnable from the analysis are interpreted as follows;

$SCI \Rightarrow 0$	under capacity and constrained industry
$SCI \Rightarrow 1$	balanced capacity industry
$SCI > 1$	overcapacity with a supply glut

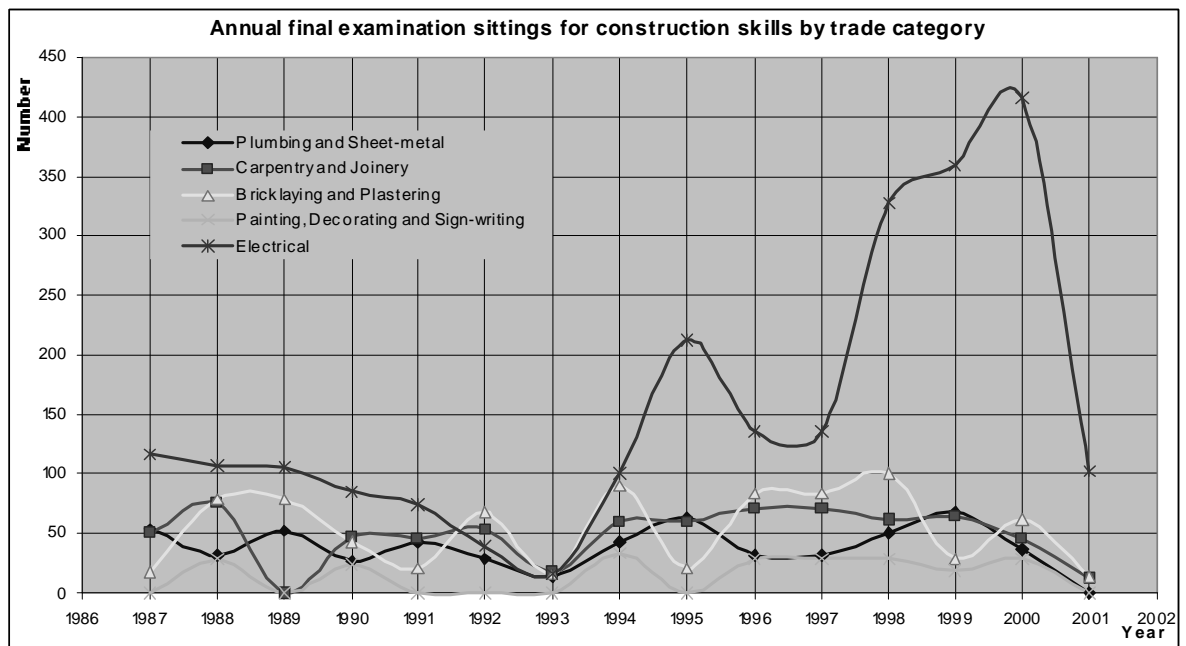
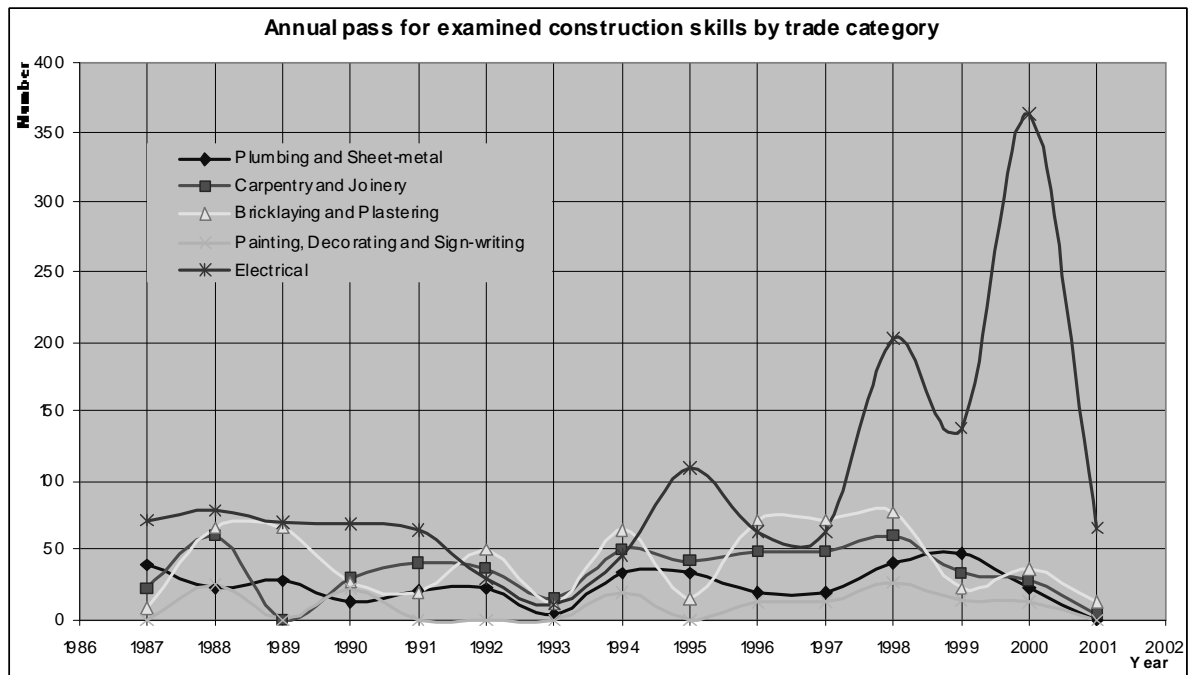
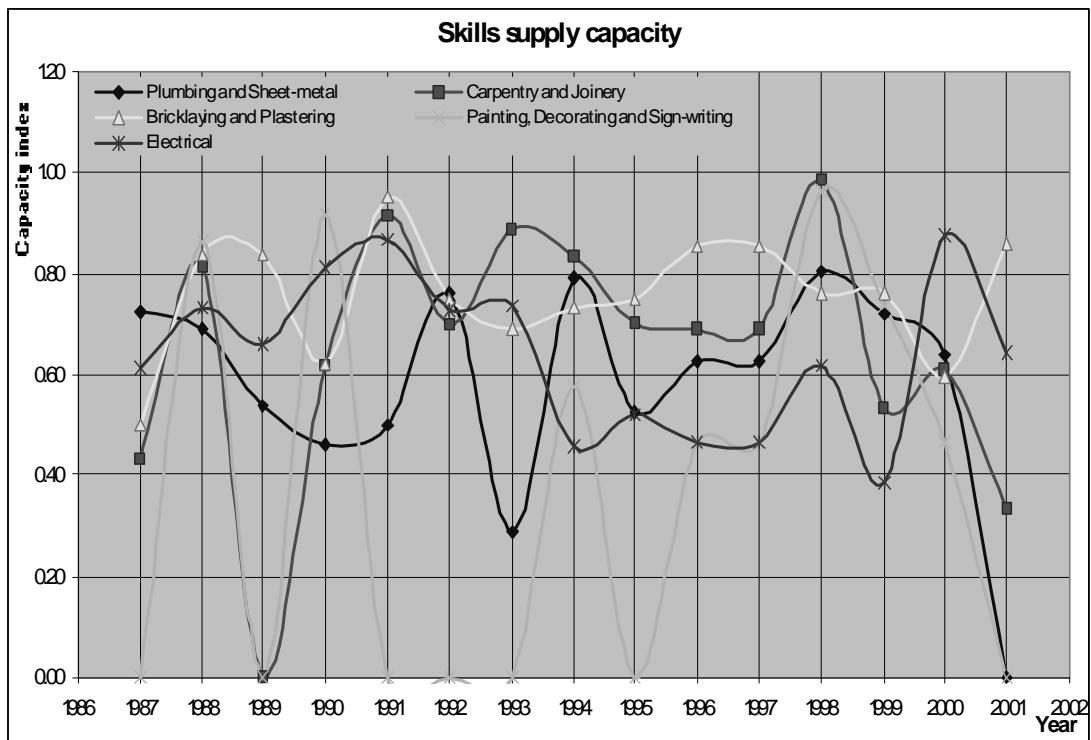


