Transaction Costs in the Mining Sector in South Africa

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Abstract

The present research identified transaction costs in the mining sector in South Africa and provided means for mitigation. A review, discussion and evaluation of theories related to transaction costs such as vertical integration, outsourcing, price, long and short terms contracts was undertaken under literature review.

A qualitative study, with two research questions, on eight companies of which four precious metals and minerals, two metallic minerals and two non-metallic minerals, was performed and provided among other results:

- Cost of doing business in South Africa is high.
- Site specificity and physical-asset specificity are the most influential specialised investments in the mining sector.
- Long term contracts are the most appropriate to mitigate transaction costs.
- Costly bargaining is the most important implication for all specialised investments.
- Exchange rates, Mining Charter, BEE, legislation, taxes, royalties, fuel and electricity increases are cited as reasons for high transaction costs.
- The small sample is a big concern as it does not allow generalising the results to over all mining companies.

The South Africa's government, as a regulator and a major stakeholder should revisit the mining charter and therefore the B-BBEE act as this clearly appeared to be a barrier to the development of mining companies.

Keywords

Transaction costs, Economics of organisation, Vertical integration, Price discrimination and outsourcing.

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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09 November 2011

Acknowledgements

Therefore I say unto you, What things soever ye desire, when ye pray, believe that ye receive them, and ye shall have them (Mark11:24).

Wherever there is success, there has to be failure. Success does not come to those who sit and wait (anonymous).

I gratefully acknowledge my supervisor, Mr. Mike Holland, for his support, assistance and guidance during the present research.

Many thanks with tears of love and joy to you my children, Ngoba, Mwamba, Mujinga and Ngala, pillar of my strength, whose support made it possible. I fall short of words, your prayers felt and sounded all the way, and let us hope for a better future living.

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CHAPTER 1: INTRODUCTION TO RESEARCH PROBLEM

The purpose of the present research is about identifying transaction costs in the mining sector in South Africa and how to mitigate them. These costs have attributes which create problems or contractual hazards. Possible problems or contractual hazards are: costly bargaining, opportunism and the "hold up problem".

Therefore making a relation between these costs, their attributes (asset specificity, frequency, uncertainty, bounded rationality and opportunism) and possible problems is central to this project. There is also a need to make a relation between these costs and the means (spot market, other contractual arrangements or vertical integration) to mitigate them.

Hence align transaction costs and governance structures (the means) according to the logic of Transaction Cost Economic as developed later in this paper is of paramount. "Selecting appropriate governance structures that efficiently mitigate the contractual hazards allow firms to economise on these transaction costs."(Raynaud *et al,* 2009, p.842)

1.1 BACKGROUND

South Africa has well-established mining companies at international level with precious metals, metallic and non-metallic minerals of high quality.

Mining in South Africa is considered as the most powerful source of industrial development of the country. South Africa has rich mineral resources and is best known as one of the world's leading raw material exporters.

Most of the country's industries have developed around the mining. South Africa possess some of the most expensive and valuable raw materials such as gold, platinum and diamond. Other minerals include chromium, manganese, uranium, vanadium, coal and iron ore. As far as mining and the volume of the export is concerned, South Africa stands in number one position for the production of platinum, chromium, manganese and vanadium (www.mapsofworld.com).

South Africa has enormous reserves of Chrome, Gold, Vanadium, Manganese, and Precious Gems and Metals. The majority of Africa's metals and minerals are produced here. This has allowed South Africa to establish itself as a world leader in mining and exploration. The mining industry in South Africa has seen significant restructuring and changes since early 1990's. Mining now employs well over 500,000 people in nearly 700 mines.

> Mergers, acquisitions, foreign listings, and unbundling have been the focus of restructuring changes. These changes were a direct result of political policy changes with the advent of the democratic constitution, the rising of traditional costs affecting marketing shares globally, and the need to correct the inherent economic disparity between blacks and whites promote under Apartheid (www.ussas.com).

These mining companies are successful and contribute positively to South Africa's economy. They constitute an important source of revenues and capital inflow for the country since over 50 % of the production is exported. They symbolise the thrust of South Africa's economy on the Johannesburg Stock Exchange (JSE).

> In 2009 the South African Mining industry contributed about 19% of GDP (8.8% directly); over 50% of merchandise exports (if secondary beneficiated mineral exports are added); about one million of jobs (about 500 000 jobs indirectly); about 18% of gross investment (10% directly); approximately 30% of capital inflows into economy via the financial account of the balance of payments; about a third of the market capitalization of the JSE (Chamber of mines annual report 2009/2010, p.2).

"Not only does the mining sector use considerable services and inputs from domestic economy, it also supplies many associated industries that use mining products to keep the wheels of South African moving." (Chamber of Mines annual report 2009/2010, p.3)

1.2 RESEARCH PROBLEM AND OBJECTIVES

The problems around the mining sector with regards to its transaction costs, the implications for business in terms of profitability and management of inherent issues are the object of the present research. In fact; at the core are the transaction costs identification and mitigation in mining companies. For the purpose of the project production costs are excluded; everyone knows about production costs and how to control them. Profitability depends on costs and costs determine profit. Therefore; the research concentrates on transaction costs and its impact on the total cost.

A look at the preferential procurement, its impact on transaction costs, as one of the areas the Mining Charter attempts to address is envisaged.

"The benefits of complying with the Charter include access to government funding and preferential procurement status for public procurement contracts." (www.fasken.com)

According to Williamson, transaction occurs:

> When a good or service is transferred across a technologically separate interface. One stage of activity terminates and another begins. With a well-working interface, as with a well-working machine, these transfers occur smoothly. In mechanical systems we look for frictions: Do the gears mesh, are the parts lubricated, is there needless slippage or other loss of energy? The economy counterparty of friction is transaction cost.

> Do the parties to the exchange operate harmoniously, or are there frequent misunderstandings and conflicts that lead to delays, breakdowns and other malfunctions. Transaction cost analysis supplants the usual preoccupation with technology and steady-state production (or distribution) expenses with an examination of the comparative costs of planning, adapting, and monitoring task completion under alternative governance structures (Williamson, 1985, pp.1-2).

The definition in the foregoing paragraph shows how broad the concept of transaction cost is. In this paper the topic is narrowed to market exchange with other parties. Each time the concept of transaction cost is used it refers to the capital and operational expenditures in mining companies.

"Clearly, the existence of the different forms of transacting adds further complications and dynamics to the definition of the concept of transaction costs." (Musole, 2009, p.48)

"For transaction cost economising purposes, the critical dimensions of transactions are complexity, the condition of asset specificity, and the disturbances to which a transaction is subject." (Williamson, 2009, pp.463-464)

The present study considers three types of companies in the mining industry:

1. Precious metals and minerals
2. Metallic minerals
3. Non-metallic minerals

These companies may act as buyers or/and suppliers in the supply chain. Thus certain forces which have an effect on transaction and production costs as a result of different activities within companies occur. These costs may have a negative impact in determining the profitability of the business and their reduction can enhance competitiveness.

Therefore, it is essential to look at the idiosyncratic requirements of each type of companies, the list of items (equipments, raw materials, and the like) used, inherent transactions, where contracts come in and where they do not, why they are different, the risks and how to mitigate them. It is also interesting to note how these costs vary amongst different types of companies.

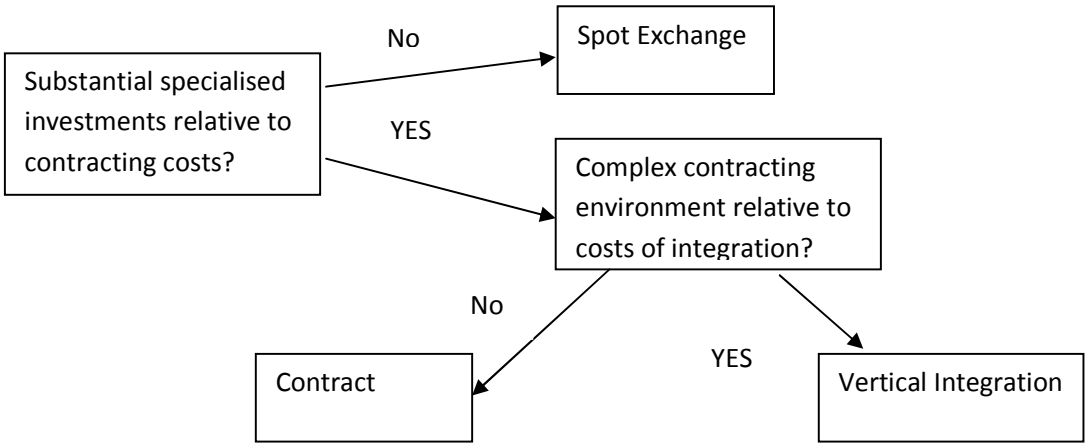
Therefore identifying what transaction costs and associated problems are, and how to mitigate them are two important questions for the research.

A compensation study encompassing short and long term contracts plus risks will be undertaken. In fact, in the coordination of the supply chain to minimise cost as depicted by figure 1 below, a firm can choose amongst different methods: Spot Exchange, short and long term Contracts, Strategic Alliances, Join Venture, and Vertical Integration. However; a choice of method depends, in part, on specialised investments made by the company.

These investments and their implications which are central to the transaction costs economics will be considered with regards to how they can influence transaction costs.

Specialised investments include site specificity, physical-asset specificity, dedicated asset and human capital which are covered in detailed under literature review. Their implications are: costly bargaining, opportunism and the "hold up problem".

Figure 1: Optimal Procurements of Inputs (Baye, 2009, p.217)



With regards to the South African environment the study takes into account the effect of regulations, the cost of doing business in South Africa and the BEE in the supply chain as this can negatively impact on margins and lead to the hold up problem.

The guiding principle of preferential procurement states:

> Our principle is to accelerate procurement from black-owned and /or, empowered enterprises and/or good contributors to B-BBEE with the main objective of growing existing or emerging entrepreneurs to produce value-added goods and services for the industry and increase employment as well as allowing for the creation of new business (Government gazette No 31744, 2008, pp 170-171).

Another point to explore is the comparison between established and BEE companies with regards to their transactions. The assumption here is that the level of transaction costs may be a barrier of entry in the mining sector to BEE companies.

1.3 NEED FOR THE RESEARCH

The need for the research is fourfold:

1. Personal motivation and interest of the researcher on the topic.

2. The position of South Africa in emerging markets.

3. The “lack” of documentation on the topic to the best of the author’s knowledge.

4. The cost of transacting is the key economic factor to economic performance.

> In order to start the debate on the relevance of the New Institutional Economics for agricultural policy research in developing countries it is appropriate to refer the following paragraph from North (2000). The cost of transacting, to put it in it bluntest form, is the key economic performance. When I go to third world countries and look at why they perform badly and examine how factor and product markets are really working, in every case, be it capital, labour or product markets, one observes that the cost of transacting is high. The cost of transacting is so costly for human beings to interact and engage in various kinds of economic activity that result is poor performance and poverty and so on. Where this takes us, of course, is to try to understand why the cost of transacting is so high (Kherallah & Kirsten, 2002, pp. 118-119).

The researcher who is an electrical engineer has spent 8 years of his career in a diamond mining company in the central region of the Democratic Republic of the Congo. Consequently, the increasing rate of South Africa's mining companies in the South of DRC has attracted his attention. "By the early 2000s, South African mining and industrial corporations, financial institutions and even some medium-sized enterprises have once asserted their role as a dominant force in the SADC region." (Miller et *al*., 2008)

Given that South Africa is a gateway for new investors in Africa and thereby in the DRC, and given that its international exposure in the mining sector is established, a comprehensive understanding of transaction costs in the mining sector and underpinning factors that influence them can help predict what can happen in the same sector in other African countries.

Therefore, it is important to have the view point as to advise companies in the mining sector on how transaction costs can affect their businesses and impact on their performance and development. This understanding and its implications will enable the researcher to gain more learning and insight given his experience and interest in the mining sector. The researcher's aim is to operate and conduct business in the emerging markets that create challenges and opportunities for developed economies.

"Large multinational corporations from developed economies seek to enter emerging economies such as Brazil, Russia, India, and China (BRIC) because they are among the fastest-growing economies in the world." (Ireland *et al*., 2011, p.172)

In emerging economies, Multinationals are provided with natural resources, low-cost labour and markets and thus gain advantage and operate in a profitable environment. The DRC for example is one of the "geological scandal" countries. One better asks what mineral DRC doesn't have rather than what minerals it does have. In fact the DRC is a field of various minerals reserve.

South Africa is well known for its potential mineral reserves that give explanation for its world position and motivate the researcher to understand transaction costs in the mining sector and how to duplicate them in other African countries.

> South Africa is one of the world's and Africa's most important mining countries in terms of the variety and quantity of minerals produced. It has the world's largest reserves of chrome, gold, vanadium, manganese and PGM's. South Africa is the leading producer for nearly all of Africa's metals and minerals production apart from diamonds (Botswana and the DRC), uranium (Niger), copper and cobalt (Zambia and the DRC) and phosphates (Morocco) (www.mbendi.com).
>
> It is estimated that South Africa holds 80% of the world's known manganese reserves as well as 72% of the world's known chromite ore reserves. In 2005 South Africa was found to be the ninth-largest producer of aluminum, the largest producer of alumino-silicates, chrome ore and ferro-chromium. South Africa was also found to be the second-largest producer of manganese ore and the ninth-largest producer of nickel in the same year (www.mbendi.com).

With such an important mining industry; there is a need to understand incurred transaction costs and to pose this simple question: "what is happening there with regards to capital and operational expenditures".

