BUSINESS-TO-BUSINESS MARKETING AND THE MARKETING OF INNOVATIONS IN THE SOUTH AFRICAN DIAMOND CUTTING AND POLISHING INDUSTRY

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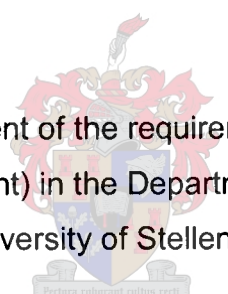

Thesis presented in partial fulfilment of the requirements for the degree of Master of Commerce (Business Management) in the Department of Business Management at the University of Stellenbosch

SUPERVISOR: PROFESSOR N.S. TERBLANCHE

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DECLARATION

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature: Date: 01-12-2005

ABSTRACT

The South African diamond beneficiation industry is currently undergoing considerable industrial, regulatory and legislative reform. The Precious Metals and Diamonds General Amendment Bill and other government initiatives will result in growth in the local industry. In order to answer Government's call for increased processing of locally produced rough diamonds, polished diamond manufacturers will be continually searching for ways to improve production output and quality with greater efficiency and effectiveness.

The study has been performed in conjunction with innovative research and development being conducted by HBD Venture No 7 (Pty) Ltd, a local company formed to design an innovative diamond sawing and polishing machine for the diamond beneficiation industries of South Africa and abroad. The company members believe that a strong market opportunity exists for the development of a more efficient, flexible and cost effective machine, whose predecessor's design has remained relatively unchanged for a century or more. It is also believed that a unique opportunity has presented itself as a result of favourable environmental factors arising from impending industry changes which will serve to promote the local processing of rough diamonds thus taking advantage of South Africa's rich potential for downstream value-creation.

The overall purpose of the study is to assist South African innovators of new and improved diamond beneficiation machinery [specifically the technological innovation being designed by HBD Venture No 7 (Pty) Ltd] to achieve a successful product design as well as commercial marketing success. This will be accomplished by enhancing their understanding of the perceptions, needs and purchase intentions of the population of South African diamond cutting and polishing firms that influence the adoption and diffusion of an innovative technology. Furthermore, the study seeks to provide innovators with an understanding of the processes and theory involved in the field of business-to-business marketing and the marketing of innovations.

The empirical study seeks to achieve the following five objectives:

1) To identify the factors, if any, that characterise firms as potential adopters or non-adopters of the technological innovation
2) To determine the optimal benefit bundle that will improve the probability of success in terms of the marketability of the technological innovation
3) To determine the most effective conduits for marketing communications in order to generate product awareness and promote the technological innovation
4) To determine the market potential for the technological innovation at various possible selling price ranges
5) To determine the radicalness of the technological innovation's impact and its effect on the organisational adoption thereof

Findings indicate that the study was unsuccessful in profiling potential adopters based upon the operational and demographic variables used. The optimal benefit bundle should include features that result in increased cutting accuracy and less wastage of the rough diamond. Personal sales calls should represent the impetus of marketing communications efforts. The empirical research suggests that the technological innovation should be priced between R20 001 and R30 000 to ensure that it is within the willing purchase price ceiling of 88.23 percent of potential buyers. Finally, the product is perceived by respondents to be semi-radical which has implications for the firm's market orientation.

OPSOMMING

Die Suid-Afrikaanse diamantverwerkingsindustrie ondergaan tans merkwaardige industriële, regulatoriese en wetgewende reformasie. Die Edel Metale en Diamante Algemene Wysigingswetsontwerp en ander staatsinisiatiewe sal lei tot plaaslike industriële groei. Om aan die staatsaanvraag na verhoogde prosessering van plaaslik-geproduseerde ruwe diamante te voldoen, gaan diamantslypers aanhoudend op soek wees na maniere om hulle opbrengs en kwaliteit te verbeter deur die verhoging van doeltreffendheid en effektiwiteit.

Die studie is uitgevoer in samehang met vernuwende navorsing en ontwikkeling uitgevoer deur HBD Venture No 7 (Edms.) Bpk., 'n plaaslike maatskappy wat gestig is met die doel om 'n nuwe diamantsny- en slypingstoestel vir die Suid Afrikaanse en buitelandse diamantverwerkingsindustrie te ontwerp. Die maatskappylede glo dat 'n sterk markgeleentheid bestaan vir die ontwikkeling van 'n meer doeltreffende, veelsydige en lonende toestel, aangesien die bestaande ontwerp vir 'n eeu of langer relatief onveranderd gebly het. Hulle glo ook dat 'n eenmalige geleentheid hom voordoen as gevolg van gunstige omgewingsfaktore. Hierdie faktore onstaan uit opkomende industriële verwikkelinge wat die plaaslike verwerking van ruwe diamante sal bevorder deur gebruik te maak van Suid Afrika se ryk potensiaal vir stroom-af waardeskepping.

Die algehele doel van die studie is om Suid Afrikaanse innoveerders van nuwe en verbeterde diamantverwerkingstoerusting [veral die tegnologiese innovasie ontwerp deur HBD Venture No 7 (Edms.) Bpk.] by te staan om 'n suksesvolle produk te ontwerp en suksesvol te bemark in die kommersiële arena. Dit kan bereik word deur die maatskappylede se kennis uit te brei in terme van die persepsies, benodighede en aankoopvoorneme van die populasie van Suid Afrikaanse diamantsnyers- en slypers wat 'n invloed het op die aanvaarding en verspreiding van vernuwende tegnologie. Die studie wil verder innoveerders voorsien van 'n begrip van die prosesse en teorieë betrokke by inter-bedryf bemarking en die bemarking van innovasies.

Die empiriese studie poog om die volgende vyf doelwitte te bereik:

1) Om die faktore te identifiseer wat firmas kenmerk as potensiële aanvaarders of nie-aanvaarders van hierdie tegnologiese innovasie
2) Om die optimale produkvoordeel-groepering vas te stel wat die moontlike sukses in terme van die bemarkbaarheid van die tegnologiese innovasie, sal verbeter
3) Om die mees effektiewe opsies vas te stel vir bemarkingskommunikasie met die doel om produkbewustheid en reklame van die tegnologiese innovasie te genereer
4) Om die markpotensiaal vir die tegnologiese innovasie teen verskillende voorkoopspryse vas te stel
5) Om die radikaalheid van die tegnologiese innovasie se impak en die invloed daarvan op organisatoriese aanvaarding te bepaal

Dit is bevind dat die demografiese en operasionele veranderlikes van die studie nie geskik was om potensiële aannemers te profileer nie. Die optimale produkvoordeel-groepering behoort kenmerke in te sluit wat sal lei tot verbeterde sny-akkuraatheid asook verminderde vermorsing van die ruwe diamant. Persoonlike verkoopsbesoeke behoort die dryfkrag agter bemarkingskommunikasie-aktiwiteite te wees. Die empiriese navorsing dui aan dat die tegnologiese innovasie tussen R20 001 en R30 000 geprys moet word om te verseker dat dit binne die gewillige aankoop-prysplafon van 88.23 persent van potensiële kopers sal val. Laastens beskou respondente die produk as semi-radikaal, wat implikasies teweeg bring vir die firma se bemarkingsoriëntasie.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND TO THE STUDY

The diamond beneficiation industry in South Africa is currently undergoing considerable industrial, regulatory and legislative reform. The Precious Metals and Diamonds General Amendment Bill and other government initiatives will result in considerable growth in the local industry with an increased number of diamond cutting and polishing businesses becoming active in the country. In order to answer Government's call for increased processing of locally produced rough diamonds, polished diamond manufacturers will be continually searching for ways to improve production output and quality of polished diamonds with greater efficiency and effectiveness. In a recent diamond value-addition study commissioned by Government to determine the potential for increasing diamond processing activity in South Africa, one of the 53 recommended intervention options for industry prosperity was the improvement of "*productivity within the cutting and polishing industry – referring to labour, management, processes and technology*" (Kaiser EDP, 2005b: vi).

The study emerges against the backdrop of innovative research and development being conducted by HBD Venture No 7 (Pty) Ltd. This local company was formed to research and develop an innovative new and improved diamond sawing and polishing machine for the South African and foreign diamond beneficiation industries. The technological innovation is a vibration-free diamond sawing and polishing machine with a revolutionary drive mechanism for the beneficiation of gem and industrial quality diamonds. The company members believe that a strong market opportunity currently exists for the development of a more efficient, flexible and cost effective machine, whose predecessor's design has remained relatively unchanged for a century or more. It is also believed that a unique opportunity has presented itself as a result of favourable environmental factors arising from impending industry changes brought about by the Precious Metals and Diamonds General Amendment Bill which will serve to promote and grow the local processing of rough diamonds thus taking advantage of South Africa's rich potential for downstream value-creation (Cromberge, 2005).

Innovative, newly developed diamond sawing and polishing machines with significant advantages over current technologies may assist diamond cutters and polishers to achieve more effective and profitable operations. To assist in understanding the needs and dynamics of South Africa's cutters and polishers of rough diamonds, empirical market research needs to be conducted that attempts, among other things, to identify important sought-after attributes of a new innovative sawing and polishing machine. This knowledge will enable up-and-coming manufacturers (specifically HBD Venture No 7 (Pty) Ltd) of innovative diamond sawing and polishing machinery to design a product that meets the market's needs and requirements, and assists in improving polished diamond yields and quality as well as reducing production costs.

In order to apply the results of such an empirical study that examines the needs and dynamics of South Africa's diamond cutting and polishing industry, it is necessary to possess a sound understanding of the concepts and mechanisms involved in the marketing of a technological innovation to an industrial (business-to-business) market. It becomes necessary to possess an understanding of the process by which organisations adopt innovative new products as well as the techniques and processes involved in successfully launching a technological innovation. Furthermore, in the case of an innovative diamond sawing and polishing machine which will compete against existing mature technologies, it is necessary to examine the strategy involved in diffusing against a mature technology.

Market research is a powerful tool as it can provide a valuable contribution to the development of innovative products (Trott, 2005). It is argued by the proponents of market research that such activities ensure that companies are customer-oriented (Trott, 2005), which implies that new products are more successful if they are designed to satisfy a perceived need rather than if they are designed simply to take advantage of a new technology (Trott, 2005). Cooper (1979: 101) succinctly summarises the importance of market research in the case of innovative industrial products in the following statement: "*The commercial viability of a new product rests in the hands of its potential customers; and therefore a solid understanding of the marketplace together with an effective market launch effort is vital to new product*

success".

1.2 OBJECTIVES AND PURPOSE OF THE STUDY

The overall purpose or goal of the study is to assist South African innovators of new and improved diamond beneficiation machinery [specifically the technologically innovative new and improved diamond sawing and polishing machine being designed by HBD Venture No 7 (Pty) Ltd] to achieve a successful product design as well as commercial marketing success by enhancing their understanding of the perceptions, needs and purchase intentions of the population of South African diamond cutting and polishing firms that influence the adoption and diffusion of an innovative technology. Furthermore, the study seeks to provide innovators with an understanding of the concepts, processes and theory involved in the field of business-to-business marketing and the marketing of innovations.

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Some recommendations will also be supplied in this regard to HBD Venture No 7 (Pty) Ltd.

1.3 METHOD OF INVESTIGATION

The method of investigation followed in this study can be divided into two main sections, namely a literature review and an empirical study undertaken by means of a self-administered questionnaire.

1.3.1 The literature study

Prior to the compilation of the questionnaire, a comprehensive literature study was undertaken into various aspects of business-to-business marketing and the marketing of innovations, as well as into existing research concerning the use of measuring instruments to explore potential customers' perceptions of new product innovations. The diamond cutting and polishing literature was also analysed in order to gain an understanding of the products and processes involved in the industry. An in-depth analysis of contemporary industry news regarding the diamond pipeline was conducted in order to obtain a thorough understanding of the dynamics of the diamond industry. Furthermore, a detailed examination was conducted into the industry, regulatory and legislative reforms that are transforming the South African diamond industry. Sources of literature included books, trade publications, websites of industry associations, statistics, research papers, pieces of legislation and other relevant documents.

An existing survey instrument was sought that had been applied to a specific industrial innovation in a particular industry to determine variables such as adopter profiles, optimal product benefit bundles, perceptions of marketing communications techniques and product market potential. The search revealed a Masters thesis produced by a graduate student of the Virginia Polytechnic Institute and State University (Cumbo, 1999). This thesis researched the adoption of innovative lumber grading/scanning technology in the secondary wood products industry. The survey questionnaire utilised by Cumbo (1999) was designed to identify potential adopters of scanning technology, the optimum benefit bundle to increase the marketable success of automated lumber grading technology, and the best methods of promotion to the industry. The measuring instrument used in the empirical study on the diamond cutting and polishing industry is based upon this questionnaire. The fifth research

variable, namely the radicalness of the technological innovation's impact and its effect on the organisational adoption thereof, was not covered in the study by Cumbo (1999) and was added to the questionnaire using resources obtained in the literature study.

1.3.2 The empirical study

A self-administered questionnaire (see Appendix I) was developed in order to collect data from a sample of respondents. The entire population of 289 South African diamond cutters and polishers was surveyed using an official mailing list obtained from the South African Diamond Board. After deducting the number of non-respondents, the total sample surveyed came to 245 companies. To each of these sampling units, a questionnaire was mailed. Every questionnaire was accompanied by a cover letter informing the respondent of the purpose of the study. Every questionnaire was also accompanied by a postage-paid return envelope for the return mailing of the completed questionnaire. A follow-up mailing in the form of a reminder postcard was conducted to every element in the sample in an effort to increase the return rate of the mail survey.

Of the 245 companies surveyed, 17 useable responses were received resulting in an overall response rate of 6.94 percent. Although this response rate is incredibly low, the literature indicates that there are no rules that govern an acceptable response rate; although higher is clearly better, it is difficult to find a systematic analysis that justifies a specified level (Dennis, 2003). Dennis (2003) argues further that implicitly, any published survey has an acceptable response rate (to the author, editor and referees if no others) regardless of how low it is.

The self-administered questionnaire consists of questionnaire items that address each of the five research objectives. Question 1 serves as a screening question to eliminate companies that erroneously appear on the mailing list and are not involved in diamond sawing and polishing. The private and delicate items concerning annual polished diamond output (question 19), annual total sales (question 20), and full-time employee complement (question 21) were included towards the end of the

questionnaire as it was believed that these items could provoke resistance amongst respondents towards the survey due to the sensitive nature of the information requested. Furthermore, the two open-ended questions (numbers 22 and 23) were relegated to the end of the questionnaire as they tend to be time-consuming and may demotivate a respondent from completing the questionnaire if they appear in the body of the form.

After the results of the empirical study are investigated, implications are drawn for the management of HBD Venture No 7 (Pty) Ltd.

1.4 THE STRUCTURE OF THE STUDY

Chapter one provides an introduction to the study, detailing the background to the research, the objectives and purpose of the study as well as the methods of investigation to be employed. Chapter two presents a detailed analysis of the diamond pipeline from the production of rough diamonds through to the marketing of the polished final product. This is followed by an examination of the status of the South African diamond cutting and polishing industry in chapter 3 as well as an investigation into industry, regulatory and legislative reforms that are transforming the industry landscape. In chapter four, the concept of business-to-business marketing is discussed followed by an analysis of the key differences between business-to-business and business-to-consumer marketing. Chapter five delves into the theory surrounding the marketing of innovations with emphasis on the strategy employed in diffusing against a mature technology; the chapter concludes with a discussion of the processes involved in launching and marketing a high-technology innovation. The design and methodology of the empirical study are covered in chapter six while chapter seven presents the results and findings of the research along with implications for the research and development being conducted by HBD Venture No 7 (Pty) Ltd.

CHAPTER 2: THE SOUTH AFRICAN DIAMOND PIPELINE – FROM ROUGH TO POLISHED

2.1 DIAMOND PRODUCTION IN SOUTH AFRICA

South Africa is a seasoned player in the global diamond industry, as its production of the precious mineral dates back to the year 1866 when its diamond deposits were first discovered on the southern bank of the Orange River. Over the years, South Africa's diamond production has increased tremendously. This has earned the country its ranking as the fourth largest diamond producer in terms of value (behind Botswana, Russia and Canada) (SADB, 2004) and the fifth largest diamond producer in terms of carat volume (behind Australia, Botswana, Russia and the Democratic Republic of Congo) (DME, 2004a) in the world. This, according to the South African Diamond Board (SADB) (diamond industry custodian, chief licensing body, and issuer of authoritative industry statistics) translates into a production figure of 12.586 million carats valued at US$1.2 billion for the year 2003 (SADB, 2004); The Department of Minerals and Energy (DME) places the production figure at 12 666 536 carats for the same year (DME, 2004b). The South African diamond industry currently employs 28 000 people: 13 000 in mining, 9 000 in retail, 3 000 in manufacturing, 2 100 in cutting and polishing and 900 in sorting and valuing (Monama, 2005).

2.1.1 The role and characteristics of the South African Diamond Board

Before one delves into more detailed statistical reporting, it is prudent to discuss the role and structure of the SADB within the South African diamond industry, as the Board plays an important role in the current overhaul of the beneficiation sector and the diamond distribution system. The mission of the SADB (a statutory body established by the Diamonds Act No. 56 of 1986) is concerned with the exercising of control over the possession, purchasing and sale, processing and export of diamonds and over matters associated therewith such as full compliance with the Kimberley Process Certification Scheme (www.sadb.co.za; DME, 2004b). The objectives of the Board are to ensure that the diamond resources of South Africa are exploited and developed in the best interests of the country and to promote the

sound development of diamond undertakings in the Republic (SADB, 2004; DME, 2004b). This objective is to be realised by supporting industry players and by facilitating black economic empowerment through the provision of assistance to historically disadvantaged individuals to enable them to participate in the manufacture and trade of diamonds, and to find creative ways of ensuring sustainability (SADB, 2004). According to the current chairperson of the SADB, Mr Abbey Chikane, the major challenge of the Board is to transform the diamond industry in line with the policies of the new political dispensation by facilitating the removal of legislative constraints on the transformation process, in order to position South Africa as a sustainable globally competitive diamond producing country (SADB, 2004). The Board also serves to facilitate an emerging consensus between government and industry leaders on the need to transform the industry and the directions to be taken in this regard (SADB, 2004). The SADB's current strategy is to grow and advance South Africa's diamond cutting, diamond polishing, and jewellery manufacturing industry sectors in order to reduce unemployment and enable the economy to benefit and grow from improved revenues through higher value chain activities.

The SADB serves to regulate the possession of and trade in unpolished diamonds. As such, possession of and trade in unpolished diamonds is prohibited in South Africa unless one is a producer who has won or recovered the diamonds from a mine as defined under Section 1 of the Mineral and Petroleum Resources Development Act No. 28 of 2002 (formerly the Minerals Act of 1991), or one is a licensee or permit holder under Chapter IV of the Diamonds Act No. 56 of 1986 (DME, 2004b). The SADB is authorised to issue the following licenses in accordance with the Diamonds Act (South Africa, 1986; DME, 2004b) [(the number and certain particulars of these licenses are subject to change pending the passing of the Precious Metals and Diamonds General Amendment Bill (DME, 2005)]:

- a diamond dealer's licence entitling the holder to carry on business as a buyer, seller, importer or exporter of unpolished diamonds
- a diamond cutting licence entitling the holder to polish diamonds for the purpose of business or trade
- a diamond tool-making licence entitling the holder to set unpolished diamonds

in tools, implements or other articles or to crush or alter those diamonds for the purpose of such setting or for the purpose of trade

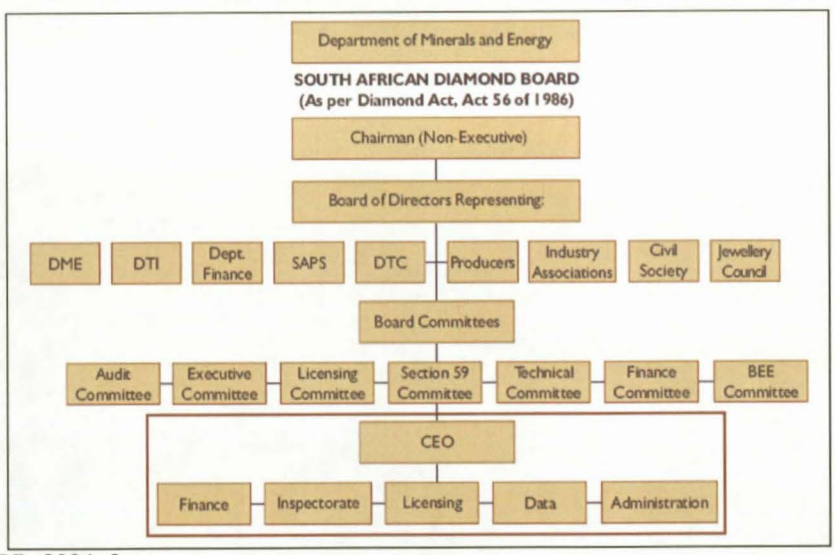
- a diamond research licence entitling the holder to conduct applied research and tests in connection with diamonds, but not to polish diamonds for the purpose of business or trade

Diamonds can only be exported through the offices of the SADB in Johannesburg, with all imports and exports of rough diamonds requiring strict adherence to the Kimberley Process Certification Scheme (DME, 2004b) (a copy of a Kimberley Process Certificate is included in Appendix A). The Kimberley Process Certification Scheme, officially implemented in January 2003 (DME, 2003), has established a certification system for the international trade in rough diamonds in order to exclude conflict diamonds (stones that are illegally mined or recovered, and traded) from the legitimate diamond market (Smillie, 2002). South Africa is one of a total of 43 diamond producing and trading countries (including the European Community) who are participants in the Scheme (Kimberley Process Secretariat, 2005) (the number of Kimberley Process Certificates issued by the SADB during the 2003 calendar year are presented in Appendix B). In accordance with the Kimberley Process, the Minister of Minerals and Energy has imposed the Scheme's minimum requirements upon all licensed diamond traders operating in South Africa (SADB, 2004). Furthermore, the SADB has instituted a secure auditable monitoring and control system designed to trace the movement of rough diamonds through the pipeline from mine to market (SADB, 2004). Lastly, the Board acts to enhance awareness about the merits of the Kimberley Process and the need for industry compliance therewith.

The SADB consists of representatives from all diamond industry role players (as appointed by the Minister of Minerals and Energy) (SADB, 2004) and, as such, represents a comprehensive spectrum of industry opinion and influence in terms of the steering of the direction of the South African diamond industry. As seen in the organogram of the SADB illustrated in Figure 1, the Board comprises representatives from the full range of relevant government institutions and ministries, as well as private enterprise (as stipulated by the Diamonds Act): the Department of Minerals and Energy, the Department of Finance, the South African Police Service, the

Department of Trade and Industry (DTI), diamond producers (such as De Beers, Trans Hex and SouthernEra), the Diamond Trading Company (DTC) (the marketing arm of De Beers) (Muller, 2004a), industry associations representing diamonds dealers [such as the DDCSA (Diamond Dealers Club of South Africa) and the RDDA (Rough Diamond Dealers Association], industry associations representing diamond cutters [such as the MDCA (Master Diamond Cutters Association) and UDASA (United Diamond Association of South Africa)], industry associations representing employees of diamond cutters [such as SADWU (South African Diamond Workers' Union), UDASA, and UASA (United Association of South Africa)], and lastly the Jewellery Council of South Africa (JCSA). In the event of the passing of the Precious Metals and Diamonds General Amendment Bill, the SADB will be replaced by a juristic person known as the South African Diamond Regulator that will no longer be representative of all industry voices.

Figure 1
Organisational diagram of the South African Diamond Board (SADB)



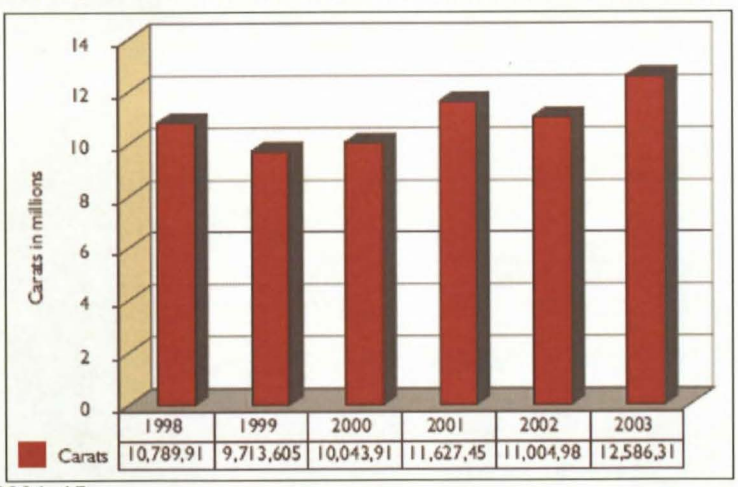
Source: SADB, 2004: 8.

Once having achieved an understanding of the nature, roles and functions of the SADB, it is feasible to commence a more detailed description of South Africa's overall diamond production.

2.1.2 Overview of total production

The SADB predicts that South Africa will maintain its ranking as the fourth largest rough diamond producer in value terms in the world for the foreseeable future (SADB, 2004). The progression of South Africa's total annual rough diamond production for the five years up until the end of 2003 is depicted in Figure 2. Examination by the astute reader of the graph presented in Figure 2 will reveal some flaws in the graph design (relating particularly to the height of certain bars and the corresponding calibrations on the vertical axis) as well as seemingly erroneous denotation of the figures in millions on the horizontal axis. However, the Chief Executive Officer of the SADB, Mr. L. Selekane (personal communication, 17 March 2005), provides assurance that the figures are correct despite the areas of concern alluded to above. Note that the same comments and concerns apply to Figures 4 and 5 presented later in the text.

Figure 2
Estimated total rough diamond production from South Africa during the period 1998-2003



Source: SADB, 2004: 15.

As can be seen in Figure 2, the country's total rough diamond production has steadily risen during the period (despite some fluctuations) from 10.789 million carats in 1998 to 12.586 million carats in 2003 (SADB, 2004). The DME (2004a) produces slightly different figures, as it reports production in 2003 to be 12.87 million carats which represents an 18 percent increase over the 2002 production figure of 10.92 million carats. The DME attributes the higher production to increased output from De Beer's Kimberley, Venetia and Namaqualand mines (DME, 2004a). As a percentage of the

total global rough diamond production of 140 million carats in 2003 (valued at US$9.4 billion) (Chamber of Mines of South Africa, 2003a), South Africa produces 9.1 percent (DME, 2004b) of the world's rough diamond supply (see Appendix C) valued at US$950 million.

South Africa's diamond resources can be divided into its primary sources of predominantly Kimberlite (and to a lesser extent, Lamproite) pipes as well as its secondary sources of alluvial (resulting from flowing water) and "placer beach" deposits (SADB, 2004). According to statistics generated by the Minerals Bureau, a total of 75 mining licensees produced diamonds in 2003, of which 16 mined Kimberlite pipes, 42 exploited alluvial deposits and 17 recovered diamonds from the marine environment (DME, 2004a).

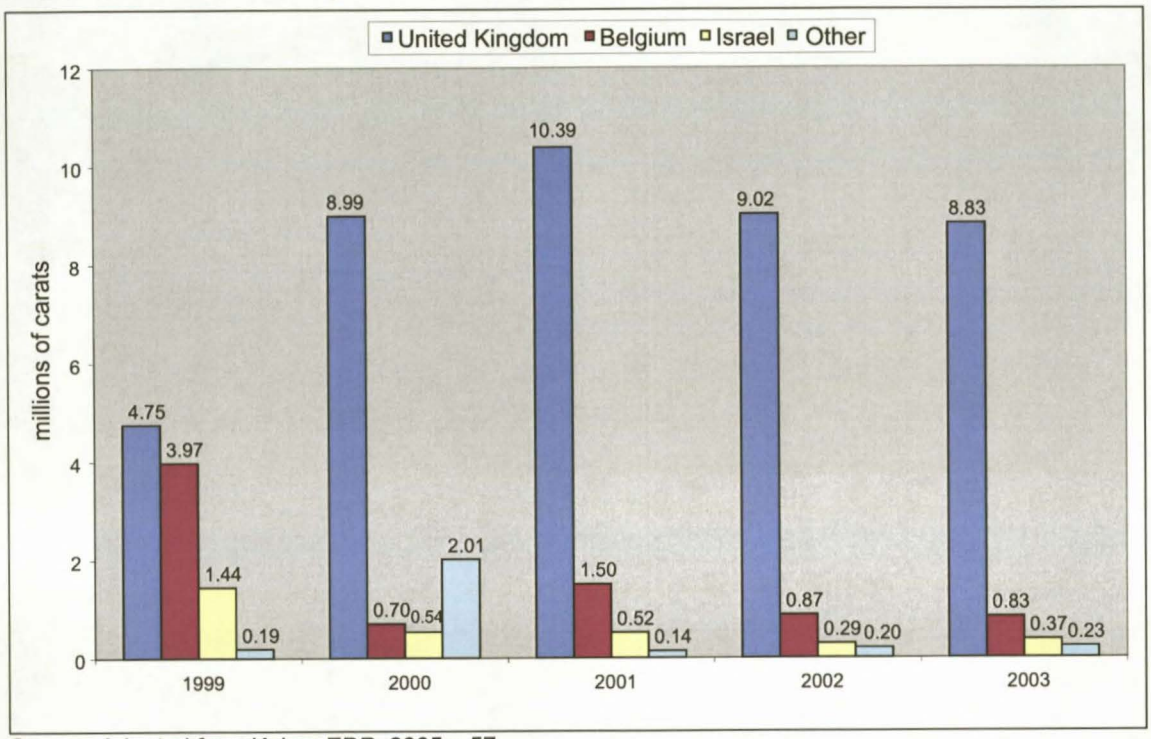
The country's diamond producers are divided into large-scale (the three largest being De Beers, Trans Hex and SouthernEra) and small-scale (Rex Diamonds, Firestone Diamonds, Trivalence Mining Corporation, Majestic Resources, Caussa Capital Corporation, Mountain Lake Resources and Petra Diamonds) mining companies (SADB, 2004; MBendi Information Services, 2004). The small producers tend to concentrate largely on the mining of alluvial or gravel deposits whereas the larger mining companies mine both primary and secondary diamond deposits with a greater emphasis on primary diamond resources (SADB, 2004).

Figures 4 and 5 provide a more detailed portrayal of the data presented in Figure 2 by separating the proportions of diamond production for which the few large and comparatively many smaller diamond mining companies are responsible. It becomes evident from Figures 4 and 5 that the large scale producers (De Beers, Trans Hex and SouthernEra) are responsible for the majority of South Africa's rough diamond production, and as such should be the focus of analysis from a raw materials production perspective. South Africa's total gross rough diamond export value for 2003 has been tentatively estimated at just over US$1.4 billion (DME, 2004b) with a total export volume of 10.26 million carats (as seen in Figure 3) (Kaiser EDP, 2005a).

The graph depicted in Figure 3 indicates that the United Kingdom, Belgium and Israel are consistently the top export markets for South African rough diamonds in terms of

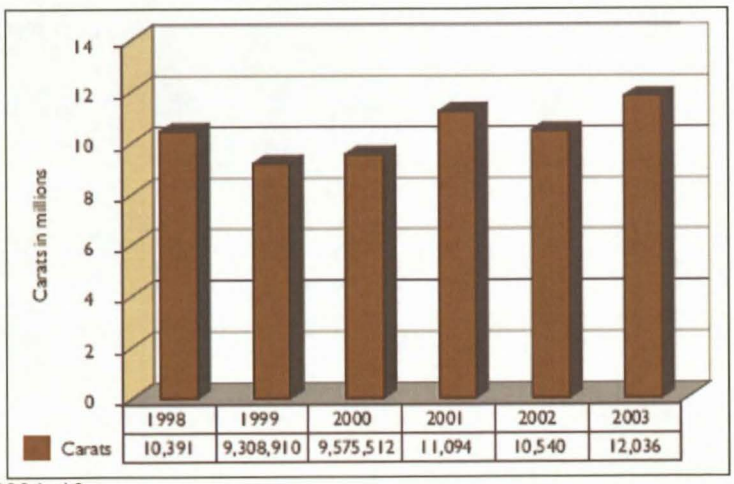
volume (Kaiser EDP, 2005a). This is also true in value terms (Kaiser EDP, 2005a). However, the United States of America is also a significant market for South African rough diamonds in terms of value as it has the highest average value per carat of any of the markets (US$1599.23 per carat in 2003) (Kaiser EDP, 2005a).

Figure 3
Top volume markets for rough diamond exports from South Africa during the period 1999-2003



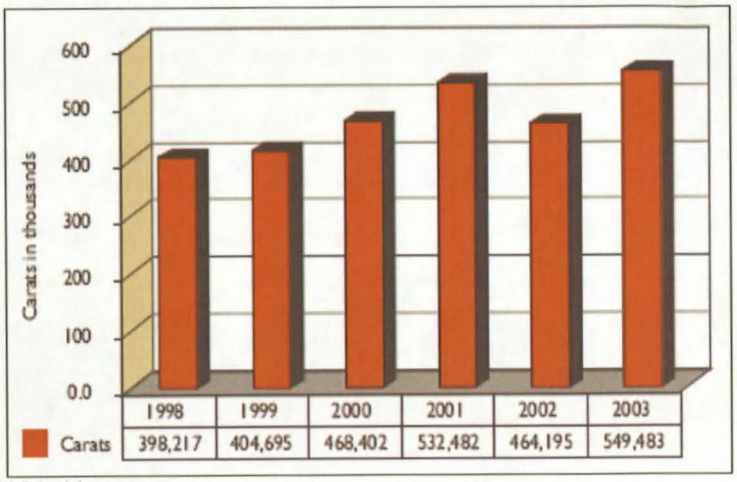
Source: Adapted from Kaiser EDP, 2005a: 57.

Figure 4
Estimated rough diamond production from South African large scale producers 1998-2003



Source: SADB, 2004: 16.

