Beyond the Tradition: Extending Quantity Surveying Services in the Zambian Mining Sector

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ABSTRACT AND KEYWORDS

Purpose
This paper investigates the service delivery of the quantity surveying profession in the Zambian mining sector.

Design/methodological approach
Literature on the quantity surveying profession and the Zambian mining sector were reviewed. A case study of the Konkola Deep Mining project (KMDP) was analysed and a combination of open-ended and closed-ended questions in self-administered questionnaires was used to establish the views of clients (mining owners), in-house design team(s), consulting designers and Professional quantity surveyors.
Findings

It was established that design consultants and in-house design teams were widely used on mining sector projects and the focus on correct engineering specification(s)/procurement procedures could only be achieved by using the services of a Quantity Surveyor. It was further established that there was a resistance by clients and the design team to engage the quantity surveyor purely based on a wrong perception of the projects being too mechanical with a deep sense of ‘engineering practice’. The lack of understanding the role of the Professional Quantity Surveyor (PQS) on mining sector projects reduced the likelihood of incorporating him to the project management team.

Research limitations/implications

The research was limited to mines on the Copperbelt Province of Zambia, with particularly emphasis on the Konkola Deep Mining Project (KDMP).

Practical implications

The study shows the importance of utilising Quantity Surveying Services in the mining sector such as value engineering and cost control.

Originality/value

The study adds to the body of knowledge on the use of quantity surveying services in the mining sector beyond the traditional roles. It aims at exploring other ways of adding value to the procurement of mining sector projects.

Key words:
Mining owners (clients), Mining Sector, Quantity Surveying Services, Professional Quantity Surveyor.

1. INTRODUCTION

The construction industry contributes significantly to the development of any economy and the same applies to Zambia. Although there has been a steady growth over the past two decades in Zambia, Ngulube (2009) points out that there is need for the quantity surveyor to be more competitive on the global construction market. However, the Zambian economy is also privileged to have a great contribution to the economy by the Mining sector. According to the Copper mining in Zambia overview (2010), the mining sec-
tor contributes just over 10% to the Gross Domestic Product (GDP), representing 80% of Zambia's export earnings. However despite this huge turnover through the procurement of large capital projects, the roles of the quantity surveyor have been overlooked.

Hanid et al (2007), observes that there has been considerable changes and challenges in the quantity surveying profession, to offer a more efficient service. Hanid et al (2007) identifies the challenges as, changes of the demand of the market, unstable economic condition in the construction industry as well as competition from other professionals. Diversification is therefore an essential tool to deal with these challenges in order to sustain the quantity surveying profession beyond the tradition by exploring other sectors to safeguard and sustain the long-term future of the profession. Ngulube (2009) further points out the traditional roles of the quantity surveyor as financial management, measurement and accounting on construction projects.

Kelly and Male (1993), suggests that the quantity surveyor can maximise the functional value of a project by managing its evolution and development from concept to completion, by the use of the comparative cost analysis and audit of all decisions against a value system determined by the client.

This paper gives a synopsis of the mining sector in Zambia with a view to underscore its importance and contribution to the nation’s economy. Quantity Surveying services that can be provided to the mines are then highlighted and further emphasised in a case study of one single largest capital investment in the Zambian mining sector. Thus, the need for utilising quantity surveying services in the mines is established and a questionnaire survey was conducted to establish the existing level of utilisation of quantity surveying services in the mines. The implications of non availability of these services in the mines are established and finally the respondents’ opinion about the need for quantity surveying services is also established before appropriate conclusions and recommendations are made.

2. GENERAL OVERVIEW OF THE ZAMBIAN MINING SECTOR

The mining sector is one of the most important sectors that contribute to the Zambian economy. In the year 2003 cobalt production increased with a turnover of 20% of the worlds cobalt supplies.