The next section reviews the literature on transaction costs, vertical integration, price, long and short term contracts. All these concepts are closely related to transaction costs.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The objective of this section is to discuss and evaluate theories related to transaction costs and their importance in the coordination of the supply chain. These concepts are:

1. Transaction costs
2. Vertical integration and outsourcing
3. Price
4. Switching costs, Long and short term contracts

A review of these concepts is discussed with the transaction costs theory as a cornerstone. Given the complications and dynamics of the definition of the concept of transaction costs as stated earlier, a review of the concept and paradigm shifts in the discipline is envisaged since the concept dates back over 80 years through seminal studies.

2.2 TRANSACTION COSTS

The best place to start is to define a transaction. What is then a transaction?

Transaction may be defined as a set of separable activities that can be undertaken within or outside of the company and they are central to the economics on local and international levels.

Benham and Benham (2001) looked at the literature and came up with few definitions that can help understand the concept of transaction costs.

> Many different definitions of transaction costs appear in the literature. They often serve as heuristic devices that are not used actually to measure transaction costs. These definitions offer powerful conceptual insights, but they have not been translated into widely accepted operational standards. Kenneth Arrow has defined transaction costs as the "costs of running the economic system." YoramBarzel defines transaction costs as ''the costs associated with the transfer, capture, and protection of rights." ThrainnEggertsson observes, "In general terms, transaction costs are the costs that arise when individuals exchange ownership rights to economic assets and enforce their exclusive rights. A clear-cut definition of transaction costs does not exist, but neither are the costs of production in the neoclassical model well defined" (Benham & Benham, 2002, p.2).

Another attempt of definitions was provided by Allen (1999) who tried to simplify the meaning of the term.

> Few words in the economics language have been more abused or fought over and this is shown to result from the emergence of two distinct definitions and uses. The 'Neoclassical' definition rests on the costs of trading across a market, while the 'property rights' definition centers on the costs of establishing and enforcing property rights (Allen, 1999, p.893).

"Transaction cost may be defined as the cost of exchanging ownership titles." (Demsetz, 1968, p.35)

> Of course, the existence of positive transacting cost has no direct relevance to economic inefficiencies. As with any cost, the question that is relevant for efficiency is whether or not the cost is appropriately economised. In some cases it will be efficient to have markets in which negotiations are carried forth to bring costs and benefits to bear on economic decisions units. The value of realigning resources as a result of such negotiations is expected to worth the cost of transacting. In other cases it will be efficient not to negotiate; in a world of positive transacting cost some external and monopoly effects are consistent with efficiency (Demsetz, 1968, p.33-34).

With regards to efficient alignment Williamson states that:

> Transaction costs economics appeals to the efficient alignment hypothesis to predict which transactions go where-to witch transactions, which differ in their attributes, are aligned with governance structures, which differ in their cost and competencies, so as to effect a (mainly) transaction cost economising outcome (Williamson, 2009, p.465).

Furubotn and Richter (1997) in their endeavour to give a comprehensive definition of transaction costs declare that:

> Transaction costs include the costs of resources utilised for the creation, maintenance, use, change, and soon of institutions and organisation.

When considered in relation to existing property and the contracts rights, transaction costs consist of the costs of defining and measuring resources or claims, plus the costs of utilising and enforcing the rights specified.

Applied to transfer of existing property rights and the establishment or transfer of contract rights between individuals (or legal entities), transaction costs include the costs of information, negotiation, and enforcement (Furubotn & Richter, 1997, p.40).

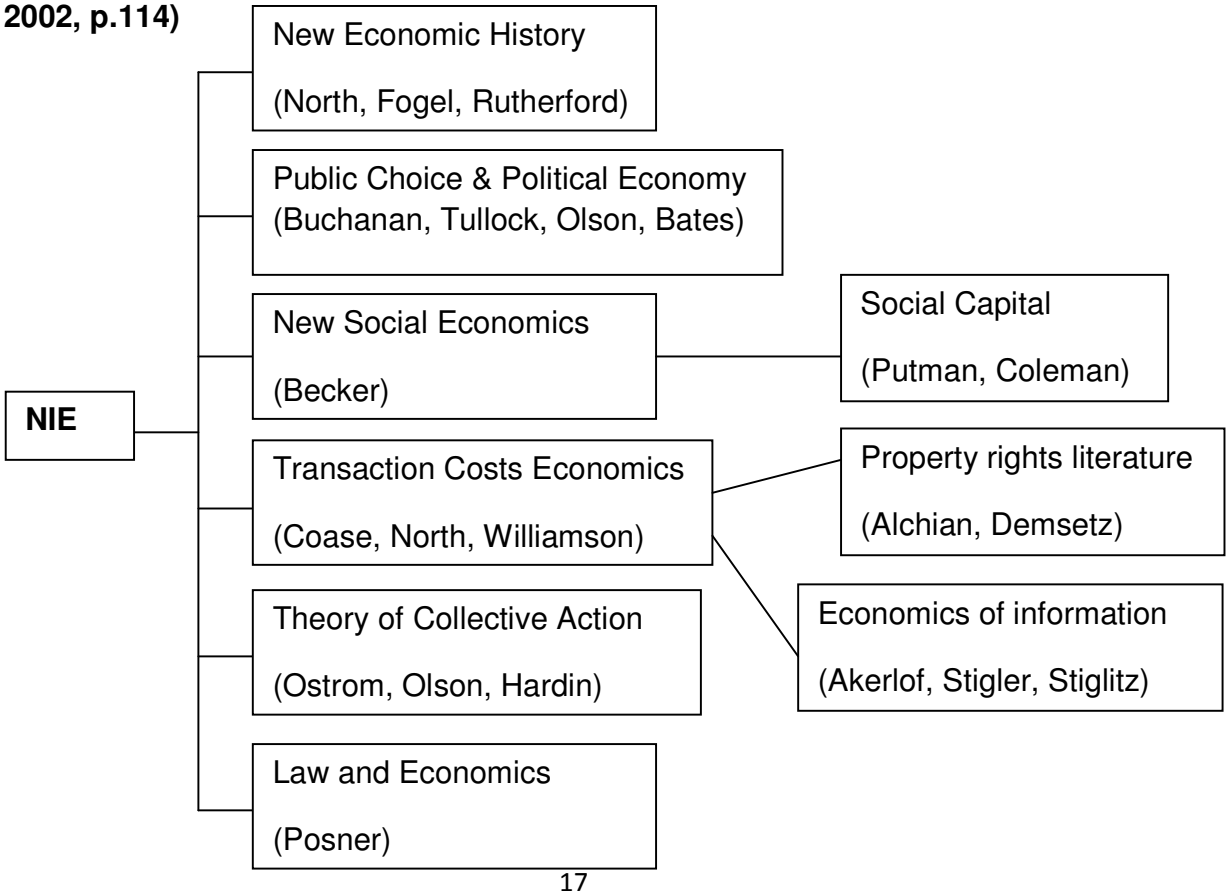
Transaction cost economics traces its origins to seminal contributions in law, economics, and organization that were made in the 1930's. Leading economic contributions were made by Commons (1934) and Coase (1937). Llewellyn (1931) added the legal insights, and Barnard (1938) offered an organisation theory perspective (Williamson, 1989, p.137).

The research project on which I and others have been working has been variously described as the "economics of governance," the "economics of organisation," and "transaction cost economics". Governance is the overarching concept and transaction cost economics is the means by which to breathe operational content into governance and organization. The specific issue that drew me into this research project was the puzzle posed by Ronald Coase in 1937: What efficiency factors determine when a firm produces a good or service to its own needs rather than outsource (Williamson, 2009, p455)?

The researcher's understanding of the concept "Transaction cost" is based on the definition of Transaction Cost Economics by Williamson of which uncertainty and frequency are additional dimensions.

> Transaction costs economics is a branch of the New Institutional Economics (figure 2) which considers that the cost of transacting, one of the determinant of development and performance, depends on institutions and governance structures. "The New Institutional Economics is a large and relatively new multidisciplinary field that includes aspects of economics, history, sociology, political science, business organisation and law" (Kherallah& Kirsten, 2002, p.110).

Figure 2: Branches of the New Institutional Economics (Kherallah& Kirsten, 2002, p.114)



> Adam Smith explained that the productivity of the economic system depends on specialisation (he says the division of labour), but specialisation is only possible if there is exchange and the lower the costs of exchange (transaction costs if you will), the more specialisation there will be and the greater the productivity of the system. But the costs of exchange depend on the institutions of a country: its legal system, its political system, its educational system, its culture, and so on. In effect it is the institutions that govern the performance of an economy, and it is this that gives the "new institutional economics "its importance for economists (Coase, 1998, p.73).
>
> Ronald Coase is considered and he is well known as the leader on the New Institutional Economics. "It is commonly said, and it may be true, that the new institutional economics started with my article, The Nature of the Firm, 1937 with its explicit introduction of transaction costs into economic analysis." (Coase, 1998, p.72)

"The phrase, 'the new institutional economics,' was coined by Olivier Williamson. It was to differentiate the subject from the 'old institutional economics'." (Coase, 1998, p.72)

The principal dimensions on which transaction costs economics presently relies for purposes of describing transactions are:

1. The frequency with which they recur,
2. The degree and type of uncertainty to which they are subject, and
3. The condition of asset specificity (Williamson, 1989, p.142).

"Transaction cost analysis entails an examination of the comparative costs of planning, adapting and monitoring task completion under alternative governance structures." (Williamson, 1989, p.142)

> The costs of coordination within a firm and the level of transaction costs that it faces are affected by its ability to purchase inputs from other firms, and their ability to supply these inputs depend in part on their costs of coordination and the level of transaction costs that they face which are similarly affected by what these are in still other firms (Coase, 1998, p.73).

"Transaction costs are the full cost of providing products or services including negotiating, monitoring and enforcing the contractual agreement." (McCarthy & Anagnostou, 2004, p. 64)

Transaction costs include:

1. The cost of searching for a supplier willing to sell a given input.
2. The costs of negotiating a price at which the input will be purchased. These costs may be in terms of opportunity cost time, legal fees, and so forth.
3. Other investments and expenditures required to facilitate exchange (Baye, 2009, p.207).

> Transaction costs may be direct or indirect. Direct costs include legal fees and charges from investment bankers who complete due diligence for the acquiring firm. Indirect costs include managerial time to evaluate target firms and then to complete negotiations, as well as the loss of key managers and employees following an acquisition (Ireland *et al.,* 2011, p.181).

The common characteristics of these definitions, the 'neoclassical' and the 'property rights' are: incomplete contracts (bounded rationality), asset specificity and opportunistic problems (self-interest).

> While all participants are rational, they don't have perfect information and they always know more about themselves than about others. A rational firm anticipates that, to the extent uncertainty exists, everyone in the market will try to use new situations to their own advantage, itself included (Hovenkamp, 2010, p.9).

Before elaborating on governance structures and organising transaction it is important to go through various critiques of transaction cost economics and see how this theory has been discussed and challenged over years.

Foss and Klein (2005) looked at the literature, reviewed and assessed critiques on transaction cost economics in their article: "The theory of the firm and its critics: A Stocktaking and Assessment". These critiques are based on fundamental characteristics of transactions cost economics.

For the purpose of the research only critiques with regards to behavioral issues (bounded rationality and motivation) have be reviewed.

Bounded rationality

> However, the role of bounded rationality in Williamson's work is mainly to provide a reason why contracts are incomplete. It is a sort of background assumption that while necessary, never really assumes a central role.
>
> Indeed, many critics have observed that to the extent that bounded rationality enters the theory of the firm, it is rather 'thin' forms (e.g., Macleod 2000; Foss 2003). The reason is presumably that the theory is taken up with comparative institutional exercises, focusing on transaction economizing, and hence has no room for the process aspects introduced by more substantive notions of bounded rationality (e.g., Furubotn 2002) (Foss & Klein, 2005, p.7).

Still, even the rather limited use of bounded rationality in the theory of the firm has been criticised. Hart (1990) argues that bounded rationality may not be necessary at all, because asymmetric information (in the form of imperfect verifiability) can do the job that bounded rationality is supposed to do, and can do so more elegantly and more consistently with mainstream modeling (see also Posner, 1993). From a different position, Dow (1987) argues that it is inconsistent to invoke bounded rationality as a necessary assumption in the analysis of contracts and governance structures, and then assume that substantively rational choices can be made with respect to the contracts and governance structures (that are imperfect because of bounded rationality) (Foss & Klein, 2005, p.7).

Motivation

While the role of bounded rationality in the theory of the firm has given rise to a fair amount of the debate, it is nothing compared to the enormous amount of critical writings on the motivational assumptions. Opportunism is particular seems to be the favorite *bête noire*.