Figure 5
Estimated rough diamond production from South African small scale producers 1998-2003



Source: SADB, 2004: 16.

2.1.3 Market perceptions of diamond supply conditions

During the 2003 calendar year, the global rough diamond market commanded high prices (SADB, 2004). According to the SADB (2004), the average price of rough diamonds increased by 20% in the year under review with De Beers' DTC (the marketing arm of the world's biggest diamond producer) announcing increases of approximately 8% [Tacy Diamond Industry Consultants (Even-Zohar, 2004a) reported the DTC's average price increase in late 2004 to be 5%]. Diamond dealers worldwide who were relying on higher expected rough diamond premiums of greater than 15 to 20 percent, experienced large losses due to speculation when premiums on DTC boxes were severely reduced to the 3 to 5 percent range (Even-Zohar, 2004b); they hoarded rough diamond inventories with a view to selling them subsequent to the emergence of higher premiums at a great profit (Even-Zohar, 2004a). Such diamond dealers will have to either sell at significant losses or hold on to inventories well into early 2006, assuming that a prosperous and lucrative 2005 Christmas season manifests itself (Even-Zohar, 2004b). The DTC based its price increase, which it believes to be a sustainable figure, on the prevalence of higher polished diamond prices and healthy global consumer demand (Even-Zohar, 2004a).

The reason for the widespread speculation is that the rough diamond market believes that the DTC is unable to satisfy demand (Even-Zohar, 2004a). This is also the

perception on the South African front, as the SADB forecasts a long-term shortage of rough diamonds with corresponding price increases (SADB, 2004). There are a number of reasons for the prevalence of this perception:

- De Beers announced that its mining production is below budget due largely (but not solely) to technical problems suffered at Debswana's Orapa and Jwaneng mines as well as an illegal strike of two weeks in August 2004 (Even-Zohar, 2004a; De Beers Group, 2004)
- The strength of the Rand and Sterling against the US Dollar; this exchange rate dilemma resulted in a loss for De Beers of US$120 million in 2003 (Katz, 2005; Bain, 2004a)
- De Beers' consummation of a settlement with Angola's state-owned diamond company Endiama (Katz, 2005)
- The economic stress placed on De Beers due to its need to find amicable solutions for the 13.5 percent of its 9 442 employees that face retrenchment due to operating losses that result from the strong rand's cutting of export income (Reuters, 2005c)
- De Beers is struggling to locate more rough diamond resources in light of the graduated constraints on its Russian rough purchases by the European Commission (Katz, 2005). De Beers and Russia's state-owned diamond monopoly, Alrosa, were forced to scale back a rough diamond distribution deal in response to concerns regarding fair competition (Reuters, 2005a). Thus, Alrosa cut the value of rough diamonds it sells to De Beers from a maximum of US$700 million in 2005 to US$275 million by 2010 (Reuters, 2005a)
- De Beers is experiencing losses at five of its seven South African mines and will be forced to close some of its operations during 2005 unless productivity can be boosted and costs cut (Fraser, 2005b)
- At the Israel Rough Diamond Seminar held in July of 2004, a decrease in the total world diamond mining reserve was reported (i.e. depleted mining is not being replaced by corresponding amounts of new discoveries) (Even-Zohar, 2004a)

The above argument represents the perception of a shortage of rough diamond supply. Another argument, equally well supported by the facts, exists that supports

the perception of an oversupply in the rough diamond market. The two views could be reconciled by the following facts: In 1999, De Beers announced that it would no longer maintain buffer stocks of rough diamonds and would offload its full supply onto the market (Even-Zohar, 2004a). As a result, the availability of rough diamonds may currently be declining, despite the fact that the market has been oversupplied for a number of years.

A mere two months after Chaim Even-Zohar, learned industry analyst and editor of the authoritative and well respected Diamond Intelligence Briefs (the periodical of choice for all top executives in the diamond and diamond jewellery business), produced the article referenced in the paragraphs above detailing the perceived shortage in rough diamond supply, he produced a further enlightening text revealing insightful interpretations of industry facts that supported the face on the other side of the coin: an oversupply of rough diamonds in the market. Before one delves into a discussion concerning the juxtaposition alluded to above, it is useful to work according to the following premise: diamond industry "fact" is never denotative/objective in its definition; it is by nature connotative/subjective. Industry statistics will almost always differ depending on the publisher concerned and can always be interpreted in a way that reveals a different truth. Whereas any researcher would hope to deal at all times with absolute truths, this is not always possible. What is possible, is to obtain an understanding of the prevailing perceptions in the market and to remember that it is these perceptions that determine the behaviour of market participants (and influence market forces) that shape the strategic direction of the industry.

Chaim Even-Zohar (2004b) vehemently asserts that the diamond market perceives shortages, and acts on those perceptions, while ignoring the facts which state that on a macro level, no such supply shortages exist. In contrast Gareth Penny, Managing Director for De Beers DTC, maintains that overall demand is ahead of supply and that there is price pressure for more expensive goods (Katz, 2005). Penny also warns of future shortages of rough diamonds, as he claims that reserves have been depleted, and asserts that there is no prospect of a new sizeable diamond mine within the next 7 to 10 years (Muller, 2004b). Penny adds that this global problem is

being aggravated by production declines at Rio Tinto's Argyle mine in Australia, which is the world's largest diamond mine by volume (Muller, 2004b).

Chaim Even-Zohar (2004b) disagrees with the optimism of Gareth Penny. He believes that the diamond industry is heading towards 16 to 18 months of a weak market for both rough and polished diamonds (Even-Zohar, 2004b). This, it is argued, is due to the fact that too many rough diamonds have been supplied to the market as evidenced by carat volume figures that indicate that more diamonds enter the diamond pipeline than are purchased by final consumers (Even-Zohar, 2004b). Furthermore, Even-Zohar (2004b) avers that consumer demand is unhealthy and, when measured in real terms, the diamond jewellery market is stagnating. In addition, growth in sales of other luxury items is outperforming diamond sales by some 400 to 500 percent (Even-Zohar, 2004b).

From 2001 to 2003 the diamond markets have been oversupplied, with total supply to the rough markets in 2003 coming to US$10.1 billion (new mining output + withdrawals from producer stockpiles) (Even-Zohar, 2004b). When converted into polished diamonds, this supply yields a value of US$16.1 billion measured in polished wholesale prices (Even-Zohar, 2004b). In 2003, however, worldwide polished diamond demand was significantly lower, in the US$14.5 to US$15.5 billion range (in polished wholesale prices); these figures indicate an oversupply of some US$1 billion or more (Even-Zohar, 2004b). A similar situation transpired in 2001 and 2002. Therefore, it can be concluded that in the last few years there has been a multiple billion dollar figure worth of diamonds in a growing stock overhang, with new rough supply being consistently and substantially higher than the sales of the resultant polished diamonds (Even-Zohar, 2004b).

The stock overhang in the diamond pipeline is enormous despite the claims by De Beers that it has diminished by 17% in the first half of 2004 since the same period in 2003 (Even-Zohar, 2004b). In addition to these problems of excessive supply, the diamond market is also plagued by price volatility. In order to demonstrate the problems of price volatility, it is useful to use the United States as an example. The

United States is the exemplar for such a discussion as it is the leading consumer of diamond jewellery and represents 45% of the world market (Kaiser EDP, 2001b). For a graphical representation of diamond consumption per world region, refer to Appendix D.

If one examines polished diamond imports into the United States, it will be observed that imports increased in the first half of 2004 by 15.5 percent to US$6.71 billion, but decreased in carat volume terms by 2.6 percent (Even-Zohar, 2004b). Therefore, it can be deduced that fewer carats are entering the country, and they are being imported at 18.5% higher average import prices (Even-Zohar, 2004b); diamond imports into the USA were at an average price of US$630 per carat in the first half of 2003 and rose to US$746 per carat in the first half of 2004 (Even-Zohar, 2004b). The price volatility described here and in the above paragraphs has created market instability and has resulted in the aforementioned speculation by industry players.

The oversupply of rough diamonds in the market is expected to continue into the foreseeable future (Even-Zohar, 2004b). De Beers alone is likely to increase production from 45 million carats in 2004 to 52 million carats in 2009 (Even-Zohar, 2004b). Tacy Diamond Industry Consultants (Even-Zohar, 2004b) are not convinced that diamond jewellery demand will grow at the same pace as rough diamond supplies and predict a difficult period ahead before sustainable demand can be achieved. This is in stark contrast to the views of Gareth Penny, the head of the De Beers DTC, (Reuters, 2005a) and Gary Ralfe, De Beers Managing Director, (Fraser, 2005b) who believe that global diamond demand is expanding and is expected to remain buoyant with strong growth in diamond demand in India, China and the USA.

In preparation for a discussion on the systems of distribution of rough diamonds as well as an analysis of the South African diamond beneficiation industry, it is insightful to provide a broad description of South Africa's two largest diamond producers, De Beers and Trans Hex.

2.1.4 De Beers Group

The De Beers Group controls nearly half of the world's rough diamond supply (Finance CustomWire, 2005). The ownership of De Beers is structured as follows: 45 percent is owned by mining giant Anglo American, an equal stake is held by the Oppenheimer family, and the final 10 percent is owned by the government of Botswana (the world's biggest diamond producing country) (Finance CustomWire, 2005).

De Beers operates four African mining businesses, namely De Beers Consolidated Mines (DBCM) which produces in South Africa, Debswana in Botswana, Namdeb in Namibia (Lanham, 2005), as well as the Williamson mine in Tanzania. The company's Botswana operation, Debswana, is a 50:50 partnership between the country's government and the De Beers Group (Finance CustomWire, 2005). De Beers' Namibian operation, Namdeb, is similarly structured as an equal shareholding joint venture between the company and the Namibian government (Bain, 2004c).

Domestic mines owned by DBCM accounted for 92.5 percent or 11 913 683 carats of South Africa's diamond production in 2003, compared with 10 402 281 carats in 2002 (DME, 2004a). The De Beers mines in South Africa, Botswana, Namibia and Tanzania, contributed 43.95 million carats (or 31.4 percent of the global mined volume) to world production by mass in 2003 and an estimated US$3,6 billion or 41 percent of the world's total production value (DME, 2004b). In addition, De Beers bought rough diamonds to the value of US$700-800 million from Russia's diamond monopoly Alrosa, and the company reported ex-stockpiles sales of US$700 million in 2003 (DME, 2004b).

De Beers Consolidated Mines is responsible for generating 83 percent (or 92.5 percent as indicated by the DME) of South Africa's diamond production (Even-Zohar, 2004c; DME, 2004a) and as such, is the producer most commonly cited when discussing the dynamics of and changes in the South African diamond industry (Even-Zohar, 2004c). Currently, however, the De Beers Group is experiencing difficulties in both its local and international operations. Five out of DBCM's seven local mines are unprofitable as a result of the strong rand against the dollar (the rand

strengthened more than 130 percent between late 2001 and the end of 2004) (Reuters, 2005c), and those experiencing financial and production difficulties are being cross-subsidised by the profitable operations (Bain, 2004b). In addition, the company's global market share has dropped from approximately 66 percent in 1998 to less than 50 percent in 2004 as it is grappling with a supply shortage that is causing concern for clients (Sightholders) (Muller, 2004c). Furthermore, due to the fact that it takes approximately seven years for a sizeable diamond mine to reach full production, the likelihood of De Beers' market share increasing in the short- to medium-term is questionable (Muller, 2004c).

On the legislative front, the Precious Metals and Diamonds General Amendment Bill is currently before parliament undergoing revision and has a high probability of being implemented as law later in 2005. The Bill will have far reaching consequences for De Beers, particularly in terms of its current distribution arrangements which involve sending its total collective production to London from which location diamonds are made available to Sightholders. One of the many far–reaching consequences of the Bill, to be discussed in detail in later sections, is that it will dictate a certain percentage of unpolished diamonds to be cut, polished or set in tools locally, with the remainder thereof being subject to an across-the-board export duty of a proposed 5 percent as a disincentive to rough diamond exports (Monama, 2005); recent reports by the Department of Minerals and Energy state that the export duty may even be revised to 10 percent (Ensor, 2005). De Beers' current strategy and business plan will be forced to undergo extensive modifications as a result.

The most recent development at De Beers is its desire to conclude a Black Economic Empowerment (BEE) deal in line with Government's BEE policy (Czernowalow, 2005). The company is seeking to conclude the BEE deal at group level, with the proposed empowerment partner acquiring a stake in DBCM (Czernowalow, 2005). Gary Ralfe, Managing Director of De Beers, has suggested that the group sell off some of its assets in order to attract BEE investors, who may not be enticed to buy into a group that operates unprofitable mines (Czernowalow, 2005). Despite this concern, more than 100 aspirant BEE partners are considering a deal with the company (Czernowalow, 2005). The deal is expected to influence De Beers' strategic direction in the future.

2.1.5 Trans Hex Group

Trans Hex (which operates in Namibia, Angola and South Africa) (Reuters, 2005b; West, 2004) is South Africa's second largest diamond producer after De Beers (MBendi Information Services, 2004). The Trans Hex Group conducts both land and marine diamond mining activities (Trans Hex Group, 2005). The company's alluvial land diamond mining activities, which occur on the banks of the Orange River predominantly in the Namaqualand area close to the Namibian border, produced 140 300 carats in the year ended 31 March 2004 which translates into a 12 percent production increase over the previous year (Trans Hex Group, 2005; MBendi Information Services, 2004). The company's marine mining division conducts diamond exploration and mining operations in the sea diamond concessions off the West Coast of South Africa and Namibia, which yielded a total of 37 913 carats during the year under review (representing a 2 percent growth in production over the previous year) (Trans Hex Group, 2005). In total, Trans Hex produced 213 036 carats during the 2003/2004 financial year (the figure includes the company's Angolan production) (Trans Hex Group, 2005).

The Trans Hex Group experienced an 18 percent drop in headline earnings during the twelve months to March 2004 in comparison with the previous financial year (West, 2004). Furthermore, Trans Hex expects to experience financial problems during the 2004 financial year as it forecasts a decline in headline earnings per share of 45 to 65 percent compared with 2003 (Reuters, 2005b). The company attributes two thirds of the aforementioned impairment to the strengthening of the rand exchange rate (Reuters, 2005b). In addition, Managing Director Llewellyn Delport expects the rand's strength to continue for at least 18 months to two years and as such, efforts are underway to strengthen the business plan to cope with the challenge (Stanford, 2004).

In order to salvage Trans Hex's profit margins that are suffering due to the strong rand, the company succeeded in instituting continuous operations (conops) at its South African Mines (Smith, 2004). This policy, which required three years of negotiations with the National Union of Mineworkers, will result in around-the clock,

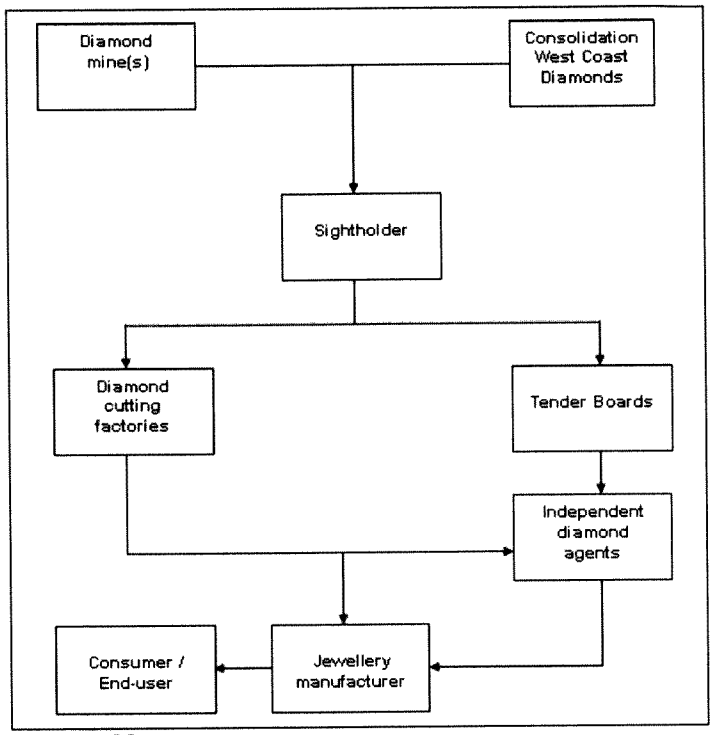
seven-days-a-week operations which will provide the company with 33 percent more production hours and more effective operations (Smith, 2004).

In terms of the effects of the Precious Metals and Diamonds General Amendment Bill, it can be argued that the Trans Hex Group is in a better position than De Beers in terms of coping with the potential legislative changes that will affect rough diamond distribution practices. Unlike De Beers' exclusive Supplier of Choice (SoC) marketing strategy (De Beers Group, n.d.), according to which rough diamonds are sold to selected DTC Sightholders (privileged clients that meet stringent membership requirements in terms of diamond and marketing expertise) at DTC Sights (sales weeks) ten times annually in London and Johannesburg, Trans Hex uses a tender sales system which ensures that their production is made available to all potential purchasers instead of a select number of core clients (Trans Hex Group, 2005). As such, it can be reasoned that the proposed Bill may have a less jarring effect on the status quo at Trans Hex. In addition, the Group is committed to aiding the local low-capital participants in the South African diamond manufacturing industry through the use of small-value tender sales at the Johannesburg Diamond Bourse (Trans Hex Group, 2005).

2.2 THE SYSTEM OF DISTRIBUTION OF ROUGH DIAMONDS

The predominant players in rough diamond trading in South Africa are the De Beers and Trans Hex groups (Kaiser EDP, 2005a). De Beers distributes its diamond production through its international diamond marketing company, the Diamond Trading Company (DTC). In addition, secondary distribution of De Beers rough diamonds is facilitated by Diamdel (Keyguide Ltd., 2001), a wholly-owned De Beers rough diamond trading subsidiary, which is a major South African supplier of rough diamonds to local small cutters, polishers and jewellery manufacturers (Monama, 2005). Trans Hex, on the other hand, employs a tender sales system in the distribution of its rough production (Trans Hex Group, 2005). Due to the fact that the De Beers Group controls almost half of the world's rough diamond supply (Finance CustomWire, 2005), the following exploration of distribution systems will largely be discussed in terms of De Beers' influence on the trading of rough diamonds.

Figure 6
Distribution pathways of South African diamonds

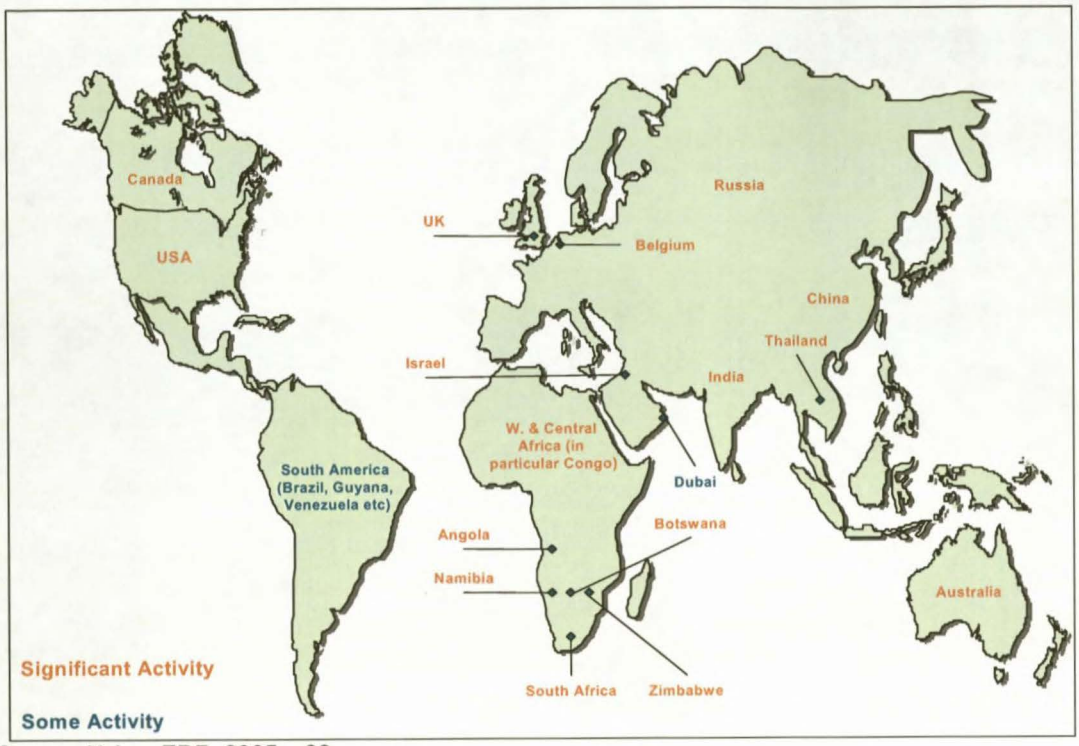


Source: Kaiser EDP, 2005a: 66.

Figure 6 illustrates the distribution pathways or channels of the South African diamond supply from the mines to final consumers for the De Beers/DTC/Sightholder value chains (Kaiser EDP, 2005a). The mode of distribution employed is predominantly transportation by hand and courier services; this is logical due to the high value of diamonds among criminal networks, and is the most secure form of delivery (Kaiser EDP, 2005a).

Figure 7 identifies the most active hubs of rough diamond trading around the world. In the past, rough diamond trading was focussed primarily in the major centres of Belgium, Israel and New York (Kaiser EDP, 2005a). The status quo has shifted and is continuing to do so, as trade patterns evolve and as new entrants (such as Russia, and the Dubai and Shanghai Diamond Exchange centres) gain momentum (Kaiser EDP, 2005a).

Figure 7
Global rough diamond trading activity



Source: Kaiser EDP, 2005a: 22.

The most profound shaping of the global rough trading environment has been due to De Beers' Sightholder system. According to this system, only DTC Sightholders [leading DTC clients (polishers and cutters as well as rough diamond dealers) carefully chosen for their diamond and marketing expertise] may purchase rough diamonds directly from the source at the DTC which is headquartered in London (Keyguide Ltd., 2001; De Beers Group, n.d.). These Sightholders (based mainly in the traditional cutting centres of Antwerp, Tel Aviv, Mumbai, New York and Johannesburg) travel to London and Johannesburg to attend the DTC's Sights (sales weeks) that take place ten times per year (De Beers Group, n.d.). The DTC pools its world production from multiple sources in London so as to offer its clients a consistent supply in a range of assortments (De Beers Group, n.d.). As such, London and Johannesburg are of prime importance in the global rough diamond trade.

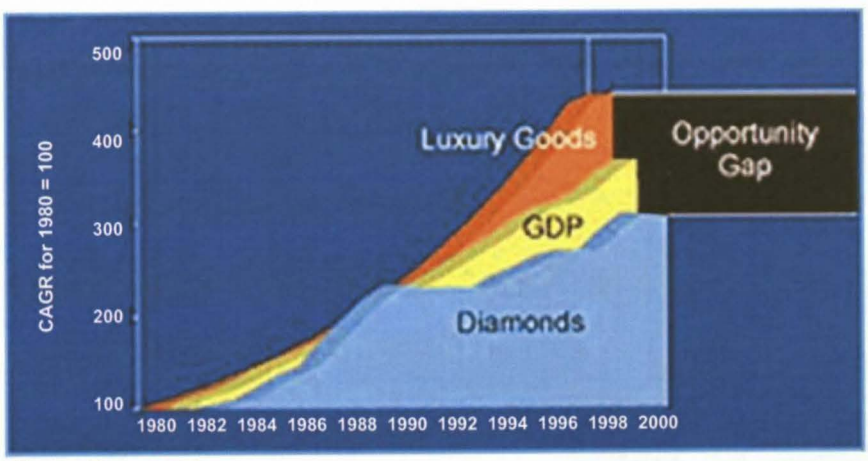
Two recent developments in the diamond industry have significantly influenced and

altered the idiosyncrasies of and processes involved in the system of trade in rough diamonds: the DTC's Supplier of Choice programme and the implementation of the Kimberley Process Certification Scheme (Kaiser EDP, 2005a).

2.2.1 De Beers' Supplier of Choice strategy and the Sightholder system

The De Beers Group first announced its Supplier of Choice (SoC) policy on July 12 2000 (Keyguide Ltd., 2001) which only later came into effect in early 2003, following the introduction of the Kimberley Process Certification Scheme (Basu, 2005). The SoC policy, the DTC's new sales and marketing strategy, was introduced in response to growing challenges facing the diamond industry. As seen in Figure 8, the growth of global diamond jewellery sales has consistently underperformed during the last two decades of the 20th century relative to GDP growth in general and to sales of luxury goods in particular (De Beers Group, n.d.).

Figure 8
Growth of diamond jewellery sales relative to GDP and sales of luxury goods



Source: De Beers Group, n.d.

The De Beers DTC SoC policy is designed to address the causes of the abovementioned underperformance which De Beers refers to as its "opportunity gap" (De Beers Group, n.d.); the initiative accordingly aims to drive growth in diamond jewellery demand in order to close this gap. The policy is a long term strategy that involves significant change throughout the diamond pipeline; thus, it is an evolving process undergoing continual development (De Beers Group, n.d.).

The SoC initiative is designed with the aim of providing DTC Sightholders with the following significant benefits (De Beers Group, n.d.):

- a consistent supply of rough diamonds
- marketing support
- access to the DTC's consumer research knowledge base

It is hoped that SoC will enable De Beers to become more customer-focused and to harness the power of marketing to increase diamond sales (De Beers Group, n.d.). Until recently the diamond industry has, by comparison with the luxury goods sector, been constrained by complex inefficiencies in the distribution of diamonds and a severe under-investment in advertising and marketing (Basu, 2005). The crux of the SoC policy is summarised well in the following commentary by De Beers Group Managing Director, Gary Ralfe: "*There's a huge untapped opportunity for all of us in the industry to grow the diamond business and match the growth rates enjoyed by leading luxury goods companies. That sector has demonstrated that brands are a catalyst for growth. To grasp the opportunity for long-term growth, we need to transform the way we do business. We want to work in partnership with our clients (Sightholders) to create a dynamic competitive and customer focused diamond industry.*" (De Beers Group, n.d.). The new initiative is heralding a more marketing-oriented approach and will, via services provided by the DTC, enable Sightholders to better identify opportunities in the marketplace and distribute their diamonds more efficiently into them (De Beers Group, n.d.). De Beers DTC has made considerable investments in generic diamond marketing activities in the past and will continue to do so into the future; the company plans to spend approximately US$180 million on the promotion of diamond jewellery in 15 countries around the world in 2005 (De Beers Group, n.d.).

The DTC expects to accomplish its SoC objectives through the enabling of the following four conditions (De Beers Group, n.d.):

- the creation of efficient distribution networks that stimulate demand
- to shape an industry that is led by advertising and marketing investment

- to bring about the emergence of internationally recognised diamond jewellery brands that meet consumer needs
- to fashion an industry that fully addresses consumer confidence issues such as synthetic and conflict diamonds

The SoC sales and marketing strategy represents a stark departure from the DTC's previous supply-driven supplier-of-last-resort policy (Basu, 2005). As such, the SoC policy has had a powerful moulding effect on industry dynamics. Under the strategy, the number of DTC Sightholders has been reduced from more than 130 worldwide in 2002 to only 95 in 2005 (Basu, 2005), following the European Commission's letter of approval allowing De Beers to review its client base every two years (Muller, 2003a). Approved Sightholder candidates retain their status only for two years, after which their contract is either renewed or negated (Kaiser EDP, 2005a). This has created much confusion, disruption and anger among industry players. The Antwerp High Diamond Council was outraged at the DTC's decision to cut the number of Sightholders in Antwerp by a third under the new SoC policy (Muller, 2003a). The diamond processing hubs that were hit the hardest by the strategy were Belgium, New York and Tel Aviv (Muller, 2003a). On the South African front, two Sightholders had their rights to participate in DTC Sights revoked (Muller, 2004a). In early 2004, however, pressure from Antwerp Sightholders forced De Beers to increase its rough diamond supplies to the country (Muller, 2004a).

The DTC's SoC strategy has proved highly controversial and has been met with considerable resistance from industry; a Belgian court ordered De Beers DTC to reinstate a Sightholder in November of 2003 (Muller, 2003c). In addition, Diamdel (De Beers' wholly owned diamond-trading subsidiary) has faced legal action on the grounds that the SoC policy has created a conflict of interest in relation to Sightholders (Muller, 2003c).

Aside from the controversial nature of the policy discussed above (which provides testimony to De Beers' stringent control over the distribution of the rough diamond supply), the criteria that clients need to possess in order to qualify as Sightholders have become rigorous. De Beers justifies these constraints in terms of its long term vision of growing diamond jewellery demand by 50 percent over the next ten years

(Kaiser EDP, 2005a). This is in light of the poor marketing investment made by the diamond industry to date: the industry has been spending a paltry 1 percent of sales revenue on advertising, while the advertising-to-sales ratio of other luxury products averages 10 percent (Kaiser EDP, 2005a). Thus, what the SoC policy is attempting to achieve is the effective channelling of the world's diamonds through fewer hands to those customers that display effective branding initiatives and marketing strategies so as to provide for the long term sustenance of the industry (Muller, 2003b).

De Beers now requires its Sightholders to (Kaiser EDP, 2005a):

- streamline their distribution
- go downstream via the securing of retail contracts or vertical integration
- support joint marketing initiatives

De Beers DTC conducts its Sightholder selection on the basis of a scorecard technique that evaluates candidates according to the following criteria (Kaiser EDP, 2005a):

- Finances
- Distribution systems
- Marketing
- Technical and manufacturing ability
- Best practice principles

On the whole, the diamond industry has accepted and embraced the SoC strategy that seeks to increase the pace of growth on the demand side (Tacy Diamond Industry Consultants, 2003). There is, however, a general feeling of discomfort among industry players regarding the lack of transparency in the DTC client selection process. In addition, the majority of Sightholders are convinced that the initial reduction in client numbers is only the beginning of a process that may result in further cuts on the Sightholder list in the future (Tacy Diamond Industry Consultants, 2003). In the long term, the success of the SoC policy and the DTC Sightholder selection process will depend on widespread industry trust and confidence in the fairness of the new system (Tacy Diamond Industry Consultants, 2003).

Currently, there are 14 Sightholders in South Africa of which only four are entirely local companies (Kaiser EDP, 2005a). This figure is scheduled to rise to 19 Sightholders in July 2005 accompanied by an increase in rough diamond supply in the categories identified as economically viable for local beneficiation (Zhuwakinyu, 2005).

Only one South African Sightholder is a dealer Sightholder who is entitled to separate Sights into smaller allotments of rough diamonds so as to make them affordable and accessible to smaller buyers (Kaiser EDP, 2005a). Diamdel, to be discussed in a subsequent section, also has the objective of catering for smaller clients. In South Africa, manufacturing Sightholders are obliged in terms of their agreement with the De Beers Group to beneficiate (add value to) a minimum of 85 percent of the rough diamonds that they take delivery of (Kaiser EDP, 2005a). Despite this, a pattern of secondary trading has emerged among some South African Sightholders. The Sightholders responsible justify their actions by arguing that during the six months between the placement of their orders with De Beers and the receipt of their Sight allotments, changes occur in the market and in their needs as customers which forces them to re-trade the rough in order to remain competitive and profitable (Kaiser EDP, 2005a).

De Beers merges its global production into what is known as the "London Mix" (Kaiser EDP, 2005a; Reuters, 2005d). However, through De Beers' Section 59 agreement with the SADB under the Diamonds Act No. 56 of 1986, the company agrees to return to South African diamond cutters and polishers an amount of rough diamonds equivalent in value to that which is exported to London (Kaiser EDP, 2005a). In fact, for the categories of rough diamonds that are viable for the local industry, De Beers imports more gems than it exports by a factor of 127 percent (Fraser, 2005b). The rough diamonds that are imported into South Africa represent a selection from the amalgamation of all of De Beers' stocks from all sources. Trans Hex, on the other hand, currently has a different Section 59 agreement with the SADB whereby all rough diamonds are first put on offer to the local market via tenders; the remainder that has not been taken up locally is exported (Kaiser EDP, 2005a).

De Beers' SoC policy has attracted much attention due to its potential for anti-trust scrutiny. As such, the European Commission's Competition Authorities are currently conducting an investigation into the Supplier of Choice marketing strategy of De Beers in order to determine if the company is involved in abuse of its dominant position (Even-Zohar, 2004e). In 2005, Antwerp diamond dealers launched a complaint to Europe's antitrust authority stating that the SoC system is crushing competition and is causing rapid price hikes (Reuters, 2005c). In conclusion, thus, the efficacy and long term survival of SoC remains to be seen.

2.2.2 Kimberley Process Certification Scheme

The Kimberley Process Certification Scheme, which was initiated on 1 January 2003, is a joint government, international diamond industry and civil society initiative (Kimberley Process Secretariat, 2005) that aims to eradicate illegal trade in conflict diamonds (rough diamonds that are used by rebel movements to finance wars against legitimate governments); this is done with the view to addressing negative consumer perceptions which have the potential for damaging diamond demand (Kaiser EDP, 2005a). Since the Scheme's inception, all rough diamond exports have been shipped in sealed containers accompanied by a Kimberley Certificate (refer to Appendix A) issued by a duly authorised body (the SADB in the case of South Africa) within the exporting country (Kaiser EDP, 2005a). The import and export of rough diamonds is limited to member countries and imports of rough diamonds may only be processed if the shipment arrives with a bona fide Kimberley Certificate (Kaiser EDP, 2005a).

The Kimberley Process has received virtually total compliance worldwide, with Kimberley Process participants accounting for approximately 99.8 percent of the global production of rough diamonds (Kimberley Process Secretariat, 2005). Within diamond trading centres, all invoices must contain a warranty from the seller confirming that the goods have been purchased from legitimate sources not involved in funding conflict, and in compliance with UN resolutions (Kaiser EDP, 2005a). The Scheme is thus bringing a new level of transparency to the international diamond trade.