The Zambia mining (2010), reports that Zambia is internationally recognised as a major producer of copper and cobalt. Figure 1 shows Zambia’s contribution of refined copper to the world market and underlines the importance of the mining industry to both the nation and the world. In 1966, it was ranked as the world's seventh largest producer of copper, generating 3.8% of the western world’s production and world’s...
largest producer of cobalt at 21.8%. It also has significant quantities of selenium and silver together with minor gold and platinum mineral elements which are produced as important by-products of the copper mining and processing. With a contribution of just over 10% to the Gross Domestic Product (GDP), representing 80% of Zambia’s export earnings, the Zambian mining industry is the nation’s bread basket (Copper mining in Zambia overview 2010).

Figure 1: The Zambian share of world refined copper production

![Zambian Share of World Refined Copper Production](image)

Source: ICSG, IWCC

Source: Mining and the Economy (2010)

2.1 The contribution of the mining sector to the economy

Zambia’s reliance on the mining sector can be further seen from the sectors contribution to the total export earnings highlighted in figure 2. The mining sector contributed US$822 million to the total export earnings of US$1050 million in 1997 and, of this; US$798 was realised from sales of copper and cobalt. The balance of mining-sector earnings come from sales of gold,
silver, and selenium, mostly byproducts of copper mining, and from emerald sales.

The above statistics highlight the nation's reliance on the mining industry which sometimes makes it vulnerable to unfavourable market conditions of copper and cobalt. This vulnerability of Zambia's economy due to its reliance on copper mining has been exposed in the very recent past by the falling copper price and by falling production levels as a result of limited reinvestment in the mining industry. However, with reinforced future production of additional metals and minerals, there is no doubt that the mining industry will continue to provide both a sound base and a stimulus for growth in the other sectors of the economy, leading to long-term prosperity.

**Figure 2:** Contributions of industrial and manufacturing sectors to Zambian export earnings (Total Value = US $1050million)

Source: Mining and the Economy (2010)

**Figure 3:** Value of mineral sales in Zambia during 1997 (Total value = US $914million)

Source: Mining and the Economy (2010)
Thus the Zambian mining sector, being the nation's key economic force should therefore strive to be as efficient as possible in the implementation of its capital projects since they account for a considerable outlay of capital. One of the initiatives to achieve cost efficiency in the implementation of capital projects in the mines is to embrace the quantity surveying profession in order to foster financial management on all construction projects.

3. QUANTITY SURVEYING SERVICES PROVIDED IN THE MINING SECTOR

According to Virnave (2003), the successful implementation of a mining project for the recovery of economic mineral constituents requires a very good knowledge of the following aspects of modern technology for exploration, extraction and mining methods, the evaluation of projects, and standard industrial practice for the development of mining metallurgical projects.

Chileshe and Kulkani (1992) suggest the following activities for the procedure of carrying out mining operations:

i.) Prospecting or search of minerals
ii.) Exploration
iii.) Development and investment stage
iv.) Exploitation and operational stage
v.) Decommissioning and post operation stage.

According to Hartman (1987:98), all the physical facilities provided to operate a mine are referred to as mine plant. In all these operations there is need for the stringent measures to be taken in order to achieve value engineering hence the need for the Quantity surveying services.

According to Virnave (2003), once the decision to invest has been arrived at using an accepted financial criterion, flow sheets with corresponding material and energy balances are prepared. Furthermore, plant layouts, piping, instrument and electrical diagrams are prepared. In addition, structural and building sketches are drawn up and an estimate of capital and operating costs are then prepared alongside a feasibility study. The final engineering design of all plant and facilities is completed based on the conceptual and preliminary engineering designs previously prepared and these include; all the details of machines and equipment definitive layouts, piping design, instrument and control design, and electrical design. Final site design lay-out and structural, civil and architectural designs are also completed.