The critique of opportunism takes various forms. Empirically, the relevance of opportunism is dismissed by pointing to difficulty in observing it, for instance in industrial networks or in long-term associations between firms and their suppliers (see, e.g., Hakansson and Snehota 1990). The obvious problem with such arguments is that they misunderstand the counterfactual nature of reasoning in the theory of the firm:

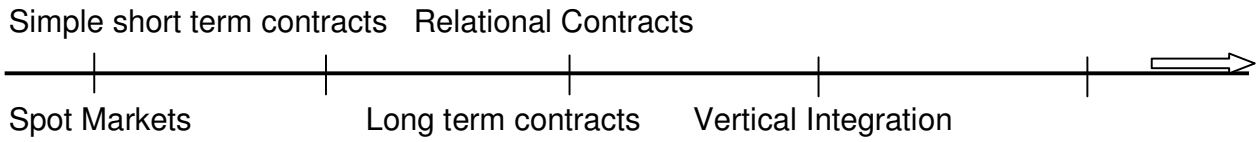
> Opportunistic behavior is seldom observed because governance structures are chosen to mitigate opportunism (Foss & Klein, 2005, p.8).
>
> According to a more recent and more sophisticated set of arguments, the primary problem with the treatment of motivation in the theory of the firm is not opportunism *per se*, but rather that modern economic approaches assume that all motivation is of the "intrinsic" type (Ghoshal) and Moran 1996; Osterloh and Frey 2000). In other words, all behavior is understood in terms of encouragement from an external force, such as the expectance of a monetary reward. (In contrast, when "intrinsically" motivated, individuals wish to undertake a task for its own sake).
>
> These arguments do not necessarily deny the reality of opportunism, moral hazard, and so on; they assert instead that there are other, better ways of handling these problems besides providing monetary incentives, sanctions, and monitoring. The arguments are often based on social psychology (notably Deci and Ryan 1985) and on experimental economics (e.g., Fehr and Gachter 2000) (Foss & Klein, 2005, pp.8-9).

These limited critiques have shown how large and multidisciplinary field the New Institutional Economics is. Sociologists, heterodox economist, management scholars and others from different horizons have made views to what Williamson tried to answer:

> Transaction cost economics is sometimes criticised because it has been fully formalised, to which I have three responses: transaction cost economics, like many other theories, has undergone a natural progressions; full formalisation is a work-in-progress; and premature formalisation runs the risk of a disconnection with the phenomena (Williamson, 2009, p471).

Turning back then to the notions of governance structures and organising transactions, the optimal procurements of inputs depicted in figure 1 can be enhanced with contracts and therefore lead to following spectrum or typology of governance structures:

Figure 3: Spectrum or typology of governance structures.



Using the same typology, Raynaud (2009), put it in a comprehensive way.

> We based our description of governance modes in supply chains on the well-known typology provided by the TCE that distinguishes between market, hybrid, and hierarchical governance (Williamson, 1991). This typology describes and ranks the different bilateral governance structures.

> As we move away from the spot market, control over a transaction becomes greater; thanks to the changes in the main coordination device (from price to hierarchy) and related governance instruments (incentive and control mechanisms). For each transaction within the supply chain, we thus looked at the type of contractual relations. However, we dig deeper in the governance design by looking more closely at some specific governance mechanisms (Raynaud *et al.,* 2009, p.846).

The characteristics of transactions can affect transaction costs. Some goods and services can be produced more efficiently if one invests in the "transaction-specific" assets.

"Whatever the particulars, the basic regularity that is associated with transactions that are supported by investments in specific assets is these assets cannot be redeployed to alternative uses and users without loss of productive value" (Williamson, 2009, p464)

Subsequently this investment in specific assets leads to costly bargaining, opportunism and the 'hold up problem'. Asset specificity can take many forms.

Without purporting to be exhaustive, asset specificity distinctions of five kinds have been made:

1. Site specificity, as where successive stations are located in a cheek-by-jowl relation to each other so as to economise on inventory and transportation expenses;

2. Physical asset specificity, such as specialised dies that are required to produce a component;
3. Human asset specificity that arises in a learning –by-doing fashion;
4. Dedicated assets, which are discrete investments in general purpose plant that are made at the behest of particular customer; and
5. Brand name capital. (Williamson, 1989, p.143)

Extremely related to transaction cost is the theory of vertical integration. It is reviewed in the next section along with the concept of outsourcing.

2.3 VERTICAL INTEGRATION AND OUTSOURCING

The importance of transaction costs often dictates the governance structure. "The general hypothesis of the strand of the NIE is that institutions are transaction cost-minimising arrangements that may change and evolve with changes in the nature and sources of transaction costs." (Kherallah & Kirsten, 2002, p.116)

Vertical integration may be foreseen as one of the governance structures used by companies, particularly large one to mitigate the nature and sources of their transaction costs.

> Vertical integration is favored when the benefits of mitigating opportunism problems that may arise as a consequence of specific investments are greater than the costs of other sources static and dynamic inefficiency that may associated with resource allocation within bureaucratic organizations that may emerge as a consequence of vertical integration (Joskow, 2010, p.27).

"Lower transaction costs mean more trade, greater specialisation, changes in production costs, and increased output. Changes in production costs likewise have an impact on transaction costs." (Benham & Benham, 2002, p.3)

"Vertical integration encourages specific investments and reduces hold up problems when markets are imperfect. According to TCE, vertical integration should therefore be more prevalent when it is harder to write long-term contracts between upstream and downstream firms." (Acemoglu *et al.,* 2009, p.1251)

> Intuitively, severe contract enforcement problems make vertical integration more likely, but suppliers will only be able to acquire producers if they can raise enough finance. Thus, some degree of financial development combined with weak contracting institutions is conducive to greater vertical integration (Acemoglu *et al.,* 2009, p.1262).

Like in the case of transaction costs, there is no unique definition or theory of vertical integration.

> I want to emphasize at the outset that there is not and will never be one unified theory of vertical integration. Moreover, while some of the literature on vertical integration continues to focus on a sharp dichotomy between the decision to "make" internally or "buy" through the market, work by Williamson and others working in transaction cost economics tradition that he pioneered, teaches us that in reality these two governance arrangements are polar cases (Joskow, 2010, p.3).
>
> Transaction cost-based theories of vertical integration pioneered by Olivier Williamson focus on the implications of incomplete contracts, asset specificity, information imperfections, incentives for opportunistic behaviour and the costs and benefits of internal organisation. These theories focus on efforts by firms to mitigate transactions costs and various contractualhazardsthat may arise with anonymous spot market transactions by choosing among alternative organisational and contractual governance arrangements that can reduce these costs (Joskow, 2010, p.1).

To decide upon appropriate governance structure, one needs to understand the incurred costs, their level and impact on the business. That is the cost perspective concept expressed by Transaction costs Economics. "We can never have a complete explanation of organisational form without attending to the transaction-cost (asymmetric-information) problems those forms help solve." (Langlois, 2004, p.11)

According to Adamantia (2009) it is worth noting that there are two perspectives, the cost perspective and the resource perspective. However as already pointed out above, the researcher understanding of transaction costs and related concepts are based on the Transaction Costs Economics theory by Williamson. Thus the cost perspective prevails.

> Both the above perspectives follow assumption of bounded rationality. A direct implication of this assumption is that managers cannot write complete contracts, and thus cannot make accurate estimations on the future value of an alliance. As result, governance choices are made based on estimation of current value to be gained (resource perspective) and on risks to be avoided due to uncertainty (cost perspective) (Adamantia, 2009, p.247).

“The motives for vertical integration may be classified into four major categories. Transaction costs considerations, Strategic considerations, Output and /or input price advantages, and Uncertainties in costs and/or prices.” (Mahoney, 1992, p.560)

> Under this scenario, the vertically integrated firm arises because it can more cheaply redirect, coordinate, and where necessary create the capabilities necessary to make the innovation work. Because control of the necessary capabilities in the firm would be relatively more concentrated than in the existing organisational structure, such a firm could overcome not only the recalcitrance of asset-holders whose capital would have to be creatively destroyed but also the "dynamic" transaction costs of informing and persuading those who possess the necessary capabilities (Langlois, 2003, pp.7-8).

"Outsourcing is an agreement in which one company contracts-out a part of their existing internal activity to another company." (McCarthy & Anagnostou, 2004, p. 63)

> In summary, the rationale for practicing outsourcing is to exploit external suppliers' investments, innovations, and specialised professional capabilities. This helps an organisation to reduce its operating costs, whilst achieving an increased focus on its core competences. This obvious and important benefit is consistent with transaction costs economics, which was largely developed by Coase (1937) and Williamson (1975, 1979) (McCarthy & Anagnostou, 2004, p. 64).

"Outsourcing is the purchase of a value-creating activity from an external supplier. Not-for-profit agencies as well as for-profit organisations actively engage in outsourcing. Firms engaging in effective outsourcing increase their flexibility, mitigate risks, and reduce their capital investments." (Ireland *et al.*, 2011, p.81)

2.4 PRICE

Another concept that comes into account when considering transaction costs and vertical integration is the price of assets, inputs and the like. There must be alignment between price, transaction cost and the type of governance structure.

> A fundamental assumption in economics-known as the law of one price-is that in a competitive market all individuals face the same prices. Our thesis here is that if the appropriate price is measured, individuals often face different prices for the same good, even in a competitive market.
>
> These price variations are likely to affect what is produced and what exchanges take place in the market, which organisations and specialties survive, and even which rules of the game persist (Benham &Benham, 2001, p.1).

"Factors that lead firms to adjust prices are: price changes by competitors, change in domestic inputs costs (non-labour), change in demand for product/service, change in wage costs, change in exchange rates, change taxes, fees, and other charges, sales campaigns." (Amirault *et al.*, 2006, p.14)

"Important factors in explaining differentiated prices setting across markets: price of competitors, transportation costs and other factors, cyclical fluctuations in demand, structural market conditions, exchange rate of payment currency, market rules, tax system." (Fabiani *et al*., 2006, p.22)

"Factors driving prices changes: labour costs, costs of raw materials, financial costs, demand, competitors' price." (Fabiani *et al*., 2006, p.35)

2.5 SWITCHING COSTS, LONG AND SHORT TERM CONTRACTS

As with all governance structures, transaction costs play an important role in decision making.

> The focus here is thus on the costs of doing business, at the heart of which is the making, monitoring and enforcing of contracts. The ease or difficulty of contracting, and the types of contract made are determined by the level and nature of transaction costs, which are influenced by the extent of imperfect information involved in making a transaction (Kherallah & Kirsten, 2002, pp.116-117).

> Contract transactions, on the other hand, depend on the specifications within a contract agreement and the object of performance is produced *ex post,* after settlement of contract. Typically, contract transactions are so constituted that either the contract contains a transfer of complete ownership (full bundle of rights), as in exchange transactions, or only certain property rights are transferred over time without forfeiting the entire bundle of rights (Musole, 2009, p.48).
>
> Long –term contracts can help to minimise the transaction costs for two parties engaging in a commitment involving significant specific assets but where full vertical integration is not feasible.
>
> Long-term contracts including requirements clauses, price indexation, liquidation damages, arbitration, and other provisions have been identified as a means to overcome the hold-up problem without vertical integration. (Von Hirschhausen & Neumann 2008, p.132).

"Switching costs are important in terminating a business relationship and securing an alternative." (Whitten et al. 2010, p.167)

Whitten (2010) tried to answer the question: do switching costs matter significantly in the strategic choice to continue outsourcing, switch vendors, or backsource?

"The major result was that outsourcing continuation was most preferred and backsourcing least preferred when switching costs were high, and the relative preference for vendor switching depended on the switching cost type." (Whitten *et al.,* 2010, p.174)

"An assembler will tend to choose vertically integrated component production when high switching costs would otherwise lock assembler into dependence upon a supplier and thereby expose that assembler to opportunistic reconstructing or to the loss of transaction-specific know-how." (Monteverde & Teece, 1982, p.207)

Table 1 on the following page summarises the critical transaction costs reviewed in the present research.

Table 1: Transaction costs sources and tangible forms (Loader & Hobbs, 1996, p.27)

Type of cost	Source/ Origin of costs	Tangible forms of transaction cost
Search costs	Lack of knowledge about opportunities(e.g. products, prices, demand, supply trading rights, market outlets)	Personal/ personnel time, travel expenses; communications costs; advertising/ promotion costs;
Screening costs	Uncertainty about reliability of the potentially suppliers/ buyers; uncertainty about the actual quality of the goods/ services offered	Consulting/ service fees; costs of credit rating checks
Bargaining costs	Conflicting objectives and interests of transacting parties; uncertainty about the willingness of others to trade on certain terms; uncertainty over transactor rights and obligations	Licensing fees; insurance premiums
Transfer costs	Legal, extra-legal o physical constraints on the movement / transfer of goods	Handling/ storage costs; transport costs; bribery and corruption expenses
Monitoring costs	Uncertainty about transactor compliance with specified terms; uncertainty about possible changes in the quality of goods and services	Auditing fees; product inspection; investments in measurement devices
Enforcement costs	Uncertainty about the level of damages/ injury to a transacting party arising from contractual non-compliance; problems in exacting penalties through bilateral agreements or through use of third parties	Arbitration, legal court fees, costs to bring social pressure

CHAPTER 3: RESEARCH QUESTIONS

All organisations seek their self-interest and pursue clear objective: Economising or how to reduce costs and increase efficiency. "Lowering transaction costs will reduce total costs and thus increase margins and sales, promoting economic growth and employment in the urban system concerned." (Musole, 2009, p.49)

> We generally assume that business firms organise their activities so as to maximise their value, which they can do both by economising, or reducing costs, and also by obtaining profits from sales at prices in excess of cost. Today we largely accept Coase's position that a firm's structure is determined by its continuous comparison of the costs and benefits of internal production against those of market procurement" (Hovenkamp, 2010, p.8).

To reduce transaction cost; it is important to understand the problems they carry and their impact on mining companies in South Africa. Given that the concept is broad, the researcher puts emphasis on capital and operational expenditures. Hence shed light on the problems around these costs and their impact on business as to profitability and management issues since the cost of transacting is the key economic factor to economic performance.

The researcher takes for granted production cost. For firms to be efficient there is a tradeoff between economies of scale and scope by buying in the market but issue may arise if there is a hold up problem.