The implementation of the Kimberley Process Certification Scheme has also brought about a number of challenges, and in some cases has created additional problems for the supply of rough diamonds (Kaiser EDP, 2005a). The Scheme has had the effect of hampering activities of the informal mining sector by making it more difficult for small diggers to participate in the industry (Kaiser EDP, 2005a). In addition, it has increased the time and effort involved in exporting through official channels (Kaiser EDP, 2005a).

2.2.3 Diamdel

Diamdel is De Beers' wholly-owned non-Sightholder trading subsidiary that buys up to 10 percent of the US$577 million that the DTC markets in South Africa as well as buying from other sources and sells to non-Sightholder clients (Bain, 2004b; Monama, 2005; Rapaport, 2005a). Therefore, Diamdel facilitates secondary distribution of De Beer's rough diamonds to smaller, less influential diamond dealers, cutters and polishers (Keyguide Ltd., 2001). According to Gary Ralfe, Managing Director of the De Beers Group, the mining giant views Diamdel as "*an obvious tool to help accomplish the government's desired transformation (of the South African diamond industry), ensuring that rough diamonds be made available to historically disadvantaged people*" (Rapaport, 2005a).

The relationship between Diamdel and De Beers is succinctly summarised in the words of Diamdel Managing Director Des Cavanagh: "*Diamdel is not a sightholder of (the) DTC; its relationship with the company is not strategic, but rather technical, inasmuch as the DTC acts as conduit for its rough diamond supply from De Beers*" (Even-Zohar, 2004d). Diamdel has always served as a place for future Sightholders to start working with De Beers; it also serves as a support structure for ex-Sightholders who are in the process of transition to a life without De Beers (Even-Zohar, 2004d).

De Beers has provided assurance to the diamond industry of its continuing support of the plight of smaller manufacturers: "*Smaller firms will be more adept than the larger players in dealing with niche markets, producing speciality cuts or devising particular marketing plans, and these need to be encouraged. It is part of our strategy to*

continue to supply manufacturers in the secondary market, through Diamdel and the other dealers" (Even-Zohar, 2004d).

According to the Director of the South African branch of Diamdel, Athol Methven, the company currently serves some 159 local clients, 50 percent of which are historically disadvantaged South Africans (Even-Zohar, 2004c). However, Methven concedes that less than 10 percent by value of Diamdel's rough diamond sales actually reach the historically disadvantaged (Even-Zohar, 2004c). In addition, the DTC and the World Federation of Diamond Bourses (WFDB) concede that the SoC policy has made it more difficult for the secondary market to find an adequate supply of rough diamonds (a situation that is believed to continue while demand is high) (Grayeff, 2004). However, both the WFDB and the DTC agree that the secondary diamond market could benefit from the SoC strategy by taking advantage of the DTC's marketing programmes (Grayeff, 2004).

Diamdel met its commitment in 2004 to sell up to US$500 million worth of rough diamonds to the global secondary market (Grayeff, 2004).

2.2.4 Problems with the existing distribution system

There are a number of problems with the existing distribution system for rough diamonds in South Africa. These problems are bringing about steps towards industry reform that are expected to lead to a great deal of growth in the domestic diamond beneficiation industry.

The current version of the Diamonds Act No. 56 of 1986 (pending the passing of the Precious Metals and Diamonds General Amendment Bill) attempts to encourage producers to provide more rough diamonds for downstream beneficiation by insisting that unless they are first offered to local industry for cutting and polishing, they will attract a 15 percent export duty (Kaiser EDP, 2005a). However, under the current Diamonds Act, producers may conclude agreements with the SADB under Section 59 of the Act; De Beers' agreement, concluded with the SADB in 1993, enables it to export all of its local production to London (free from export duty) from where the South African industry is supplied (Muller, 2004d).

It has become evident that the current distribution system has prevented enough rough diamonds from being cut and polished in South Africa, and has therefore prevented the creation of jobs and the development of new skills within the diamond sector (Muller, 2004d). In addition, it has become apparent that the current 15 percent export duty under the Diamonds Act has been ineffective in discouraging exports of rough diamonds and promoting local beneficiation. To exacerbate the matter, the Act makes provision for the deferment of the payment of export duty under Section 64 which reads as follows:

> *(1) If the Board is satisfied that any unpolished diamond is exported-*
> *(a) to be exhibited or displayed;*
> *(b) to obtain an expert opinion on it;*
> *(c) in the case where that diamond is of unusual size or value, in an endeavour to find a purchaser for it; or*
> *(d) in circumstances where that diamond is likely to be returned unsold to the exporter,*
> *the Board may defer payment of export duty on that diamond for such period, but not exceeding six months from the date upon which that diamond was registered for export in terms of this Chapter, as the Board may determine. (South Africa, 1986: 29)*

By analysing the data presented in Table 1, it becomes evident that almost all exports of rough diamonds from the Republic have taken place duty free. Thus, the current provisions of the Act have been ineffective in discouraging rough diamond exports in favour of promoting supply to the local beneficiation industry.

Table 1
Summary of export duty and deferment trends

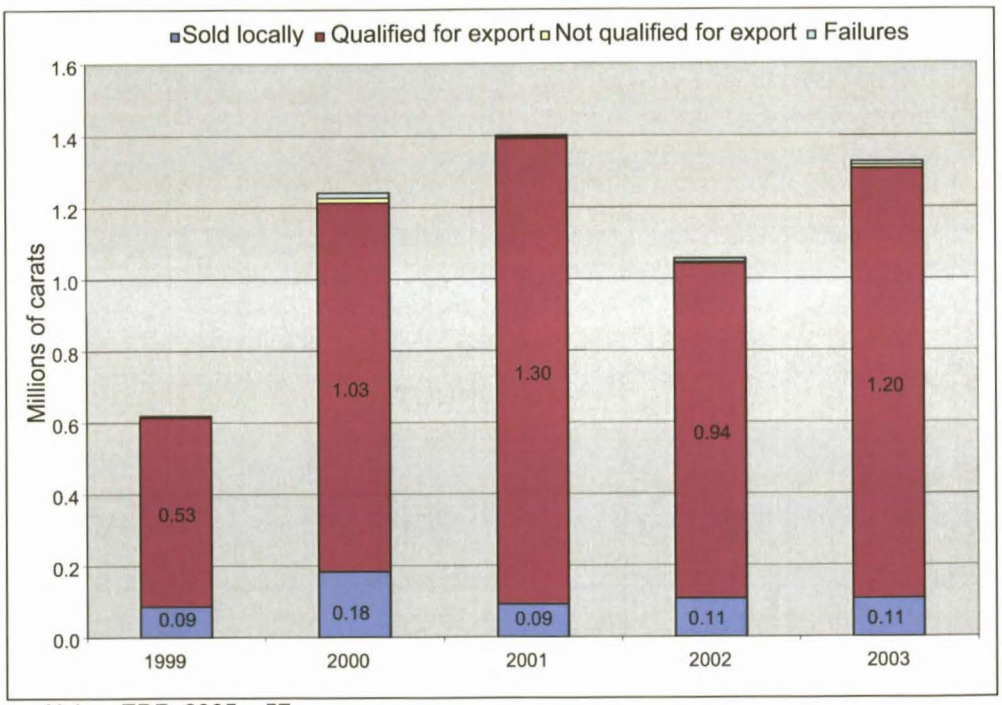
	Proportion of transactions per export duty category					
	1999	**2000**	**2001**	**2002**	**2003**	**Average**
% of total transactions with exemption/deferment granted	100.0%	99.0%	81.9%	98.8%	99.1%	96.0%
% of total transactions that enjoy export duty exemption	94.0%	93.2%	93.4%	93.7%	95.3%	94.0%
% of total transactions that enjoy export duty deferment	5.9%	6.6%	6.6%	5.7%	4.4%	5.8%

Source: Kaiser EDP, 2005a: 56.

Various concerns have been expressed by industry players and representatives

regarding the local trading of rough diamonds particularly in terms of regularity and suitability of supply, as well as affordability and pricing following allegations regarding discrepancies in the fair market value of rough diamonds (Kaiser EDP, 2005a). Concerns have also been raised about the lack of a discernable audit trail in order to monitor the Section 59 agreements between diamond producers and the SADB (Kaiser EDP, 2005a). As can be determined from the graph in Figure 9, a larger volume of rough diamonds qualified for export than were sold domestically under the current Section 59 system (Kaiser EDP, 2005a).

Figure 9
Volume of rough diamonds traded on the SA Diamond Bourse during the period 1999-2003



Source: Kaiser EDP, 2005a: 57.

Problems and inadequacies in the South African distribution system for rough diamonds have led to outcries from the beneficiation industry. Two hundred emerging diamond dealers and processors, represented by the United Diamond Association of South Africa (UDASA), have approached Government to institute a forensic audit of rough diamond production due to the fact that much of South Africa's rough diamonds do not become available to black processors and manufacturers (Monama, 2005). According to UDASA chairperson Ernest Malakoane, "*each time (members of UDASA) approach Diamdel ... for rough*

(diamonds), (they) are told there are no diamonds. We need to know where all the rough ends up" (Monama, 2005). Malakoane continues by accusing De Beers of paying lip service to Black Economic Empowerment (BEE) and of stifling the growth of the local beneficiation sector, adding that his own company was forced to retrench 16 polishers because it struggled to obtain rough diamonds (Monama, 2005). UDASA is of the view that Diamdel sells far less than 10 percent of rough diamonds available for local processing to black entrepreneurs and that its members and many other smaller diamond beneficiators are being allocated "chaff and crumbs"; as a result, smaller diamond cutters and polishers are struggling for business (Monama, 2005).

The above claims are corroborated by Barbara Klaassen, director of Ideal Diamonds, who states that her company was forced to place its staff on short time in order to avoid retrenchments due to lack of rough diamonds (Monama, 2005). Klaassen believes that South Africa produces enough rough diamonds to support the local beneficiation sector, but states that "*the problem is in the distribution of ... (rough) diamonds to local factories. The amount of work coming the way of small factories is only a fraction of what gets given to the few dominant players, some of whom are foreigners who just ship out the stones.*" (Monama, 2005). Ten other small diamond cutters and polishers at the Velani Hive, which operates from the SA Diamond Centre in downtown Johannesburg, are also struggling to obtain supply of quality rough diamonds (Monama, 2005). The general belief prevails, therefore, that De Beers is hampering the supply of rough diamonds to the small and medium diamond beneficiation sector (Monama, 2005).

In May 2005, UDASA commenced legal proceedings against De Beers and the South African Government due to alleged violations of the Diamond Act No. 56 of 1986, following the failure by the Department of Minerals and Energy to institute a forensic audit of rough diamond supply (Tanna, 2005). It is also alleged that Diamdel has failed in its function of providing for secondary distribution of rough diamonds to smaller enterprise in the downstream industry (Tanna, 2005). De Beers continues to defend its position by stating the following: "*De Beers still brings back more diamonds by value into the country than De Beers Consolidated Mines produces in South Africa. In 2003 (De Beers) imported 127 percent of what was cut, and in 2004*

(the) figure stood at 108 percent." (Tanna, 2005).

Analysis of industry news, thus, points unwaveringly to a malfunctioning system of rough diamond distribution. The most recent allegation is aimed at De Beers where the company has been accused of improperly exporting large quantities of South African rough diamonds in 1994 that were exempt from export duty (Reuters, 2005d).

2.3 THE ROLE OF DIAMOND SAWING AND POLISHING IN THE POLISHED DIAMOND MANUFACTURING PROCESS

In order to explain the roles of diamond sawing and polishing in the course of producing a polished diamond, the manufacturing process of Rand Precision Cut Diamonds (Pty) Ltd. will be used as the exemplar in this instance. The company, which is located in the S.A. Jewellery Centre in Main Street Johannesburg, is a renowned diamond cutting works with a powerful retail presence in both Australia and the United States. In addition, the firm is a DTC Sightholder. The manufacturing process to be described below is adapted from the Rand approach by excluding three non-essential proprietary or company-specific stages, in order to provide a generic overview of the process involved in producing a polished diamond.

The generic manufacturing process of a polished diamond consists of seven stages:

- Marking
- Sawing
- Cutting/Bruting
- Polishing/Blocking
- Rondisting
- Crossworking
- Brilliandeering

The first stage, marking, involves the planning of the final configuration of the polished diamond. A rough diamond almost never naturally possesses the right dimensions to become a polished diamond, or it may have an inclusion of some sort that needs to be minimised. As a result, the rough diamond must first be sawn into two parts, and it is the marker who must decide where it will be sawn. Using his/her

trained eye the marker draws a perfect line, by hand in traditional pen and ink, around the diamond in the exact place where it is to be sawn (Rand Brand, n.d.; Watermeyer, 1982).

After the marking phase, it becomes the sawyer's task to separate the diamond into two parts (Rand Brand, n.d.). The diamond is sawn in two along its crystal grain structure with the use of either a laser-based or a traditional diamond sawing machine similar but not limited to the machines depicted in Figure 10; the examples provided are manufactured by NOVEX Ltd., a German producer of machines, equipment and technology for the diamond industry. According to Bettonville N.V., a leading Antwerp-based manufacturer of tools for the diamond industry, the current circular diamond sawing machine design was developed approximately 100 years ago (Bettonville N.V., 2001) and has not undergone any significant improvement to date. According to Watermeyer (1982), circular diamond saws were first noted in 1874 and took over 40 years to diffuse into the general beneficiation industry before which the sawing process was kept largely secret by family diamond cutting and polishing concerns in Antwerp.

Figure 10
Common form factors of currently available traditional diamond sawing machines

Source: NOVEX Ltd., 2005a.

The sawing blade on the machine is normally a very thin phosphor bronze plate that rotates at a high speed (up to speeds of 12 000 r.p.m.) (Rand Brand, n.d.; Wilks &

Wilks, 1994; Watermeyer, 1982). The edge of the blade is coated with diamond powder in order to be able to cut through the rough diamond, due to the principle that only diamond is capable of sawing through another diamond (diamond is the hardest substance known to man) (Rand Brand, n.d.; Wilks & Wilks, 1994). The diamond sawing process, depicted in Figure 11, can take many days depending upon the size (in carats) of the rough diamond (Rand Brand, n.d.; Wilks & Wilks, 1994). In the instance depicted in Figure 11, the sawing process resulted in a loss in weight of 0.30 carats or 1.5 percent of the raw material (standard weight loss during sawing averages two to three percent on a one carat stone) (The American Institute of Diamond Cutting, n.d.; Watermeyer, 1982). Consequently, any diamond sawing machine or process that reduces expensive losses of raw material can increase efficiency and improve profitability. Vibration of the sawing blade is a major contributing factor in raw material loss (Wilks & Wilks, 1994).

Figure 11
Sawing through a 20.09 carat rough diamond

Source: The American Institute of Diamond Cutting, 2004.

After the rough diamond has been sawn, the cutting/bruting process begins in which the rough diamond takes on a rounded shape (Rand Brand, n.d.; Wilks & Wilks, 1994). The sawn diamond is placed on a rotating spindle (similar in concept to a lathe) opposite another diamond configured in an identical setup (Rand Brand, n.d.; Wilks & Wilks, 1994). The two diamonds are then brought together in order to achieve their rounded shape in the process illustrated in Figure 12 (Rand Brand, n.d.).

Figure 12
Cutting/bruting a 12.23 carat diamond

Source: The American Institute of Diamond Cutting, 2004.

The process of polishing or blocking shown in Figure 13 follows the cutting stage, whereby eight facets (four on the top and four on the bottom) are applied to the stone after which it begins to take on the appearance and proportions of a polished diamond (Rand Brand, n.d.). This is achieved by grasping the bruted diamond in a "pot" around the girdle area and applying the eight facets by grinding them on a porous cast iron wheel (scaife) coated with diamond powder (The American Institute of Diamond Cutting, n.d.; Wilks & Wilks, 1994). As is the case in sawing, success in the polishing of a rough diamond requires that the scaife run smoothly, free of vibration with the diamond held rigidly (Wilks & Wilks, 1994).

Figure 13
Wheel used to polish/block bruted diamonds

Source: The American Institute of Diamond Cutting, 2004.

The stage that follows is the rondisting phase whereby the highest possible degree of roundness is achieved; the technician mounts the diamond on a mini lathe and, using a diamond-mounted hand tool, carefully polishes the edge of the spinning diamond in order to create a shape that is perfectly round and has a perfectly even girdle thickness around the widest part of the diamond (Rand Brand, n.d.). The sixth step in the diamond manufacturing process is known as crossworking, whereby the crossworker grasps the diamond firmly in a tool known as the tang. The tang is equipped with a swivel head that facilitates configuration of the exact positions required for the facets that need to be applied (Rand Brand, n.d.). The rough diamond is then pressed against a polishing wheel coated with diamond powder in order to cut the remaining facets into the rough diamond (Rand Brand, n.d.). This process results in 16 main facets, eight on both the top and bottom of the diamond, that are perfectly aligned in order to release the diamond's lustre (Rand Brand, n.d.).

The final stage in the manufacturing process is known as brilliandeering whereby the remaining 40 facets are applied by hand in order to unlock the ultimate brilliance of the diamond (Rand Brand, n.d.).

Diamond sawing and polishing are therefore integral components in the polished diamond manufacturing process.

2.4 THE MARKET FOR SOUTH AFRICAN POLISHED DIAMONDS

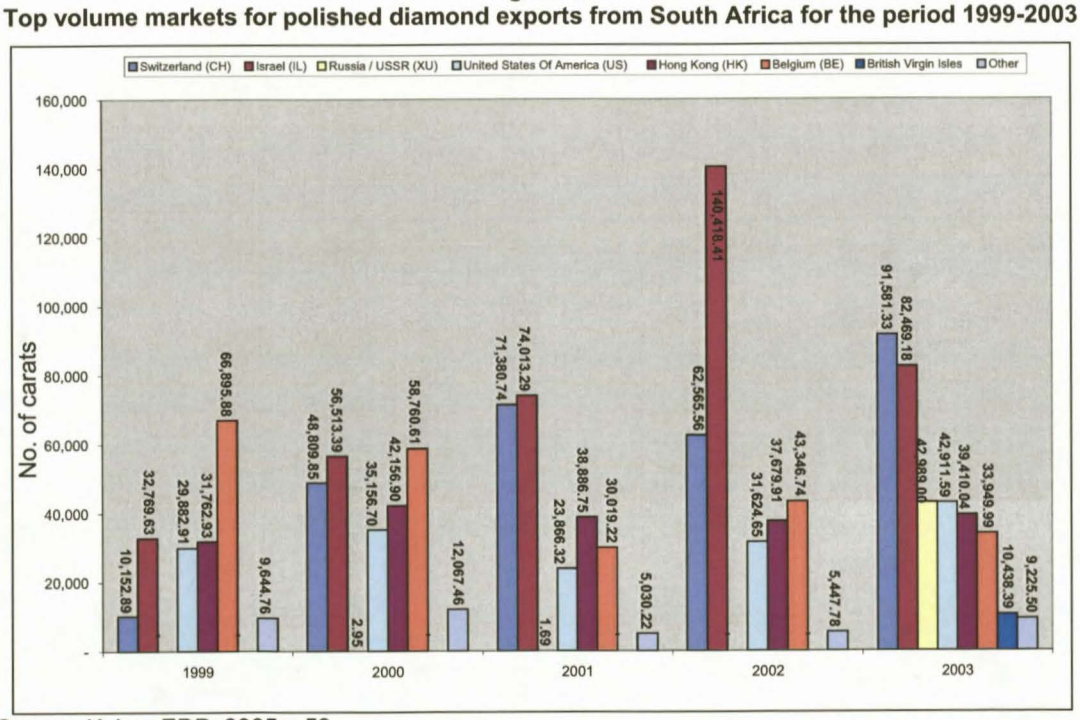
In order to complete a holistic overview of the South African diamond pipeline, it is imperative that one conclude with a synopsis of the markets for and trading of the end product of beneficiation – the polished diamond.

According to Kaiser Associates EDP, the average market value of a traded South African polished diamond varies between R2 000 and R5 000, with the most popular clarity being S1/S2 and the most desirable colour being J (Kaiser EDP, 2005a) (refer to Appendix G for an explanation of the four characteristics that determine a diamond's beauty, rarity and value). The main polished markets that South Africa trades with and supplies are the Middle East, Europe and the United States; the United States and Europe predominantly import South Africa's exclusive and high

quality medium-to-large polished stones of between 2 and 10 carats (Kaiser EDP, 2005a).

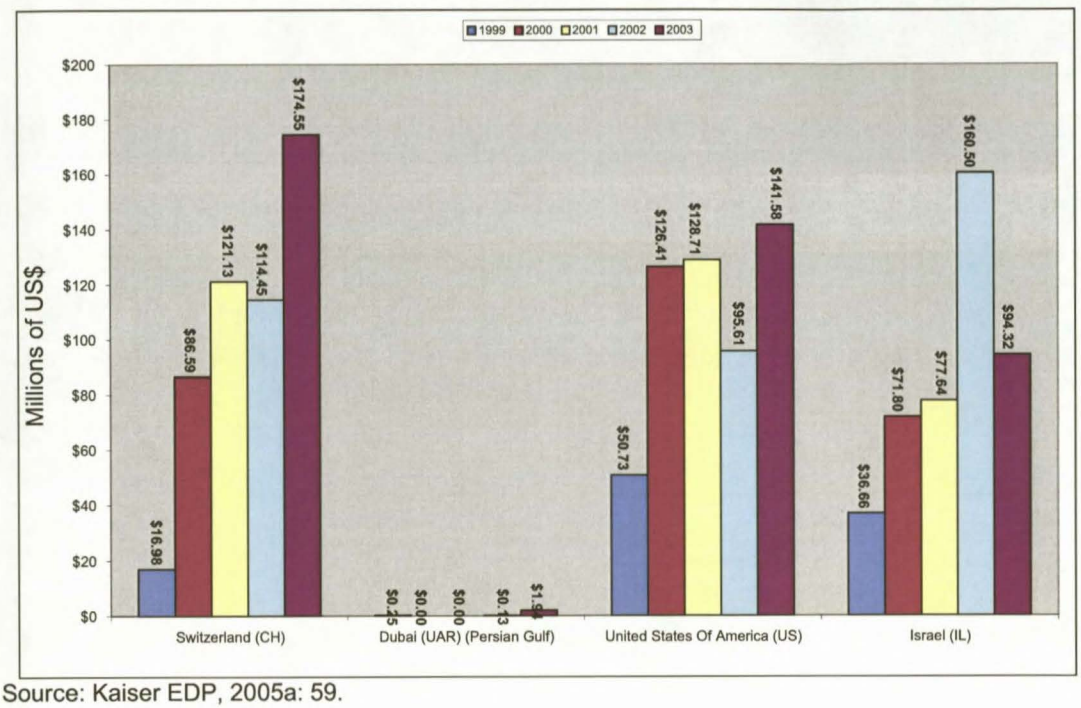
Figures 14 and 15 illustrate the top markets for South African exports of polished diamonds in terms of both volume and value growth for the period 1999-2003 (Kaiser EDP, 2005a). As illustrated in the graph in Figure 14, the top volume market for South African polished diamonds in 2003 was Switzerland followed by Israel, Russia and the United States (Kaiser EDP, 2005a). An interesting shift in export markets in terms of both value and volume of polished diamonds is occurring, with sales depicted in Figure 14 to traditional trading centres such as Belgium decreasing (down from 66 895.88 carats in 1999 to 33 949.99 carats in 2003) and alternative markets such as Switzerland (indicated in Figure 15) showing considerable growth (from sales of US$114 450 000 worth of polished in 2002 to US$174 550 000 in 2003) (Kaiser EDP, 2005a). Recent years have also demonstrated the emergence of alternative markets such as Dubai in terms of volume and value per carat and China in terms volume (Kaiser EDP, 2005a).

Figure 14
Top volume markets for polished diamond exports from South Africa for the period 1999-2003



Source: Kaiser EDP, 2005a: 59.

Figure 15
Top value growth markets for polished diamond exports from South Africa for the period 1999-2003



Source: Kaiser EDP, 2005a: 59.

2.5 SUMMARY AND IMPLICATIONS FOR THE STUDY

This chapter constructs a foundation for the empirical study by contextualising the role of beneficiation machinery and the processes associated therewith within the broader more complicated diamond pipeline. The diamond pipeline (value chain seen in Appendix H) is a complex sequential system that begins with the production of rough diamonds by the diamond mines. These rough stones are then distributed downwards along the pipeline to intermediaries who supply diamond cutters and polishers, who in turn supply polished diamond dealers. These dealers then sell the polished stones to jewellery manufacturers who fashion the end products that adorn the consumers who wear them.

It has been made clear that diamond sawing and polishing machines are integral components in the process of producing the final diamond product. As such, any market shifts or dynamics that mould the overall pipeline will have an indirect impact on the demand for such machinery. The increase in South Africa's diamond production to 12.87 million carats in 2003 bodes well for the demand for beneficiation

equipment. Furthermore, the fact that the current design for diamond sawing machinery has remained almost unchanged over the last 100 years is indicative of a long overdue available market opportunity for HBD Venture No 7 for a more efficient design. It has been emphasised that loss of raw material is a serious concern for diamond cutters and polishers and as such, any diamond sawing machine or process that reduces losses in raw materials can increase efficiency and improve the bottom line.

Under the De Beers SoC policy which was discussed in detail above, South Africa is due to experience an increase in its number of Sightholders. More importantly, this increase will accompany a rise in local rough diamond supply in the categories identified as viable for local beneficiation. In terms of demand for South African polished diamonds, Figure 14 indicates an increase in demand of approximately 30 000 carats between 2002 and 2003.

The above factors are all positive indicators that suggest an increase in the indirect demand for diamond sawing and polishing machines. Chapter 3 will serve to reinforce this argument by focusing specifically on the beneficiation portion of the diamond pipeline. It will explore the critical changes that are occurring in the industry, regulatory and legislative environments that surround the beneficiation of rough diamonds. The chapter will cement the argument that the industry is expecting definite growth in the demand for diamond beneficiation machinery.

CHAPTER 3: THE CHANGING LANDSCAPE OF SOUTH AFRICAN DIAMOND BENEFICIATION

3.1 BENEFICIATION STATISTICS AND THE STATUS OF THE SOUTH AFRICAN DIAMOND CUTTING AND POLISHING INDUSTRY

Up until recently, South Africa has generally been considered by the rest of the world to be a second-tier diamond cutting and polishing centre; a large majority of the country's rough diamond production is exported to form part of the DTC's "London Mix" and its manufacturing activity has been overshadowed by cheaper production centres (Singer, 2005). However, a handful of the globe's largest diamond firms have a manufacturing presence in South Africa either through greenfield-FDI or through strategic alliances with local manufacturers (Singer, 2005). Despite this, the rarity of sought-after rough diamonds and prevailing price volatility over the 18 months leading up to April 2005 have placed strain on rough diamond purchasing and domestic manufacturing activities (Singer, 2005).

There are a variety of conditions (some of them understandably paradoxical) that are changing or are rumoured to change in the South African diamond cutting and polishing industry (Singer, 2005):

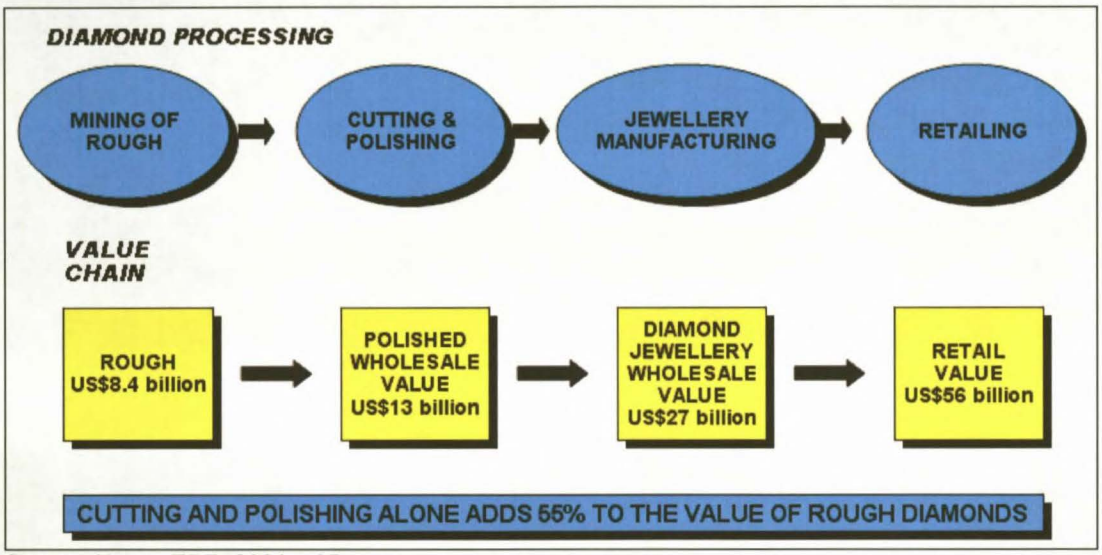
- De Beers DTC brokers are, for the first time in history, about to offer their services to the local industry
- It is rumoured that the DTC's "London Mix" may be dissolved with all of its sorting and valuing operations relocated to South Africa
- It is rumoured that the South African division of Diamdel may be disbanded
- An increased number of foreign diamond manufacturers are assessing the feasibility of erecting manufacturing plants in South Africa

In light of the ostensibly tough and pale conditions prevailing in the diamond beneficiation market, the question arises as to what forces are triggering or driving the heightened interest in the South African diamond market (Singer, 2005).

The answer lies in the Government's aggressive new policy towards the promotion of domestic diamond beneficiation championed by the Minister of Minerals and Energy,

Phumzile Mlambo-Ngcuka (Singer, 2005). The Minister is exploring some radical avenues towards the creation of a higher diamond value chain in the country. If one considers the proportional increases in returns for the country's economy that result from progressive movement along the diamond value chain, it becomes easy to understand Government's interest in expanding domestic beneficiation activities. This logic is illustrated in Figure 16. Further evidence of the value-added benefits of moving along the diamond value chain can be viewed in Appendix F.

Figure 16
Diamond jewellery value chain in 1999 (expressed in worldwide US$ values)



Source: Kaiser EDP, 2001a: 95.

Although the abovementioned interventions will be discussed in detail in a section to follow, it is insightful to note their benefits and drawbacks from a holistic point of view. The positive aspect is that there will most certainly be an increase in diamond beneficiation activity and resulting polished diamond buying activity in South Africa (Singer, 2005). The drawback is that the local manufacturing industry lacks the capacity and expertise to realise the intentions of the Government's policy (Singer, 2005). Above and beyond the major structural changes taking place, the real short term challenge facing the domestic diamond industry is whether a balance can be reached on a legislative and regulatory level between socioeconomic beneficiation ideals and economic rationalism combined with corporate realities (Singer, 2005). If this short term challenge can be surmounted, the long term future of the South African diamond industry shows promise (Singer, 2005).

It is useful to review some beneficiation statistics on the South African diamond cutting and polishing industry in order to gain some insight into the overall trends in the diamond manufacturing value chain. To this end, Tables 2 and 3 illustrate the value and volume of diamonds moving through the various stages in the value chain.

Table 2
South African diamonds value chain by value in US$ for the period 1999-2003

Category	Sub-category	1999	2000	2001	2002	2003	CAGR 99-03
Mining Production		$772,085,426.99	$840,524,662.20	$836,568,861.12	$758,000,399.38	$907,244,939.01	4.1%
Mining Sales	To local	$722,925,188.44	$1,260,866,325.99	$843,897,403.49	$801,516,977.42	$1,005,909,413.10	8.6%
	To international	$7,336,776.72	$7,669,260.18	$7,246,522.98	$5,107,282.69	$5,480,479.91	-7.0%
	Total sales	$730,261,965.16	$1,268,535,586.17	$851,143,926.47	$806,624,260.11	$1,011,389,893.01	8.5%
Dealer Purchases	From local	$1,474,737,332.73	$2,137,053,107.33	$1,939,039,117.69	$1,627,094,327.80	$1,818,772,022.28	5.4%
	From international	$268,393,073.60	$370,543,656.50	$3,523,293.57	$243,982,539.87	$458,577,732.27	14.3%
	Total purchases	$1,743,130,406.33	$2,507,596,763.83	$1,942,562,411.26	$1,871,076,867.68	$2,277,349,754.54	6.9%
Dealer Sales	To local	$845,971,576.35	$1,089,325,694.23	$1,045,152,124.66	$904,604,289.81	$1,237,697,988.42	10.0%
	To international	$680,105,885.18	$890,022,523.30	$758,895,643.79	$796,045,381.39	$849,566,999.61	5.7%
	Total sales	$1,526,077,461.52	$1,979,348,217.53	$1,804,047,768.45	$1,700,649,671.20	$2,087,264,988.03	8.1%
Cutters & Polishers Purchases	From local	$579,273,578.87	$1,953,454,300.46	$709,201,872.11	$742,319,421.96	$986,200,392.60	14.2%
	From international	$30,697,670.32	$45,227,827.13	$9,497,507.54	$2,902,764.38	$29,399,273.15	-1.1%
	Total purchases	$609,971,249.19	$1,998,682,127.59	$718,699,379.65	$745,222,186.35	$1,015,599,665.74	13.6%
Cutters & Polishers Sales	To local	$95,751,811.26	$260,280,589.19	$154,340,060.73	$159,917,211.54	$265,943,847.39	29.1%
	To international	$47,978,359.62	$213,649,998.88	$112,448,614.53	$94,030,375.21	$89,272,050.92	16.8%
	Total sales	$143,730,170.88	$473,930,588.07	$266,788,675.27	$253,947,586.75	$355,215,898.31	25.4%
Imports	Rough	$501,366,624.34	$553,099,644.18	$424,046,273.63	$485,663,850.67	$480,446,064.30	-1.1%
	Polished	$8,350.00	$53,471,443.67	$33,792,114.42	$50,089,926.86	$51,141,324.29	784.6%
	Total	$501,374,974.34	$606,571,087.85	$457,838,388.05	$535,753,777.53	$531,587,388.59	1.5%
Exports	Rough	$1,092,425,686.74	$1,397,445,431.39	$1,079,988,793.53	$1,174,284,370.48	$1,253,046,140.65	3.5%
	Polished	$295,940,875.43	$474,723,441.02	$476,256,332.66	$510,741,339.26	$549,638,590.03	16.7%
	Total	$1,388,366,562.17	$1,872,168,872.41	$1,556,245,126.19	$1,685,025,709.74	$1,802,684,730.68	6.7%

Source: Kaiser EDP, 2005a: 48.