Once all the final engineering and architectural drawings, bills of quantities, specifications and other contract documents are ready, then the process of procurement can be formulated for the purpose of selecting a contractor who can translate the designs into the actual plant.
Hartman (1987:10) considers underground mining to be generally complex and very expensive while at the same time acknowledging the fact that surface mining necessitates a large capital investment but generally results in high productivity, low operating cost, and good safety conditions. The scope of works which has potential for the Professional Quantity Surveyor (PQS) penetrating the mining sector according to Hanid et al. (2007) can be split in two phases which are the technical and commercial roles.

3.1 Technical roles

3.1.1 Feasibility Studies

The PQS will be responsible to perform detailed feasibility study schemes in order to draw up the most suitable plan consistent with the company’s corporate objectives.

3.1.2 Health, Safety and the Environment (HSE)

The PQS will plan, implement and execute HSE processes and activities in relation to HSE standards, policies and guidelines.

3.1.3 Project Construction Management

The PQS will among other duties plan, lead and execute projects from feasibility stage, evaluation and supervision in relation to planned cost and programme schedules.

3.2 Commercial roles

3.2.1 Cost Engineering and Estimating

This role will provide cost engineering services for the development of total cost estimates and cost analysis required for budget forecasts, preparing of bills of quantities, pre-tender estimate and cost control.
3.2.2 Commercial Management and procurement

To manage all aspects of the contracting activities in order to ensure that all requisitions and commercial evaluations are carried out effectively and efficiently. The Engineering Procurement Construction Management (EPCM) procurement system can thus be applied through the services of the Quantity Surveyor.

3.2.3 Finance accounting and forensic auditing

Plan and execute the daily financial accounting which will comprise of subsequent forensic auditing and cash flow forecasting.

4. CASE STUDY- KONKOLA DEEP MINING PROJECT (KDMP)

The Konkola Deep Mining Project (KDMP) was aimed at expanding the production of copper ore at Konkola Mine from 2 million tonnes per annum to 7.5 million tonnes per annum by accessing the rich ore body that lies beneath what the current operations have been exploiting (KCM, 2010). This project would extend the life of Konkola Mine by 23 years. This involved the sinking of a new mine shaft to the depth of 1,490 metres, the deepest new shaft sinking project in Africa. In addition, the project involved the deepening of existing, sinking of three new ventilation shafts, one de-watering shaft and the construction of a new pump chamber.

Alongside the KDMP, a modern concentrator was built to handle the additional ore that would be produced at Konkola. The concentrator will treat 6 million tonnes of ore per annum. The Development of the KDMP, the concentrator and the new smelter is one of only three such plants in the whole world. The commissioning of the KDMP was a signpost to a future loaded with exciting opportunities for growth. According KCM (2010), it deemed the project to be a success and thanked the many contractors (local and foreign), employees and the Government for their support during the development of the project. The Shaft sinking and construction activities was executed by Grinaker-LTA Mining. It was projected that this project would give KCM access to the ore reserves at a depth of 1,350m and is expected to significantly increase the life of the mine to beyond 2030. Phase 2 of the project would see the continued development of its new shaft complex to the design depth of 1,500m. TWP (2010), a multi-disciplinary engineering consulting firm, concluded that the achievement of this project is a culmination of four years of preparatory work including the design and overall project management through the EPCM procurement contract. TWP (2010) further suggests that in order for a mining project to
achieve overall success, the PQS will play a vital and pivotal role to ensure that the cost budget estimates are monitored at every stage.

Plate 1: Konkola Deep Mining Project (KDMP)

5. METHODOLOGY

A combination of primary and secondary data was used as part of the empirical findings process. For primary data, a combination of open-ended and closed-ended questions as part of a self-administered questionnaire was used to collect data from clients (mining owners), designers and contractors. Additionally, informal interviews were conducted with public and private sector clients, designers and contractors. Similar opinions relative to
open-ended questions were grouped together and captured using Microsoft Excel. The contractors and consultants were selected on the basis of mining owners’ register(s), while the professional bodies on the basis of them being custodians/overseers of the construction industry in Zambia. Additionally, secondary data was obtained from existing sources as well as the KDMP case study.