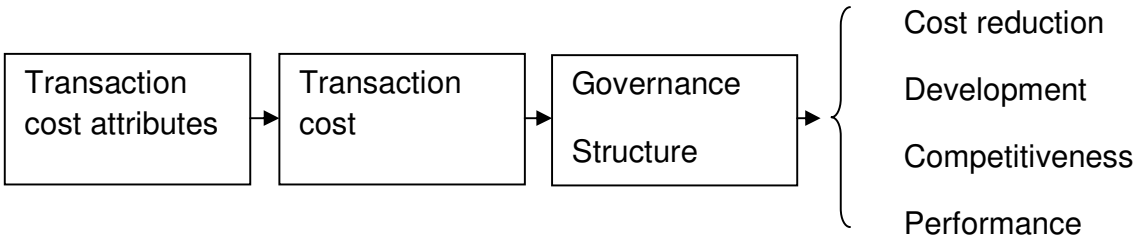
A strong investigation of the above paragraph suggests the following research questions.

Research question 1: What are the transaction costs in the mining sector?

Research question 2: What companies do to mitigate transaction costs?

Therefore, considering the implications of specialised investments, an additional research question to pose may be:"Is the mining sector engaged in specialised investments?" If yes, is it experiencing all these implications?

Elements needed to answer these questions are provided under the literature review of which the essential can be summarised and put in the following simple and comprehensive framework comprising of three building blocks.



Therefore; the process is simple. It involves gathering the maximum of transaction cost attributes, identifying the problems they create in the mining sector. From there; a list of transaction costs will be established and the appropriate governance structures identified.

This is the object of the survey and data analysis in the next chapters.

Intuitively; the principle of alignment suggests that this framework has a feedback or a back loop which makes it an iterative process in order to meet efficiency.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 RESEARCH DESIGN

A qualitative method in an exploratory design has been used.

> Exploration serves other purposes as well. The area of investigation may be so new or so vague that a researcher needs to do an exploration just to learn something about the research or management dilemma. Important variables may not be known or may not be defined thoroughly (Blumberg et al., 2008, p.201).

"Similarly, a new investigation often starts with qualitative studies exploring new phenomenon and, later on, quantitative studies follow to test the validity of propositions formulated in previous qualitative studies." (Blumberg et al., 2008, p.192)

Therefore; a qualitative research has been undertaken with an objective to elicit the impact of transaction costs and related factors in the mining sector.

4.2 DATA GATHERING PROCESS AND DATA ANALYSIS

Data used in the present research were obtained from a self-administered questionnaire filled by company's representatives in a management position.

The respondents have been working for a while in the supply chain environment. The assumption was that these representatives are well–informed in the mining environment and they know the topic being dealt with. The Likert scale and open ended questions has been used.

"The Likert scale is the most frequently used variation of the summated rating scale. Summated scales consist of statements that express either a favorable or unfavorable attitude towards the object of interest." (Blumberg et al., 2008, p.466)

"Likert scales help us to compare one person's score with a distribution of scores from a well-defined sample group." (Blumberg et al., 2008, p.466)

"Open-ended questions are appropriate when the objective is to discover opinions and degree of knowledge. They are also appropriate when the interviewer seeks source of information, dates of events and suggestions, or when probes are used to secure more information."(Blumberg et al., 2008, p. 522)

"Finally, it may be better to use open-ended questions when the interviewer does not have a clear idea of the participant's frame of reference or level of information. Such conditions are likely to occur in exploratory research or in pilot testing." (Blumberg *et al*., 2008, p. 522)

The questionnaire administered to the research subjects had three sections including all three types of measurement question. “Both questionnaires and interview schedules contain three types of measurement question: administrative questions, classification questions and target questions (structured or unstructured).” (Blumberg *et al.*, 2008, p.505)

The three sections used in the questionnaire to elicit the responses to the research questions are:

1. Firms characteristics (administrative questions)
2. South African mining environment (classification questions)
3. Relevance of transactions costs (target questions)

4.3 POPULATION AND SAMPLING

Universe:

Only companies operating in South Africa and members of the Chamber of mines were considered (Appendix1). These companies were classified into three types:

1. Precious metals and minerals
2. Metallic minerals
3. Non-metallic minerals

Unit of analysis:

There was a choice between a mining company and a transaction cost as unit of analysis. The researcher preferred mining company which is close to the research design.

In fact the study was not on the number of transactions operated but rather on the relevance and impact of transaction costs in the mining sector. Therefore the researcher took interest in a mining company as unit of analysis.

Sampling techniques

A subjective approach, non probability sampling technique namely the purposive sampling, was used. The rationale behind was that:

- The non probability technique is less expensive and not as time consuming as the probability technique.
- The researcher wanted to ensure that certain groups are covered

"Additional reasons for choosing non-probability over probability sampling are cost and time." (Blumberg *et al*., 2008, p.252)

Quota sampling has been used. "We use it to improve representativeness. The logic behind quota sampling is that certain relevant characteristics describe the dimensions of the population" (Blumberg *et al*., 2008, p.253)

Sample size:

The researcher considered all mining companies operating in South Africa and members of the Chamber of mines and planned to use a sample of 18 companies. That is six companies under each type.

Table 2: Sampling structure (Questionnaires will be used as stated earlier)

MINING COMPANIES MEMBERS OF THE CHAMBER OF MINES			
Type 1	Type 2	Type 3	
Precious metals and minerals	Metallic Minerals	Non-metallic minerals	Total
6	6	6	18

"Questionnaires and surveys are written sets of questions designed to quickly accumulate information from a wide number of respondents. Questionnaires and/or surveys are most appropriate with broad audiences, when quick turnaround is needed, and where statistical analysis is appropriate." (PMBOK, 2008, p.109

4.4 RESEARCH LIMITATIONS

The limitations of the research methodology and the project as a whole can be summarised as follows:

Limitation1

Number of respondents by company:

The number of respondents by company was limited to one. As stated earlier the assumption was that a senior, Executive manager or someone in the management position in supply chain, procurement is well-informed in the mining environment and has a broad view of the present topic.

Limitation 2

Given that transaction cost is a broad and complex field it was decided to limit the research to operational and capital expenditures. This may dilute the effect of costs in the whole environment. In this regard; the researcher encourages that an emphasis be put on other costs and assess the impact on the business performance and profitability.

Limitation 3

A limited set of questions on small sample was used and this didn't allow the use of advanced techniques. This in part because the researcher did not want to deviate from his topic however had time allowed an investigation on the sources or origins of these costs; this would have revealed a different pattern of the South African environment. This can be envisaged in further researches.

Limitation 4

Non-probabilistic judgmental method was used. In fact due to logistics issues the researcher preferred to rely on this method as it is not costly and non time consuming. At the same time; this method carries with it inadequate and poorly planned sampling designs.

Limitation 5

It would be interesting to analyse the link between performance and transaction costs and extend the implications of specialised investments in the mining sector. Then incorporate the property right theory.

Limitation 6

The instrument, questionnaire, used in the research comes with certain problems. "Some respondents answer factual questions incorrectly; what people say they do and what they actually do may differ; respondents' answers can be unstable; small changes in wording sometimes produce major changes in the distribution of responses; respondents commonly misinterpret questions." (Tharenou *et al.* 2007, p.108)

Limitation 7

The project is based on Transaction Costs Economics and Williamson's work that constituted the cornerstone of the present research. An emphasis on Property rights theories or the resource –based view of the firm and evolutionary economics would bring other considerations, assumptions and may be lead to different results with regards to supply chain management, performance, development and competitiveness.

All these limitations can be summarised in these problems related to methodology design used.

> The use of unreliable measures; the use of statistical tests that have lower power (e.g., small sample, poor measures, too variables for the sample size); Inadequate and poorly planned sampling designs; use of non-pretested instruments; and results inappropriately generalized beyond the sample (Tharenou *et al.* 2007, p.48).

CHAPTER 5: RESULTS

5.1 BACKGROUND &FRAMEWORK

In the foregoing chapters, the author made an assumption on the universe according to which only companies operating in South Africa and members of the Chamber of mines will be considered in this research. The author also classified these companies into three types: Precious Metals and Minerals, Metallic Minerals and Non-Metallic Minerals with 6 companies falling under each category. Appendix 1 shows a list of mining companies.

However after data collection the framework contained fewer companies than suggested under the methodology in chapter 4. The reasons being confidentiality and the resistance to answer the survey as this dealt with no public information.

MINING COMPANIES MEMBERS OF THE CHAMBER OF MINES			
Type 1	Type 2	Type 3	
Precious metals and minerals	Metallic Minerals	Non-metallic minerals	Total
4	2	2	8
50%	25%	25%	100%

The small samples may affect the results but according to (Blumberg, 2008) in a qualitative study the emphasis is more on words, sentences and narratives rather than on number or figures(Blumberg *et al*., 2008).

Data have been discussed mainly around the two research questions.

Research question 1: What are the transaction costs in the mining sector?

Research question 2: What companies do to mitigate transaction costs?

To answer these questions the author planned to gather a maximum of information on transaction costs attributes, identify the problems faced by mining companies and the appropriate governance structures they prefer to operate within in order to mitigate these costs.

The Likert scale as well as open ended questions has been used. With regards to the Likert scale respondents are asked to agree or disagree with a set of statements. "Each response is given a numerical score to reflect its degree of attitudinal favourableness, and the scores may be totalled to measure the participant's attitude." (Blumberg *et al.*, 2008, p.466). In the present research respondents had to choose one of five levels of agreement with 1 being the least favourable and 5 the most favourable.

Regarding the South African environment and relevance of transaction costs open-ended questions were used. With all the speculation on the impact of nationalisation, regulations, BBBEE, and the like on the South African economy this seemed opportune.

"Open-ended questions also help to uncover certainty of feelings and expressions of intensity, although well-designed closed questions can do the same" (Blumberg *et al.*, 2008, p.522)

5.2. FIRMS CHARACTERISTICS

In the following sections these acronyms are used:

PMM: Precious Metals & Minerals

MM: Metallic Minerals

NMM: Non Metallic Minerals

All the companies in the present research are large with a minimum of 5 000 workers and a turnover of a minimum of $ 5 billion.

In the PMM, sales are export oriented with a minimum of 85%. Eighty five percent of their inputs is sourced from the local market. There is a high competition in local and international markets.

In the MM, sales are also export oriented with a minimum of 55%. They source almost equally in the local and the international markets and therefore the exchange rate has an impact on the sales. Competition is low in the local and international markets.

In the NMM, sales are local oriented with a minimum of 70%. Competition is high in the international markets.

The PMM is the most important with leading companies like Anglo American, Anglo Gold Ashanti, Goldfields and DeBeers.

The precious metals & minerals industry includes gold, silver, platinum, palladium, rhodium and industrial and gem-quality diamonds. The market is valued using total annual mining production volumes and annual average London Metal Exchange (LME) prices for each metal. All currency conversions in this profile were calculated using 2010 average rates. The South African precious metals & minerals industry had total revenues of $ 23.3 billion in 2010, representing a compound annual growth rate (CAGR) of 1.1% for the period spanning 2006-2010.

Industry production volumes decreased with a compound annual rate of change (CARC) of 5.1% between 2006 and 2010, to reach a total of 539.7 thousand metric tons in 2010. The performance of the industry is forecasted to accelerate, with an anticipated CAGR of 3.9 % for the five-year period 2010-2015, which is expected to drive the industry to a value of $ 28.2 billion by the end of 2015 (www.reportsnreports.com).

Much has been said on the mining sector, how successful it is and how it contributes to South Africa's economy. Yet mining companies feel like the government, important stakeholder in their business does not support their operating environment to be favorable for business. Therefore; there is a need to have their take on the South Africa's environment with regards to some concepts that may shed light on the understanding of their transaction costs. This is the object of the following sections.

5.3. RESEARCH QUESTION ONE

What are the transaction costs in the mining sector?

5.3.1 DESCRIPTIVE STATISTICS

Descriptive statistics were performed, frequencies and cross-tabulations tables were provided. For the purpose of the project only median tables are given.

5.3.1.1. IMPACT OF BEE AND REGULATIONS ON TRANSACTION COSTS

Table 3: BEE, REGULATION, Costs of doing business in SA and Privatisation/ Mean-Median

Statistics								
	N				Std. Deviation	Percentiles		
	Valid	Missing	Mean	Median		25	50	75
BEE impacts negatively on transaction costs	7	1	2.14	2.00	.690	2.00	2.00	3.00
Q1 recoded	7	1	3.86	4.00	.690	3.00	4.00	4.00
Transaction costs are highly influenced by regulations	7	1	3.43	3.00	.976	3.00	3.00	4.00
Q2 recoded	7	1	2.57	3.00	.976	2.00	3.00	3.00
Costs of doing business in South Africa are high	7	1	3.86	4.00	.900	4.00	4.00	4.00
Q4 recoded	7	1	2.14	2.00	.900	2.00	2.00	2.00
Privatisation threats impact on transaction costs, therefore on the entire business	7	1	2.43	2.00	1.272	2.00	2.00	3.00

The author has chosen some concepts of the South Africa's environment to test the level of their impact on transaction costs as shown in table 3. A discussion is conducted under chapter 6.

Table4: List of regulations that impact on Transaction Costs

Mining Types	Companies	Regulations cited
PMM	PMM1	• Fuel regulations and legislation • Labor legislation • Foreign exchange legislation
PMM	PMM2	• Tax • Customs duty • Localisation • BEE
PMM	PMM3	• Transfer Pricing • Withholding tax
PMM	PMM4	
MM	MM1	• Income tax • Labour • Royalties • Mines Health and Safety
MM	MM2	
NMM	NMM1	• Toll roads and road usage regulations • Fuel tax • Municipal regulations • Electricity hikes
NMM	NMM2	• Mining charter • BBBEE Act

Table 4 gives per type of companies a list of regulations that impact on transaction costs.