Table 3
South African diamonds value chain by volume in carats for the period 1999-2003

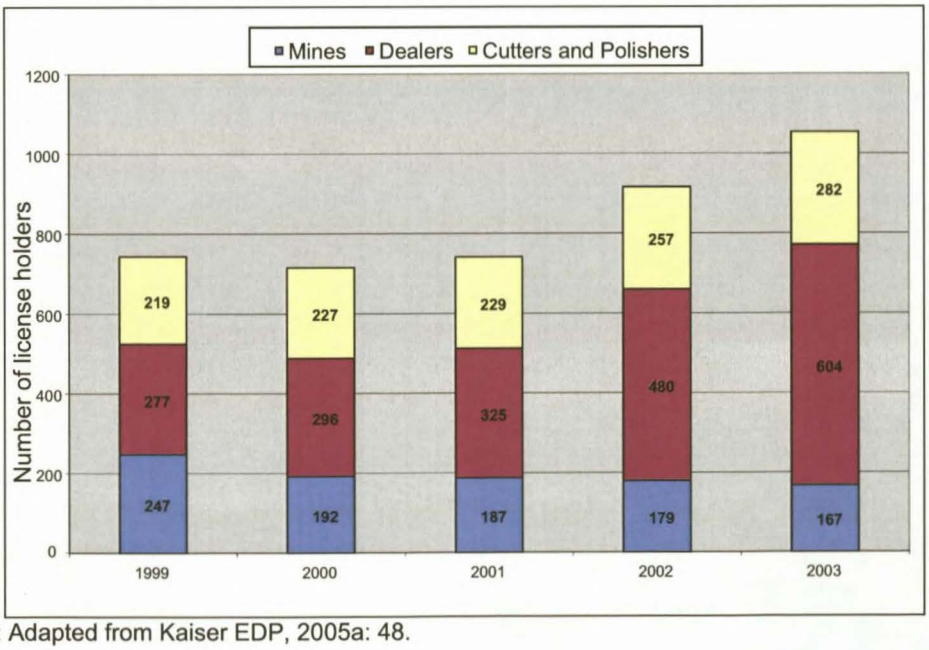
Category	Sub-category	1999	2000	2001	2002	2003	CAGR 99-03
Mining Production - carats		11,154,317.11	11,007,116.35	11,624,983.86	11,034,256.08	12,556,389.34	3.0%
Mining Production - No. of stones > 5 carats		1,228	54,759	5,397	8,569	7,082	55.0%
Mining Sales	To local	18,781,746.37	20,150,048.58	16,358,010.83	12,442,871.51	11,853,899.06	-10.9%
	To international	124,135.88	108,636.35	105,291.56	86,364.82	92,777.25	-7.0%
	Total sales	18,905,882.25	20,258,684.93	16,463,302.39	12,529,236.33	11,946,676.31	-10.8%
Dealer Purchases	From local	16,140,545.79	21,982,216.08	19,623,978.98	14,148,349.58	13,540,366.05	-4.3%
	From international	652,490.24	949,332.30	22,387.34	603,639.42	806,034.45	5.4%
	Total purchases	16,793,036.03	22,931,548.38	19,646,366.32	14,751,989.00	14,346,400.50	-3.9%
Dealer Sales	To local	2,333,277.29	2,516,778.55	7,458,094.38	3,067,690.35	2,222,803.44	-1.2%
	To international	8,491,320.85	11,057,971.03	10,384,360.07	10,337,979.71	11,568,835.74	8.0%
	Total sales	10,824,598.14	13,574,749.58	17,842,454.45	13,405,670.06	13,791,639.18	6.2%
Cutters & Polishers Purchases	From local	1,099,099.21	1,614,366.60	1,295,103.48	1,707,587.15	1,719,449.04	11.8%
	From international	40,921.77	48,150.52	10,307.09	7,573.89	70,708.08	14.7%
	Total purchases	1,140,020.98	1,662,517.12	1,305,410.57	1,715,161.04	1,790,157.12	11.9%
Cutters & Polishers Sales	To local	234,126.30	547,736.33	425,352.45	454,479.38	501,828.10	21.0%
	To international	100,128.45	423,102.95	293,608.91	273,572.47	217,930.13	21.5%
	Total sales	334,254.75	970,839.28	718,961.36	728,051.85	719,758.23	21.1%
Imports	Rough	3,292,784.76	3,336,245.41	2,561,452.24	5,198,982.80	20,828,616.02	58.6%
	Polished	1.67	71,678.25	49,858.72	716,507.44	335,367.21	2016.9%
	Total	3,292,786.43	3,407,923.66	2,611,310.96	5,915,490.24	21,163,983.23	59.2%
Exports	Rough	10,359,128.15	12,241,809.11	12,542,941.03	10,381,728.05	10,257,698.99	-0.2%
	Polished	181,109.00	253,467.86	243,198.23	321,083.05	352,975.02	18.2%
	Total	10,540,237.15	12,495,276.97	12,786,139.26	10,702,811.10	10,610,674.01	0.2%

Source: Kaiser EDP, 2005a: 47.
Note: highlighted cells represent inaccurate statistical data at the source

This statistical data and its resultant findings form part of a study conducted and concluded in February 2005 by the consultancy firm Kaiser Associates Economic Development Practice (Kaiser EDP) on behalf of the Fund for Research into Industrial Development, Growth and Equity (FRIDGE which is financed by the Department of Trade and Industry) to determine the potential for increasing diamond processing and trading activity in South Africa.

In spite of the abovementioned alleged strain on rough diamond purchasing and domestic diamond manufacturing activities, the data in Tables 2 and 3 are indicative of vibrancy and growth in the downstream portions of the South African diamond industry (Kaiser EDP, 2005a). The data indicate an increase in compound annual growth rate (CAGR) in volume and value terms in both diamond dealer total sales (6.2 percent CAGR by volume and 8.1 percent CAGR by value, 1999-2003) and cutters and polishers total sales (21.1 percent CAGR by volume and 25.4 percent CAGR by value, 1999-2003) in spite of the decrease in total mining sales in volume terms over the same period (Kaiser EDP, 2005a). The above trend is also evidenced in the number of entities registered as license holders with the SADB at two stages in the diamond value chain, as illustrated in the graph in Figure 17.

Figure 17
Number of active South African diamond industry members/license holders registered with their respective licensing bodies for the period 1999-2003



Source: Adapted from Kaiser EDP, 2005a: 48.

The number of active license holders (business entities) registered as diamond cutters and polishers increased from 257 to 282 between 2002 and 2003 (this represents a CAGR of 6.5% for the period 1999-2003) (Kaiser EDP, 2005a). An even larger increase occurred in the number of active license holders registered as diamond dealers; the number of diamond dealers increased from 480 in 2002 to 604 in 2003 (signifying a CAGR of 21.5% for the period 1999-2003) (Kaiser EDP, 2005a). In the diamond mining sector, however, there has been a steady decline in the number of registered diamond mining entities due to consolidation in the industry resulting in a negative CAGR of 9.2% for the period 1999-2003.

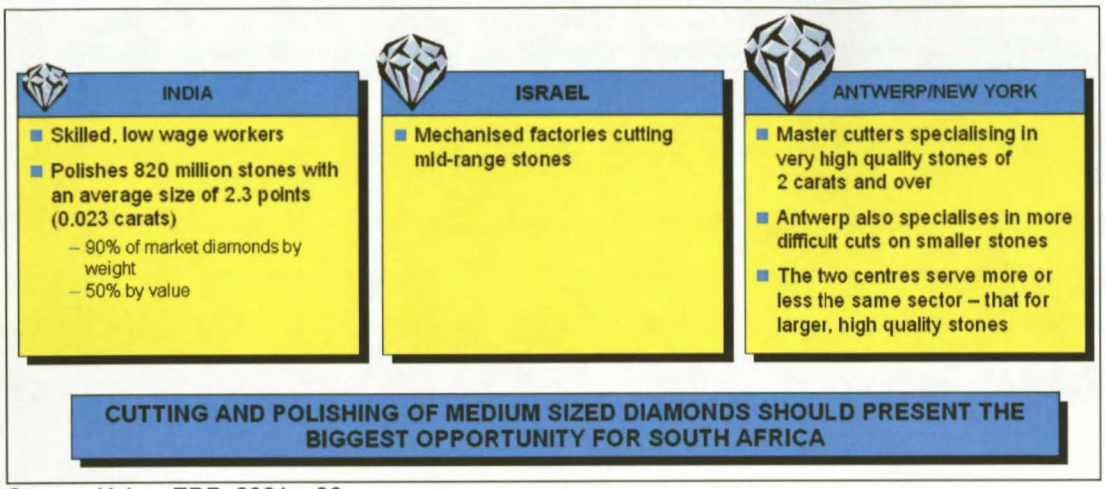
No significant increase in the number of active diamond cutting and polishing enterprises occurred in South Africa from the end of 2003 until September 2005. The official mailing list of South African diamond cutters and polishers was obtained from the SADB on the 28th September 2005 and indicated the presence of 289 active diamond cutting and polishing businesses countrywide. This number constitutes the market size for that particular target market.

At this point in time, the South African jewellery manufacturing industry (of which diamond cutting and polishing is an integral component) is miniscule as it accounts for a meagre 0.4 percent of the world's total jewellery consumption (Rapaport, 2005a; Fraser, 2004b). Accordingly, Gareth Penny (Managing Director of De Beers DTC) believes that it is likely that there is much room for growth in the South African diamond beneficiation and jewellery manufacturing industries (Rapaport, 2005a). Penny adds, however, that this potential for industry expansion is not without its limitations (Rapaport, 2005a). He refers to the paramount importance of the "10 percent" rule which states that in order for diamond cutting to be profitable, it must be possible to cut the rough diamond at a cost of no more than 10 percent of the value of the rough diamond (Rapaport, 2005a). Due to the fact that in South Africa it costs between US$40 to US$60 per carat to cut a rough diamond (including the costs of labour), domestic diamond cutting only becomes profitable when dealing with higher value stones priced at US$400 per carat or more. Nicky Oppenheimer (2005) believes local cutting costs to be in the range of US$40 to US$50 per carat. Therefore, it is possible for South African diamond cutters to be internationally competitive with larger, better quality and more expensive rough diamonds because

the costs of cutting are low relative to the price fetched by the finished product, thus allowing for reasonable profitability (Rapaport, 2005a; Oppenheimer, 2005). Consequently, it is clear that the South African industry cannot polish the entire country's production due to competition from more lean and efficient centres such as India (which benefits from cutting costs of between US$10 and US$12 per carat), China and Dubai (Oppenheimer, 2005; Fraser, 2005a; Venter, 2005). De Beers uses this point to defend its "London Mix" policy by arguing that many rough stones could go unprocessed if they were not exported to low-cost cutting centres (Creamer, 2005a). However, as will be revealed in the next section, new proposed legislation will ensure that no rough supplies that are economical to be cut locally will leave South Africa (Creamer, 2005a).

Studies show that the majority of the world's diamond cutting and polishing is undertaken in manufacturing centres in India, Antwerp, Tel Aviv and New York (Kaiser EDP, 2001a). The focus that each location has in terms of rough diamond size and quality is dependent upon the economic relationship between the centre's cutting and polishing costs (predominantly labour costs) and the cost of rough diamonds. Therefore, each centre tends to focus upon a certain caratage or caratage range of rough diamond subject to the economic factors that constrain its choices. As can be seen in Figure 18, the South African cutting and polishing industry is best suited to the beneficiation of medium-sized diamonds and should be in direct competition with Israel. The new legislation that is to be introduced bears its focus on this range of rough diamond supplies.

Figure 18
The raw material focus of the world's diamond cutting and polishing centres



Source: Kaiser EDP, 2001a: 96.

A brief analysis of South Africa's diamond beneficiation competitors reveals the following:

- Antwerp currently has a diamond cutting and polishing industry employing 2 000 cutters, down from approximately 40 000 at its peak, and it is trying to preserve its role as a principal diamond trading centre
- Israel is relocating entire cutting and polishing factories to India and China to reap benefits from cheap labour, high-end technology and economies of scale
- Dubai, an emerging diamond manufacturing hub, offers an environment free of exchange controls and tax, a convenient trading location and massive government assistance

The study conducted by the consultancy firm Kaiser Associates Economic Development Practice (Kaiser EDP) to determine the potential for increasing diamond processing and trading activity in South Africa determined that whilst there is a prospect for growth in South Africa's diamond beneficiation industry, it is less exciting than was otherwise expected. According to the eight month study which cost R2 million to conduct, it is believed that at most the opportunity exists for South Africa's diamond cutting and polishing industry to double in size from currently employing approximately 2 000 people to 4 000 (Venter, 2005). According to Kaiser EDP's Managing Director Rupert Barnard, "*the report shows that there are some*

niche opportunities available in South Africa going downstream, but not a huge amount." (Venter, 2005).

In summary, the findings of the study (based on domestic supply conditions and the international competitive landscape) are as follows (Venter, 2005):

- South Africa should (in the short to medium term):
    - focus on the cutting and polishing of medium to large rough diamonds
    - focus on niche markets for handcrafted jewellery particularly for the tourism market
    - act on the potential for the creation of a SADC/African diamond trading hub, most probably in Botswana
- South African should (in the long term):
    - extend the industry into higher-end diamond jewellery manufacture and retail

The report indicates that the above positioning strategies are unlikely to represent a massive scale of opportunity, but rather more niche positions due to strong competition from countries with lower cost structures (Venter, 2005). In addition, study findings indicate that industry growth is constricted by the fact that South Africa has a small consumer market for diamond jewellery as well as weak linkages with the main international consumer markets (Venter, 2005).

The research conducted by Kaiser EDP culminates in 53 recommended intervention options for stakeholders. The most noteworthy of these are the following (Venter, 2005):

- The facilitation of increased access to suitable and affordable rough diamond supplies for the local industry
- The improvement of the productivity of labour, management, processes and technology within the cutting and polishing industry
- The acceleration of the development of advanced cutting, setting and jewellery manufacturing skills

- The enabling of vertical integration and the facilitation of black economic empowerment (BEE) and investment

To conclude, the study indicates that government intervention in the diamond manufacturing industry to ensure increased beneficiation will come at a high cost in comparison to the benefits that can be reaped by intervening in other industries (Venter, 2005). Government's intervention will present only limited benefits due to its capital intensity, high risks and barriers to entry, as well as the difficulties arising from an extremely competitive international environment (Venter, 2005).

3.2 INDUSTRY, REGULATORY AND LEGISLATIVE REFORMS THAT ARE TRANSFORMING THE SOUTH AFRICAN DIAMOND INDUSTRY

The industry, regulatory and legislative environments surrounding the South African diamond beneficiation industry are undergoing considerable reform. This restructuring is hinged upon two Governmental objectives to be realised within the context of positioning the country as a globally competitive diamond manufacturer (Rapaport, 2005b):

- The promotion of equitable access for all South Africans to the country's diamond resources in support of Black Economic Empowerment (BEE)
- The promotion of local beneficiation of South Africa's diamond resources in order to increase employment and add value to raw materials by expanding downstream diamond cutting and polishing activities

These objectives are formulated in response to an identified need to address certain barriers to local diamond beneficiation. Some of these barriers are identified by Minister of Minerals and Energy Mlambo-Ngcuka and are as follows (Mining Weekly, 2005; Rapaport, 2005c; Le Roux, 2005):

- The domination of the SADB by industry representatives
- Artificial inflation of prices of economically cuttable unpolished diamonds with a view to their export
- Bankrolling of local licensees by foreigners at the diamond exchanges where purchase of unpolished diamonds is predominantly for export

- Strict client criteria used by the diamond bourses and other selling houses
- Current regulations discourage people from investing in local downstream beneficiation activities, creating a tendency to export rough diamonds

The piece of proposed legislation that serves as a vehicle for the facilitation of the majority of the abovementioned transformation is the Precious Metals and Diamonds General Amendment Bill (to be found in Appendix E) which makes considerable modifications to the Diamonds Act No. 56 of 1986. The Bill is intended to improve access to rough diamonds with a view to strengthening the emerging culture of local value addition to raw materials (Mining Weekly, 2005).

The Department of Minerals and Energy proposes, amongst other things, the introduction of beneficiation licenses for control purposes and the reinforcement of export duties as a disincentive to the economically counterproductive export of rough diamonds (Mining Weekly, 2005; Le Roux, 2005). In addition, the DME and the DTI are involved in a continual process of negotiations regarding the introduction of further incentives for the local beneficiation industry (Mining Weekly, 2005). The Minister of Minerals and Energy, Mlambo-Ngcuka, believes that South Africa can and should compete with other diamond cutting centres through the Government's creation of an enabling environment (Rapaport, 2005c). While the Minister believes that South Africa cannot currently compete with India or China, she believes that Indian and Chinese manufacturers will be attracted to South Africa due to the new regulations in order to obtain grades of diamonds that are not freely available in international marketplaces (Rapaport, 2005c). Two De Beers Sightholders, namely Rosy Blue of Belgium and Julius Klein of New York, have recently purchased polished diamond manufacturing facilities in South Africa (Muller, 2004e). In the words of the Minister, "*there are more potential investors who are waiting in the wings. We cannot wait to welcome them.*" (Creamer, 2005b: 4). In addition, the Minister believes that South Africa can compete on costs with Antwerp and Israel (Rapaport, 2005c). Another reason for increased FDI in South Africa's diamond beneficiation industry is the fact that De Beers has made it clear that it is going to support sustainable beneficiation in producer countries (Rapaport, 2005a).

Therefore, while Government has no intention of subsidising the diamond cutting and polishing industry, it is seeking to provide incentives through the creation of an enabling environment and infrastructure (Rapaport, 2005c). A powerful enabling force will be the establishment of a state diamond trader aimed at providing more diamonds to local beneficiators, thus nationalising the distribution function currently performed by De Beers DTC and Diamdel (Reuters, 2005d; Onstad, 2005). Government is also supporting plans for manufacturing and training precincts for precious metals and jewellery at the Johannesburg International Airport, Kimberley, Cape Town, Durban, Midrand and Pelindaba (Le Roux, 2005).

3.2.1 The replacement of the South African Diamond Board

Under the Bill, the SADB as it is currently constituted will be dissolved via the deletion of sections 3 to 13 of the Act (DME, 2005). In its place, an entity to be known as the South African Diamond Regulator (SADR) will be created which is to be dominated by government officials from the Department of Trade and Industry, the Department of Minerals and Energy, the Treasury, the South African Police Service and other related institutions (Rapaport, 2005b).

The Regulator will include independent professionals and experts from the diamond industry; however, unlike its predecessor, these elements will not represent specific constituencies and their interests and will have no decision-making or strategic power outside of an advisory role within the Regulator (Rapaport, 2005b). In addition, the above private parties will be appointed by the Minister of Minerals and Energy according to their perceived alignment with the objectives of Government. The most important objective of the Regulator as set out in section 13B of the Bill is "*to implement, administer and control all matters relating to the exploitation, trade, local beneficiation and export of diamonds*" (DME, 2005: 20).

The replacement of the SADB represents an effort to overcome one of the numerous barriers to local diamond cutting and polishing cited by Minerals and Energy Minister Mlambo-Ngcuka, namely the Board's domination by industry representatives (Mining Weekly, 2005). The proposed amendments to the Diamonds Act No. 56 of 1986 are

engineered to dilute the regulatory powers of the SADB thereby eliminating the perception that the industry is self-regulating (Bain, 2004b). In this regard, Minister Mlambo-Ngcuka has been quoted as stating *"...[Government] will save...[the diamond industry] the embarrassment of conflict of interest"* (Bain, 2004b).

3.2.2 Black Economic Empowerment

Via South Africa's BEE policy, historically disadvantaged black and other South Africans are being attracted to participate in all sectors of commerce, most importantly in this case the diamond beneficiation sector (Rapaport, 2005b). The BEE drive is expected to complement significant growth in the diamond cutting and polishing industry. A black empowered company is defined as having a minimum of 15 percent black shareholding, which is to be increased to a minimum of 26 percent within five years (Rapaport, 2005b). This is evidenced by the fact that De Beers is boosting its South African rough diamond supply (in the larger sizes which are economically viable to be cut and polished locally) by 15 percent through an increase in its number of South African Sightholders from 14 to 19 (Fraser, 2005d). According to De Beers' SoC strategy, its South African Sightholders must have a black partner or an implemented plan to acquire one (Fraser, 2005d). As a result, 60 percent of De Beers' Sightholders have empowerment partners as of June 2005; in 2003, the figure stood at only 20 percent (Fraser, 2005d). Other criteria ensure that South African Sightholders are committed to the promotion of local beneficiation.

The BEE drive extends further down the diamond pipeline from Sightholders to smaller diamond manufacturing enterprise. Government requires all diamantaires to periodically produce a BEE scorecard that demonstrates their level of compliance with broad-based Black Economic Empowerment based on factors such as equity participation in the company by black people, and provision of access for historically disadvantaged people to global diamond markets (Rapaport, 2005b).

Finally, the BEE initiative extends into the mining conglomerates with De Beers expecting to close an empowerment deal by the end of 2005 (Fraser, 2005b). In addition, Government is exploring a variety of incentive options to promote beneficiation of minerals in order to boost employment and economic prosperity in

South Africa (Fraser, 2005c). While mining conglomerates such as De Beers are not being forced to begin their own beneficiation operations, they are being encouraged to facilitate increased local diamond cutting and polishing (Fraser, 2005c). One strategy that Government is using is to allow the obligation of 26 percent empowerment equity by May 2014 to be diluted to 16 percent if the mining company in question exerts sufficient effort to promote diamond beneficiation (Fraser, 2005c; Le Roux, 2005).

3.2.3 Precious Metals and Diamonds General Amendment Bill

The Precious Metals and Diamonds General Amendment Bill (DME, 2005) proposes a number of radical revisions to the Diamonds Act No. 56 of 1986. The critical areas of revision are discussed under the subsections below. The version of the Bill under discussion is the latest issue released on 21 January under notice 33 of 2005 in the Government Gazette No. 27167 (included in Appendix E).

3.2.3.1 Types of licenses (amendment of section 26)

Section 42 of the Bill makes amendments to the four licenses (dealing, cutting, tool-making and research) issued by the SADB (to be replaced by the SADR).

The diamond dealer's license will only be valid for a period not exceeding three years according to the Bill (DME, 2005). A diamond dealer may carry on business provided that "*...unpolished diamonds intended for export ... first be offered at a Diamond Exchange and Export Centre before being registered for export, and shall be subject to the export duty as contemplated in section...[63 of the Bill]...*" (DME, 2005: 25). It is clear that the rephrased clause is designed to promote local beneficiation. According to Abbey Chikane, chairman of the SADB, the Export Centre will determine the grade of diamonds that are unsuitable for local processing, whereas the central Diamond Exchange will attend to the demands of smaller-scale industry players by facilitating transactions and providing expert advice on pricing, marketing and sales (Rapaport, 2005b). According to Minister Mlambo-Ngcuka, the Diamond Exchange will replace De Beers' Diamdel (Rapaport, 2005c).

Both of the existing diamond cutting and tool-making licenses will be known as diamond beneficiation licenses which will, according to the Bill, only be valid for a period not exceeding five years (Mining Weekly, 2005; DME, 2005). These licenses will be subject to a provision that states that the Minister may from time to time determine by regulation a percentage of rough diamonds that must be cut, polished, or set in tools locally with the remaining percentage subject to an export duty as contemplated in section 63 of the Bill (DME, 2005). These new regulations will ensure increased local diamond beneficiation.

The Bill makes provision for a further two licenses: a temporary diamond buyer's permit and a Diamond Trading House license (DME, 2005). The temporary diamond buyer's permit (which has a duration of one week) entitles a non-South African to buy unpolished diamonds from the Diamond Exchange and Export Centre for purposes of export subject to the proposed export duty (DME, 2005). The Diamond Trading House license entitles the licensee to facilitate the local buying and selling of unpolished diamonds at approved premises.

3.2.3.2 Agreements for supply of unpolished diamonds to cutters and tool-makers (amendment of section 59)

The Bill serves to delete section 59 of the Act (Muller, 2004d). By section 59 agreement between producers and the SADB, if producers make their production available to the local polishing industry at competitive prices, they are free to export any percentage of their production free of duty (Fraser, 2004a; Reuters, 2005d). This clause in the existing Act enabled the De Beers Group to obtain a section 59 agreement with the SADB in 1993 which allows it to export all of its local production to its "London Mix" free from the export duty of 15 percent of the fair market value of the unpolished diamonds (Muller, 2004d; South Africa, 1986). As a result, the Bill makes it mandatory for all rough diamonds produced in South Africa which are economically cuttable locally to be first offered to the local industry (Even-Zohar, 2004f).

3.2.3.3 Levying of export duty on unpolished diamonds (amendment of section 62)

This amendment is closely related to the deletion of section 59. The amendment of section 62 results in an across-the-board export duty to be levied on unpolished diamonds leaving the Republic, the amount of which is to "*be determined and provided for in a separate Act of Parliament*" (DME, 2005; Le Roux, 2005). The proposed amount of the new export tax has been fluctuating according to recent reports which state that it could be set anywhere between five, ten and fifteen percent of the fair market value of the rough diamonds (Fraser, 2004a; Monama, 2005; Ensor, 2005). This new export duty, to which there will be no exceptions, is expected to encourage more value to be added to South African diamonds before they are exported (Fraser, 2004a). The Department of Minerals and Energy has received powerful resistance from De Beers and other industry members against the introduction of such an export duty (Ensor, 2005). According to Lindiwe Hendricks, the recently appointed successor to Minerals and Energy Minister Phumzile Mlambo-Ngcuka, the imposition of an export duty is "*non-negotiable*" although the Department is "*very open to lowering it*" (Ensor, 2005). The Minister elaborates by saying that the Department will "*be talking to the national treasury to consider a lower export duty as some of the [industry] debates have [proven convincing] ... [and the Department will] consider a duty that, while deterring wholesale exports of our raw minerals, does not encourage illegal diamond trading*" (Ensor, 2005).

3.2.3.4 Exemption from export duty (amendment of section 63)

The Bill serves to abolish large portions of section 63 of the Act, which encourages foreigners to buy and export diamonds in South Africa without regard for local value addition to the mineral (Rapaport, 2005b). Under the new Bill, if foreign diamantaires are interested in buying unpolished diamonds for export in South Africa, they will have to endure a rigorous process of approval that ensures that the rough diamonds scheduled for export are not suitable for local cutting and polishing (Rapaport, 2005b). The Bill serves to delete subparagraphs (i), (ii) and (iii) of paragraph (a) of subsection (1) of the Act (South Africa, 1986), meaning that an unpolished diamond

shall be exempted from export duty only under the following three conditions (DME, 2005):

- The unpolished diamond has been allocated or offered to a local beneficiator pursuant to the provisions of section 77A
- The unpolished diamond is a synthetic diamond
- If the Minister of Minerals and Energy with the concurrence of the Minister of Finance, determines that it may be so exempted

As a result of the above provisions, it will become highly irregular for an unpolished diamond to be exempted from export duty. It is logical that this will serve to artificially promote the local cutting and polishing of rough diamonds.

3.2.3.5 Deferment of payment of export duty (amendment of section 64)

The Bill provides for the complete cancellation of section 64 of the Act which had the effect of reducing the efficacy of local growth in diamond beneficiation (DME, 2005; Mining Weekly, 2005). Section 64 allows companies to export rough diamonds with the postponement of payment of export duty for a period of six months (South Africa, 1986). As long as the rough diamond is returned to the Republic within the prescribed six month period, no export duty has to be paid (South Africa, 1986). The deferment of the payment of export duty is permitted under the following conditions in accordance with the Act (South Africa, 1986):

- If the rough diamond is to be exported for the purpose of public exhibition or display
- If the rough diamond is to be exported for the purposes of obtaining an expert opinion
- If the rough diamond is of unusual size or value and it must be exported in an endeavour to locate a buyer for it
- In circumstances where the rough diamond is likely to be returned unsold to the exporter

Section 64 is often abused by exporters of unpolished diamonds to the detriment of local diamond manufacturing. Often, rough diamonds exported under this clause are not returned to the Republic (Rapaport, 2005b). In addition, in some instances fraudulent exporters export expensive stones and substitute them with low-quality inexpensive stones for their return to South Africa (Rapaport, 2005b). The Bill will serve to correct this problem.

3.2.3.6 Insertion of section 77A

Section 77A of the Bill serves to grant the SADR powers to determine the terms and conditions under which all producers or associations of producers offer unpolished diamonds to local beneficiators (Mining Weekly, 2005).

The most noteworthy excerpts from section 77A read as follows: "*In order to promote regular supply and equitable access to, and local beneficiation of unpolished diamonds, the Regulator must ... determine the terms and conditions under which all producers ... offer unpolished diamonds to local beneficiators. In determining the terms and conditions ... the Regulator must ... within six months from the commencement of this Act, and thereafter annually identify and categorise producers ... and annually and after investigation and consultation with the local diamond industry, take into consideration the amount of South Africa's rough diamond production; the quality, quantity and class of each producers' annual production and its suitability to local beneficiation; the local demand of unpolished diamonds; classes of unpolished diamonds economically cuttable locally; and any other relevant factors: provided that the Regulator may exempt from export duty, the local production determined not economical to polish locally*" (DME, 2005: 33).

It is apparent, henceforth, that Governmental intervention will result in a large boost in the growth of the diamond cutting and polishing industry in South Africa.

3.2.4 Problems surrounding the Precious Metals and Diamonds General Amendment Bill

There are a number of expected problems surrounding the implementation of the Bill to be discussed in the sections that follow.

3.2.4.1 Export duty

The proposed export duty on rough diamonds is expected to have certain negative effects upon industry. This export tax will be exercised in addition to the proposed eight percent royalty on the revenue of diamond producers under the draft Mineral and Petroleum Royalty Bill (Muller, 2004d; Fraser, 2004a); this represents the highest level of royalties in the bill, the second draft of which is available for public comment during the first half of 2005, with scheduled submission to Parliament before the close of the year (Muller, 2004d; Bolin, 2005). This proposed package of taxation appears to specifically target the diamond mining industry and De Beers in particular (Muller, 2004d). According to Des Kilalea of the research and sales division of Nedcor Securities, "*if [one adds] the 30% company tax[,] ... diamond producers end up with a corporate tax rate of about 43% ... [which represents a serious consequence of the Bill]*" (Muller, 2004d). It is expected that the cumulative effect of these taxes will make operations difficult for companies such as De Beers who are already struggling with the problems of selected unprofitable operations; in addition, a major burden will be placed upon junior operators, particularly those in the start-up phase (Fraser, 2004a).

Certain industry representatives believe that if the Bill is passed in its entirety, it will serve to "drive the industry underground" as economic principles dictate that the unpolished resource must leave the country to be processed elsewhere (Muller, 2004d). It is believed that those involved in the export of South African rough will be forced *"into a situation that is unworkable"* (Muller, 2004d). Finally, many industry proponents are of the view that the Bill will encourage the same conditions as in Russia at present or back in the 1980's when rough diamonds were smuggled abroad due to the financial rand dual currency system (Muller, 2004d; Fraser, 2004b; Ensor, 2005). This perspective is further supported by the comments of De Beers'

Managing Director, Jonathan Oppenheimer, who states that when a government tries to "*...impose financial restrictions on the flow of [rough] diamonds[,] they have traditionally tended to be smuggled.... It also potentially could have significant impact in opening the door ... to the use of these flows for money laundering and the like*" (Reuters 2005e).

3.2.4.2 Potential unemployment increase

South African mining companies are requesting that Government reconsider its plans to impose an export duty on all rough diamonds as it is feared that as an unintended result, thousands of jobs could be at risk in the mining sector (Fraser, 2004a). Selected industry experts believe that the 5 percent export levy will be harmful to small-scale diamond mining operators, particularly those in the Northern Cape (Fraser, 2004a). Twenty thousand workers are employed in small-scale operations in the region; these operations do not have the flexibility to absorb such a duty into their output and revenue streams which could put many operators out of business (Fraser, 2004a). In a more recent report, Chamber of Mines chief economist Roger Baxter was quoted as saying that an export duty is the "*wrong medicine*" to promote local diamond beneficiation and that it will result in higher production costs and a possible 12 000 job losses (Ensor, 2005).

3.2.4.3 Application of the De Beers Supplier of Choice policy

As was hoped, a number of De Beers' Sightholders have established cutting and polishing facilities in South Africa (Muller, 2004e). While this move will have the benefit of generating increased manufacturing capacity in the country, the sudden shift to South Africa is expected to create considerable friction between De Beers and many of its current Sightholders abroad, who perceive that the diamonds they are cutting (linked to their investments in long-term marketing programmes under the SoC system) may be diverted to South African cutting factories (Muller, 2004e).