5.1 Findings

5.1.1 Utilisation of Quantity surveying services

100% of the respondents from PQS firms considered the utilisation of quantity surveying services in the mines to be low and attributed this to lack of knowledge about quantity surveying in the mines, hence the engagement of engineers. Similarly, all the contractors (100%), were of the view that the services are lowly utilised and they singled out the contracts departments which where key in the preparation of contract documents and awarding of contracts as being the most affected departments. 82% of design consultants said that the utilisation of these services in the mines was low while 18% regarded it to be very low. 83% of the construction professional bodies looked at the utilisation levels to be poor, only 17% concluded that it was good.

5.1.2 Implications of Non-Availability of Quantity Surveyors in the Mines

98% of the mining owners' capital project managers agreed that they were faced with site project management problems. An open-ended question was posed to the capital project managers to outline the problems faced; the major ones highlighted by different respondents were:

- Knowledge management was neglected in the sense of information flow.
- 100% of the respondents pointed out budgeting problems due to underestimating of the project value by the in-house design team leading to budget and cost over-run.
- Over-pricing of the contract value by the contractors without the design team noticing the significant differences.
- Over-claiming of the works done by the contractors due to the use of non-detailed specifications and bills of quantities.

On the other hand, 100% of the contractors also said that they faced problems on mining projects such as:

- failure by the in-house project team to understand contractual obligations;
- failure to reconcile claims, hence honouring the payments at a later date outside the jurisdiction of the contract;
5.1.3 The Need for Quantity Surveying Services in the Zambian Mines

80% of the mining companies interviewed were fully aware of the services offered by the PQS and indicated that such services were offered by engineers whose services they considered to be satisfactory. 67% of the project engineers were of the view that they did not see the need for quantity surveyors, while 33% thought otherwise and appreciated the skills of the PQS such as financial management, contract management and detailed cost budget estimates. Figure 3 shows an indication of copper production in the world. Zambia stands out to be the eighth largest producer with a turnover of over half a million tonnes of copper. This can therefore represent the amount of construction projects undertaken, which then translates in the inevitable use of quantity surveying services for mining sector projects.

Figure 4: Copper Mining production in the World
6. DISCUSSION AND CONCLUSION

The findings clearly suggest that the implementations of quantity surveying services in the mining sector are without a doubt evidently required. 80% of the mining companies and contractors interviewed agreed that quantity surveyors must be employed on mining projects. Furthermore, it was evident that with the unique skills of the PQS, a mining project will achieve the much desired milestones according to TWP (2010).

The potential services/roles which can be offered by the PQS were categorised as technical and commercial as detailed in table 1.

Table 1: Category of services offered by the PQS in the mining Sector

<table>
<thead>
<tr>
<th>Category of services</th>
<th>Preliminary</th>
<th>Pre-contract</th>
<th>Post contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical role(s)</td>
<td>Feasibility studies</td>
<td>Health safety and the environment.</td>
<td>Project, Construction management</td>
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</table>

The need for quantity surveying services world over cannot be overemphasised, and the Zambian mining sector cannot be an exceptional to this phenomenon. The benefits of utilising the quantity surveyor are cumulative and vary from project to project, and ultimately outweigh the cost of paying professional quantity surveying fees by the client.

7. RECOMMENDATION

The potential improvement of project performance through cost control is attainable by financial management. Engineering consultants should advice the mining owners about the utilisation of quantity surveying services which not only would improve cost, quality and time but also the overall project success. The adoption of the Engineering, Procurement, Construction Management (EPCM) procurement contract, according to Loots and Henchie (2007:8) is a viable procurement route for international infrastructure and major construction projects. The role of the PQS who’s not necessarily the constructor, will be to advise the owner on the strategy of procurement and implementation of the strategy.
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