Table5: Reasons why costs of doing business in SA are high.

Mining Types	Companies	Reasons cited
PMM	PMM1	• High start-up cost of a new business • High labour costs • Taxes • Cost of fuel • Cost of electricity
PMM	PMM2	• Local manufacturing capability • Exchange rates • High proportion of imported goods in finished goods
PMM	PMM3	• Labour costs are high, inflexible labour laws • Fuel/Tolls impact on logistics • Monopolies exist in the banking sector • Electricity increases
PMM	PMM4	• Importing of steel for example is higher than locally produced products • Majority of Local purchases is not linked to rate of exchange fluctuation • Save on shipping, forwarding and clearing charges
MM	MM1	• Royalty on unrefined minerals • Strikes and above inflation wage demands • Above inflation electricity increases
MM	MM2	
NMM	NMM1	• Transports costs are high, rail limited, trucks • Taxes are high • Taxes are multiple (Fuel, road, export)
NMM	NMM2	• Geographically remote • Expensive logistics compared to world benchmark • Expensive labour

Table 5 gives per type of companies the reasons why costs of doing business in South Africa are high.

5.3.1.2. SPECIALISED INVESTMENTS

Table6: Influence of specialised investments on transaction costs/ Mean and median.

Statistics								
	N				Std. Deviation	Percentiles		
	Valid	Missing	Mean	Median		25	50	75
Site specificity	6	2	4.33	4.50	.816	3.75	4.50	5.00
Physical –asset specificity	6	2	4.00	4.00	.894	3.00	4.00	5.00
Dedicated asset	6	2	3.50	3.50	1.049	2.75	3.50	4.25
Human capital	6	2	4.00	4.00	.894	3.00	4.00	5.00

For a set of specialised investments descriptive statistics were performed per type of companies and for all mining companies. Here only statistics for all mining companies are provided in table 6 which reports that site specificity has the highest median and dedicated asset the lowest. Therefore; site specificity is the most influential on transaction costs.

Table7: Implications of specialised investments/ Mean and median.

SS: Site Specificity, **PAS**: Physical-Asset Specificity, **DA**: Dedicated Asset

HC: Human Capital

Statistics								
	N				Std. Deviation	Percentiles		
	Valid	Missing	Mean	Median		25	50	75
SS: Costly bargaining	5	3	4.00	4.00	.000	4.00	4.00	4.00
SS: Opportunism	5	3	3.80	4.00	.837	3.00	4.00	4.50
SS: Hold up problem	5	3	3.20	3.00	.447	3.00	3.00	3.50
PAS: Costly bargaining	5	3	4.00	4.00	1.000	3.00	4.00	5.00
PAS: Opportunism	5	3	3.00	3.00	.707	2.50	3.00	3.50
PAS: Hold up problem	5	3	3.00	3.00	.707	2.50	3.00	3.50
DA: Costly bargaining	5	3	3.40	3.00	.894	3.00	3.00	4.00
DA: Opportunism	5	3	3.00	3.00	.707	2.50	3.00	3.50
DA: Hold up problem	5	3	3.40	4.00	.894	2.50	4.00	4.00
HC: Costly bargaining	6	2	3.67	3.50	.816	3.00	3.50	4.25
HC: Opportunism	5	3	3.40	3.00	.548	3.00	3.00	4.00
HC: Hold up problem	5	3	2.80	3.00	.447	2.50	3.00	3.00

For each specialised investment; a set of implications were suggested. Descriptive statistics were performed per type of companies and for all mining companies. Here only statistics for all mining companies are provided in table 7which reports that:

- Specialised investment site specificity has costly bargaining as the implication with the highest median.
- Specialised investment physical-asset specificity has costly bargaining as the implication with the highest median.
- Specialised investment dedicated asset has costly bargaining and hold up problem as the implication with the highest mean. However; the hold up problem presents the highest median.
- Specialised investment human capital has costly bargaining as the implication with the highest mean and median.

Table8: Influence of specialised investments on SAIC, BC, MAEC

SAIC: Search and Information Costs

BC: Bargaining Costs

MAEC: Monitoring and Enforcement Costs

Statistics								
	N				Std. Deviation	Percentiles		
	Valid	Missing	Mean	Median		25	50	75
SAIC: Site Specificity	5	3	4.00	4.00	.000	4.00	4.00	4.00
SAIC: Physical-asset specificity	5	3	3.80	4.00	.447	3.50	4.00	4.00
SAIC: Dedicated asset	5	3	3.60	4.00	.548	3.00	4.00	4.00
SAIC: Human Capital	5	3	3.60	3.00	.894	3.00	3.00	4.50
BC: Site Specificity	5	3	3.80	4.00	.447	3.50	4.00	4.00
BC: Physical-asset specificity	5	3	3.40	3.00	.548	3.00	3.00	4.00
BC: Dedicated asset	5	3	3.20	3.00	.447	3.00	3.00	3.50
BC: Human Capital	5	3	3.20	3.00	.447	3.00	3.00	3.50
MAEC: Site Specificity	5	3	4.20	4.00	.447	4.00	4.00	4.50
MAEC: Physical-asset specificity	5	3	4.00	4.00	.000	4.00	4.00	4.00
MAEC: Dedicated asset	5	3	3.80	4.00	.447	3.50	4.00	4.00
MAEC: Human Capital	5	3	3.80	4.00	.837	3.00	4.00	4.50

For each specialised investment; descriptive statistics were performed per type of companies and for all mining companies on its influence on three different types of costs. Here only statistics for all mining companies are provided in table 8 which reports that:

- With regards to SAIC, specialised investment site specificity has the highest mean and median, and is therefore the most influential.
- With regards to BC, specialised investment site specificity has the highest mean and median, and is therefore the most influential.
- With regards to MAEC, specialised investment site specificity has the highest mean and median, and is therefore the most influential.

5.3.2 TEST STATISTICS

The Kruskal-Wallis test is a non-parametric test, alternative to the parametric one-way ANOVA. Its purpose is to test the difference among the ranks of independent groups. In the present research the independent groups are the three mining types. It does not assume the normality and the homogeneity of variances of group's data. This test performs well on small samples; therefore it is appropriate in this study as the samples are small.

The Kruskal-Wallis test was performed for the different concepts. The results from the test were depicted as follows: where N is the number of mining companies under a mining type, df the degrees of freedom, Asymptotic Sig. the level of significance and these are presented here and discussed in chapter 6.

5.3.2.1. IMPACT OF BEE AND REGULATIONS ON TRANSACTION COSTS

A Kruskal-Wallis test was performed on the impact of BEE and regulations on transaction costs. For tables 9 to 12, one can see that the differences among the ranks of the three types of mining are not different on the 10% or better 5% level ($p < 0.10$ or $p < 0.05$).

Table9: BEE impact negatively on transaction costs.

Mining type	N	Mean Rank
PMM	4	4.38
MM	1	3.50
NMM	2	3.50
Total	7	
Chi-Square	Df	Asymp.Sig.
.350	2	.839

Kruskal-Wallis' Chi-Square has a value of 0.350 and a p value of 0.839 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on BEE.

Table10: Transaction costs are highly influenced by regulations

Mining type	N	Mean Rank
PMM	4	4.13
MM	1	3.00
NMM	2	4.25
Total	7	
Chi-Square	Df	Asymp.Sig
.279	2	.870

Kruskal-Wallis' Chi-Square has a value of 0.279 and a p value of 0.870 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the fact that transaction costs are highly influenced by regulations.

Table 11: Costs of doing business in SA are high

Mining type	N	Mean Rank
PMM	4	3.25
MM	1	4.00
NMM	2	5.50
Total	7	
Chi-Square	df	Asymp.Sig
2.250	2	.325

Kruskal-Wallis' Chi-Square has a value of 2.250 and a p value of 0.325 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the fact that the cost of doing business in South Africa is high.

Table 12: Privatisation threats impact on transaction costs

Mining type	N	Mean Rank
PMM	4	4.38
MM	1	3.50
NMM	2	3.50
Total	7	
Chi-Square	df	Asymp.Sig
.342	2	.843

Kruskal-Wallis' Chi-Square has a value of 0.342 and a p value of 0.843 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception of privatisation threats.

5.3.2.2. INFLUENCE OF SPECIALISED INVESTMENTS

A Kruskal-Wallis test was performed on the influence of specialised investments on transaction costs in general and particularly on search and information costs, bargaining costs, monitoring and enforcement costs. Here only the results of the general case have been presented. Appendix2, Kruskal-Wallis Test, shows other results.

For tables 13 to 16, one can see that the differences among the ranks of the three types of mining are not different on the 10% or better 5% level.

Table 13: Influence of site specificity on transaction costs

Mining type	N	Mean Rank
PMM	3	4.17
MM	1	5.00
NMM	2	1.75
Total	6	
Chi-Square	Df	Asymp.Sig
3.236	2	.198

Kruskal-Wallis' Chi-Square has a value of 3.236 and a p value of 0.193 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception of the influence of site specificity on transaction costs.

Table 14: Influence of physical-asset specificity on transaction costs

Mining type	N	Mean Rank
PMM	3	3.50
MM	1	5.50
NMM	2	2.50
Total	6	
Chi-Square	Df	Asymp.Sig
1.875	2	.392

Kruskal-Wallis' Chi-Square has a value of 1.875 and a p value of 0.392 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the influence of physical-asset specificity on transaction costs.

Table 15: Influence of Dedicated asset on transaction costs

Mining type	N	Mean Rank
PMM	3	2.67
MM	1	6.00
NMM	2	3.50
Total	6	
Chi-Square	Df	Asymp.Sig
2.525	2	.283

Kruskal-Wallis' Chi-Square has a value of 2.525 and a p value of 0.283 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the influence of dedicated asset on transaction costs.

Table 16: Influence of Human capital on transaction costs

Mining type	N	Mean Rank
PMM	3	3.50
MM	1	5.50
NMM	2	2.50
Total	6	
Chi-Square	Df	Asymp.Sig
1.875	2	.392

Kruskal-Wallis' Chi-Square has a value of 1.875 and a p value of 0.392 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the influence of human capital on transaction costs.

5.3.2.3. IMPLICATIONS OF SPECIALISED INVESTMENTS

A Kruskal-Wallis test was performed on the implications of specialised investments.

For tables 17 to 20, one can see that the differences among the ranks of the three types of mining are not different on the 10% or better 5% level.

Tables 17: Implications of site specificity

Implication of Site Specificity on Costly bargaining

Mining type	N	Mean Rank
PMM	3	3.00
NMM	2	3.00
Total	5	
Chi-Square	df	Asymp.Sig
.000	1	1.000

Kruskal-Wallis' Chi-Square has a value of 0.000 and a p value of 1.000 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of site specificity on costly bargaining.

Implication of Site Specificity on opportunism

Mining type	N	Mean Rank
PMM	3	3.33
NMM	2	2.50
Total	5	
Chi-Square	df	Asymp.Sig
.370	1	.543

Kruskal-Wallis' Chi-Square has a value of 0.370 and a p value of 0.543 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of site specificity on opportunism.

Implication of Site Specificity on Hold up problem

Mining type	N	Mean Rank
PMM	3	2.50
NMM	2	3.75
Total	5	
Chi-Square	Df	Asymp.Sig
1.500	1	.221

Kruskal-Wallis' Chi-Square has a value of 1.500 and a p value of 0.221 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of site specificity on hold up problem.

Tables 18: Implications of physical-asset specificity

Implication of physical-asset specificity on costly bargaining

Mining type	N	Mean Rank
PMM	3	3.00
NMM	2	3.00
Total	5	
Chi-Square	Df	Asymp.Sig
.000	1	1.000

Kruskal-Wallis' Chi-Square has a value of 0.000 and a p value of 1.000 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of physical-asset specificity on costly bargaining.

Implication of physical-asset specificity on opportunism

Mining type	N	Mean Rank
PMM	3	3.00
NMM	2	3.00
Total	5	
Chi-Square	Df	Asymp.Sig
.000	1	1.000

Kruskal-Wallis' Chi-Square has a value of 0.000 and a p value of 1.000 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of physical-asset specificity on opportunism.

Implication of physical-asset specificity on hold up problem

Mining type	N	Mean Rank
PMM	3	2.33
NMM	2	4.00
Total	5	
Chi-Square	Df	Asymp.Sig
1.667	1	.197

Kruskal-Wallis' Chi-Square has a value of 1.667 and a p value of 0.197 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of physical-asset specificity on hold up problem.

Tables 19: Implications of Dedicated asset

Implication of Dedicated asset on costly bargaining

Mining type	N	Mean Rank
PMM	3	3.33
NMM	2	2.50
Total	5	
Chi-Square	Df	Asymp.Sig
.667	1	.414

Kruskal-Wallis' Chi-Square has a value of 0.667 and a p value of 0.414 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of dedicated asset on costly bargaining.

Implication of Dedicated asset on opportunism

Mining type	N	Mean Rank
PMM	3	3.00
NMM	2	3.00
Total	5	
Chi-Square	df	Asymp.Sig
.000	1	1.000

Kruskal-Wallis' Chi-Square has a value of 0.000 and a p value of 1.000 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of dedicated asset on opportunism.

Implication of Dedicated asset on hold up problem

Mining type	N	Mean Rank
PMM	3	3.00
NMM	2	3.00
Total	5	
Chi-Square	df	Asymp.Sig
.000	1	1.000

Kruskal-Wallis' Chi-Square has a value of 0.000 and a p value of 1.000 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of dedicated asset on hold up problem.