Thus, the move by De Beers' Sightholders raises some challenging issues for the company and its policies:

- Firstly, will De Beers offer Sight privileges to every client that complies with the

political demands in South Africa to help foster a local cutting industry through job creation and training? Alternatively, will it only support those with a high ranking under the SoC policy, which measures the performance of De Beers' clients on the basis of an internationally applied scorecard? (Muller, 2004e)

- Secondly, at what price will these manufacturers receive unpolished diamonds from De Beers DTC? It is widely accepted that only larger better-quality rough diamonds are viable to be manufactured in South Africa. Accordingly, these ranges are in the shortest supply, and are also the diamonds that, pro rata, generate the least employment. Will De Beers be pressured to change its pricing structure so that a wider range of rough diamonds can be manufactured profitably in Southern Africa, which would create more jobs? (Muller, 2004e)

3.2.4.4 State diamond trader

According to industry opinion, the launching of a state diamond trader will lead to problems regarding the distribution of rough diamonds and it is believed that associated state intervention could undermine the sector (Reuters, 2005f). The formation of such an entity will serve to nationalise the distribution function currently performed by De Beers DTC and Diamdel and could lead to market manipulation (Onstad, 2005). According to MacDonald Temane, chairman of the Master Diamond Cutters Association, "*the whole concept of having a state diamond trader is flawed ... All over the world governments have recognised that it is better ... to ... [impose] tax and privatise. What the state diamond trader is doing is nationalising through the back door*" (Onstad, 2005). Temane believes that a healthier alternative to establishing a state diamond trader is for Government to enter into partnership with De Beers to relocate its sorting function from London to South Africa (Onstad, 2005). However, the Chief Executive of the SADB, Louis Selekane, assures the industry that there is no cause for concern as the state diamond trader proposal "*will all be demand driven ... [and will not result in] anything that would harm the market*" (Reuters, 2005f). He adds that the diamond trader would begin on a small scale by only handling enough diamonds to provide materials to smaller cutters and polishers

that have historically largely been excluded from rough diamond acquisition (Reuters, 2005f).

3.3 SUMMARY AND IMPLICATIONS FOR THE STUDY

At the present time, a flurry of positive forces are exerting pressure on the South African diamond beneficiation industry to undergo growth. However artificial this growth may appear to some industry proponents, it is poised to result in the expansion of most if not all elements or phases in the diamond pipeline; the stage in the pipeline that is scheduled for most rapid growth due to pending and current industry, regulatory and legislative reform is that of diamond cutting and polishing. This has important implications for the technologically innovative machine developed by HBD Venture No 7 (Pty) Ltd.

It can be deduced from the events discussed in this chapter that an increase in diamond cutting and polishing activity will result in complementary growth in the demand for diamond sawing and polishing machinery. This is a market opportunity that, in the opinion of the writer, will reach its most ripened state between the end of 2005 and the beginning of 2006: the expected date when the Precious Metals and Diamonds General Amendment Bill will be passed into law (Reuters, 2005g). A synopsis of the supporting arguments is warranted.

The Minister of Minerals and Energy is currently engaged in the exploration of radical avenues towards the creation of a higher diamond value chain with increased beneficiation and diamond buying activity in South Africa (new proposed legislation will ensure that no rough supplies that are economical to be cut locally will leave South Africa). The prevailing market attitude is positive as an increased number of foreign diamond manufacturers are assessing the feasibility of erecting manufacturing plants in South Africa (many already have a local manufacturing presence). The data in Tables 2 and 3 provide testimony to the vibrancy and growth in the downstream portions of the South African diamond industry. Further increases in the number of license holders registered as diamond cutters and polishers are expected (this figure increased from 257 entities in 2002 to 282 in 2003).

Due to the fact that South Africa has relatively high cutting costs, domestic diamond cutting only becomes profitable when dealing with larger, better quality and higher value rough stones priced at US$400 per carat or more. Improved locally produced diamond sawing and polishing machinery has the potential to increase efficiency and cost effectiveness in the beneficiation process, thus assisting the industry to become more internationally competitive. If such machinery can assist in significantly reducing the costs of diamond cutting and polishing, the industry may find that it has become competitive in the processing of an even wider range of rough stones.

According to the Kaiser EDP diamond value addition study which cost R2 million to conduct, it is believed that the opportunity exists for South Africa's diamond cutting and polishing industry to double in size from currently employing approximately 2 000 people to 4 000. Accordingly, one could expect the demand for diamond sawing and polishing machinery to experience corresponding growth.

The final factor that the author believes is very much in favour of any local manufacturer of innovative diamond polishing and sawing machinery concerns Government's standpoint or attitude regarding the support and promotion of such initiatives. Of the 53 recommended intervention options that Kaiser EDP has developed that Government has adopted in its stance toward increased beneficiation, one is particularly advantageous for innovators such as HBD Venture No 7: "*The improvement of the productivity of labour, management, processes and technology within the cutting and polishing industry*" (Venter, 2005). It can be concluded with a great deal of confidence that a lucrative market opportunity exists for innovators who can produce effective, efficient and improved diamond sawing and polishing machinery.

The chapter that follows will cover the subject of business-to-business marketing in an effort to contextualise the results of the empirical study within a broader framework of applied industrial marketing.

CHAPTER 4: BUSINESS-TO-BUSINESS MARKETING

4.1 BUSINESS-TO-BUSINESS MARKETING – A DEFINITION AND SCOPE

Business-to-business (B2B) marketing, organisational marketing or industrial marketing as it is otherwise known, is defined by Morris, Pitt and Honeycutt (2001) as the creation and management of mutually beneficial relationships between organisational suppliers and organisational customers. Unlike in the case of business-to-consumer (B2C) marketing, the focus here falls upon the flow of goods and services that serve in the production of other products, or that serve to comprise part of other goods and services or that facilitate or enable the operation of an enterprise (Morris et al., 2001). Morris et al. (2001) go on to stress that the term "enterprise" is broadly defined and that all formal organisations, public or private, profit or non-profit, participate in the buying and selling of business-to-business products and services.

In order to clearly understand the concept and scope of B2B marketing, one must understand the nature of the B2B marketing transaction. Bingham and Raffield (1990) assert that a B2B marketing transaction takes place whenever a product or service is sold for any use other than for personal consumption. As a result, all of the activities involved in this transactional process constitute the domain of B2B marketing. Business markets are broad entities and include those markets for products and services that are purchased by all types of businesses, various governmental agencies and institutions for consumption, for use in the manufacturing process or for resale to other businesses (Eckles, 1990).

While B2B marketing is fundamentally different to B2C marketing for a multitude of reasons, the most elemental of which being explained above, the viability of the B2B marketing enterprise still rests upon the purchase by the final consumer of some downstream product with which the firm in question is inextricably linked. For this very reason, the basic fundamentals of marketing are just as applicable in a B2B environment as they are in a B2C setting; it is merely the degree of the overlap between the two that varies somewhat from author to author in the literature.

Mahin (1991) notes an important significance of the abovementioned distinction. Due to the fact that these market distinctions focus on who conducts the buying and on buying motives, not on product type, it is possible to have the same product sold to both business and consumer markets. He also stresses that each business market consists of many sub-segments that possess unique pre-negotiation, negotiation, or post-negotiation needs. It can be deduced henceforth, that business markets present a more complicated set of target market segment needs to be served than is usually the case in consumer markets.

4.2 DIFFERENCES BETWEEN BUSINESS-TO-CONSUMER AND BUSINESS-TO-BUSINESS MARKETING

To a large extent, marketing in the B2B and B2C arenas is similar in many ways due to the fact that the basic tools and concepts (marketing concept, marketing mix, market segmentation, and the product life cycle) are equally applicable in both consumer and industrial markets (Morris et al., 2001). The true difference lies in the design and implementation of marketing strategies and tactics to meet organisational versus consumer needs.

Morris et al. (2001) describe the major distinguishing elements as concerning the degree of importance of technical product characteristics, the critical importance of industrial products due to their effect upon the operations and economic health of the customer firm, and the fact that the customer is an organisation, an umbrella entity, rather than an individual consumer. The following five differences between B2B and B2C marketing centre around these three major distinguishing elements: the product being marketed, the economics of industrial demand, the customer's buying behaviour, marketing communications processes, and economic and financial factors (a summary of these differences, as will be discussed below, is to be found in Table 4). A further two differentiating factors relevant to the contrast between B2C and B2B marketing, are their contemporary marketing approaches/practices used and their differences in market orientation.

Table 4
Distinguishing characteristics of industrial marketing and their significance to the B2B marketer

Major Distinguishing Characteristics	Significance for the B2B marketer
Importance of technical product characteristics	Customer needs must be clearly understood and monitored Marketers must consider all costs a customer will incur with a product over its useful life Product life cycle is shorter because of technological change, necessitating continual product innovation Product quality is critical Distribution channels are shorter and more direct There is a need for technically qualified sales personnel and knowledgeable, specialised middlemen After-sale service, training and technical assistance are stressed Packaging is more functional and less promotional
Products being marketed affect the operations and economic health of the user	Buyer/seller negotiation skills are crucial Formal contracts are drawn Strong vendor loyalty exists; marketers should strive to develop long-term relationships Conservative attitudes are encountered in purchase decision making; marketers need to lower the buyer's perceived risk Formal product and supplier evaluation occurs Purchases are for inventory as well as use; inventories may need to be financed Delivery reliability is critical Industry demand is fairly inelastic Size and cost of purchases are large
The customer is an organisation rather than an individual consumer	Price bidding is employed Discounts are prevalent There are fewer customers, often geographically concentrated Many people are involved in buying decisions Longer, more complex buying process Marketing communications are more focused, using personal selling over advertising Marketing research is more difficult A major customer can have a strong bargaining position, placing the marketer in a vulnerable position Make or buy option exists Reciprocity arrangements develop Tax and accounting implications of products and services being purchased affect what is bought as well as when and how it is bought

Source: Morris et al., 2001: 23.

4.2.1 The product being marketed

Industrial products tend to be more complex in character than consumer products, and the relevant properties are typically more technical in nature (Morris et al., 2001; Wilson, 1999; Dwyer & Tanner, 2002; Ford et al., 2001; Simkin, 2000; Wilson & Woodside, 2001). Consequently, the industrial product represents a multiplicity of physical and performance-related specifications (that often involves much detailed engineering data) that in most cases requires a level of precision and accuracy

beyond that normally required by buyers of consumer goods (Eckles, 1990). In addition, Morris et al. (2001) make the logical, yet not at all trivial, observation that where industrial products are concerned, functional attributes are of paramount importance whereas symbolic attributes (unlike in the instance of B2C products) play a more subordinate or in some cases, an insignificant role. Many industrial goods carry a large currency value and most are sold in large quantities (although there are exceptions particularly in the cases of expensive capital goods, machinery and so forth) (Bingham & Raffield, 1990). Due to the greater concern with the technical aspects of B2B products, these industrial products are custom produced or made to specification (to a large or small degree) for the customer organisation (Reeder, Brierty, & Reeder, 1991) although this depends on the type of product marketed, and there are cases where industrial products may be standardised and mass marketed to a particular target segment. The significance of this technical complexity is that industrial products often necessitate a protracted negotiation process that may take significant time to complete, requiring the services of technically competent and informed salespeople (Mahin, 1991). The salesperson may even function as a coordinator of a sales team comprising engineers, production personnel and top management.

Many industrial products are marketed to the business market at different stages of completion, with much of what is sold taking the form of raw and semi-finished goods. Unlike in the case of B2C marketing, organisational buyers frequently conduct purchasing to fill inventories in addition to satisfying immediate usage needs (Morris et al., 2001). In addition, the industrial buyer often has the choice between purchasing the product or leasing it.

For industrial buyers, the value proposition often includes far more than the core product and the attribute bundle may include, among other things, technical assistance for installation and operation of equipment, pre- and post-sale service and support, and an emphasis on timely delivery (Reeder et al., 1991). When making the purchase decision, industrial buyers of B2B products consider not only the product's selling price but also the costs that will be incurred over the product's useful life

including installation, maintenance and servicing expenses (Morris et al., 2001).

A further difference between B2C and B2B goods concerns the matter of packaging; for industrial products, packaging is more concerned with protection of the product than with the presentation of promotional information (Morris et al., 2001). The final and probably the most overriding distinction is that the daily operations and long-term economic viability of the customer organisation are directly affected by the product's satisfactory performance (Morris et al., 2001).

4.2.2 The economics of industrial demand

Industrial goods contribute directly or indirectly to the manufacture of consumer goods, either as an element in their composition or as a facilitator of the production process (Mahin, 1991). As a result, the demand for industrial goods is ultimately *derived* from the demand for consumer goods (Coviello & Brodie, 2001; Wilson, 1999; Dwyer & Tanner, 2002; Ford et al., 2001; Simkin, 2000; Wilson & Woodside, 2001). *Derived demand* creates an interesting marketing opportunity for the B2B marketer, whereby he or she may be able to affect sales by appealing not just to direct business customers but also to the ultimate consumer, or any other party along the marketing channel (Morris et al., 2001; Blythe & Zimmerman, 2005).

According to Mahin (1991), the derived demand nature of B2B products is significant for business marketers for three reasons. Firstly, downstream market trends require careful monitoring by upstream suppliers so as to avoid losing sight of changing customer preferences farther downstream. In other words, one must be concerned with the needs and market trends originating with one's customer's customers. This is due inevitably to the dependency of derived-demand products on factors beyond the control of the B2B marketer and creates the need for companies to become acquainted with the conditions in markets beyond the one in which they are directly active (Chisnall, 1995). Secondly, derived demand makes possible "pull" marketing programmes which are designed to influence the demand priorities of the ultimate consumer and thus the demand for one's own industrial products. Otherwise known as "back-pressure" selling, this process involves initiating marketing interventions

lower down in the demand chain (Chisnall, 1995). Thirdly, the existence of a derived demand results in upstream suppliers experiencing demand volatility (Wilson, 1999; Dwyer & Tanner, 2002; Ford et al., 2001; Simkin, 2000; Wilson & Woodside, 2001). This means that when a drop or rise in demand occurs further downstream or at the point of final consumption, the upstream industrial organisation will be late in sensing the change in downstream demand, thus adding a degree of unpredictability and instability to the business marketplace (Eckles, 1990). In the case of capital goods for example, these demand patterns are not only short-term, but can include estimates of demand extending over twenty years or longer (Chisnall, 1995).

Another characteristic of industrial demand that is related to derived demand is known as *joint* or *shared demand.* Joint demand occurs when two or more items are used in combination to produce a product (Bingham & Raffield, 1990). When components (such as a hammer head and handle) experience a joint demand, it is essential that the industrial marketer be intimately knowledgeable about the products that involve joint demand (Morris et al., 2001). This is necessary to be able to respond effectively to the erosion in sales that results from supply shortages of joint demand products. The concept of joint demand is also significant in that a change in specifications of a related joint product item will result in the need to adjust the industrial firm's product in order for the B2B marketer to remain an active participant in the joint demand network (Reeder et al., 1991).

The third characteristic of industrial demand is that it is often *concentrated* such that a handful of companies may account for a disproportionate share of the B2B firm's sales (Morris et al., 2001; Wilson, 1999; Dwyer & Tanner, 2002; Ford et al., 2001; Simkin, 2000; Wilson & Woodside, 2001). The ramifications of this fact are as follows: B2B firms are far more dependant on a given customer, and the loss of that customer has a more serious impact on sales.

The final characteristic of industrial demand, which serves to distinguish B2B from B2C markets, is *inelasticity.* Where the product represents a key component, perhaps made to exact specifications, the industrial buyer may be less sensitive to

changes in the price of that component (Morris et al., 2001; Wilson, 1999; Dwyer & Tanner, 2002; Ford et al., 2001; Simkin, 2000; Wilson & Woodside, 2001). This is especially true when there are few substitutes for the product, where switching costs are high and where the market is highly concentrated. Also, since B2B firms purchase industrial products to satisfy the demand of their downstream customers, demand for an upstream industry's product is usually inelastic (Mahin, 1991). Hence, demand will not increase dramatically for the industrial product even if prices are reduced dramatically due to the derived demand nature of such goods. This is in considerable contrast to the concepts covered in consumer pricing theory and the way that B2C markets function (Mahin, 1991).

4.2.3 The customer's buying behaviour

B2C and B2B customers diverge considerably when it comes to the who, why, how, when, where, and what involved in the buying process (Morris et al., 2001).

In the case of an organisational buyer, purchases involve the participation of a number of individuals, with any given buying decision often involving the inputs from employees in the engineering, production, finance, marketing, research and development, and purchasing departments (Morris et al., 2001; Wilson, 1999; Dwyer & Tanner, 2002; Ford et al., 2001; Simkin, 2000; Wilson & Woodside, 2001). This collection of interacting individuals, each of whom plays a significant role in the purchase of a particular product, is known as the buying centre (Eckles, 1990). The business buying process involves close interaction among functional specialists and a hierarchy of management, resulting in a more complicated selling situation that makes greater demands on the marketer to possess a broad spectrum of specialist technical knowledge (Mahin, 1991). Although, in theory, all organisational members are geared towards actions that best endeavour to satisfy the firm's needs and objectives, various departmental members often experience conflicting interests when selecting a particular product or supplier is concerned; this creates a very political buying process. As such, the B2B marketer experiences much difficulty in determining where to concentrate marketing efforts in order to influence key decision makers (Morris et al., 2001).

In B2B markets, purchasing decisions are generally made on the basis of compliance with specifications, cost-effectiveness, and dependability of supply, rather than on social or psychological needs (Reeder et al., 1991). Therefore, organisational customers are characterised by more rational buying motives, and impulse buying by business customers is most uncommon (Mahin, 1991).

B2B markets tend to be characterised by stable buying relationships, unlike consumers in B2C markets who frequently change their purchasing strategies and habits (Reeder et al., 1991). Therefore, buyer-seller relationships in industrial markets usually develop over considerable time and are characterised by high switching costs; this is exacerbated by the frequent presence of reciprocity between industrial buyer and seller (each is a customer of the other) (Reeder et al., 1991). In light of the above, organisational buyers do not select suppliers heedlessly, and most must achieve certainty of a potential supplier's technical, administrative and financial capabilities (Reeder et al., 1991). Also, B2B buyers conduct exchanges on behalf of the corporate entity and are therefore accountable to the organisation for their purchase outcomes (Garber & Dotson, 2002). Due to this, business buyers are particularly cautious when selecting new suppliers (Rieck, 2000). However, once decided, a customer is likely to be source-loyal unless significant problems develop (Morris et al., 2001).

This tendency to be source-loyal is determined to a large extent by inertia (Eckles, 1990). Eckles (1990) identifies three reasons to explain this phenomenon. Firstly, much organisational buying is done in a routine manner. Secondly, purchasing managers are incredibly busy organisational members and favour transacting with established suppliers who are self-perpetuating and easily maintained. Thirdly, purchasing managers display a tendency to satisfice some of their decision-making rather than to seek to optimise on all decision-making activities.

4.2.4 Marketing communications processes

Due to the complexities of industrial products and the process of organisational buying, the marketing communications process between seller and buyer differs significantly from that typically found in B2C markets (Morris et al., 2001). In

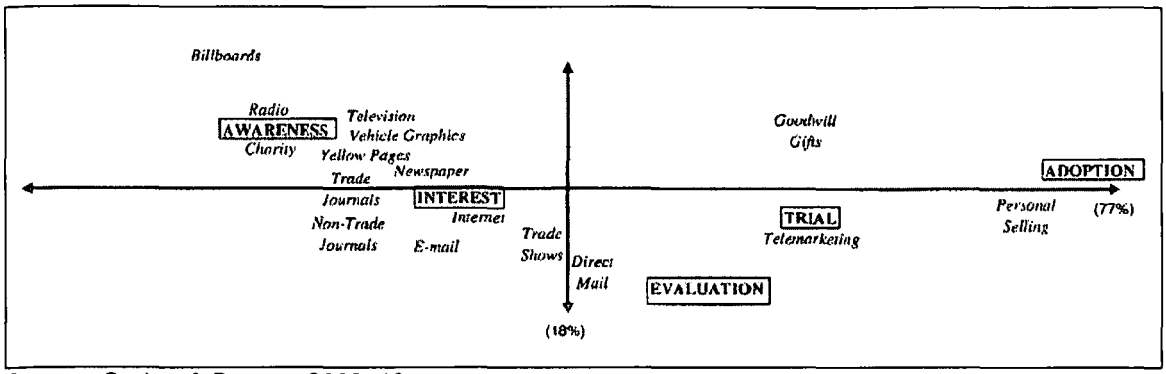
industrial markets, personal selling often becomes the thrust of one's promotional efforts, as the lengthy and involved buying decision produces a need for personal contact, with the sale taking on the appearance of a social negotiation process. In addition, different media may be more or less effective depending on the progress and phase of the buying process (Morris et al., 2001).

Garber and Dotson (2002) note that rational advertising appeals are the approach more frequently used in B2B advertising campaigns. The authors also remark that quality and price have been found to be particularly strong influences in B2B buying and, therefore, are likely to play a strong role in B2B marketing communications. Garber and Dotson (2002) list responsiveness, competence and reliability as the three top attributes that are most likely to influence a B2B exchange. While traditional advertising and personal selling remain an important part of the B2B promotional mix, much growth is being seen in the use of telemarketing and database marketing in B2B marketing communications (Garber & Dotson, 2002).

B2B marketers employ marketing communications tools somewhat differently in order to achieve each of the five objectives outlined in the new product adoption model (awareness, interest, evaluation, trial and adoption) for which they are deemed best suited. Research conducted by Garber and Dotson (2002) and Shimp (2003) will be employed to illustrate the differences alluded to above. Garber and Dotson (2002) undertook a survey of marketing managers in the motor carrier industry (a B2B industry) in order to provide an insight into the unique use of marketing communications tools by B2B marketers. Although the results cannot be generalised to all B2B marketers, they do provide some insight into the matter.

Figure 19 illustrates the results of Garber and Dotson's study (2002). Figure 19 details the number of times that a respondent linked a particular marketing communications tool with a particular communications function. The map that was generated shows marketing communications tools and marketing communications functions as points in a joint space. The physical proximity of a particular tool to a given function reveals its suitability for influencing that function, as perceived by motor carrier marketers.

Figure 19
Motor carrier marketers' associations of communications tools with communications functions, with the latter represented as stages of the individual-level new product adoption model



Source: Garber & Dotson, 2002: 12.

Sixteen marketing communications tools were included in the survey, save for sales promotion which is not commonly used in the motor carrier industry investigated here. The research concluded that those marketing communications tools dealing with mass communication (billboards, radio, television, vehicle graphics, Yellow Pages advertising, newspaper advertising, advertising in trade and non-trade journals) are strongly associated with achieving the awareness stage of the new product adoption model (Garber & Dotson, 2002). In addition, most of these tools are positioned between the awareness and interest stages, indicating their suitability in affecting these two early phases of the model. The Internet and e-mail as marketing communications tools are particularly suitable for facilitating the interest and evaluation stages of new product adoption.

Direct mail is most apt for the facilitation of the evaluation stage of the model. Telemarketing is most appropriate for achieving the trial stage, while personal selling is best matched with the adoption stage of the model (Garber & Dotson, 2002).

The mixture of marketing communications tools in B2C companies is somewhat different to the utilisation of marketing communications in the B2B instance discussed above. Shimp (2003) notes that the B2B marketing communications mixture typically emphasises personal selling with supplementation from trade advertising, technical literature, and trade shows. For B2C companies, mixture decisions are more

complex because greater options are available (Shimp, 2003). For consumer goods firms, personal selling is mostly used in *push* efforts, while advertising is used to *pull* products through the marketing channel.

4.2.5 Macroeconomic and financial factors

Morris et al. (2001) refer to a number of macroeconomic and financial aspects that differentiate B2B from B2C marketing.

Firstly, B2B markets are often characterised as oligopolistic with relatively few competitors (Morris et al., 2001). In such a situation, corporate strategies are far more interdependent and one firm's strategic actions are strongly influenced by the anticipated reactions of its competitors. This results in a strongly competitive emphasis that is price based or non-price based, the consequence of which can be the emergence of price leadership in the industry.

Secondly, the concentration among buyers (Wilson, 1999; Dwyer & Tanner, 2002; Ford et al., 2001; Simkin, 2000; Wilson & Woodside, 2001) suggests the possibility of considerable relative economic power on both sides of the market transaction. The exchange outcomes of B2B relationships rely upon the balance of buyer and supplier bargaining power.

The final aspect of the industrial market structure that characterises B2B markets is that of reciprocity. This implies that the fact that the customer is often a key supplier of the B2B marketer indirectly affects either party's willingness to significantly alter the terms of sale (Morris et al., 2001). In addition, the high currency value of the product and the need for industrial customers to maintain inventories make economic variables such as interest rates, inflation figures and the business cycle critical concerns for B2B marketing.

4.2.6 Contemporary marketing approaches/practices

While market characteristics and influences, demand patterns, buyer behaviour, buyer decision processes and so forth may differ across firms serving consumer and business markets, attention needs to be given to the determination of whether or not B2C and B2B firms fundamentally differ in terms of contemporary marketing practice. In order to answer this question, a study conducted by Coviello and Brodie (2001) is discussed. In this study two related hypotheses were investigated: (1) are marketing practices really different between consumer and B2B firms?, and (2) how do the marketing practices of consumer firms compare to those of B2B firms, when examined in the context of a more relational (and less transactional) view of marketing?

Before one can reveal whether or not differences in contemporary marketing practice exist, one needs to briefly peruse the relevant conceptualisations of marketing practice classified according to exchange and managerial dimensions. The four marketing practices according to which B2B and B2C firms are presumed to differ or not to differ, are transaction marketing, database marketing, interaction marketing and network marketing (Coviello & Brodie, 2001). The authors classify transaction marketing and database marketing under the transactional perspective, whilst interaction marketing and network marketing are classified as relational in nature. Coviello and Brodie's (2001) integrated conceptual framework (reflecting a pluralistic view of marketing practice) is presented in Table 5.

Table 5
Four marketing practices classified by exchange and managerial dimensions

	Transactional perspective		Relational perspective	
	Transaction marketing	Database marketing	Interaction marketing	Network marketing
Purpose of exchange	Economic transaction	Information and economic transaction	Interactive relationships between a buyer and seller	Connected relationships between firms
Nature of communication	Firm "to" mass market	Firm "to" targeted segment or individuals	Individuals "with" individuals (across organizations)	Firms "with" firms (involving individuals)
Type of contact	Arms-length, impersonal	Personalized (yet distant)	Face-to-face, interpersonal (close, based on commitment, trust, and cooperation)	Impersonal – interpersonal (ranging from distant to close)
Duration of exchange	Discrete (yet perhaps over time)	Discrete and over time	Continuous (ongoing and mutually adaptive, may be short or long term)	Continuous (stable yet dynamic, may be short or long term)
Formality in exchange	Formal	Formal (yet personalized via technology)	Formal and informal (ie at both a business and social level)	Formal and informal (i.e. at both a business and social level)

Managerial intent	Customer attraction (to satisfy the customer at a profit)	Customer retention (to satisfy the customer, increase profit, and attain other objectives such as increased loyalty, decreased customer risk, etc.)	Interaction (to establish, develop, and facilitate a cooperative relationship for mutual benefit)	Co-ordination (interaction between sellers, buyers, and other parties across multiple firms for mutual benefit, resource exchange, market access, etc.)
Managerial focus	Product or brand	Product/brand and customers (in a targeted market)	Relationships between individuals	Connected relationships between firms (in a network)
Managerial investment	Internal marketing assets (focusing on product/service, price, distribution, promotion capabilities)	Internal marketing assets (emphasizing communication, information, and technology capabilities)	External market assets (focusing on establishing and developing a relationship with another individual)	External market assets (focusing on developing the firms position in a network of firms)
Managerial level	Functional marketers (e.g. sales manager, product development manager)	Specialist marketers (e.g. customer service manager, loyalty manager)	Managers from across functions and levels in the firm	General manager

Source: Coviello & Brodie, 2001: 387.

Transaction marketing is focused upon single exchanges or transactions at any one time, with a rather short time perspective. The unit of analysis is the single market transaction and profits are expected to follow from today's exchanges (Grönroos, 1994). Transaction marketing is also oriented towards product features with low service emphasis, and entails moderate customer contact and limited customer commitment (Coviello & Brodie, 2001). According to the continuum generated by Grönroos (1994), it is argued that consumer goods are usually characterised by transaction marketing, whilst industrial products lend themselves towards relationship marketing. In Coviello and Brodie's (2001) framework, transaction marketing involves creating discrete economic transactions at arms-length in the context of a formal exchange. On the managerial level, the focus is on marketing the product/brand to the target market, with marketing activities relegated to functional marketing areas (Coviello & Brodie, 2001).

Database marketing involves applying a technique/tool to develop and manage long-term customer relationships, with the purpose of the exchange being both informational and economic (Coviello & Brodie, 2001). The database marketer relies on information technology to help retain customers over time. Communication patterns are driven and managed asymmetrically by the seller in discrete exchanges over time. In the case of database marketing, the managerial focus widens to include both the product/brand and specifically targeted customers, with marketing activities conducted on the specialist marketing management level (Coviello & Brodie, 2001).

The purpose of the exchange in the case of interaction marketing is to develop interactive buyer/seller relationships with the aid of face-to-face interpersonal customer contact. Relationships form at both a business and social level, with the two parties being mutually active and adaptive. The managerial intent in interaction marketing is to establish, develop and facilitate a cooperative symbiotic relationship, involving marketing actions from organisational members across all functions and levels in the firm (Coviello & Brodie, 2001).

The purpose of the exchange in the network marketing instance is to generate interconnected relationships between firms. In this case, resources are committed across organisations to develop a position in a network of organisations (Coviello & Brodie, 2001). This is generally accomplished through business and social transactions over time, and results from the development and maintenance of individual, interaction-based relationships. As is the case in interaction marketing, exchanges occur on both a formal and informal level; however, the managerial intention in network marketing is to induce coordination between sellers, buyers, and other parties across multiple firms for mutual benefit (Coviello & Brodie, 2001).

When comparing the marketing practices across B2C and B2B organisations, Coviello and Brodie (2001) uncovered both similarities and differences. On an aggregate level, the authors established that the marketing practices of firms serving consumer markets differed from those of firms serving business markets.

In general, firms serving consumer markets were found to emphasise activities pertaining to transaction marketing and database marketing. In addition, the results of the study indicated that relative to B2B firms, consumer organisations practised significantly higher levels of certain aspects of transaction marketing (Coviello & Brodie, 2001); they are more likely to "*focus their efforts on attracting new customers, emphasise the product offering, invest in areas related to the traditional marketing mix, emphasise marketing communication that is directed from the firm to the mass market, engage in customer contact that is arms-length and impersonal, and participate in relational exchanges which involve no future personalised contact between the customer and the firm*" (Coviello & Brodie, 2001: 392).

Additionally, consumer firms differ from B2B firms in their practice of certain aspects of database marketing; B2C organisations are more likely to "*invest resources in communication technologies, utilise specialist marketers to conduct various marketing activities, and focus their marketing communication on customers in a specific, targeted segment*" (Coviello & Brodie, 2001: 392).

In general, firms serving business markets were found to be more relational than consumer organisations in some of their marketing practices. Firstly, B2B firms were shown to be more likely than consumer firms to practice higher levels of interaction marketing: they emphasised interpersonal contact with primary customers, as well as marketing communications that involved individual employees directly interacting with customers; also, B2B firms display a tendency to participate in relational exchanges that involve ongoing personal contact between buyers and sellers, and to invest resources to develop personal bilateral relationships (Coviello & Brodie, 2001).

Secondly, business marketers have been shown to be more involved in network marketing, where they are more likely to emphasise interpersonal contact with primary customers and participate in relationships involving ongoing contact with the organisational network.

Coviello and Brodie (2001) suggest an explanation for the fact that B2B firms differ from B2C firms in terms of their marketing practices. They propose that the practices of consumer firms are driven by volume requirements due to market size, whereas business firms are more likely to manage fewer relationships; for this reason, interaction and network marketing are deemed more suitable for use by B2B marketers.

Despite the differences in marketing approaches or practices discussed above, B2B and B2C organisations display a significant number of similarities in this regard. Both B2B and consumer firms place a large emphasis on the generation of financial return, with marketing activities carried out by functional managers (these are indicative of transaction marketing) (Coviello & Brodie, 2001). Both types of firm also practice conceptualised aspects of database marketing (although to a greater degree in the B2C instance) as demonstrated by a high level of intent to retain customers, a

shared planning focus on the customer base, investment in communication technology, and acquisition of customer information (Coviello & Brodie, 2001). In addition, aspects of interaction marketing are manifested in the marketing practices of both types of firms: intention to develop long-term, individual relationships with buyers; and a planning focus on specific customers with the intent to develop cooperative relationships (Coviello & Brodie, 2001). Lastly and less frequently, network marketing is practiced by both firm types, as organisations invest in external marketing assets to develop and coordinate system-wide relationships (Coviello & Brodie, 2001).

To conclude the discussion on contemporary marketing practices/approaches, it would be prudent for B2B marketers to identify which marketing approaches best challenge the traditional organisation, so as to cope with the pressure of effectively applying different approaches as the firm and its portfolio of relationships evolves.

4.2.7 Market orientation

Gounaris and Avlonitis (2001) investigate the relationship between the marketing practices of consumer firms and their B2B counterparts with an emphasis on discriminating between them on the basis of their market orientation adoption profile. To quote Kohli and Jaworski (Kohli & Jaworski, 1990: 13), in their seminal article on market orientation and its impact on company performance, "*a market orientation appears to provide a unifying focus for the efforts and projects of individuals and departments within the organisation, thereby leading to superior performance*". This logic dictates that companies that can be distinguished and discriminated between in terms of their performance should also differ in terms of the degree to which they adopt a market orientation (Diamantopoulos & Hart, 1993). Before one can expound on the way in which B2C and B2B firms differ in terms of market orientation, one needs to clearly define the concept.