Figure 4. Skills demand profile for construction crafts in Zambia





##### 5. Skills supply profile for construction crafts in Zambia

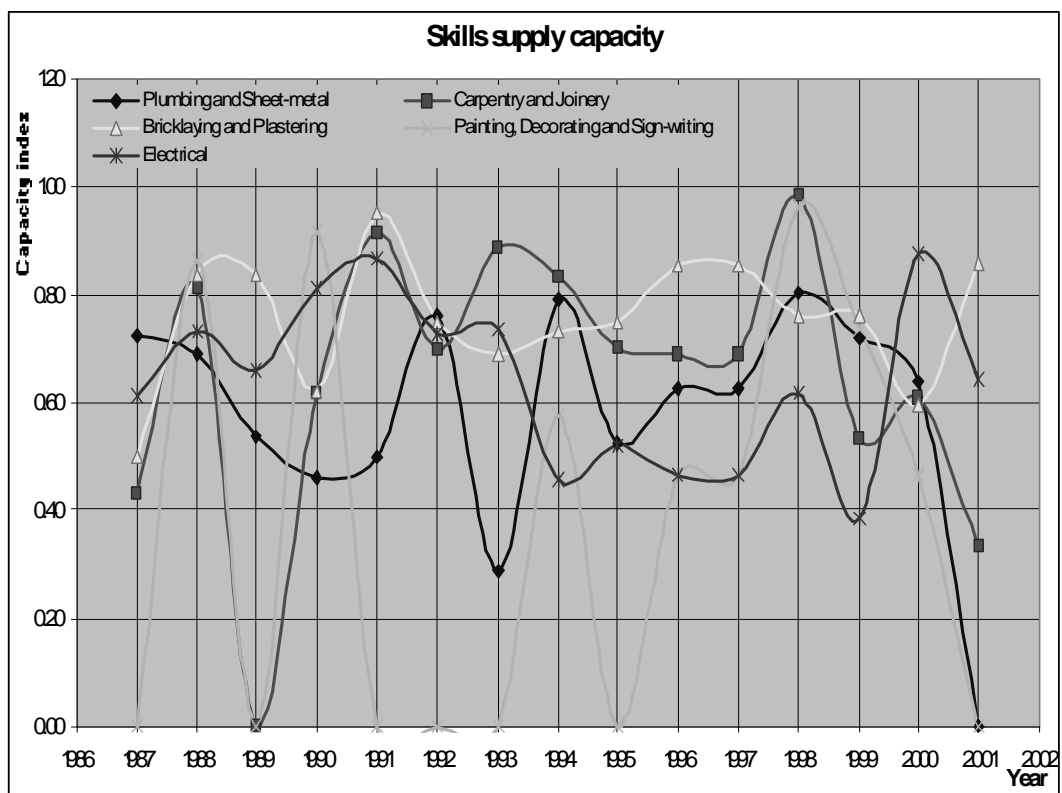


Figure 6. Skills capacity profile for construction crafts in Zambia

## **6. Discussion**

With the exception of electrical trades there was a stable level for the demand and supply of skills in construction from 1987 to 2001. The electrical trades reflected a surge in demand and supply of skills 1998. The returned figures in 2001 for the electrical trades however, indicate that although the growth in demand and supply from 1998 was sustained over a protracted period, it could still be viewed as a noise.

The capacity indices for the different skill categories however, show a consistent under capacity with indices averaging a range between 0.4 – 0.8. In very many cases the indices closer to 0.8 reflect peaks that distort the stable trend. More recent indices closer to 2001 present a case of an exacerbating under-capacity across all the skills categories, notwithstanding the dramatic growth in numbers for the electrical trades.

The low indices across the various trade categories present a very strong case for improving the pre-examination activities for the different skills. This would call for a greater appreciation of the conditions that influence such inefficiency. More significantly, it would be useful to conduct a similar exercise for other countries, particularly, ones' that share a similar context to enable the Zambian construction industry to assess how it measures up.

## **7. Conclusion**

The future effectiveness of the construction industry in every country depends on the quality of the workforce it educates and trains. The analysis of the Zambian construction industry demand and supply of skills in the trade categories shows a gross under-capacity across the existing areas where training is offered. The demand supply analysis presents a method for evaluating the efficiency for developing and utilising skills in any industry or sector through the use of the skills capacity index (SCI). Such an index could also provide a basis for cross-industry comparative analysis.

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