Tables 20: Implications of Human capital

Implication of Human capital on costly bargaining

Mining type	N	Mean Rank
PMM	3	4.17
MM	1	4.50
NMM	2	2.00
Total	6	
Chi-Square	df	Asymp.Sig
2.278	2	.320

Kruskal-Wallis' Chi-Square has a value of 2.278 and a p value of 0.320 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of human capital on costly bargaining.

Implication of Human capital on opportunism

Mining type	N	Mean Rank
PMM	3	3.67
NMM	2	2.00
Total	5	
Chi-Square	df	Asymp.Sig
1.778	1	.182

Kruskal-Wallis' Chi-Square has a value of 1.778 and a p value of 0.182 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of human capital on opportunism.

Implication of Human capital on hold up problem

Mining type	N	Mean Rank
PMM	3	2.67
NMM	2	3.50
Total	5	
Chi-Square	Df	Asymp.Sig
.667	1	.414

Kruskal-Wallis' Chi-Square has a value of 0.667 and a p value of 0.414 and is not statistically significant. Thus, there is no evidence that the three types of mining are different in their perception on the implication of human capital on hold up problem.

5.4. RESEARCH QUESTION TWO

What companies do to mitigate transaction costs?

5.4.1 DESCRIPTIVE STATISTICS

Descriptive statistics were performed, frequencies and cross-tabulations tables were provided. For the purpose of the project only Median tables are given.

5.4.1.1. GOVERNANCE STRUCTURES

Table21: Ranking of governance structures

Descriptive statistics were performed on the ranks of different governance structures of which the following table is a summary.

Governance Structure	Number of respondents	Ranking Percentage					
		1	2	3	4	5	6
Short term contract	4		50%		50%		
Long term contract	6	83%	17%				
Vertical Integration	2					50%	50%
Spot Market	5		20%	40%		20%	20%
Outsourcing	5	40%	20%	40%			
Relational Contracts	2		50%	50%			

As shown by table 21, four respondents have chosen the short term governance, and 50% ranked it second while other 50% ranked it fourth.

Table 22: Frequency of contracts review and adjustment

OPEX				CAPEX			
Short term		Long term		Short term		Long term	
Minim.	Maxim.	Minim.	Maxim.	Minim.	Maxim.	Minim.	Maxim.
3 months	1 year	1 year	3 years	1 year	3 years	1 year	5 years

As shown by table 22, for the operating expenditures, the minimum period to review a contract is three months in the short term while the maximum is one year.

For the capital expenditures, the minim period to review a contract is one year in the long term while the maximum is 5 years.

Table 23: Appropriate governance structure to reduce opex transaction costs

Statistics

	N				Std. Deviation	Percentiles		
	Valid	Missing	Mean	Median		25	50	75
Opex: Long term	7	1	4.71	5.00	.488	4.00	5.00	5.00
Opex: Vertical Integration	7	1	3.43	3.00	.976	3.00	3.00	4.00
Opex: Spot market	7	1	2.57	2.00	1.512	1.00	2.00	4.00
Opex: Outsourcing	7	1	3.57	3.00	.787	3.00	3.00	4.00
Opex: Relational contracts	7	1	4.00	4.00	1.000	3.00	4.00	5.00

For each governance structure, descriptive statistics were performed per type of companies and for all mining companies. Here only statistics for all mining companies are provided in table 23 which reports that the long term contract has the highest median and therefore the most appropriate to reduce Opex costs.

Table 24: Appropriate governance structure to reduce Capex transaction costs.

Statistics								
	N				Std. Deviation	Percentiles		
	Valid	Missing	Mean	Median		25	50	75
Capex: Long term	7	1	4.71	5.00	.488	4.00	5.00	5.00
Capex: Vertical Integration	7	1	3.14	3.00	1.345	2.00	3.00	4.00
Capex: Spot market	7	1	2.86	3.00	1.345	2.00	3.00	4.00
Capex: Outsourcing	7	1	3.71	4.00	.756	3.00	4.00	4.00
Capex: Relational contracts	7	1	4.00	4.00	1.000	3.00	4.00	5.00

For each governance structure, descriptive statistics were performed per type of companies and for all mining companies. Here only statistics for all mining companies are provided in table 24 which reports that the long term contract has the highest median and therefore the most appropriate to reduce Capex costs.

5.4.1.2 REASONS FOR CHANGING CONTRACTS

Table 25: Listed reasons for changing contracts

Statistics								
	N				Std. Deviation	Percentiles		
	Valid	Missing	Mean	Median		25	50	75
Incomplete contracts	7	1	3.86	5.00	1.676	2.00	5.00	5.00
Uncertainty	7	1	2.71	2.00	1.890	1.00	2.00	5.00
Asset specificity on your part	7	1	3.86	4.00	1.345	4.00	4.00	5.00
Asset specificity on the other part	7	1	3.43	4.00	1.512	2.00	4.00	5.00
Opportunistic on your part	7	1	2.71	3.00	1.380	1.00	3.00	4.00
Opportunistic on the other part	7	1	3.00	3.00	1.291	2.00	3.00	4.00
Frequency of transaction	7	1	3.57	4.00	1.397	3.00	4.00	5.00

For each listed reason descriptive statistics were performed per type of companies and for all mining companies. Here only statistics for all mining companies are provided in table 25 which reports that incomplete contracts have the highest median and therefore the most important reason to change a contract.

Table 26: Other reasons that motivate the change of contracts.

Mining Types	Companies	Reasons cited
PMM	PMM1	• Contract price • Quality of goods and/or services • Service delivery
PMM	PMM2	• Global market change in commodity pricing • Change in consumption volumes • Change in Scope and or Supply Specification • Exchange rates • Change in Ocean Shipping cost and routing
PMM	PMM3	• Value proposition greater than current status quo • Legislation • Poor Performance
PMM	PMM4	• Input cost drivers • Change in scope of work (additions or deletions) • Outcome of a tendering process • Status of BEE rating of contractor
MM	MM1	• Non performance • Late order delivery • Incomplete order delivery • Price escalations

Table 26 gives per type of companies a list of other reasons for changing contracts.

5.4.2. TEST STATISTICS

A Kruskal-Wallis test was performed on appropriate governance structures to reduce opex, capex and reasons for chancing contracts. Results are under appendix 2 and one can see that the differences among the ranks of the three types of mining are not different on the 10% or better 5% level.

CHAPTER 6: DISCUSSION OF RESULTS

Chapter 5 has presented the results where as the present chapter discusses the results in terms of the research questions and in the light of the literature review. Were the research objectives met? Are they any particular concerns with the results? The following two sections elaborate on these questions.

Each section will discuss the results, the test done and give a conclusion.

6.1. RESEARCH QUESTION ONE

What are the transaction costs in the mining sector?

This section interprets the results and tries to answer the research question one in an environment specific to South Africa which is a mirror of developing countries.

According to Kherallah and Kirsten (2002); the cost of transacting in developing countries is high and this cost is so costly for human beings to interact and engage in various kinds of economic activity and that results is poor performance and poverty. Therefore; there is a need to understand this cost and why it is high.

As shown by table 3 the costs of doing business in South Africa are high and the impact of BEE on transaction costs is low. This is certainly because the question has the term “negatively” within it. The same question when recoded shows a high impact.

One may not understand why this question is recoded and argue that it is not necessary given that it is not possible to do a reliability test due to the small number of respondents. In this regards the impact of BEE is low.
However when asked to cite regulations that impact on transaction costs, table 4, and reasons why the cost of doing business in South Africa are high, table 5, a same pattern of answers emerge of which BEE.

Amongst other reasons are electricity and fuel hikes, exchange rates, BBBEE act, royalties, mining charter, legislation, expensive labour. Further mining companies find that taxes are multiple, for example fuel, road and export taxes.

With regards to BEE; some think that in the short term it may be expensive to transact with BEE suppliers but in the long term when a majority of the companies are productive, expertise will grow and transaction will become less costly. The thought is that transaction is high because most BEE suppliers are in the start up stage, as time progresses it will get less costly.

The mining charter and the preferential procurement is a cost to the mining sector, while for the government; it is a way to get access to its funding and public procurement contracts. As stated in chapter one, the guiding principle of the charter is to accelerate procurement from black-owned and /or, empowered enterprises and /or good contributors to B-BBEE with the main objective of growing existing or emerging entrepreneurs to produce value-added goods and services for the industry and increase employment as well as allowing creation of business.

This seems controversial as the mining sector finds the labour expensive; resulting in an inability to create more jobs and resolve unemployment challenges whilst having to deal with taxes' burden.

One limitation of the research is that the author did not work separately on established and BEE owned companies in order to explore the comparison with regards to their transactions. This is an opportunity for future research.

The forgoing paragraphs clearly state the weight of regulations, legislation and the role of the government in the mining sector to alleviate the operating conditions.

For the surveyed companies, privatisation threats have a low impact on transaction. The same question when recoded to get the impact of nationalisation shows that its impact on transaction is high. This confirms the perception in the current debate on nationalisation.

For most of the companies privatisation is more efficient, although people tend to lose their jobs. And they are yet to see an efficient nationalisation model that will have a positive impact on transaction costs.

For a set of specialised investments; descriptive statistics were performed per type of companies and for all mining companies. Here only statistics for all mining companies are provided in table 6 which reports that site specificity has the highest influence on transaction costs. Here after the ranking.

Site specificity	Physical-asset specificity	Dedicated asset	Human capital
1	2	3	2

This shows the importance of site and physical-asset specificity in the mining sector.

For each specialised investment; a set of implications were suggested. Descriptive statistics were performed per type of companies and for all mining companies. Here only statistics for all mining companies are provided in table7 which reports that for any specialised investment, costly bargaining is the first implication in weight, followed by opportunism and the hold up problem.

For each specialised investment; descriptive statistics were performed per type of companies and for all mining companies on its influence on costs. Here only statistics for all mining companies are provided in tables 8 which reports that for any costs items site specificity is the most influential followed by physical asset, dedicated asset and human capital. Here after the ranking.

Site specificity	Physical-asset specificity	Dedicated asset	Human capital
1	2	3	3

In summary, Tables 6, 7 and 8 deliver the following consequences:

South African mining companies invest more in site and physical-asset specificity which imply a costly bargaining that leads to high transaction costs.

The research question two is aligned with this and may justify why long term contracts and strategic alliances are the most used governance structures as shown by Appendix 3.

The importance of transaction costs often dictates the governance structure. Kherallah and Kirsten (2002) declared that the general hypothesis of the strand of the NIE is that institutions are transaction cost-minimising arrangements that may change and evolve with changes in the nature and sources of transaction costs.

In an environment with high competition where there is a risk of hold up, mining companies do not initially invest in dedicated asset in order to avoid the hold up problem. This may happen with a power plant built close to a coal mining to avoid transportation costs but is still under threat of a probable hold up problem.

The foregoing comments were based on descriptive statistics. The Kruskal-Wallis test revealed that:

- Tables 9, 10, 11, 12 with regards to BEE, regulations, costs of doing business in SA, privatization, indicate that there is no case where the differences among ranks of the three types of mining are different on the 10% or better (lower) level.
- Tables 13,14,15,16 with regards to the influence of specialised investments on transaction costs, indicate that there is no case where the differences among ranks of the three types of mining are different on the 10% or better (lower) level.
- In appendix 2, one can see that only in three cases the differences among the ranks of three types of mining are different on the 10% when monitoring and enforcement costs are influenced by human capital and on the 5% when the search and information costs are influenced by dedicated asset and when bargaining costs are influenced by physical-asset specificity.

The conclusion is that there is a discrepancy between the results from the descriptive statistics and the Kruskal-Wallis test. Appendix 4 on cross tabulation shows that there is a significant difference between the values of the different types of mining. Why is this a problem? The statistic test does not confirm the descriptive statistics results as well as the results of open ended questions certainly because of the small samples. One must take care not to generalise over all South African mining companies since the present sample is rather small. This is aligned with limitations 6 and 7 under chapter 4 on the research methodology.

The instrument, questionnaire, used in the research comes with certain problems. “Some respondents answer factual questions incorrectly; what people say they do and what they actually do may differ; respondents’ answers can be unstable; small changes in wording sometimes produce major changes in the distribution of responses; respondents commonly misinterpret questions.” (Tharenou *et al.* 2007, p.108)

> The use of unreliable measures; the use of statistical tests that have lower power (e.g., small sample, poor measures, too variables for the sample size); Inadequate and poorly planned sampling designs; use of non-pretested instruments; and results inappropriately generalized beyond the sample (Tharenou *et al.* 2007, p.48).

6.2. RESEARCH QUESTION TWO

What companies do to mitigate transaction costs?

The best place to start in answering this question is to deal with the governance structures. According to Raynaud, Sauvee and Valceschini (2009); selecting appropriate governance structures that efficiently mitigate the contractual hazards allow firms to economise on transaction costs.

Williamson (2009), stated that governance is the overarching concept and transaction cost economics is the means by which to breathe operational content into governance and organisation.

Kherallah and Kirsten (2002) noted that transaction costs economics is a branch of the New Institutional Economics which considers that the cost of transacting, one of the determinant of development and performance, depends on institutions and governance structures.

As shown by table 21: ranking of governance structures, eight companies were asked to choose the most appropriate governance structure and to rank them if necessary. Then six companies ranked long term contract, five ranked sport market, five ranked outsourcing, four ranked short term, two ranked vertical integration and two ranked relational contract. Long term contract has been ranked as the first choice by 83% of the respondents that is five companies out of six respondents.

Outsourcing has been ranked first by 40% of the respondents (two out of five), second by 20% (one company out of five) and third by 40% (two out of five).