A company's market orientation represents the coalescence of a cultural and behavioural approach towards business, and as such can be conceived as the managerial process through which a company continually endeavours to adapt to its market (Gounaris & Avlonitis, 2001). Therefore, the concept of market orientation

must be defined from a behavioural and a cultural perspective for it to be comprehended. From a behavioural viewpoint, a market-oriented organisation is one in which "*...the three pillars of the marketing concept (customer focus, coordinated marketing, and profitability) are operationally manifest*" (Kohli & Jaworski, 1990: 3). In terms of the cultural nature of the concept, market orientation is defined as a system of corporate values and beliefs hinged upon: "*(1) the creation of superior customer value at a profit while not neglecting the interests of other key stakeholders; (2) the shaping of the company's internal environment and climate so that the company can be responsive to market information*" (Gounaris & Avlonitis, 2001: 356).

The results of the study reveal that industrial goods companies are less market oriented in terms of both culture and behaviour than are consumer goods firms, and are thus more inclined to adopt a sales orientation (Gounaris & Avlonitis, 2001). Thus, the authors uncover a number of discriminating factors concerning market orientation that differentiate consumer from industrial producers.

Gounaris and Avlonitis (2001) conclude that, on the whole, B2C firms:

- are more inclined to embrace the principles and beliefs of a marketing orientation
- place more emphasis on generating customer derived intelligence through formal marketing research
- are more inclined to formulate strategies based upon specific factors relating to target markets by tailoring products to suit market conditions, by using differential pricing, and by utilising marketing communications that are not solely based upon past experience and objectives
- implement marketing holistically by empowering the marketing department to lead the company's long-term planning
- maintain control over an increased number of tasks.

In contrast, B2B companies exhibit a sales orientation when conducting business. In general, B2B firms:

- do not display a tendency to generate customer derived intelligence through regular market research

- neglect individual customer needs by treating them as an aggregate for which a range of products is produced that is not adjusted according to market conditions
- price products on the basis of production cost and utilise marketing communications based upon past experience
- relegate the marketing department to a less vital status by reducing its participation in long-term planning and the number of activities for which it bears responsibility.

4.3 THE CLASSIFICATION OF BUSINESS-TO-BUSINESS CUSTOMERS AND MARKETS

Business markets are distinguished from consumer markets to a greater extent by the nature of the customer than by the nature of the product (Mahin, 1991). These customers can be classified into three categories: commercial enterprises, governmental organisations, and institutions. Each of these organisational buyer types possesses a unique mission that affects its purchasing motives and buying behaviour (Mahin, 1991).

The mission of commercial enterprises is to serve customer needs at a profit, and as such acquire products and services for their economic value (Mahin, 1991). When marketing the value proposition to commercial enterprises, the B2B marketer must persuade multiple influencers in the decision-making unit (DMU) or buying centre, and must contend with multiple buying motives in a complex purchasing process (Wilson, 1999; Dwyer & Tanner, 2002; Ford et al., 2001; Simkin, 2000; Wilson & Woodside, 2001).

The second organisational buying type is the governmental organisation, whose mission it is to provide for and maintain the welfare of its citizens (Mahin, 1991). Governmental units have a complex purchasing process that is similar to that of commercial enterprises in that it almost always requires protracted negotiation. Governmental buyers also make extensive use of bid buying and tend to buy from the contractor with the lowest price and most satisfactory value proposition.

Institutions such as medical centres, educational bodies, and charity organisations constitute the third organisational buyer type (Eckles, 1990). The mission of institutions is to provide for and nurture social and charitable concerns. Depending on the nature of the concern, an institution usually has a number of professionals from any particular field who exert a considerable amount of influence over the buying process (e.g. doctors).

These industrial buyer types operate in any of three business markets. The business market categories are as follows: original equipment manufacturers (OEMs), end-users, and industrial distributors or dealers (Reeder et al., 1991).

Original equipment manufacturers (OEMs) are entities that purchase industrial products which they, in turn, incorporate as components into the products they produce for eventual sale to either the business or consumer market (Bingham & Raffield, 1990).

An end-user purchases industrial products or services to support its manufacturing processes or to facilitate the operations of its businesses (Reeder et al., 1991). Unlike in the case of OEMs, industrial goods and services purchased by end-users are not incorporated as components into the final product. Although end-users may purchase the same products as OEMs, they do not resell the products in any form and merely use or consume the product in the manufacturing process or in daily operations (Eckles, 1990).

Industrial distributors or dealers act as channel intermediaries involved in the reselling of goods in basically the same form to business markets (Bingham & Raffield, 1990). Industrial distributors and dealers take title to the goods, keep inventories, and sell and service the products. Distributors and dealers operate generally as full-service wholesalers and perform the same tasks that a manufacturer would perform in selling directly to the user, except at a lower final cost to customers (Bingham & Raffield, 1990). Because the distributor breaks bulk and provides inventory and delivery services, the use of a distributor is less expensive than using branch houses or company salespeople.

4.4 CLASSIFYING INDUSTRIAL PRODUCTS

Much discord abounds in the extant literature regarding the categorisation of industrial products. Mutual exclusivity is almost impossible to obtain in a situation where various authors propose multitudes of overlapping and often synonymous categories (Eckles, 1990; Bingham & Raffield, 1990; Chisnall, 1995; Reeder et al., 1991; Mahin, 1991; Morris et al., 2001). The schema proposed by Morris et al. (2001) was chosen due to its simplicity.

Morris et al. (2001) categorise products and services sold in B2B markets into three classes: foundation goods, entering goods, and facilitating goods. Foundation goods are products that are used in the manufacture of other products or services. They do not represent components of the finished product, but are usually expensed or utilised in the production process (as in the case of capital equipment) (Blythe & Zimmerman, 2005). Entering goods (which include component parts, raw materials and processed materials) actually form part of the finished product in the manufacturing process. Entering goods are usually expensed rather than capitalised (Blythe & Zimmerman, 2005). Facilitating goods are products and services that facilitate or enable the operation of an enterprise. They help an organisation achieve its objectives, although they do not comprise any part of the product or production process (Blythe & Zimmerman, 2005). Facilitating goods (such as market research services, cleaning supplies etc.) are expensed by the company rather than capitalised, and are usually divided into supplies and business services (Blythe & Zimmerman, 2005).

4.5 SUMMARY AND IMPLICATIONS FOR THE STUDY

The chapter commences with the provision of a comprehensive definition of business-to-business marketing along with a delineation of its scope. Following this is a detailed discussion of the seven dimensions along which business-to-business and business-to-consumer marketing differ in order to provide one with an understanding of the idiosyncrasies and unique processes and workings of industrial marketing management. This complements the empirical study which deals specifically with the marketing of a technological innovation (foundation good) to a

B2B market, namely the diamond cutting and polishing sector of the South African diamond beneficiation industry. Without a thorough understanding of the concepts and workings of B2B marketing, the results of the empirical study cannot be conceptualised within a larger commercial marketing picture. The understanding of the nature of B2B marketing provided by this chapter will provide HBD Venture No 7 (Pty) Ltd and other companies like it with a basis from which to apply the results of the research.

One of the objectives of the empirical research is to determine the optimal benefit bundle that will improve the probability of success in terms of the marketability of the new and improved diamond sawing and polishing machine. Although the empirical study mostly analyses the benefit bundle in terms of physical product features, this chapter reminds the reader (HBD Venture No 7 in particular) of the context within which the results must be interpreted. It provides a degree of holism to assist in interpreting the results. As such, Reeder et al. (1991) stresses that for industrial buyers, the value proposition often includes far more than the core product and the attribute bundle may include, among other things, technical assistance for installation and operation of equipment, pre- and post-sale service and support, and an emphasis on timely delivery. When making the purchase decision, industrial buyers of B2B products consider not only the product's selling price but also the costs that will be incurred over the product's useful life including installation, maintenance and servicing expenses (Morris et al., 2001). These teachings must be kept in mind when the technological innovation is eventually commercialised.

Another important aspect of industrial marketing which justifies the empirical study of the marketing of an innovative diamond sawing and polishing machine is that of *derived demand*. This concept states that the demand for the product purchased by final consumers, in this case diamond jewellery and other diamond-based products, will indirectly determine the demand for industrial goods and services experienced by manufacturers. Current world diamond prices are expected to remain high due to the fact that the rough diamond market is continually struggling to meet demand (diamond demand is forecasted to grow to $14 billion annually over the next ten

years) (Namakwa Diamond Company, 2005); growing economies are demanding far higher volumes of diamonds than have historically been the case. This results in a need for diamond cutters and polishers to produce polished stones with higher levels of productivity and efficiency. In order to accomplish this, the industry will experience a heightened demand for diamond beneficiation machinery.

One of the five objectives of the empirical research executed during this study involves determining the most effective conduits for marketing communications in order to generate product awareness and promote the diamond sawing and polishing machine. This chapter discusses marketing communications processes within the realm of B2B marketing and thus provides a theoretical basis upon which to interpret the results of the study. HBD Venture No 7 (Pty) Ltd must remember that personal selling is often the necessary thrust of one's promotional efforts in industrial markets (Morris et al., 2001). This is due to the lengthy and involved buying decision whereby the sale takes on the appearance of a social negotiation process. In order to assist in the development of a marketing plan, the chapter explains the different marketing communications media that may be used depending on the progress and phase of the buying process.

Another important aspect of B2B marketing explored in this chapter is the lack of market orientation exhibited by B2B firms. It has been shown that B2B firms tend to display a sales rather than a market orientation when conducting business (Gounaris & Avlonitis, 2001). In many cases this can be counter-productive for industrial marketing firms and in general a sales orientation should be avoided [this teaching should not be overlooked by HBD Venture No 7 (Pty) Ltd and other companies engaged in technological innovation]. Studies have revealed a strong positive relationship between the possession of a market orientation and a new product's market performance (Atuahene-Gima, 1995). Furthermore, market orientation is shown to have a strong positive effect on proficiency of predevelopment activity, proficiency of launch activity, service quality, product advantage, marketing synergy, and teamwork (Atuahene-Gima, 1995). Although market orientation is found to be an important factor in the success of new products, its influence varies depending upon

the degree of product newness (incremental versus radical) (Atuahene-Gima, 1995). Furthermore, it has been shown that market orientation has a greater positive influence on the performance of incremental product innovations than on radical product innovations (Atuahene-Gima, 1995). Although one should not disregard the importance of a market-oriented approach in the development of radically new products, a market orientation may be less important for the success of radically new products (Atuahene-Gima, 1995); thus, such products may be sold based upon the sophistication and complexity of their technological attributes (Atuahene-Gima, 1995). This is significant for HBD Venture No 7 (Pty) Ltd because management can choose to positively influence new product development activities and performance by investing in organisational activities that enhance the market orientation of the firm (Atuahene-Gima, 1995); the decision to invest in such activities can only be made if the firm understands the market's perception of the product as being either radical or incremental. To aid in the firm's understanding of the market's perceptions in this regard, the empirical study attempts to determine the degree of radicalness (product newness) of a new and improved innovative diamond sawing and polishing machine. This knowledge is valuable because HBD Venture No 7 (Pty) Ltd will need to know how much market orientation to invest in, in order to achieve commercial product success. This is logical because firms are more likely to face stronger competition for incremental new products than for radically new products and thus require a greater degree of market orientation for success (Atuahene-Gima, 1995). HBD Venture No 7 (Pty) Ltd must decide on the level of market orientation that is warranted given the cost of building such an orientation while considering compatibility with factors such as the organisation's innovation strategy, the environment and the degree of newness of the product to the customer and the firm (Atuahene-Gima, 1995).

The chapter concludes with a short insight into the types of customers and markets encountered in the field of business-to-business marketing as well as a classification of the broad types of industrial products that exist in the B2B domain.

The purpose of the chapter is to provide the reader with a sound understanding of

business-to-business marketing in order to facilitate the comprehension of the study into the viability of the marketing of a high-technology innovation (a diamond sawing and polishing machine) in the diamond cutting and polishing industry of South Africa. In addition, the chapter provides the basis for the development of a strategic marketing plan for the abovementioned innovation. The chapter that follows focuses specifically on the intricacies involved in the marketing of technological innovations.

CHAPTER 5: THE MARKETING OF INNOVATIONS

5.1 THE NATURE OF TECHNOLOGICAL INNOVATION

The gestation of a technological innovation is one of the most challenging tasks facing business management and industrial marketing management in particular. Innovation is not accomplished through any one distinct action, but rather comprises a complex process of interrelated actions requiring expert integration and control by a number of contributors (Chisnall, 1995). These inputs into the process originate from any number of organisational functions including research and development, production, human resources, purchasing, finance etc., which, when partnered with the marketing function, facilitate successful and profitable innovation (Chisnall, 1995).

It is of paramount importance to all business marketers to note that innovation is essential in achieving competitive advantage: innovation leads to competitive advantage and can occur in any value-creating activity of the organisation. In addition, successful innovation is dependent upon the firm possessing a strong marketing capability (Weerawardena, 2003). A robust marketing capability is thus critical at the new product development stage where customer needs and the competition must be assessed and information must be shared for comprehensive innovative ideas to proceed through the stages of development. It can be concluded that adequate marketing resources and skills are indispensable in the successful development of new product innovations (Weerawardena, 2003). However, bringing a superior technological innovation to market is no guarantee of industrial customer acceptance (Lee & O'Connor, 2003b); there is no assurance that the status quo will be changed via the replacement of the current product with the superior innovation (Woodside, 1996). Even for well-managed new product development processes, there is still an expected failure rate of between 30 and 50 percent for innovations at launch (Beard & Easingwood, 1996; Lee & O'Connor, 2003b). Woodside's (1996) study on the theory of rejecting superior, new technologies serves as a humbling reminder to marketers that a degree of "innovation resistance" resides in business customers in most markets that needs to be understood, navigated and overcome in order to ensure the commercial success of an innovation.

In order to genuinely comprehend the notion of technological innovation, it must be clearly distinguished from the concept of invention. The process of innovation is quite distinct from that of invention, as invention can exist either independently of, or combined with, innovation (Chisnall, 1995). Chisnall explains that "*it is possible to innovate without anything we should identify as invention, and invention does not necessarily enhance innovation, but produces of itself...no economically relevant effect at all*" (Chisnall, 1995: 269).

In order to clarify the concept of "technological innovation" for the purpose of the subsequent sections on the marketing of innovations, it is useful to delineate the scope of the innovation concept using the definition devised by the Central Advisory Council for Science and Technology. Technological innovation denotes "*the technical, industrial and commercial steps which lead to the marketing of new manufactured products and to the commercial use of new technical processes and equipment. At one extreme, (technological) innovation can simply imply investment in new manufacturing equipment or any technical measures to improve methods of production; at the other it might mean the whole sequence of scientific research, market research, invention, development, design, tooling, first productions and marketing of a new product*" (Chisnall, 1995: 269).

Having discussed the nature of the concept, one can proceed with an examination of a modern model of technological innovation.

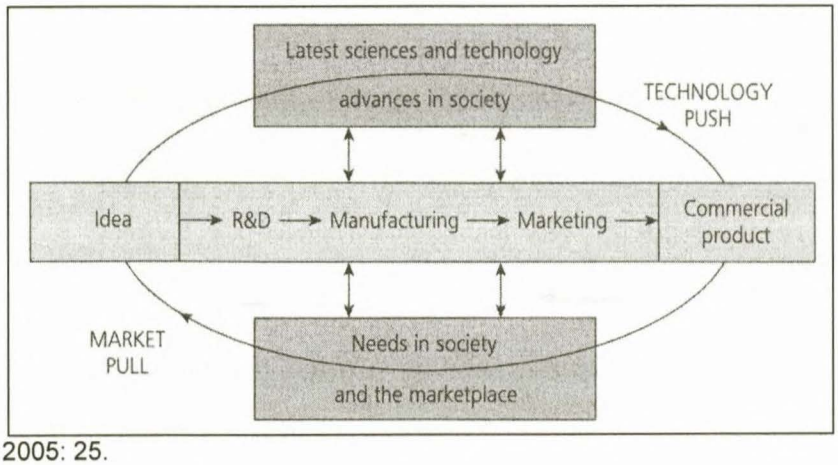
5.2 AN INTERACTIVE MODEL OF TECHNOLOGICAL INNOVATION

Models to explain the dynamics of innovation have evolved over the years, beginning with the development of linear models. The first linear model was technology-driven (referred to as "technology-push") where research and development provides the impetus for innovation and customers are merely passive recipients of the end result of value chain processes (Trott, 2005). This model fails to account effectively for reality, and in response the "market-pull" linear model was developed in which the marketing function, in close interaction with customers, plays the role of innovation initiator.

The simultaneous coupling model was developed next in order to explain *how* innovations occur, rather than to explain *where* their origins are rooted. This model suggests that it is the result of the simultaneous coupling of knowledge within the manufacturing, research and development, and marketing functions that fosters innovation (Trott, 2005).

The interactive model of innovation, as presented in Figure 20, develops the theme of the simultaneous coupling model further and links the two linear models in order to provide a more comprehensive representation of the innovation process. This model emphasises that innovations occur as the result of the interaction of the marketplace, the science base and the organisation's capabilities (Trott, 2005). The use of information flows is used to explain how innovations transpire and that they can arise from many points of origin. The model is logically sequential and is divided into a series of functionally distinct, but interacting and interdependent stages (Trott, 2005). The overall innovation process can thus be thought of as a complex set of communication paths, with both internal and external linkages, over which knowledge is transferred. The flow of communication is not necessarily linear and there is provision for feedback in the model. In addition, linkages with the science base and the marketplace occur between all organisational functions, not just with research and development or marketing (Trott, 2005).

Figure 20
Interactive model of innovation



Source: Trott, 2005: 25.

It becomes clear that organisations that effectively manage the process depicted in Figure 20 will be more successful at innovation. In order to complement an

understanding of the process of innovation and to eventually explain how an innovation is marketed to industrial buyers, one must comprehend the process according to which members of the decision-making unit (DMU) decide whether or not to adopt an innovation, thereby implementing an innovation into daily operations.

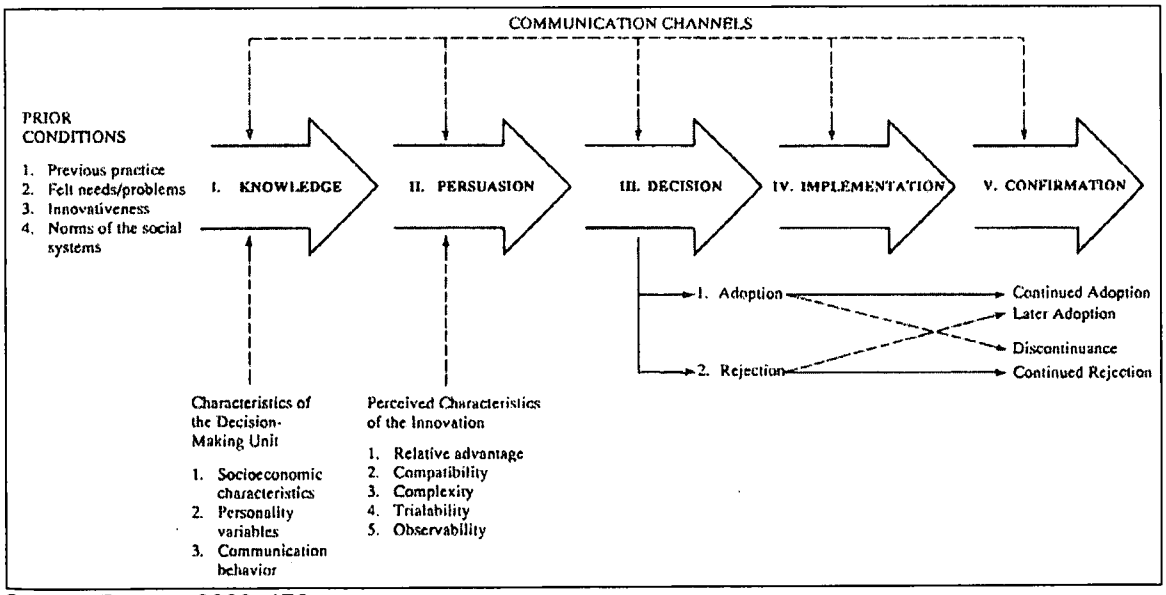
5.3 THE INNOVATION-DECISION PROCESS AND THE ADOPTION OF INNOVATIONS BY ORGANISATIONS

The innovation-decision process is the process through which a member of the decision-making unit (DMU) passes from gaining initial knowledge of an innovation, to forming an attitude towards the innovation, to making a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision (Landrum, 1998; Rogers, 2003). This process, as illustrated in Figure 21, consists of a series of choices and actions over time through which a DMU member evaluates a new idea and decides whether or not to incorporate the innovation into ongoing practice.

The innovation-decision process begins with the knowledge stage, which commences when a DMU member is exposed to an innovation's existence and gains an understanding of how it functions (Rogers, 2003; Landrum, 1998). These organisational members may gain awareness/knowledge about an innovation through either passive or active behaviours. During the second stage of the model, the persuasion stage, a favourable or unfavourable attitude is formed toward the innovation; during this stage, the DMU seeks innovation evaluation information to reduce uncertainty about an innovation's expected consequences (Rogers, 2003). Marketers play a vital role in providing the needed marketing information to facilitate adoption, by convincing the DMU of the innovation's superior value over the current product utilised by the company (i.e. providing assurance that the innovation has a distinct relative advantage over currently employed technologies). The decision stage takes place when the DMU member engages in activities that lead to a choice to adopt or reject an innovation (Rogers, 2003). As uncertainty can lead to rejection, it is essential that B2B marketers maximise the innovation's trialability (either first hand or vicarious), as no organisation will adopt an innovation without first determining its effectiveness and viability on a probationary basis; any marketing intervention, thus, that serves to demonstrate the product's benefits to potential

adopters will accelerate the rate of adoption. The use of reference sites as a market attack tactic (discussed in the section on launching and marketing a high-technology innovation) is an exemplar of the facilitation of trialability to enhance adoption. The fourth stage in the innovation-decision process, the implementation stage, occurs when the DMU puts an innovation to use, and involves overt behaviour change as the innovation is actually applied in the organisation. Uncertainty regarding the consequences of adoption are still paramount during this stage of the process. B2B marketers must provide all information necessary so as to dispel all uncertainty regarding operational problems, usage directions and so forth. The final stage in the process, the confirmation stage, occurs when the DMU seeks reinforcement for the innovation-decision taken, and may reverse the decision if exposed to conflicting messages regarding the innovation (Rogers, 2003). The B2B marketer should, thus, take all steps necessary to provide after sales service and to continue positive marketing communications activities that serve to reconfirm positive customer attitudes towards the innovation, thus reducing the effects of cognitive dissonance.

Figure 21
A model of five stages in the innovation-decision process



Source: Rogers, 2003: 170.

Often, marketers of technological innovations find themselves in a risky situation in which they need to challenge a mature, established technology. As will be discussed in the following section, the B2B marketer can mitigate this risk by creating conditions of high performance advantage and low operational novelty. An innovation's relative

performance advantage and degree of operational novelty should be evaluated and compared (relative to the antecedent technology) before a strategy for market launch is planned.

5.4 STRATEGY INVOLVED IN DIFFUSING AGAINST A MATURE TECHNOLOGY

Marketing a new technological innovation in a market where an older, mature technology is firmly established as the market standard is a daunting task. However, as will be shown using theories formulated by Weiss and Dale (1998), the skilful manipulation of innovation attributes can facilitate an innovation's success and improve its rate of adoption.

5.4.1 Relative advantage and operational novelty – an explanation

Using Roger's (2003) five attributes of innovation that affect the rate of adoption (relative advantage, compatibility, complexity, trialability and observability), Weiss and Dale (1998) formulate their theory by focusing upon two constructs: relative advantage and operational novelty (a cross-coupling of the attributes of complexity and compatibility). Relative advantage and operational novelty independently influence adoption of a new technology and can be used in concert to help evaluate a prospective product as part of a qualitative market analysis.

Relative advantage is conceptualised as the extent to which an innovation is perceived as being an improvement over the idea it supersedes (Limthongchai & Speece, 2003; Agarwal & Prasad, 1997); it is important, in this case, to reiterate that relative advantage is a perceived rather than an intrinsic quality of technological innovations (Weiss & Dale, 1998). Thus, objective advantages based upon quantifiable measures of product performance can enhance diffusion only to the extent that they are perceived as being advantages by users. Consequently, product developers must rely on customer-preference research and must work closely with industrial customers to understand their business needs, in order to truly achieve relative advantage over an established technology.

Operational novelty is a contraction of the innovation attributes of complexity and compatibility (Weiss & Dale, 1998). Like relative advantage, these two attributes are

subject to the forces of perception. Compatibility is viewed as the degree to which an innovation is perceived as being consistent with the established practices, values, past experiences, traditions, needs, and expectations of a customer (Rogers, 2003; Limthongchai & Speece, 2003), and can either accelerate or retard the rate of adoption (Limthongchai & Speece, 2003); it is therefore a matter of operational familiarity as users often become habituated to the operational requirements of an established technology, and a different protocol of operation can be disconcerting (Weiss & Dale, 1998). Complexity is viewed as the degree to which an innovation is perceived as relatively difficult to understand and use (i.e. its perceived ease of use) (Adams, Nelson & Todd, 1992; Davis, Bagozzi & Warshaw, 1989; Moore and Benbasat, 1991). Even new operating requirements that are simpler than those associated with the mature technology may be perceived as complex purely because they are different. Therefore, it can be deduced that complexity may arise from incompatibility with the established protocols and procedures of an antecedent technology. New ideas that are simple to comprehend will be adopted more rapidly than innovations that require the adopter to acquire new knowledge, skills, and understanding (Premkumar, Ramamurthy, & Nilakanta, 1994). In addition, innovations that are perceived as being easier to use and less complex have a greater likelihood of being accepted and used by potential users (Agarwal & Prasad, 1997).

The inverse of operational novelty is operational compatibility (Weiss & Dale, 1998). Operational compatibility engenders comfort, whereas operational novelty produces anxiety. This logic can be illustrated using a hypothetical example from industry. A new bottling machine is introduced that operates using a revolutionary gearing mechanism that dramatically reduces wear and tear and thus represents a significant relative advantage over existing machinery. If the user interface, machine dimensions, and visible design are similar to the antecedent machinery, little new learning will be required and the modifications will be transparent to the user. Therefore, the machine will offer much operational compatibility and little operational novelty, as the user will not need to adapt to new operating requirements. Such a machine will experience a heightened rate of adoption. In summary, the closer that innovations resemble their antecedents in form, fit, and function, the less uncertain will be their acceptance in the marketplace.

5.4.2 The interaction between relative advantage and operational novelty

The interaction between operational novelty and relative advantage produces a situation in which product market forecasting is somewhat complicated. Operational novelty increases the uncertainty associated with the introduction of a technological innovation, with the level of uncertainty increasing as operational novelty increases (Weiss & Dale, 1998). A relative performance advantage, however, tends to reduce market uncertainty (Weiss & Dale, 1998).

It is important to note that increased operational novelty does not necessarily bring about failure in the marketing of an innovation. What is true is that an innovation with high operational novelty increases the uncertainty of market acceptance, thereby creating elevated market and financial risk for the innovating firm (Weiss & Dale, 1998). In addition, even with low operational novelty, technological innovations can fail in the marketplace if they do not offer a sufficiently great relative performance advantage over their antecedent technologies.

Attempting to directly displace a mature, satisfactory, and dominant technology is a difficult proposition due to the fact that market strength of established technologies increases with longevity. A mature technology generally offers ease of use and possesses the comforting attributes of consistent performance and predictable life-cycle costs. Therefore, a technology's longevity confers upon itself formidable advantages that are difficult to challenge directly: customer trust, an established distribution infrastructure, and a history of incremental improvements that result in product stability.

5.4.3 Issues in strategy development when diffusing against a mature technology

In order to evaluate market risk and develop an effective strategy for the introduction of a technological innovation in a market inhabited by a mature technology, two sets of questions need to be asked and objectively answered (Weiss & Dale, 1998):

Firstly,

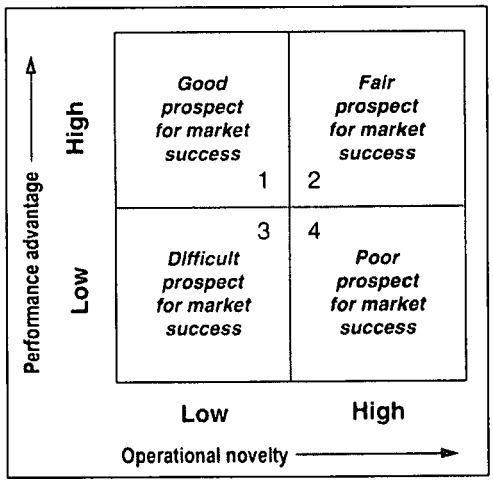
- What are the performance differences of the new product in comparison with the mature technology?
- Will the performance advantages be perceived as tangible and substantial by the customer?
- Do negative performance differences exist that will offset positive performance differences?
- Is the cost structure of the new product (including pay-back profile) an improvement?

Secondly,

- What are the operational novelties of the new technology relative to the operation of products based upon the mature technology?
- Is the operation of the new product perceivably different and to what degree?

The answers to the two sets of questions above can be compared with one another and analysed via the creation of a matrix, as seen in Figure 22.

Figure 22
Matrix for the evaluation of market risk for new technology products



Source: Weiss & Dale, 1998: 302.

The matrix in Figure 22 illustrates that both relative performance advantage and operational novelty must be considered when devising a strategy for the market introduction of a technological innovation. The ignorance or disregard of either factor will result in a poor quality forecast of market receptivity (Weiss & Dale, 1998).

New technology products in the first quadrant of the matrix, with high relative performance advantage and low operational novelty, are generally good prospects for market success (Weiss & Dale, 1998). In this case, a marketing strategy involving direct confrontation with the mature technology, while still risky, would not be ill-advised. Therefore, an aggressive marketing campaign with creative pricing and advertising strategies may be successful.

Technological innovations that fall into the fourth quadrant of the matrix, with low relative performance advantage and high operational novelty, are poor prospects for market success (Weiss & Dale, 1998).

New technology products located in the third quadrant of the matrix in Figure 22, with low relative performance advantage and low operational novelty, are difficult prospects for market success in that they offer minimal benefits in comparison with the mature technology. However, because in terms of functionality they are compatible with existing technology, they may experience limited success as an average quality viable substitute for the market standard (if priced competitively) (Weiss & Dale, 1998). This occurrence is unusual, however, since older technologies typically fill this role as their costs decrease and as quality and performance standards are raised by newer technologies (Weiss & Dale, 1998).

Lastly, technological innovations residing in the second quadrant of Figure 22 (with high relative performance advantage and high operational novelty) are fair prospects for market success but are still problematic (Weiss & Dale, 1998). B2B marketers need to undertake actions that reduce or compensate for the high operational novelty in order to improve chances of success.

5.4.4 Marketing actions that enhance the success of innovations diffusing against mature technologies

There are a number of marketing actions that B2B marketers can pursue to improve the success rate of new technological innovations diffusing against mature technologies.

In the case of products with high relative performance advantage and high operational novelty (quadrant two in Figure 22), potential customers may be reluctant to adopt due to the requirement of learning and adopting a new operating procedure or maintenance regime (Weiss & Dale, 1998). If the B2B marketer takes the appropriate action to reduce the operational novelty and associated adoption reluctance, the adoption likelihood will improve. For example, the industrial marketer may choose to bundle a training programme with the product in order to overcome high operational novelty. Alternatively, the product developer may make minor modifications to the product design in order to increase perceived compatibility with previous practice.

For industrial products and technologies, the attributes and actions of supplier and adopter firms will affect diffusion and may reduce adoption resistance created by high operational novelty. A highly competitive environment among adopters may make firms open to change and more willing to tolerate substantial operational novelties associated with new technologies.

The perceived attributes of the supplier firm can enhance or discourage potential adoption (Weiss & Dale, 1998). A new firm with no track record of customer support and no established reputation for continuity and accountability will struggle to achieve adoption among customers. A number of strategies are available to overcome this negative perception, including "*joining forces with a more established firm (perhaps even a former competitor), licensing an established brand name or licensing the technology to an established firm, bundling the hardware product with a service product, or offering pricing and financing options that share investment risk (such as flexible leasing arrangements)*" (Weiss & Dale, 1998: 303).

The pressures and culture of the adopter industry will, in part, determine strategy development. An industry that is hypercompetitive is often more interested in technology that reduces design cycle time rather than adds end-product enhancements (Weiss & Dale, 1998). However, in relatively stable and secure industries there is often no compulsion or motivation to investigate new innovations, particularly when operational novelties are involved that require modifications to established operating protocol. In such cases, product managers and marketers

should seek to gain a toe-hold and then increase competitive pressure (Weiss & Dale, 1998). The strategy may involve using market penetration pricing initially in order to create the necessary early competitive advantage.

If the technological innovator can quickly introduce differentiating features into its product's look, feel, or performance, or increase shareholder value by realising efficiencies in productivity, it may create a competitive challenge that will force an adjustment by the entire industry (Weiss & Dale, 1998).

In a mature industry with little incentive to adopt technological innovations, the biggest challenge for the B2B marketer may be finding a toe-hold. Here, there is little possibility that the technological innovation can out-compete the refined version of an established technology in its primary domain of application (Adner & Levinthal, 2002). In this case, an oblique market entry strategy is appropriate. Such a strategy involves exploring various possible applications of the innovation and identifying an unmet market need that can be exploited (Weiss & Dale, 1998). Therefore, rather than challenging the mature technology directly, the marketer focuses on a niche or unmet need (Adner & Levinthal, 2002) that serves as a basis for a long term, oblique challenge to the existing technology.

The issue that remains to be explored is how to launch and market a high-technology innovation, which is the subject of the next section.

5.5 LAUNCHING AND MARKETING A HIGH-TECHNOLOGY INNOVATION

The bringing of an innovation to market is a critical chapter in the commercialisation process and the success of an innovation depends heavily on how well B2B marketers perform in the execution of a product launch (Lee & O'Connor, 2003b).