Spot market and short term contract present also a certain interest but not well pronounced as long term contract and outsourcing in the present case.

According to Baye (2009), substantial specialised investments relative to contracting costs lead to complex contracting environment relative to costs of integration and in this case contracts are preferred over spot market and vertical integration.

The frequency of contract review is another important element as it is linked to the frequency with which transaction costs recur. Williamson (1989); presents the frequency with which transactions recur as one of the principal dimensions on which transaction costs economics relies for purposes of describing transactions.

Therefore; as shown by table 22; frequency of contracts review and adjustment; the minimum period for long term contracts on opex is one year and the maximum is three years. The same table shows that the minimum period for long term contracts on capex is one year and the maximum is five years.

However; one can argue that there is no way to review contracts on capex every year as generally these span on a number of years and this exercise may imply important bargaining costs.

Table 21 shows that vertical integration is not acclaimed in the mining sector where long term is most preferred. Table 7 shows that site specificity is the most influential specialised investment on transaction costs and therefore the most significant. According to Von Hirschhausen and Neumann (2008) long term contracts can help to minimise the transaction cost for two parties engaging in a commitment involving significant specific assets but where full vertical integration is not feasible.

Ireland, Hoskisson and Hitt (2011); state that firms engaging in effective outsourcing increase their flexibility, mitigate risks, and reduce their capital investments.

Tables 23 and 24 where descriptive statistics performed per type of companies and for all mining companies confirmed the preeminence of long term contracts as appropriate structure to reduce opex and capex transaction costs.

Table 25, where descriptive statistics were performed per type of companies and for all mining companies, reports that incomplete contracts and asset specificity on the side of the interested company are the most important reasons to change a contract. In an environment with high competition, uncertainty, opportunistic problems or self interest, each company seeks its own benefit. This is aligned with the theory of transaction costs of which uncertainty and opportunism are characteristics. The common characteristics of these definitions, the 'neoclassical' or the 'property rights' are: incomplete contracts (bounded rationality), asset specificity and opportunistic problems (self-interest).

According to Hovenkamp (2010); while all participants are rational, they do not have perfect information and they always know more about themselves than about others, therefore a rational firm anticipates that, to the extent uncertainty exists, everyone in the market will try to use new situations to their own advantage, itself included

Kherallah and Kirsten (2002); indicated that the ease or difficulty of contracting, and the types of contract made are determined by the level and nature of transaction costs, which are influenced by the extent of imperfect information involved in making a transaction.

Williamson (1989); stated that the condition of asset specificity is one of the principal dimensions on which costs economics relies for purposes of describing transactions.

Table 26 provides other reasons that motivate the change of contracts. Amongst these reasons are price variations, change in demand for product, change in exchange rates, change in taxes.

Fabiani (2006); found that there are important factors in explaining differentiated prices setting across markets namely: price of competitors, transportation costs and other factors, cyclical fluctuations in demand, structural market conditions, exchange rate of payment currency, market rules, tax system.

Benham and Benham (2001); concluded that price variations are likely to affect what is produced and what exchanges take place in the market, which organisations and specialties survive, and even which rules of the game persist.

Amirault, Kwan and Wilkinson (2006); declared the factors that lead firms to adjust prices are: price changes by competitors, change in domestic inputs costs (non labour), change in demand for product/service, change in wage costs, change in exchange rates, change taxes, fees, and other charges, sales campaigns.

Fabiani (2006); found again that factors that drive prices change are: labour costs, costs of raw materials, financial costs, demand, and competitors' price.

The foregoing comments were based on descriptive statistics. The Kruskal-Wallis test revealed that:

For tables 23, 24, 25 with regards to appropriate governance structures to reduce opex, capex and reasons for chancing contracts a Kruskal-Willis test was performed; results are under appendix 2. There is no case where the differences among ranks of the three types of mining are different on the 10% or better (lower) level. Therefore; the big concern is rather the small samples than the results.

The conclusion is that there is a discrepancy between the results from the descriptive statistics and the Kruskal-Wallis test. Why is this a problem? The statistic test does not confirm the descriptive statistics results as well as the results of open ended question certainly because of the small samples. One must take care and not to generalise over all South African mining companies since the present sample is rather small.

To conclude this chapter; the author went through the objectives of the present research as set out in chapter one and put them together with literature review in chapter two and the research questions in chapter three. Therefore the objectives stated and made by the research:

- The first objective was to identify transaction costs in the mining sector and how to mitigate them. To do this; the author needed to understand the concepts of transaction costs. This was well covered under literature review where theories related to transaction costs such as governance structures ad price were discussed and evaluated.

- The problems around the mining sector with regards to its transition costs, the implications for business in terms of profitability and management. The questionnaire survey helped to identify inherent issues.

  A look at the preferential procurement and its impact on transaction costs as one of the areas of the Mining Charter. Thus the study took into account the effect of regulations, the cost of doing business in South Africa and particularly the impact of the B-BBEE.

- A compensation study encompassing short and long term contracts plus risks was undertaken. However; risks were not dealt with in depth and were limited to the costs encountered in the mining sector.

The above elements have a link with the need for the present research as stated in chapter1.

- The researcher who used to work for a diamond mining company in DRC has got the understanding and the implications of transaction costs that enabled him to gain insights. Therefore; his personal motivation and interest are met.
- The research's contribution to the documentation on transaction costs in the mining sector in South Africa. Any points not elaborated on properly in the present research are reported under recommendations in chapter 7 for future researches.
- South Africa is a gateway to Africa for developed countries. The author's aim is to operate and conducting business in emerging markets that creates challenges and opportunities for developed economies.

  By understanding what is happening in South Africa, the author can predict what can happen in the same sector in other African countries and have a view point as to advise the mining companies.

CHAPTER 7: CONCLUSION

7.1. BACKGROUND

Transaction cost is a broad concept. For the purpose of the research; it was narrowed to operating and capital expenditures in the mining sector in South Africa. Two research questions with regards to transaction costs and means to mitigate them formed the foundation of the research. A literature review provided necessary theories to understand the problems around transaction costs and how to deal with the research questions. A self-administered survey questionnaire allowed the author to gather necessary information on three types of mining companies. This questionnaire covered firms' characteristics, South Africa's environment and relevance of transaction costs. Descriptive and test statistics were performed on the different data and the results were presented and analysed.

Key findings and recommendations are provided in the following sections.

7.2. MAIN FINDINGS OF THE RESEARCH

- The importance of the specialised investment site specificity in the mining sector is emphasised. It is the most influential on transaction costs in general and particularly on search and information costs, bargaining costs and monitoring and enforcement costs.
- Costly bargaining is the important implication for all specialised investments.
- Long term contract is the most preferred governance structure to mitigate opex and capex transaction costs.
- Incomplete contracts are the most important reason to change a contract.
- Cost of doing business in South Africa is high.
- Nationalisation and BEE have a high impact on transaction costs and therefore on business profitability.
- Regulations that impact on transaction costs and reasons why costs of doing business in South Africa are high and present a same pattern: taxes, BEE, high labour costs, royalties, exchange rates, mining charter.
- The small sample is a big concern and one must take care and not generalising over all South African mining companies as this can jeopardise the findings.

7.3. SUMMARY

South Africa has its own realities, BEE and nationalisation threats, that impacts business profitability. South African mining companies invest in site specificity and physical-asset specificity which imply a costly bargaining that leads to high transaction costs. There is a need for long term contracts to mitigate these costs in a highly competitive environment where there is a risk of the hold up problem.

7.4. RECOMMENDATIONS TO STAKEHOLDERS

This section deals with recommendations to stakeholders and new investors in the South African mining sector. Nevertheless; the key findings can also be replicated in other African countries. As stated in chapter1 under the need for the research section, it is important for the researcher, also a stakeholder, to have a comprehensive understanding of transaction costs in the mining sector and underpinning factors in order to predict what can happen in the same sector in other African countries.

There is a clear message from mining companies to the South Africa government on regulations and taxes. There are taxes and regulations that hamper them to go forward. Many of them are multinationals. Ireland (2001); stated that large multinational corporations from developed economies seek to enter emerging economies.

Therefore; South Africa has to accommodate them in order to get them invest in the country and contribute to reduce unemployment by offering them low taxes and less stringent regulations.

The government, as a regulator, needs to revisit the mining charter and therefore the B-BB act as they clearly appear in the reasons cited by the mining companies. A joined committee between the mining sector and the relevant state department can work together on the subject matter and come up with suggestions to improve the operating environment for South African mining companies.

7.5. RECOMMENDATIONS FOR FUTURE RESEARCH

The present research has treated the qualitative side of the topic with its flaws and benefits. Therefore; the qualitative study may still be revisited. However a quantitative study on the same topic which requires the extending of the universe to any mining company, member or not of the Chamber of mines must be undertaken. Therefore; an increase in the sample and number of companies per type compared to the previous framework. Each type, precious metals and minerals, metallic minerals and non metallic minerals will be subdivided into three categories: large, medium and small. "The greater the number of sub-groups of interest within a sample, the great the sample size must be, as each sub-group must meet minimum sample size requirements." (Blumberg *et al.*, 2008, p.241)

Then the new frame would look like the following.

MINING INDUSTRY IN SOUTH AFRICA									
Type 1			Type 2			Type 3			
Precious metals and minerals			Metallic Minerals			Non-metallic minerals			Total
Different categories									
Small	Medium	Large	Small	Medium	Large	Small	Medium	Large	

The number of companies under each category will take into account criteria of quantitative study.

The author did not deal with BEE owned companies and suggests that a comparison be done between established and BEE companies in the procurement process. However; the level of transaction costs in these companies may be analysed. Therefore; one question needs to be answered which is: "Are transaction costs a barrier of entry in the mining sector to BEE companies?"

The present literature review is a gateway to performance in the mining sector, therefore a related research question may be asked. What is the link between performance and transaction costs? It is clear that transaction costs affect businesses and their development. There is still a lot to say on performance with regards to transaction costs.

Another question may be a broad view on the implications of specialized investments in the mining sector.

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APPENDIX 1: LIST OF MINING COMPAGNIES (http://www.bullion.org.za, 2011/03/24)

Precious Metals and Minerals	Metallic Minerals	Non-Metallic Minerals
De Beers Consolidated Mines Limited	Semancor Chrome	Anglo Operations Limited, Anglo Coal Division
Namakwa Diamond Company	Kumba Iron Ore Limited	BHP Billiton Energy Coal
Trans Hex Group Limited	ASA Metals (Pty) Limited	Exxaro Resources Limited
African Rainbow Minerals (Gold) Limited	Delta Mining (Pty) Limited	Kangra Group(Pty) Limited
AngloGold Ashanti Limted	G&W Base and Industrials (Pty) Limited	Kuyasa Mining(Pty) Limited
Gold Fields Limited	Imerys South Africa (Pty) Limited	Optimum Coal
Harmony Gold Mining Company Limited	Richards Bay Minerals	Sasol Mining(Pty) Limited
Pamodzi Gold	Vametco Mineral Corporation (Pty) Limited	Total Coal South Africa
Anglo American PlatinumCorporation Ltd	RioTinto	Tweewaters Fuel(Pty) Ltd
Impala Platinum Ltd		Umcebo Mining(Pty) Ltd
Lonmin Platinum Ltd		Xstrata Coal South Africa
Randgold and Exploration Limited		

APPENDIX 2: KRUSKAL-WALLIS RESULTS

KRUSKAL-WALLIS

Ranks

	Mining Type	N	Mean Rank
BEE impacts negatively on transaction costs	PMM	4	4.38
	MM	1	3.50
	NMM	2	3.50
	Total	7	
Q1 recoded	PMM	4	3.63
	MM	1	4.50
	NMM	2	4.50
	Total	7	
Transaction costs are highly influenced by regulations	PMM	4	4.13
	MM	1	3.00
	NMM	2	4.25
	Total	7	
Q2 recoded	PMM	4	3.88
	MM	1	5.00
	NMM	2	3.75
	Total	7	
Costs of doing business in South Africa are high	PMM	4	3.25
	MM	1	4.00
	NMM	2	5.50
	Total	7	

Q4 recoded	PMM	4	4.75
	MM	1	4.00
	NMM	2	2.50
	Total	7	
Privatisation threats impact on transaction costs, therefore on the entire business	PMM	4	4.38
	MM	1	3.50
	NMM	2	3.50
	Total	7	
Rank: Short term contract	PMM	4	2.50
	Total	4[a]	
Rank: Long term contract	PMM	4	3.75
	NMM	2	3.00
	Total	6	
Rank: Vertical Integration	PMM	2	1.50
	Total	2[a]	
Rank: Spot Market	PMM	4	3.50
	NMM	1	1.00
	Total	5	
Rank: Outsourcing	PMM	2	3.00
	MM	1	1.50
	NMM	2	3.75
	Total	5	
Rank: Relational contracts	PMM	2	1.50
	Total	2[a]	
Site specificity	PMM	3	4.17
	MM	1	5.00
	NMM	2	1.75
	Total	6	
Physical –asset specificity	PMM	3	3.50
	MM	1	5.50
	NMM	2	2.50
	Total	6	
Dedicated asset	PMM	3	2.67
	MM	1	6.00
	NMM	2	3.50