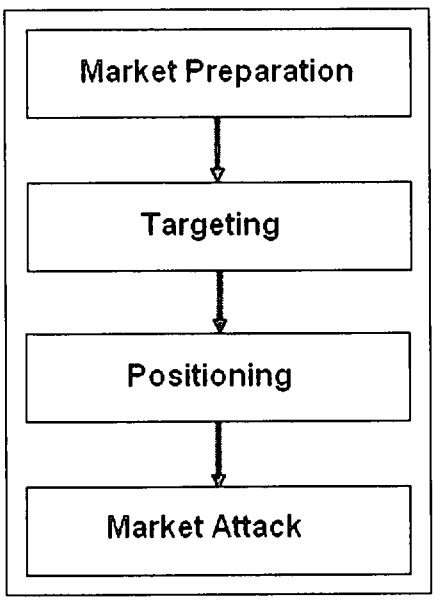
Using research conducted by Beard and Easingwood (1996), a framework of 22 tactics and their associated marketing actions will be discussed in order to provide some direction to the industrial marketer dealing with the complex and often perplexing process of launching a high-technology innovation. In addition, the appropriate applications of the aforementioned marketing and launch techniques will

be discussed in terms of the newness of the market and the degree of technological maturity involved.

5.5.1 Marketing and launch processes

Industrial marketers can develop marketing tactics for a new product launch based upon the process illustrated in Figure 23. Initially, the B2B marketer will take actions to prepare the market while the product is still under development. Next, the marketer will put into motion actions designed to target the product to a specific market. Thirdly, positioning tactics will come into play to position the product based upon the marketer's understanding of the competitive situation (Beard & Easingwood, 1996). Finally, the process is completed by developing and implementing tactics aimed at attacking the market.

Figure 23
Process of launch tactic development



Source: Beard & Easingwood, 1996: 91.

5.5.1.1 Market preparation techniques

The way in which the B2B marketer prepares the market for launch is crucial to the commercial success of an innovation. Beard and Easingwood (1996) identify four market preparation tactics/techniques that are formed from 16 marketing actions (as illustrated in Table 6).

Licensing the product technology can serve to increase the usage of a new technological format which can assist in reaching out to global markets. In addition, it encourages the formation of technological standards, thus intensifying the rate of adoption. Licensing is also a method of raising the necessary capital to cover the significant investment in research and development.

The business marketer can choose to pursue the midpoint between sole manufacturing and licensing, by selling the manufactured technology through other original equipment manufacturers (OEMs). This market preparation tactic enables the innovator to retain full ownership over its technology while simultaneously expanding market potential beyond its own marketing capacity, albeit at a smaller profit margin.

The provision of pre-launch information in a strategic manner is a decisive factor in the success of any technological innovation (Beard & Easingwood, 1996; Sattler & Schirm, 2001). Preannouncing prior to market introduction can serve to build buyer curiosity and interest in the new product and can also encourage potential customers to delay their purchases until the technological innovation becomes available (Lee & O'Connor, 2003b). The stakeholders who typically need to be informed are the distribution network, the service suppliers, and the media. The business marketer needs to carefully craft the revelation of information so as to sufficiently arouse market and stakeholder interest without revealing valuable design elements to potential imitators.

In the event that special distribution arrangements need to be made in order to enter the market, the business marketer has a number of options (listed in Table 6). An increasingly popular means of accomplishing this is through a joint venture involving collaborative development of the technology.

Table 6
Market preparation techniques and associated marketing actions

Tactic	Associated marketing actions
Licensing the product technology	Licensing to inaccessible markets Licensing to create a standard Licensing to create a national image Licensing to reach an unfamiliar market

Supply to other OEMs	Supplying only OEMs Supplying OEMs to increase sales volume Supplying OEMs to access new markets Supplying OEMs to create a national image
Provide pre-launch information	Give technical information to media before the launch Give pre-launch demonstrations of the product Give technical information to some support industries Hold conferences on future technology directions
Create special distribution arrangements	Look for new dealers in new markets Form a joint venture with another producer Give distribution rights to competitors in new markets Create new dealerships in existing markets

Source: Adapted from Beard & Easingwood, 1996: 91.

5.5.1.2 Targeting techniques

When the marketing strategy is compatible with the target segment, the rate of adoption is increased. Beard and Easingwood (1996) identify five targeting tactics/techniques derived from 21 marketing actions (illustrated in Table 7).

The targeting of innovators is an appropriate tactic for very new technologies, as innovators exert much influence and are highly responsive to the benefits of new technologies. Difficulty lies in the identification of the innovator segment, however, and the insights of company salespeople and market research are frequently needed to identify it. In the case of smaller organisations with limited resources and experience, innovators are targeted through the use of advertising tailored to their specific profile.

When the business marketer is marketing an innovation that is not a technological leader, it is appropriate to target early adopters. Early adopters are often large companies that demonstrate a need to adopt new technology in order to maintain competitiveness. Targeting early adopters is best suited to the target marketing of discontinuous technological innovations where the perceived risk of adoption is high.

The targeting of late adopters is applied when the market contains a competing new technology that has already been accepted and absorbed to a large degree. The dormant late adopter portion of the market is usually large and can be exploited in order to grow the market as a whole. The targeting of late adopters is an important tactic to employ and should not be overlooked in the midst of the excitement of a technological breakthrough.

The targeting of existing customers is the tactic best suited to rapidly changing advanced technologies, and to marketing situations where the decision to adopt relies upon a great deal of technical expertise and mutual trust between buyer and supplier.

Targeting competitors' customers is an aggressive tactic that is aimed at urging the customer to adopt the innovation on the basis of a superior value/price proposition. This is achieved by emphasising improvements over competitors' products, and in some countries, drawing direct comparisons with the competing product.

Table 7
Targeting techniques and associated marketing actions

Tactic	Associated marketing actions
Target innovators	Use experience to identify innovators Do market research to identify innovators Target the customers that are quick to adopt new products Tailor advertising to the innovator profile
Target early adopters	Direct marketing effort at large organisations Run conferences on the future of the technology Concentrate on good product support services Meet the needs of large customers Delay launch while awareness increases
Target late adopters	Research market expectations of the product Use commodity marketing techniques Distribute the product as widely as possible
Target existing customers	Run seminars for existing customers Meet the needs of existing customers Use customer records Offer price discounts to existing customers Offer special support to existing customers
Target competitors' customers	Emphasise improvements over competitors' products Emphasise improvements on own product Directly compare own product with competitors' products Offer a trade-in for the old product

Source: Adapted from Beard & Easingwood, 1996: 92.

5.5.1.3 Positioning techniques

For some specialised technological innovations (e.g. custom application semiconductors) with very narrowly defined applications, positioning is not necessary. For other technologies, potential benefits and applications are more wide-ranging and positioning is essential. To this end, Beard and Easingwood (1996) identify six positioning tactics/techniques developed from 23 marketing actions (illustrated in Table 8).

For smaller innovating firms with limited marketing resources, a useful tactic is to position the product so that it appeals only to the largest customers in the market, by concentrating marketing efforts solely on that area. It must be kept in mind that qualities such as product reliability and durability, service, and cost efficiency are of utmost importance to larger industrial buyers. The small firm must be able and prepared to supply these components of the value proposition.

The use of a low price as a positioning strategy (penetration pricing) is effective only insofar as the market considers price to be a primary determinant of customer choice. B2B marketers who utilise this strategy should keep in mind the maxim that states that price should reflect market expectations of product performance rather than objective technical excellence.

One of the most common positioning techniques used for new high-technology products is to emphasise the technological superiority of the innovation, thus creating an image as a technological leader. Although this is a valuable positioning tactic, it is not without its shortcomings. Firstly, the B2B marketer may be assuming a level of technological knowledge that is not present throughout all of the target market. Secondly, a preoccupation with technological specifications has the potential to cloud the genuine benefits that customers could realise from the innovation. Thus, due to the fact that the decision-making unit (DMU) may contain some non-technically minded individuals, a more benefit-specific tactic may prove more effective.

By emphasising a special application of the product, the technological innovation is made comprehensible to the target market by demonstrating the benefits that it possesses for the customer's specific environment. Via this tactic, the product is positioned according to benefits rather than features. The tactic is best suited to complex technologies that are being sold to non-technical customers where the technology offers a wide range of possible applications.

The penultimate positioning tactic presented here is the emphasis of a "safe bet" option. Via this tactic, customer uncertainty is overcome and reliability and service security are communicated. This positioning technique is most appropriate for well-established producers with good reputations. However, the tactic can still be

employed by producers without sound market presence through the use of service agreements, guarantees and so forth.

For producers that cannot draw on a "safe bet" image, an image of exclusivity can be employed. This tactic is best suited to smaller, new-to-market firms that need a premium selling price to justify the lack of economies of scale in production. In this case, the product is carefully designed to be visually appealing and much weight is placed upon engineering quality.

Table 8
Positioning techniques and associated marketing actions

Tactic	Associated marketing actions
Appeal to heavy users	Concentrate on the largest companies Concentrate on the needs of heavy users Work a long time with each customer
Emphasise exclusivity	Concentrate on the quality of the product Concentrate on the engineering of the product Appeal to higher income enterprises Concentrate on the appearance of the product
Emphasise a low price	Price the product below average Undercut the dominant competitor's price Offer a usually expensive technology at a low price Concentrate on reducing the cost-price margin
Emphasise technological superiority	Emphasise the new technology in the product Emphasise mainly technological features Be first to introduce a new technology Create an image as a technological leader
Emphasise a special application	Tailor the product to one application Research the needs of one application Tailor product development to one application
Emphasise a safe bet (customer protection)	Keep specification to established standards Stress the credibility of the company Provide special product support schemes Make it easy to move on to the next generation Guarantee compatibility with future technology

Source: Adapted from Beard & Easingwood, 1996: 93.

5.5.1.4 Market attack techniques

The market attack techniques/tactics chosen for the launch of a technological innovation will depend upon the objectives of the launch, which in turn depend upon the state of the technology and the associated market awareness (Beard & Easingwood, 1996). When the market is unaware of the innovation, attack tactics will focus on conveying the generic benefits of the technology. However, when the market is well aware of the innovation, the attack tactics will be concerned with establishing a brand name and competitive advantage. Beard and Easingwood (1996) identify seven market attack tactics/techniques that are formed from 30 marketing actions (illustrated in Table 9).

The first market attack tactic, the use of opinion leaders, is an effective technique in the generation of word of mouth marketing communications and in the stimulation of adoption. Popular celebrities of the particular trade/industry and experienced users can be featured in advertising or make appearances at company seminars.

When market awareness is sufficiently developed such that customers are interested in a particular product or company, reference sites can be used to acquaint the customer with product benefits. Reference sites are developed from beta test sites, where a customer agrees to take the technological innovation on favourable terms in return for dealing with initial design faults and providing feedback to the innovating company. These reference sites increase the trialability of the product and intensify innovation adoption.

Market education as a market attack tactic is the most generic approach and is best suited to a market that is unaware of the innovation and its benefits (Beard & Easingwood, 1996; Pettersson & Svanström, 2003). Marketing communications funding is focused on public relations activities aimed at educating the market about the novel technology, its benefits and possibilities (Beard & Easingwood, 1996; Lee & O'Connor, 2003a). This strategy may go beyond raising awareness to communicating the vision that the technology has for the future of business customers and final consumers. The newer and more innovative a product is, the more likely it is that customers might not appreciate its significance at the time of launch, and in this case, need to be taught to recognise the new technology's differential benefits (Lee & O'Connor, 2003a). Market education also brings about networking effects; communication occurs with the industry's service and media infrastructure thus building credibility and acceptance, and stimulating word of mouth.

Another market attack tactic that can be employed is to create a winner image for the technological innovation, whereby large resources are devoted to media sensation aimed at communicating the destined success of the product. By emphasising the innovation's probability of success, credibility is built and the wide exposure creates market awareness.

For some technological innovations, an effective market attack technique is to develop a strong dealer focus (Hultink & Schoormans, 1995). In order to achieve this, the B2B marketer must relinquish rights to direct sales in favour of devoting distribution and promotional functions to the dealer network. This tactic is particularly appropriate when marketing technologically complex products on a large scale that require extensive service support.

A market attack tactic that is advantageous in terms of stimulating trialability is to market the product on lend or lease agreement. Leasing helps to reduce resistance to adoption by minimising the perceived risk experienced by customers in purchasing a technology with a potentially short life cycle that may soon become obsolete. This approach is typically suitable for small firms with little or no industry track record.

The final market attack tactic involves promoting to one special customer. This tactic is especially useful for small technology producers, whereby the judicious use of public relations in the relevant media can quickly build credibility in the marketplace.

Table 9
Market attack techniques and associated marketing actions

Tactic	Associated marketing actions
Use opinion leaders	Put high profile stories in the trade press Advertise support from influencers in the industry Advertise adoption by influencers in the industry Use important journalists in the trade press Use influencers to give seminars
Use reference sites	Use beta test sites as reference sites Use only large organisations as reference sites Look for new reference sites
Use educating methods	Give lectures on the product technology Run a road show for the product Create awareness of the product technology Run a corporate programme for the technology Run seminars on the product technology
Use a winner image	Give the product a big prestigious launch Enter the product into competitions Promote the success of the company Follow up the launch with a report on its success Associate the product with achievement
Promote the product to dealers	Do a launch promotion for dealers only Distribute the product through dealers only Give assistance to dealers with presentations Provide a promotional package to dealers
Lend or lease the product	Offer to rent out the product Lend the product for trial Earn revenue only from product services Give a money back guarantee
Promote to one special customer	Sell only through the sales service Persuade certain influential customers to adopt Get a customer involved in product development Make the product part of a customer's product

Source: Adapted from Beard & Easingwood, 1996: 95.

5.5.2 Market and technological maturity, and the appropriate uses of marketing and launch techniques

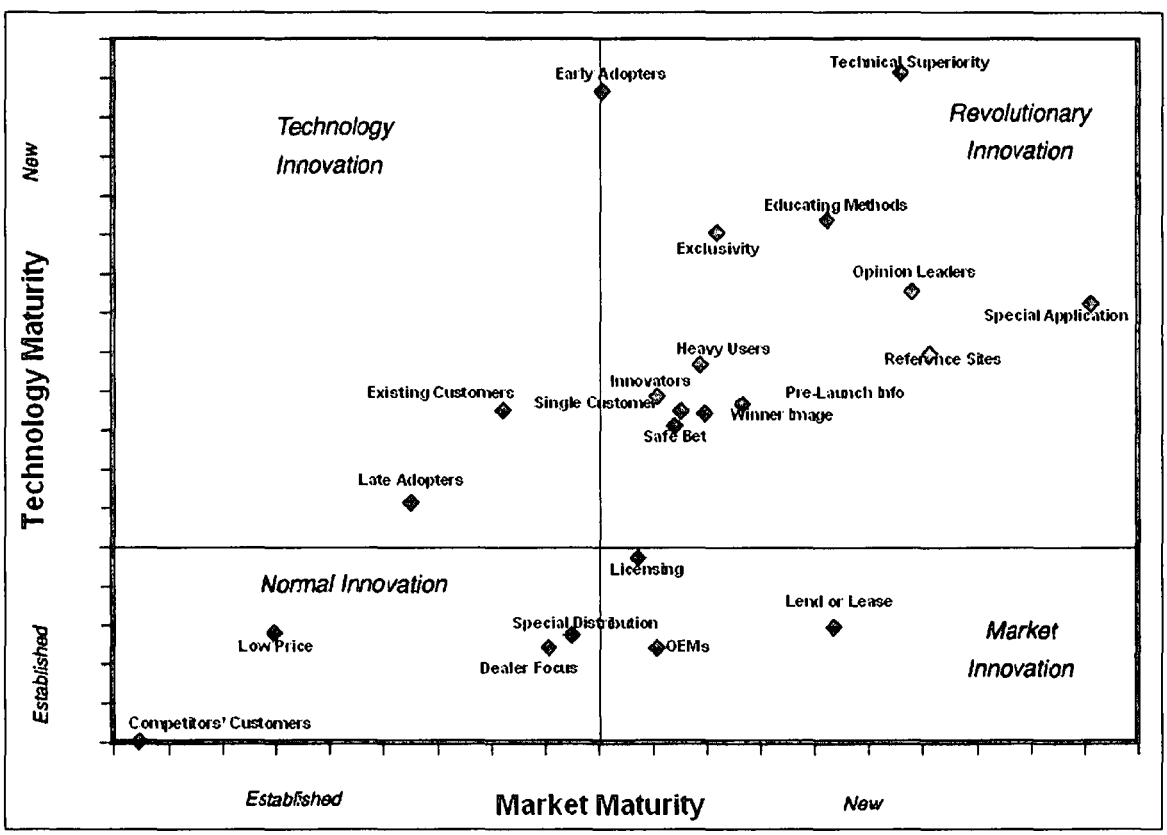
The appropriateness of the above launch tactics was found by Beard and Easingwood (1996) to be dependant upon the newness of the market and the degree of technological maturity of the innovation. The market, in this context, can be either established or new. In terms of technological maturity, a technology is considered new if the primary technology is less than a year old, and established if more than three years old.

In the instance of new markets, market preparation tactics play a minor role. In addition, targeting tactics are used to a far smaller degree than in established markets. In contrast, the positioning and market attack tactics are very important in new markets. Of the positioning tactics, the emphasising of technological superiority and a special application feature very strongly. The market attack tactics for new markets focus heavily on the use of opinion leaders, reference sites, educating methods, and lending and leasing, thus highlighting the importance of interpersonal contact and sales force involvement in this context. In the case of established markets, however, the use of launch tactics in general tends to be weak and slightly negative in significance (Beard & Easingwood, 1996).

In the case of new technologies more emphasis is placed on targeting tactics, with innovators and early adopters being focused upon, and late adopters being avoided. The market preparation tactic of choice is the provision of pre-launch information regarding the benefits of the new technology. New technologies are positioned heavily upon the basis of technological superiority with some emphasis being placed upon special applications and a "safe bet" image. All of the market attack tactics, save for the promotion of the product to dealers and lending or leasing, play a positive role in the launch of a new technology (especially prominent is the use of educating methods). For established technologies, B2B marketers place much emphasis on the targeting of competitors' customers, on positioning according to low price, and on the use of a dealer focus and lending or leasing as market attack techniques.

Now that clarity has been provided on the issue of launch tactic use and suitability in terms of new and established markets, and new and established technologies, the use of launch tactics can be examined according to innovation type. This is a very important distinction to draw due to the fact that the same launch tactics will not be appropriate for every innovation across a technology maturity/market maturity matrix of possibilities. Figure 24 illustrates the market-technology matrix (Beard & Easingwood, 1996), depicting the four innovation types (normal, technology, market and revolutionary) and their associated appropriate launch tactics.

Figure 24
Market and technological maturity and the use of launch tactics



Source: Adapted from Beard & Easingwood, 1996: 101.

5.5.2.1 Normal innovations

Normal innovations occur in established markets with established technologies. Normal innovations are concerned with incremental extensions of the marketing and technological possibilities such as the cost reducing improvement of a process

technology, the addition of product features, and so forth (Beard & Easingwood, 1996). As can be seen in Figure 24, normal innovations are marketed on the basis of competing for market share (the targeting of competitors' customers) and low price (the appropriate positioning tactic). In addition, the market is prepared through the creation of special distribution arrangements and attacked by promoting the product to dealers.

5.5.2.2 Technology innovations

A technology innovation occurs when a new technology is introduced into an established market (Beard & Easingwood, 1996). Thus, while the technology may be new, the solution that the technology provides for consumers does not change (i.e. typewriters and computer word processors both solve the same problem of creating documents more efficiently and effectively than by hand).

The two launch tactics for this innovation type found in Figure 24 effectively encapsulate the strategic priorities of an established market with a new technology (Beard & Easingwood, 1996). Existing customers are targeted with the technology innovation so as to prevent them from being lost to the competition. In addition, late adopters are targeted in order to generate new sales. The strategy, thus, involves coaxing customers into migrating to the new technology without requiring a change in customer behaviour or usage characteristics.

5.5.2.3 Market innovations

Market innovations arise when established technologies are introduced into new markets. Here, suppliers have the upper hand in terms of leveraging experience gained from marketing the technology to familiar markets (Beard & Easingwood, 1996). When marketing a market innovation, the B2B marketer needs to cater for customer uncertainties, such as confusion regarding the benefits offered or lack of information, in the launch strategy.

The launch tactics that feature most prominently in the marketing of market innovations deal with the issue of market preparation. When marketing market

innovations, B2B marketers are most likely to issue licenses to other manufacturers to produce the technology or to supply the product to other OEMs. These two tactics are forms of strategic alliances, which are future-oriented relationships forged between two or more organisations in which each attempts to leverage the strengths of the other to achieve mutually beneficial goals (Hough, Neuland & Bothma, 2003). Finally, with regard to market attack tactics, the most suitable tactic in the case of market innovations is to lend or lease the product, thus improving the trialability of the product offering.

5.5.2.4 Revolutionary innovations

Revolutionary innovations appear when a new technological agenda is formulated for an industry resulting in the creation of a market with a new need, demanding a different form of consumption (Beard & Easingwood, 1996). Beard and Easingwood's study (1996) revealed a number of launch tactics that are dominant in the case of revolutionary innovations. Revolutionary innovations tend to be targeted at the early adopter customer profile and they are positioned to emphasise technological superiority, a special application or some form of exclusivity. The predominant market attack tactics utilised in this instance are educating methods and reference sites. The only market preparation tactic used for revolutionary innovations is the release of pre-launch information on the innovation. As a whole, these tactics suggest that revolutionary innovations are marketed on a small scale where the intention is to raise awareness of the new technology and its applications to a small group of well-informed customers. These tactics are expensive to implement however; early adopters insist on high quality evidence of promised benefits, and positioning according to exclusivity demands a costly exclusive approach to promotion. In addition, emphasising a special application requires detailed research, custom support and promotional materials as well as the possible requirement of customising the product. Furthermore, running conferences and seminars is expensive, requiring the services of highly qualified sales engineers or specialists. Lastly, reference sites can only be used for a limited number of potential customers.

While the above tactics are appropriate for very new markets and technologies, Beard and Easingwood (1996) identify a number of other tactics that are suitable for

launching and marketing a revolutionary innovation involving a slightly more mature market and technology; these tactics are aimed at creating a broader appeal. Positioning the technological innovation for heavy users is aimed at expanding the market, whereas positioning according to a "safe bet" image allows the firm to anticipate or respond to competition while the market expands. Attacking the market by creating a winner image seeks to attract broad appeal for the technological innovation quickly and dramatically (Beard & Easingwood, 1996).

5.6 SUMMARY AND IMPLICATIONS FOR THE STUDY

This chapter on the marketing of innovations has significant implications for the objectives of the empirical research. It lays a foundation of knowledge for the determination of effective marketing communications conduits for the promotion of an innovative diamond sawing and polishing machine. It also provides a framework of reference for the development of an optimal benefit bundle that will improve the marketable success of the technological innovation. Furthermore, the chapter provides the innovator with the strategic tools necessary to overcome the resistance to innovation adoption that prevails in most B2B markets.

HBD Venture No 7 (Pty) Ltd and other companies involved in the marketing of innovations to a B2B market will improve their commercial success by heeding the strategic lessons learnt from the discussion on the innovation-decision process whereby innovations are adopted by organisations. By doing so, the marketer will be able to lubricate and expedite the passage through the five stages from the acquisition of knowledge regarding the innovation to confirmation of a wise purchase decision taken. The marketer of an innovation must pay particular attention to the importance of reducing uncertainty in the mind of the potential adopter during the innovation-decision process.

As is the case for HBD Venture No 7 (Pty) Ltd's innovative diamond sawing and polishing machine (and the technological innovations of many other companies in various industries) the company is finding itself in a situation where it needs to challenge a mature and established technology. The traditional diamond sawing

machine and polishing machine constitute two antecedent technologies that pose barriers to the innovation's marketable success. This chapter discusses the importance of creating conditions of high relative performance advantage and low operational novelty prior to the development of a successful market launch strategy. The empirical study that follows serves to determine the degree of relative advantage and operational novelty that the diamond cutting and polishing market perceives regarding the new machine. This market research will enable the company to tailor the benefit bundle to ensure that the two aforementioned conditions are met in order to successfully diffuse against the established technology.

The new machine developed by HBD Venture No 7 (Pty) Ltd is believed to reside in quadrant one of the matrix for the evaluation of market risk for new technology products. The empirical market research to be conducted during this study will assist in establishing if this is true and will reveal any design aspects that require improvement. As stated by Weiss and Dale (1998), new technology products that fall into this first quadrant are good prospects for market success and should perform well using a marketing strategy involving direct confrontation with the mature technology. With this in mind, Weiss and Dale (1998) advise an aggressive marketing campaign along with creative pricing and advertising strategies. The chapter also reveals a number of marketing actions that can enhance the success of innovations diffusing against mature technologies. Although the company's innovative machine possesses the innovation attributes necessary to engage in a direct confrontation with the mature traditional technology, it is possible for a number of reasons that the diamond beneficiation industry is one with little incentive to adopt technological innovations. In this case, Adner and Levinthal (2002) and Weiss and Dale (1998) advise an oblique market entry strategy whereby the company must focus on a niche or unmet need. As such, HBD Venture No 7 (Pty) Ltd may find it beneficial to focus on that portion of the market that considers industrial diamond cuts (a unique capability of the company's innovation) a priority. The empirical market research will determine if a portion of South Africa's diamond cutters and polishers indeed consider the ability to create industrial diamond cuts to be a beneficial feature of the new and improved diamond sawing and polishing machine.

The final section of the chapter deals with the launching and marketing of a high-technology innovation. Launch tactics and their associated marketing actions are discussed in order to provide B2B marketers of high-technology innovations and HBD Venture No 7 (Pty) Ltd in particular with a number of options for the launching of a high-technology product. These techniques are then conceptualised in terms of the newness of the market and the degree of technological maturity involved.

Industrial marketers such as HBD Venture No 7 (Pty) Ltd will need to develop marketing tactics for a new product launch based upon four stages: market preparation, targeting, positioning and market attack. In terms of market preparation, it will be essential for HBD Venture No 7 (Pty) Ltd to provide pre-launch demonstrations of the product to reduce scepticism and perceived risk amongst potential customers. In addition, it will be beneficial for the company to target innovators who act as opinion leaders and exert much influence in the market. The empirical research conducted in this study will assist in identifying this innovator segment. Targeting competitors' products by emphasising product improvements will be an essential element of the company's target marketing strategy. Emphasising technological superiority and a special application for the product will be crucial to the company's positioning strategy, while market attack may be best accomplished through the use of lease agreements that stimulate trialability and reduce perceived risk towards the technology innovation.

The design and methodology employed in the empirical study is the subject of the chapter that follows.

CHAPTER 6: DESIGN AND METHODOLOGY OF THE EMPIRICAL STUDY

6.1 PROBLEM STATEMENT AND JUSTIFICATION FOR THE STUDY

The diamond beneficiation industry in South Africa is currently undergoing considerable industrial, regulatory and legislative reform. The Precious Metals and Diamonds General Amendment Bill and other government initiatives will result in considerable growth in the local industry with an increased number of diamond cutting and polishing businesses becoming active in the country. In order to answer Government's call for increased processing of locally produced rough diamonds, polished diamond manufacturers will be continually searching for ways to improve production output and quality of polished diamonds with greater efficiency and effectiveness. In a recent diamond value-addition study commissioned by Government to determine the potential for increasing diamond processing activity in South Africa, one of the 53 recommended intervention options for industry prosperity was the improvement of "*productivity within the cutting and polishing industry – referring to labour, management, processes and technology*" (Kaiser EDP, 2005b: vi).

HBD Venture No 7 (Pty) Ltd is a local start-up venture that is involved in the design and development of a locally produced innovative new and improved diamond sawing and polishing machine for the South African market (with future export possibilities). Innovative, newly developed diamond sawing and polishing machines with significant advantages over current technologies may assist in achieving more effective and profitable operations. To assist in understanding the needs and dynamics of South Africa's cutters and polishers of rough diamonds, empirical market research has been conducted (the results of which appear in the chapter that follows) that attempts, among other things, to identify important sought-after attributes of a new innovative sawing and polishing machine. This knowledge will enable up-and-coming manufacturers (specifically HBD Venture No 7 (Pty) Ltd) of innovative diamond sawing and polishing machinery to design a product that meets the market's needs and requirements, and assists in improving polished diamond yields and quality as well as reducing production costs.

Market research is a powerful tool as it can provide a valuable contribution to the development of innovative products (Trott, 2005). It is argued by the proponents of market research that such activities ensure that companies are customer-oriented (Trott, 2005). In practice, this implies that new products are more successful if they are designed to satisfy a perceived need rather than if they are designed simply to take advantage of a new technology (Trott, 2005). Thus, the approach taken by many companies with regard to market research is that if sufficient research is undertaken, the chances of product failure are reduced (Trott, 2005). Market research serves to counteract the danger involved in developing products without giving due consideration to the market (Trott, 2005). Cooper (1979: 101) succinctly summarises the importance of market research in the case of industrial products in the following statement: "*The commercial viability of a new product rests in the hands of its potential customers; and therefore a solid understanding of the marketplace together with an effective market launch effort is vital to new product success*".

However, market research during new product development can be counterproductive when dealing with major innovations where potential adopters are unable to adequately comprehend the product and a new market must be born (Trott, 2005). In the case of the technologically innovative diamond sawing and polishing machine to be developed by HBD Venture No 7 (Pty) Ltd, market research does not pose this problem as the machine performs similar functions to two pieces of existing equipment albeit with considerable additional functionality and flexibility. Its functioning can be conceptualised by adopters and the market already exists. As a result, the empirical market research conducted here will enable HBD Venture No 7 (Pty) Ltd and other possible manufacturers of diamond beneficiation machinery to understand customers' level of satisfaction with current equipment, their attitudes towards various added features and benefits, their pricing perceptions and their purchase intentions.

Now that the empirical research has been justified on a micro level, it is necessary to examine industry-specific dynamics that justify the need for market research in terms of the development of high-technology innovations for the diamond cutting and polishing market.

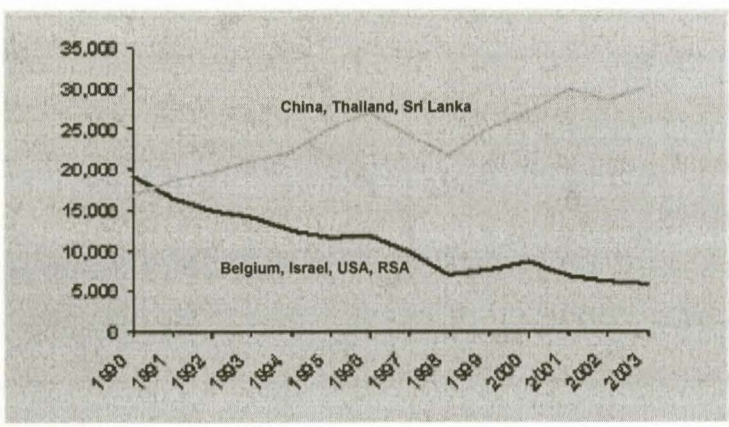
World rough diamond prices are currently high and have significant potential to remain high in the long-term as rough diamond supply continues to struggle to meet demand (Namakwa Diamond Company, 2005). This is due in part to the fact that growing economies are demanding far higher volumes of rough diamonds than has historically been the case (Namakwa Diamond Company, 2005). In addition, diamond cutters and polishers are demanding higher volumes of rough diamonds due to corresponding high demand for polished diamonds (the final product). Elementary principles of economics state that expectations of future price increases of a particular good (polished diamonds) will result in an increase in the current demand for that good (Arnold, 2001). The empirical market research conducted here concerning the innovative new and improved diamond sawing and polishing machine being developed by HBD Venture No 7 (Pty) Ltd can easily be justified along the lines of economics theory using the principle of derived demand for factors of production. Arnold (2001) states that in order to manufacture a product (polished diamond) one requires labour, capital (machinery) and resources (rough diamonds) – the factors of production. The demand for factors of production is a derived demand, and is derived from and directly related to the demand for the final product (Arnold, 2001). If the demand for the final product (polished diamond) rises, the demand for the factors used to produce the product increases (Arnold, 2001). Therefore, diamond cutters and polishers will experience heightened demand for diamond sawing and polishing machinery, especially that of a technologically innovative nature. Technological improvements often result in the use of fewer inputs (labour, time etc.) to produce a good or lower input prices (machinery that is cheaper to purchase, maintain and run) and inevitably bring about lower variable production costs (Arnold, 2001). In light of the above argument, the importance of this empirical research intended to improve the chances of the innovation's marketable success is undeniable.

Currently, the South African diamond cutting and polishing industry lacks global competitiveness in terms of both processing costs and output volumes; the country is only able to economically compete in the processing of larger, higher value rough diamonds (with an estimated value of between US$350 and US$1000 per carat depending upon the Rand-Dollar exchange rate) (Kaiser EDP, 2005b); refer to the

table in Appendix J for a record of the high price class of rough diamonds that South Africa purchases for processing.

This is due to the fact that the current industry structure is too small, and has inadequate use of advanced technology to contend with scale and technology intensive international competitors that employ efficient production processes; this has contributed to a comparatively high processing cost of between US$35 and US$100 per carat (Kaiser EDP, 2005b). In some cases, South African cutting and polishing costs can be as much as 100 times more expensive than those of lower cost centres such as India and China (refer to Appendix K) (Kaiser EDP, 2005b). Thus, South Africa is excluded from the small stone market as it is an arena where price is far more important than quality and foreign cutters and polishers benefit from more efficient production (Kaiser EDP, 2005b). The South African diamond cutting and polishing industry is estimated to be the fifth largest by value after India, Israel, the United States and China (Kaiser EDP, 2005b). The majority of global cutting and polishing activity has relocated over the past decade to lower cost processing hubs such as India and China as illustrated in Figure 25 (Kaiser EDP, 2005b).