Total	6	

Human capital	PMM	3	3.50
	MM	1	5.50
	NMM	2	2.50
	Total	6	
SS: Costly bargaining	PMM	3	3.00
	NMM	2	3.00
	Total	5	
SS: Opportunism	PMM	3	3.33
	NMM	2	2.50
	Total	5	
SS: Hold up problem	PMM	3	2.50
	NMM	2	3.75
	Total	5	
PAS: Costly bargaining	PMM	3	3.00
	NMM	2	3.00
	Total	5	
PAS: Opportunism	PMM	3	3.00
	NMM	2	3.00
	Total	5	
PAS: Hold up problem	PMM	3	2.33
	NMM	2	4.00
	Total	5	
DA: Costly bargaining	PMM	3	3.33
	NMM	2	2.50
	Total	5	
DA: Opportunism	PMM	3	3.00
	NMM	2	3.00
	Total	5	
DA: Hold up problem	PMM	3	3.00
	NMM	2	3.00
	Total	5	
HC: Costly bargaining	PMM	3	4.17

MM	1	4.50
NMM	2	2.00
Total	6	

HC: Opportunism	PMM	3	3.67
	NMM	2	2.00
	Total	5	
HC: Hold up problem	PMM	3	2.67
	NMM	2	3.50
	Total	5	
Opex: Long term	PMM	4	5.00
	MM	1	1.50
	NMM	2	3.25
	Total	7	
Opex: Vertical Integration	PMM	4	3.50
	MM	1	5.50
	NMM	2	4.25
	Total	7	
Opex: Spot market	PMM	4	3.88
	MM	1	5.00
	NMM	2	3.75
	Total	7	
Opex: Outsourcing	PMM	4	4.38
	MM	1	5.50
	NMM	2	2.50
	Total	7	
Opex: Relational contracts	PMM	4	5.00
	MM	1	2.00
	NMM	2	3.00
	Total	7	
Capex: Long term	PMM	4	5.00
	MM	1	1.50
	NMM	2	3.25
	Total	7	

Capex: Vertical Integration	PMM	4	4.50
	MM	1	1.00
	NMM	2	4.50
	Total	7	
Capex: Spot market	PMM	4	4.50
	MM	1	4.50
	NMM	2	2.75
	Total	7	
Capex: Outsourcing	PMM	4	4.00
	MM	1	5.00
	NMM	2	3.50
	Total	7	
Capex: Relational contracts	PMM	4	5.00
	MM	1	2.00
	NMM	2	3.00
	Total	7	
Incomplete contracts	PMM	4	3.50
	MM	1	5.50
	NMM	2	4.25
	Total	7	
Uncertainty	PMM	4	3.88
	MM	1	6.50
	NMM	2	3.00
	Total	7	
Asset specificity on your part	PMM	4	4.25
	MM	1	6.50
	NMM	2	2.25
	Total	7	
Asset specificity on the other part	PMM	4	4.38
	MM	1	6.50
	NMM	2	2.00
	Total	7	
Opportunistic on your part	PMM	4	4.38
	MM	1	3.00
	NMM	2	3.75

	Total	7	
Opportunistic on the other part	PMM	4	4.00
	MM	1	7.00
	NMM	2	2.50
	Total	7	
Frequency of transaction	PMM	4	5.00
	MM	1	4.50
	NMM	2	1.75
	Total	7	

SAIC: Site Specificity	PMM	3	3.00
	NMM	2	3.00
	Total	5	
SAIC: Physical-asset specificity	PMM	3	3.50
	NMM	2	2.25
	Total	5	
SAIC: Dedicated asset	PMM	3	4.00
	NMM	2	1.50
	Total	5	
SAIC: Human Capital	PMM	3	3.67
	NMM	2	2.00
	Total	5	
BC: Site Specificity	PMM	3	2.67
	NMM	2	3.50
	Total	5	
BC: Physical-asset specificity	PMM	3	2.00
	NMM	2	4.50
	Total	5	
BC: Dedicated asset	PMM	3	3.33
	NMM	2	2.50
	Total	5	
BC: Human Capital	PMM	3	3.33
	NMM	2	2.50
	Total	5	

MAEC: Site Specificity	PMM	3	3.33
	NMM	2	2.50
	Total	5	
MAEC: Physical-asset specificity	PMM	3	3.00
	NMM	2	3.00
	Total	5	
MAEC: Dedicated asset	PMM	3	3.50
	NMM	2	2.25
	Total	5	
MAEC: Human Capital	PMM	3	4.00
	NMM	2	1.50
	Total	5	

Test Statistics[a,b]

	Chi-Square	df	Asymp. Sig.
BEE impacts negatively on transaction costs	.350	2	.839
Q1 recoded	.350	2	.839
Transaction costs are highly influenced by regulations	.279	2	.870
Q2 recoded	.279	2	.870
Costs of doing business in South Africa are high	2.250	2	.325
Q4 recoded	2.250	2	.325
Privatisation threats impact on transaction costs, therefore on the entire business	.342	2	.843
Rank: Long term contract	.500	1	.480
Rank: Spot Market	2.105	1	.147
Rank: Outsourcing	1.500	2	.472
Site specificity	3.236	2	.198
Physical –asset specificity	1.875	2	.392
Dedicated asset	2.525	2	.283
Human capital	1.875	2	.392
SS: Costly bargaining	.000	1	1.000
SS: Opportunism	.370	1	.543
SS: Hold up problem	1.500	1	.221
PAS: Costly bargaining	.000	1	1.000
PAS: Opportunism	.000	1	1.000
PAS: Hold up problem	1.667	1	.197
DA: Costly bargaining	.667	1	.414
DA: Opportunism	.000	1	1.000
DA: Hold up problem	.000	1	1.000
HC: Costly bargaining	2.278	2	.320
HC: Opportunism	1.778	1	.182
HC: Hold up problem	.667	1	.414
Opex: Long term	3.900	2	.142
Opex: Vertical Integration	.794	2	.672
Opex: Spot market	.264	2	.876
Opex: Outsourcing	1.950	2	.377

Opex: Relational contracts	2.500	2	.287
Capex: Long term	3.900	2	.142
Capex: Vertical Integration	2.333	2	.311
Capex: Spot market	.972	2	.615
Capex: Outsourcing	.375	2	.829
Capex: Relational contracts	2.500	2	.287
Incomplete contracts	.880	2	.644
Uncertainty	1.956	2	.376
Asset specificity on your part	3.367	2	.186
Asset specificity on the other part	3.292	2	.193
Opportunistic on your part	.397	2	.820
Opportunistic on the other part	3.115	2	.211
Frequency of transaction	3.255	2	.196
SAIC: Site Specificity	.000	1	1.000
SAIC: Physical-asset specificity	1.500	1	.221
SAIC: Dedicated asset	4.000	1	.046 **
SAIC: Human Capital	1.667	1	.197
BC: Site Specificity	.667	1	.414
BC: Physical-asset specificity	4.000	1	.046 **
BC: Dedicated asset	.667	1	.414
BC: Human Capital	.667	1	.414
MAEC: Site Specificity	.667	1	.414
MAEC: Physical-asset specificity	.000	1	1.000
MAEC: Dedicated asset	1.500	1	.221
MAEC: Human Capital	3.333	1	.068 *
a. Kruskal Wallis Test			
b. Grouping Variable: Mining Type			

*** : p < 0,10***

****: p < 0,05***

APPENDIX 3: SUPPLY OF EQUIPMENTS AND COMMODITIES

APPENDIX 3A: SUPPLY OF EQUIPMENTS

GOVERNANCE STUCTURES

SM: Spot Market **SA**: Strategic alliances **LT**: Long term contract
ST: Short term contract **JV**: Joint Venture **VI**: Vertical Integration

MINING COMPANIES

EQUIPMENTS	PMM1	PMM2	PMM3	PMM4	MM1	MM2	NMM1	NMM2
Excavator	SA	SA LT	SA			SA LT	LT JV	SM SA LT ST
Grader	SA	SA LT	SA			SA LT	LT JV	SM SA LT ST
Dozer	SA	SA LT	SA			SA LT	LT JV	SM SA LT ST
Dumper	SA	SA LT	SA			SA LT	LT JV	SM SA LT ST
Loader	SA	LT	SA			SA LT	LT JV	SM SA LT ST
Crane	SA	SM	LT			SA LT	SM JV	SM SA LT ST
Compressor	SA	SM	LT			SA LT	SM JV	SM SA LT ST
Genset	SA	SM	LT			SA LT	SM JV	SM SA LT ST
Roller	SA	SM	LT			SA LT	LT JV	SM SA LT ST
Heavy Mining Equipment	SA	SM LT						
Underground Mining Equipment	SA		SA					
Underground support	SA	LT						
TOTAL PER GOVERN. STRUCTURE	12	5 4 7	6 4			9 9	3 6 9	9 9 9 9

APPENDIX 3B: SUPPLY OF COMMODITIES

GOVERNANCE STUCTURES

SM: Spot Market **SA**: Strategic alliances **LT**: Long term contract
ST: Short term contract **JV**: Joint Venture **VI**: Vertical Integration

MINING COMPANIES

COMMODITIES	PMM1	PMM2	PMM3	PMM4	MM1	MM2	NMM1	NMM2
Tyres	SA						SA ST	
Explosives	SA						LT	
Grinding media	SA							
High Chrome media	SA							
Steel	SA							
Reagents		LT						
Professional Services		SM						
Mining and Drilling		LT						
MRP		SM LT						
Capital		SM LT						
Water	LT	LT	SM VI	LT			LT	LT
Electricity, Power, Energy	SA LT	LT	SM	LT			LT	LT
Petrol, Diesel, Fuel, coal	SA LT	LT	LT	LT		LT	LT ST	LT
Gas, liquid petroleum	LT		LT	LT		LT	LT	LT
Gas, refrigerant	LT	LT	LT	LT		LT	LT	LT
Carbon monoxide	LT		LT			LT	LT	LT
Electrodes	LT	LT	LT	ST		JV	LT	LT
Methane gas	LT		LT			LT	LT	LT
Acetylene	LT	LT	LT	LT		LT	LT	LT

Nitrogen			LT		LT		LT			LT			LT			LT		LT
Oxygen			LT		LT		LT			LT			LT			LT		LT
Oil, hydraulic & others			LT		LT		LT						LT			LT		LT
Sulphuric acid			LT		LT			ST		LT			LT			LT		LT
Nitric acid			LT					ST		LT			LT			LT		LT
Caustic	SA				LT			ST		LT			LT			LT		LT
Hydrochloric acid			LT		LT			ST		LT			LT			LT		LT
Lime			LT		LT			ST			ST		LT			LT		LT
Sodium carbonate			LT		LT			ST			ST		LT			LT		LT
Sodium nitrate			LT					ST					LT			LT		LT
Ferrous sulphate			LT					ST					LT			LT		LT
Manganese dioxide			LT					ST					LT			LT		LT
Silica powder			LT				LT						LT			LT		LT
Chlorine			LT	SM			LT			LT			LT			LT		LT
Calcium hypochlorite			LT				LT			LT			LT			LT		LT
TOTAL PER GOVERN. STRUCTURE		8	23	4	18	2	13	9	1	14	3		21	1	1	25	2	24

APPENDIX 4: CROSS TABULATIONS BY MINING TYPE

Cross Tabulations by Mining Type

BEE impacts negatively on transaction costs * Mining Type Cross tabulation

			Mining Type			Total
			MM	NMM	PMM	
BEE impacts negatively on transaction costs	Neutral	Count	0	0	2	2
		% within Mining Type	.0%	.0%	50.0%	28.6%
	Disagree	Count	1	2	1	4
		% within Mining Type	100.0%	100.0%	25.0%	57.1%
	Strongly disagree	Count	0	0	1	1
		% within Mining Type	.0%	.0%	25.0%	14.3%
Total		Count	1	2	4	7
		% within Mining Type	100.0%	100.0%	100.0%	100.0%

Transaction costs are highly influenced by regulations * Mining Type Cross tabulation

			Mining Type			Total
			MM	NMM	PMM	
Transaction costs are highly influenced by regulations	Strongly agree	Count	0	0	1	1
		% within Mining Type	.0%	.0%	25.0%	14.3%
	Agree	Count	0	1	1	2
		% within Mining Type	.0%	50.0%	25.0%	28.6%
	Neutral	Count	1	1	1	3
		% within Mining Type	100.0%	50.0%	25.0%	42.9%
	Disagree	Count	0	0	1	1
		% within Mining Type	.0%	.0%	25.0%	14.3%
Total		Count	1	2	4	7
		% within Mining Type	100.0%	100.0%	100.0%	100.0%

Costs of doing business in South Africa are high * Mining Type Cross tabulation

			Mining Type			Total
			MM	NMM	PMM	
Costs of doing business in South Africa are high	Strongly agree	Count	0	1	0	1
		% within Mining Type	.0%	50.0%	.0%	14.3%
	Agree	Count	1	1	3	5
		% within Mining Type	100.0%	50.0%	75.0%	71.4%
	Disagree	Count	0	0	1	1
		% within Mining Type	.0%	.0%	25.0%	14.3%
Total		Count	1	2	4	7
		% within Mining Type	100.0%	100.0%	100.0%	100.0%

Privatisation threats impact on transaction costs, therefore on the entire business * Mining Type Cross tabulation

			Mining Type			Total
			MM	NMM	PMM	
Privatisation threats impact on transaction costs, therefore on the entire business	Strongly agree	Count	0	0	1	1
		% within Mining Type	.0%	.0%	25.0%	14.3%
	Neutral	Count	0	0	1	1
		% within Mining Type	.0%	.0%	25.0%	14.3%
	Disagree	Count	1	2	1	4
		% within Mining Type	100.0%	100.0%	25.0%	57.1%
	Strongly disagree	Count	0	0	1	1
		% within Mining Type	.0%	.0%	25.0%	14.3%
Total		Count	1	2	4	7
		% within Mining Type	100.0%	100.0%	100.0%	100.0%