Figure 25
Estimated diamond manufacturing workforce for the period 1990-2003



Source: Kaiser EDP, 2005b: 4.

These lower cost centres are developing into major threats as they are becoming increasingly capable of processing the larger variety of rough diamonds with the requisite quality (Kaiser EDP, 2005b). It is evident, therefore, that improved locally produced technology will widen the scope of the domestic market and enable it to become more internationally competitive thus achieving economic growth. It may

also assist the South African industry in counteracting the threats posed by lower cost processing hubs.

A deeper look into the nature and beginnings of the South African diamond beneficiation industry reveals the importance of market research into new technological innovations for the industry. The local diamond beneficiation industry has grown out of the emergence of traditional family businesses; consequently, formal business training and cross-fertilisation of benchmark business principles have been lacking (Kaiser EDP, 2005b). In addition, the industry is widely considered to be secretive and guarded which has lead to limited collaboration in production, distribution and marketing (Kaiser EDP, 2005b; Watermeyer, 1982), and a slow reaction and stunted desire to adopt competitive advanced technologies.

In comparison to the more efficient beneficiation hubs, the technology adoption rate of South African cutters and polishers is slow especially in the case of smaller operators (Kaiser EDP, 2005b). To aggravate matters, the stringent local credit environment makes it costly for most industry members to invest in high-technology equipment, which is solely available by import. The industry's labour constituency has stated that there may be significant scope for improvement in cost competitiveness through the re-evaluation of production processes and the enhancement of technology utilisation (Kaiser EDP, 2005b); concerns have also arisen that diamond-specific technologies are no longer being developed in South Africa (Kaiser EDP, 2005b). Currently, there are only two local distributors of diamond sawing and diamond polishing machines, namely Bettonville SA and Norsid Engineering. Both companies import their equipment from manufacturers in Belgium. Thus, a South African diamond cutter and polisher has only two options when seeking to purchase either a diamond sawing or diamond polishing machine:

1) Place an order with one of the two importers located in South Africa
2) Place a direct order with one of a number of foreign manufacturers located predominantly in Belgium, Germany, India, China and South Korea (many of the companies offer an online buying portal)

The fact that there are no locally produced, possibly cheaper substitutes available worsens the rate of adoption of advanced technology. In concert, these industry dynamics have hindered the development of economies of scale and prevented the achievement of international competitiveness in manufacturing processes.

The Kaiser EDP diamond value-addition study produced 11 potential areas for intervention by both industry and Government to achieve greater sustainable growth and competitiveness in the South African diamond beneficiation industry. The sixth intervention option reads as follows: "*Improved productivity of cutting and polishing and gemstone jewellery industry – labour, management, production process/quality and technology improvements*" (Kaiser EDP, 2005b: 17). Under this particular intervention option, Kaiser EDP lists nine potential interventions; the intervention relating to innovative technology development reads as follows: "*Support mechanisms for R&D [Research and Development] and purchase of capital equipment*" (Kaiser EDP, 2005b: vi). This intervention is further detailed in terms of core activities and role players involved as well as the associated potential costs and benefits as seen in Table 10.

Table 10
Support mechanisms for research and development (R&D) and purchase of capital equipment

Core activities	Role players	Potential costs and benefits
◦ Industry investment in equipment [including Computer-Aided Design (CAD) / Computer-Aided Manufacturing (CAM), laser bruting machines and Sarin diamond planners)], potentially in cooperation with foreign direct investment (FDI). Equipment could either be located in common facilities with secure access, or within larger operations with agreements on usage rights and a fee structure (if required) for smaller cutters ◦ Remove import duties on capital equipment that cannot be competitively produced in South Africa ◦ Marketing of the Small and Medium Enterprise Development Programme (SMEDP), the Technology and Human Resources for Development Programme (THRIP), the Support Programme for Industrial Innovation (SPII), the Foreign Investment Grant (FIG) etc. to the diamond industry, and streamline application processes through organised initiatives (e.g. the Customised Sector Programme) ◦ Utilisation of GODISA Trust incubator resources ◦ Identification of support gaps and the development/implementation of suitable support where possible	◦ The Department of Trade and Industry (DTI), the Council of Trade and Industry Institutions (COTII), and the Department of Science and Technology (DST) ◦ Industry (investment and feedback)	◦ Costs: o Capital equipment investment o Incentive administration ◦ Benefits: o Greater cost and quality competitiveness (dependent on sufficient availability of rough to utilise equipment)

Source: Adapted from Kaiser EDP, 2005b: 40.

Table 10 illustrates that one of the core activities of role players in the diamond beneficiation industry is to invest in technologically advanced processing equipment (Kaiser EDP, 2005b); the innovative diamond sawing and polishing machine being developed by HBD Venture No 7 (Pty) Ltd falls into this category. Investment in new technology is shown to have significant benefits for industry, specifically in terms of the engendering of greater cost and quality competitiveness (Kaiser EDP, 2005b). It is expected, thus, that the industry will be strongly predisposed towards the adoption of new beneficiation technologies; therefore, any market research aimed at aiding the successful design, introduction and diffusion of a new diamond sawing and polishing technology will support industry growth and prosperity.

6.2 PURPOSE AND OBJECTIVES OF THE STUDY

The overall purpose or goal of this empirical study is to assist South African innovators of new and improved diamond beneficiation machinery [specifically the technologically innovative new and improved diamond sawing and polishing machine (referred to hereafter from time to time as "the technological innovation") being designed by HBD Venture No 7 (Pty) Ltd] to achieve a successful product design as well as commercial marketing success by enhancing their understanding of the perceptions, needs and purchase intentions of the population of South African diamond cutting and polishing firms that influence the adoption and diffusion of an innovative technology.

It is necessary at this point to provide a concise definition of the technological innovation. HBD Venture No 7 (Pty) Ltd is developing a vibration-free diamond sawing and polishing machine that incorporates a revolutionary drive mechanism and a more advanced sawing and polishing technique, allowing for the cutting of a wider range of profiles and shapes into gem quality diamonds. The machine also possesses some applications for industrial quality diamonds:

- the creation of diamond tipped bits/heads used in other diamond-based cutting machines and tools, in particular for the tooling and automobile industries (Wilks & Wilks, 1994)
- the creation of diamond-shaped knives and scalpels for the medical industry (surgery relating to ophthalmology in particular) (Wilks & Wilks, 1994)

The empirical study seeks to achieve the following five objectives:

1) To identify the factors, if any, that characterise firms as potential adopters or non-adopters of the technological innovation
2) To determine the optimal benefit bundle that will improve the probability of success in terms of the marketability of the technological innovation
3) To determine the most effective conduits for marketing communications in order to generate product awareness and promote the technological innovation
4) To determine the market potential for the technological innovation at various possible selling price ranges
5) To determine the radicalness of the technological innovation's impact and its effect on the organisational adoption thereof

There are a number of specific terms that need to be defined in preparation for the empirical study. The term "benefit bundle" is defined in this study as the system capabilities and product attributes offered by a manufacturer of a technological innovation and/or required by the market (Cumbo, 1999). Market potential refers to the attractiveness of the target market to the industrial marketer (Song & Parry, 1996). An innovation's radicalness or product newness as a construct constitutes a continuum with two polar extremes of incremental and radical innovations (Littler, 2001). Incremental innovations are seen as involving marginal improvements/adaptations to existing technology in a way that does not require significant changes in behaviour (Littler, 2001; McDade, Oliva & Pirsch, 2002). Radical innovations are viewed as originating from new technology, are disruptive to existing patterns of behaviour and represent a major or revolutionary technological advance (Littler, 2001; McDade et al., 2002).

6.3 BACKGROUND TO THE STUDY

This empirical study emerged against the backdrop of innovative research and development being conducted by HBD Venture No 7 (Pty) Ltd. This local company was formed to research and develop an innovative new and improved diamond

sawing and polishing machine for the South African and foreign diamond beneficiation industries. The technological innovation is a vibration-free diamond sawing and polishing machine with a revolutionary drive mechanism for the beneficiation of gem and industrial quality diamonds. After a production-ready prototype is developed, the machine will be manufactured locally (the content of which in terms of both labour and materials will be sourced almost completely on the domestic front) for the South African market with a view to export further on in the product life cycle. The company members believe that a strong market opportunity currently exists for the development of a more efficient, flexible and cost effective machine, whose predecessor's design has remained relatively unchanged for a century or more. The business was also developed to take advantage of the impending industry changes brought about by the Precious Metals and Diamonds General Amendment Bill which will serve to promote and grow the local processing of rough diamonds thus taking advantage of South Africa's rich potential for downstream value-creation (Cromberge, 2005).

The true technological breakthrough that the new machine represents is the use of a revolutionary drive mechanism that avoids the problem of vibration resulting from a physical drive system that is in direct contact with the machine's axle. It is this innovative design that enables the machine to run at continuous high speeds without vibration. As will be revealed later, the unconventional drive mechanism generates considerable benefits for the overall efficiency of the polished diamond manufacturing process. The technological innovation will serve to simplify the process of diamond sawing and polishing. Despite its revolutionary design, it is believed that the machine will not require cutting technicians to learn any major new operating skills/techniques. The result is an efficient and streamlined process that boosts profitability.

The technologically innovative diamond sawing and polishing machine being developed by HBD Venture No 7 (Pty) Ltd will compete directly against the combined functionality of two mature technologies and indirectly against one new laser-based technology. The two mature technologies are the traditional diamond sawing machine and the traditional diamond polishing machine illustrated in Figure 26 and Figure 27 respectively. The laser-based system is presented in Figure 28.

Figure 26
Traditional diamond sawing machine

Source: NOVEX Ltd., 2005a.

Figure 27
Traditional diamond polishing machine

Source: NOVEX Ltd., 2005b.

Figure 28
Laser diamond sawing machine

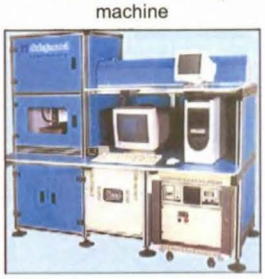
Source: Sahajanand Laser Technology, 2003.

In chapter 2, the indispensable roles of diamond sawing and polishing in the polished diamond manufacturing process were discussed in order to clarify the motive behind customers' needs for diamond sawing and polishing machinery. In order to demonstrate the relative advantage of the technological innovation being developed by HBD Venture No 7 (Pty) Ltd over the competition, it is necessary to provide an overview of the advantages and disadvantages of the new and improved diamond sawing and polishing machine vis-à-vis the competition. Before presenting a summarised comparison of the various pieces of equipment, it is noteworthy to discuss in detail a particular disadvantage of the laser diamond sawing machine.

Although laser diamond sawing machines can saw diamonds considerably more quickly than traditional diamond sawing machinery, they are exorbitantly expensive (up to 100 times more expensive than a traditional sawing machine), very large and not without their drawbacks. Therefore, although they are positioned towards the elite end of the diamond cutting and polishing market, they will nevertheless compete indirectly with the technological innovation. The main disadvantage of the laser system centres upon the wavelength of light employed to produce the beam. Many laser sawing systems currently on the market utilise the infra-red spectrum of light to more easily produce the laser energy needed to cut the rough diamond (American Beam Inc., 2004). Diamonds absorb virtually all of the energy produced by ultraviolet lasers but exhibit low absorption characteristics for infra-red light (American Beam Inc., 2004). Due to the material's lack of absorption of infra-red energy, the laser is able to enter the body of the raw material and result in the destruction/shattering of a good quality rough diamond; this is particularly likely if the laser strikes a lattice strain within the material (American Beam Inc., 2004). Even if the rough diamond is not destroyed, the laser inevitably leaves some sub-surface damage to a depth of perhaps 20µm (Wilks & Wilks, 1994). It is evident therefore that the efficiency gains offered by the laser system can be offset to a degree by the risk of damage and breakage of the valuable raw material. Some producers have implemented auto frequency features to vary the laser's power output in order to moderate the breakage hazard. Despite this, the risk of breakage is not eliminated.

The innovative new and improved diamond sawing and polishing machine possesses significant improvements over traditional sawing and polishing machines and does possess some advantages over laser sawing technology. Table 11 tabulates the advantages and disadvantages of the technological innovation relative to competing products.

Table 11
A comparison between the technological innovation and existing technologies

Product	Comparative advantages and disadvantages
Traditional diamond sawing machine 	*Advantages:* • Simple design • Industry is familiar with the machine and is comfortable using it • Comparatively cheaper than other alternatives *Disadvantages:* • The design is antiquated • Blade has a propensity to skew or deviate leading to losses/wastage of precious raw material • Motor burns out regularly when the blade strikes a particularly hard area in the rough diamond • Comparatively slow (8000 – 12000 r.p.m.) • Requires an expensive and heavy concrete mounting table to reduce vibration (Watermeyer, 1982) • Sawing speed cannot be controlled as it is held constant by the electric motor
Laser diamond sawing machine 	*Advantages:* • Very fast • Ability to cut profiles/shapes *Disadvantages:* • Cannot cut facets • Very expensive • Real breakage risk for the rough diamond
Diamond polishing machine 	*Advantages:* • Utilises a small-sized scaife *Disadvantages:* • The polishing scaife is only able to create a flat facet • Unable to profile convex shapes into the rough diamond
HBD Venture No 7 (Pty) Ltd new and improved innovative diamond sawing and polishing machine	*Advantages:* • Vibration-free sawing leading to significantly reduced raw material losses • Can perform two operations using one machine • Increased cutting accuracy • Reduced probability of the sawing blade becoming skew • Ability to cut a range of new profiles/shapes • Does not need to be mounted on an expensive and heavy concrete mounting table • Saves space • Greater sawing speed which can be controlled electronically • Reduced processing time for harder diamonds • Only requires semi-skilled labour • Does not require three-phase power – can be installed away from urban energy

	infrastructure • Can be produced locally at a potentially lower cost • More efficient/economical than existing large machinery used to create industrial diamond cuts • Efficient collection of the diamond powder by-product *Disadvantages:* • Potentially less energy efficient than existing machinery

In light of the information presented in Table 11 it can be extrapolated that even if solely based on a technological advantage, the product being designed by HBD Venture No 7 (Pty) Ltd does have some prospect for winning market share. If the product becomes commercially available, it will be well poised for the expected doubling in size of the South African diamond beneficiation industry (Venter, 2005).

Beyond South Africa's borders, India has been known to employ between 600 000 and 800 000 diamond cutters and polishers in 30 000 factories during the 1990's (Sevdermish, Miciak & Levinson, 1999) and represents the largest potential export market for the machine; according to Canada's Mineral Resources Directorate (MRD) the country is the largest beneficiator of rough diamonds in the world (Mineral Resources Directorate, 1998). The following countries are ordered in terms of their diamond cutting and polishing labour forces, and represent the most lucrative export markets for the machine after India (MRD, 1998):

- China having 10 000 cutters and polishers in 80 factories
- Russia having 7 000 to 8 000 cutters and polishers in 50 factories
- Thailand having 7 000 to 8 000 cutters and polishers in 35 factories
- Israel with 7 000 cutters and polishers in 450 factories
- Belgium with 3 100 cutters and polishers in 250 factories
- Sri Lanka with 3 000 cutters and polishers
- Botswana with 1 000 cutters and polishers in 3 factories
- United States of America with 500 to 600 cutters and polishers

6.4 METHODOLOGY AND QUESTIONNAIRE DESIGN

The descriptive empirical study attempts to collect both quantitative and qualitative primary data relating to the five research objectives by means of structured questionnaires distributed using a mail survey (Babbie & Mouton, 2001). The

questionnaire will produce a combination of numerical and textual data (Babbie & Mouton, 2001). The units of analysis (Babbie & Mouton, 2001) are profit-making organisations, specifically South African companies with diamond sawing and polishing machinery currently in place who are actively involved in the cutting and polishing of rough diamonds. The units of observation (Babbie & Mouton, 2001) are the managers of those companies who are providing information regarding their organisations.

6.4.1 The literature review

Prior to the compilation of the questionnaire, a comprehensive literature study was conducted into various aspects of business-to-business marketing and the marketing of innovations (as dealt with in chapters four and five respectively), as well as into existing research concerning the use of measuring instruments to explore potential customers' perceptions of new product innovations. The diamond cutting and polishing literature was also analysed (Wilks & Wilks, 1994; Watermeyer, 1982) in order to gain an understanding of the products and processes involved in the industry.

An existing survey instrument was sought that had been applied to a specific industrial innovation in a particular industry to determine variables such as adopter profiles, optimal product benefit bundles, perceptions of marketing communications techniques and product market potential. The search proved unsuccessful in terms of finding articles where a specific survey instrument was used on a product innovation in a particular industry. However lacking in terms of the specific instrument sought, the literature contained an abundance of journal articles dealing with critical reviews of various customer research methods (van Kleef, van Trijp & Luning, 2005; Elfvengren, Kärkkäinen, Torkkeli & Tuominen, 2004).

After scientific journal databases had been exhausted, an extensive perusal of Internet search engines revealed a Masters thesis produced by a graduate student of the Virginia Polytechnic Institute and State University (Cumbo, 1999). This thesis researched the adoption of innovative lumber grading/scanning technology in the

secondary wood products industry. Cumbo (1999) utilised a mail survey of wood cabinet, furniture, dimension, and flooring manufacturers in the United States of America to assess, among other things, the market potential for automated lumber grading technology. The survey questionnaire was designed to identify potential adopters of scanning technology, the optimum benefit bundle to increase the marketable success of automated lumber grading technology, and the best methods of promotion to the industry. Cumbo's (1999) study analysed four separate sectors within the secondary wood products industry. The study of innovative new and improved diamond sawing and polishing machinery will only analyse one sector, namely that consisting of diamond cutters and polishers. Cumbo's (1999) questionnaire which consisted of 25 items was used as a template against which the diamond sawing and polishing questionnaire was designed. The questions were adapted for relevance to the diamond cutting and polishing industry and were altered to assess the specific product attributes and benefits of the machine being developed by HBD Venture No 7 (Pty) Ltd. The fifth variable, namely the radicalness of the technological innovation's impact and its effect on the organisational adoption thereof, was not covered in the study by Cumbo (1999). It was added to the questionnaire using articles published by Littler (2001) and McDade et al. (2002).

An innovation's perceived radicalness is a useful and important construct to determine in an empirical study concerning the adoption of a new technological innovation. The literature on the radicalness of high-technology products (Littler, 2001; McDade et al., 2002) states that as the impact of new high-technology products increases from incremental to semi-radical to radical, organisational preference for the new technologies increases; however, the percentage of firms that adopt the new technology decreases. The research states that while customers prefer more innovative (radical) products, incremental or semi-radical products are the products adopted more frequently by organisations (McDade et al., 2002). Therefore, although a radical new high-technology product may offer a major technological advantage, it may offer low levels of compatibility with the experiences of the users, a level of complexity for users, and a strong need for additional training in order to understand the new product (McDade et al., 2002). This, then, translates into high levels of technological and financial risk associated with adopting a radical

new product that can serve to decrease the product's rate of adoption and associated marketable success (McDade et al., 2002). Although this does not mean that companies promoting radical new high-technology products cannot gain a foothold in the marketplace for their products, it does mean that radical high-technology companies must develop meaningful strategies designed to counteract the perceived risks associated with the adoption of their radical products (McDade et al., 2002). By determining the perceived radicalness of the technologically innovative diamond sawing and polishing machine, HBD Venture No 7 (Pty) Ltd will be assisted in knowing if strategies need to be implemented in order to reduce perceived risk so as to increase the adoption rate for the innovation.

6.4.2 The development of the measuring instrument for the empirical study

A questionnaire was developed based upon the five research objectives using the measuring instrument drawn up by Cumbo (1999) as a template, as well as a measure of radicalness employed by McDade et al. (2002). The questionnaire was reviewed by the Department of Business Management at the University of Stellenbosch for relevance to the study objectives. The draft questionnaire was then pre-tested by one diamond cutting and polishing concern in Stellenbosch; pre-testing of the questionnaire is essential in order to uncover errors in questionnaire design such as ambiguous and unanswerable questions (Babbie & Mouton, 2001). Last adjustments were made using the insights obtained from the pre-test and the questionnaire was finalised as having the four pages and 23 items seen in Appendix I.

6.4.3 The content and outline of the measuring instrument

The self-administered questionnaire (Babbie & Mouton, 2001) consists of questionnaire items that address each of the five research objectives. Question 1 serves as a screening question to eliminate companies that erroneously appear on the mailing list and are not involved in diamond sawing and polishing. The private and delicate items concerning annual polished diamond output (question 19), annual total sales (question 20), and full-time employee complement (question 21) were included towards the end of the questionnaire as it was believed that these items could provoke resistance amongst respondents towards the survey due to the

sensitive nature of the information requested. Furthermore, the two open-ended questions (numbers 22 and 23) were relegated to the end of the questionnaire as they tend to be time-consuming and may demotivate a respondent from completing the questionnaire if they appear in the body of the form.

6.4.3.1 Determination of adopter profile

The first research objective concerning the creation of a profile of potential adopters of new and improved diamond sawing and polishing machinery is to be accomplished via question 7. Question 7 asks the respondent to rate 15 machine features (obtained from Table 11) according to the benefit that they would have for the respondent's operations on a 1-6 ordinal rating scale where "1" represents no benefit and "6" represents a huge benefit. For each response, a mean will be calculated over the 15 items in question 7. Logic dictates that companies that perceive a greater benefit of the machine for their operations (those that score a mean of between 4 and 6 on question 7) are likely to be potential adopters. This mean will then be compared with the results of the following questions in order to determine if a pattern can be distilled that enables one to target a particular lucrative portion of the industry that displays a certain characteristic:

- Question 3 – the average cost per hour of sawing and polishing a diamond
- Questions 4 and 5 – the time and cost that sawing and polishing consume as a percentage of that of the total manufacturing process
- Question 17 – the level of satisfaction with current sawing and polishing machinery (specifically those dissatisfied respondents that scored a mean of between 1 and 3 over the 10 items)
- Question 19 – annual polished diamond output
- Question 20 – annual total sales
- Question 21 – number of full-time employees
- Question 13 – desire for technological leadership
- Question 14 – international marketing
- Question 15 – public or private company ownership

6.4.3.2 Determination of optimum benefit bundle

The second research objective is to determine the optimal benefit bundle desired by diamond cutters and polishers in order to enable HBD Venture No 7 (Pty) Ltd to design a machine that caters for the market's expressed needs. Question 6 is used to determine what machine features/attributes the respondents consider to be important. By asking respondents to rate 15 features of a new and improved diamond sawing and polishing machine on a 1-6 ordinal scale (1 = least important; 6 = most important), one can determine via an analysis of the mean response of each variable those factors that the market considers to be most important for incorporation into the design of the machine.

Question 2 provides nominal data concerning the most important factor that influenced respondents' past purchase decisions when acquiring diamond sawing and polishing machinery. By analysing the frequency with which respondents report the various factors, one is able to determine the most important factor. HBD Venture No 7 (Pty) Ltd will then know what factor to focus on in product development in order to defeat the competition. Question 8 will reveal the maximum selling price that customers are willing to accept. This will provide the developers with an idea of how much money they can afford to spend on incorporating improved machine features; furthermore, they will know what factors to focus on in the development and will avoid wasting development capital on incorporating undesirable features. If questions 4 and 5 reveal high mean time and cost figures, this will further justify the need to ensure that the technological innovation is time and cost effective. Question 17 will reveal strengths/weaknesses of current technologies that should be protected against/exploited during marketing campaigns as well as during product development. The qualitative data provided by the open-ended questions 22 and 23 will provide further insights into what factors should be included/excluded from the product benefit bundle.

6.4.3.3 Determination of most effective marketing communications

Question 16 asks respondents to rate on a 1-6 ordinal scale 11 conduits for marketing communications. By calculating and ordering the mean ratings for each variable, one will be able to determine the forms of marketing communications that

are perceived as being more important by potential adopters. This will assist in selecting the best promotional channels come product launch. The information provided by questions 2, 6 and 17 will enable the marketer to determine what the spearhead factors are that should lead the marketing campaign. Lastly, question 12 which deals with intra-industry contact and communication will give an indication of the speed at which word of mouth or viral marketing will take place.

6.4.3.4 Determination of market potential

Question 8 asks the respondent to select a nominal category that indicates the maximum selling price range that the respondent is willing to accept. This information provides HBD Venture No 7 (Pty) Ltd with an understanding of the price ceiling for the technological innovation. This is a very important factor to know so that when the final selling price is set, the company avoids estranging a large portion of the target market. Question 9 asks the respondent to specify the number of machines that would be purchased for each of the potential price ranges. It was expected that the respondent would specify a certain number of machines in his chosen maximum price range and, depending on his needs, would increase the purchase quantity for the lower price ranges. This information will enable HBD Venture No 7 (Pty) Ltd to know how many machines it can expect to sell during the first year after product launch. Question 10, which is a ratio measure, asks the respondent to specify the payback period on the machine according to the price range that he/she selected. This information gives HBD Venture No 7 (Pty) Ltd an idea of the credit terms that will need to be extended in order to make the necessary sales. Lastly, question 11 will be a definitive indicator of whether or not there are any other innovative manufacturers of diamond sawing and polishing machinery that are also currently developing innovative technologies. The results of question 11 will provide an insight as to whether or not HBD Venture No 7 (Pty) Ltd is a pioneer in this type of new product development.

6.4.3.5 Determination of radicalness

Question 18 is used to determine the radicalness of the technological innovation's impact and its effect on the organisational adoption thereof. The question will

facilitate the classification of the technological innovation into one of three categories (McDade et al., 2002):

- Incremental – product innovations that represent a marginal improvement over existing technology
- Semi-radical – product innovations that represent a significant improvement over existing technology
- Radical – product innovations that represent a major or revolutionary technological advance

McDade et al. (2002) developed a ten-item impact measure that uses a five-point Likert scale for responses. By determining a mean for each respondent over the ten items and then by obtaining an average of that value, one will be able to determine if the innovation is perceived as incremental (average between 1 and 2.33), semi-radical (average between 2.34 and 3.66) or radical (average between 3.67 and 5). The ten statements were integrated by McDade et al. (2002) from the following literature sources listed in Table 12.

Table 12
Statements used to develop the radicalness scale

Statement	Literature source
a) The product technology contains new knowledge	Dewar, R.D. & Dutton, J.E. (1986). The adoption of radical and incremental innovations: an empirical analysis. *Management Science*, *32*(11), 1422-1433.
b) The product technology is a major technological advance	Dewar, R.D. & Dutton, J.E. (1986). The adoption of radical and incremental innovations: an empirical analysis. *Management Science*, *32*(11), 1422-1433.
c) The product technology is an improvement over existing technology	Dewar, R.D. & Dutton, J.E. (1986). The adoption of radical and incremental innovations: an empirical analysis. *Management Science*, *32*(11), 1422-1433.
d) The product technology will require a great amount of new learning for most adopters (i.e. high adoption and/or switching costs)	Rogers, E.M. (1983). *The Diffusion of innovations* (3rd ed.). New York: Free Press. Rogers, E.M. (1995). *The Diffusion of innovations* (4th ed.). New York: Free Press.
e) The product technology will **not** be compatible with established product technologies	Rogers, E.M. (1983). *The Diffusion of innovations* (3rd ed.). New York: Free Press. Rogers, E.M. (1995). *The Diffusion of innovations* (4th ed.). New York: Free Press.
f) The product technology has a strong relative advantage over established product technologies	Rogers, E.M. (1983). *The Diffusion of innovations* (3rd ed.). New York: Free Press. Rogers, E.M. (1995). *The Diffusion of innovations* (4th ed.). New York: Free Press.
g) The product technology will destroy existing competencies (user skills) of most adopters	Tushman, M.L. & Anderson, P. (1986). Technological discontinuities in organizational environments. *Administrative Science Quarterly*, *31*(3), 439-465.
h) The product technology will be the first of its kind to significantly advance the state-of-the-art	Anderson, P. & Tushman, M.L. (1990). Technological discontinuities and dominant designs: a cyclical model of technological change. *Administrative Science Quarterly*, *35*(4),

	604-633.
i) The product technology will establish a new dominant design or product standard	Abernathy, W.J. & Utterback, J.M. (1978). Patterns of industrial innovation. *Technology Review*, *80*(7), 40-47.
j) The product technology will result in the best combination of price and key performance parameters in the industry	Durand, T. (1992). Dual technological trees: assessing the intensity and strategic significance of technological change. *Research Policy*, *21*(4), 361-380.

Source: Adapted from McDade et al., 2002: 454.

6.5 SAMPLE DEVELOPMENT

At the end of August 2005 the South African Diamond Board, after protracted negotiations with the manager of administration and licensing and the Chief Executive Officer to overcome strong resistance to the release of an official mailing list, was coaxed into releasing the postal details of the supposed population of 586 active diamond cutting and polishing companies in South Africa. In the early portion of 2005, the SADB was unwilling to release their official mailing list for the purposes of academic research involved in aiding the local beneficiation of rough diamonds. It was argued at that time that such a list was confidential and as such could not be released.

Prior to the receipt of the SADB's official mailing list, an improvised list of postal addresses was created by pooling company names and details obtained from various business directories (Braby's online business directory, the electronic yellow pages, Lifestyle Navigators online and the Jewellers' Network online trade portal) and trade associations (MDCA and DDCSA). Although this approach had the advantage of providing up-to-date contact details, it failed to distinguish between diamond cutters and diamond dealers due to the category schema used by the business directories. This improvised mailing list was abandoned in favour of the authoritative mailing list provided by the SADB.

Assurance was received from the SADB that the mailing list covered the entire population of active South African diamond cutters and polishers; this number produced some scepticism due to the conflicting number of active cutters and polishers illustrated in the secondary data seen in Figure 17. All scepticism was waived however, and the SADB's mailing list was accepted as being definitive. The study population of 586 elements was the same as the sampling frame. It was

decided that in order to facilitate optimal generalisability and representativeness of the data, the entire population would be surveyed.

During the weeks that followed the mailing off of the survey (the content of which is discussed in a previous section), in excess of 130 envelopes were returned undelivered or unanswered for a variety of reasons including:

- Returned to sender – post office box closed
- Returned to sender – reason unknown
- Returned to sender – recipient gone away or no address left
- Returned to sender – incorrect or insufficient postal address
- Questionnaire returned blank – recipient has never been or is no longer involved in the cutting and polishing of rough diamonds

It was decided at this point that the study population provided by the SADB was unreliable, unrevised and outdated and that the true number of active diamond cutting and polishing concerns in South Africa could not be distilled based upon the official list provided. It appeared that the mailing list was deeply flawed and contained both active and inactive diamond cutters and polishers as well as companies solely involved in diamond dealing. After lodging a number of complaints with the SADB, the Board released a new corrected mailing list consisting of 289 active diamond cutting and polishing companies. Assurances were provided that the postal addresses were up-to-date and that the companies listed were true diamond cutting and polishing going concerns. The survey was then re-mailed to the population of 289 companies. In the period following the re-mailing, a total of 44 envelopes were returned undelivered or unanswered for reasons similar to those listed above. After deducting the number of non-respondents, the total sample surveyed came to 245 companies.

The response rate for the survey was expected to be unusually lower than would be the case in other B2B industry sectors. This is due to a number of reasons:

- The industry is by nature very sensitive, secretive and guarded and is thus unwilling to provide information regarding processes and activities (Watermeyer, 1982; J. Erikson, personal communication, 21 October 2005).

- The non-Sightholding portion of the industry (93.4% of the total number of companies) is very apathetic and despondent towards the introduction of innovative technology due to the lack of rough diamonds at suitably low prices that allow for an acceptable profit to be made in processing. This attitude was confirmed via correspondence (D. Janzen, personal communication, 17 October 2005) as well as telephonic and face-to-face interviews with diamond cutters and polishers (G. Munro, personal communication, 20 October 2005; L. Lipchin, personal communication, 26 October 2005). According to D. Janzen (personal communication, 17 October 2005), the biggest constraint on the diamond cutting and polishing industry is the "*...availability of raw material...Efficient manufacturing methods has really not featured at all as a priority...We don't need machines, we need [rough] diamonds and trained workers to polish them before we start investing in more machines...It remains to be seen whether in fact and if so by when will the supply problem be eradicated...Until then, current machinery and manpower will remain hugely under utilized in the non-sight holding sector of the diamond manufacturing industry*".
    - There is great frustration amongst the non-Sightholding portion of the diamond cutting and polishing industry with De Beers and the Diamonds Act No. 56 of 1986. The industry holds De Beers largely accountable for the prohibitively high prices of rough diamonds that prevent smaller manufacturers from obtaining adequate rough supply in order to conduct business; this preoccupation with the problem of unhealthy rough diamond supply creates disinterest amongst industry members towards research concerning innovative technologies. The non-Sightholding sector is fighting to obtain rough supply at the same favourable prices that Sightholders enjoy (L. Lipchin, personal communication, 26 October 2005).
- Due to a large portion of the industry being very traditional, the concept of an innovation that can both saw and polish diamonds using one machine is absurd.

6.6 SURVEY

A mail survey was the chosen method of gathering primary data for a number of

pragmatic reasons. Mail surveys are the least expensive approach to gaining information through empirical research and the method can completely eliminate interviewer bias (Blythe & Zimmerman, 2005). Mail surveys possess a number of disadvantages, however, such as a low response rate and lack of control over the units of observation who actually provide the responses (this is in spite of the fact that the questionnaire is addressed personally to the company manager) (Blythe & Zimmerman, 2005). Furthermore, mail surveys are slow in relation to other data gathering methods (Blythe & Zimmerman, 2005). Telephone, facsimile and Internet survey techniques were an attractive option as they are more efficient methods of obtaining data. However, they are considerably more expensive and the industry is such that it is impossible to obtain a complete reliable list of telephone numbers or e-mail addresses. Furthermore, a large portion of the diamond cutting and polishing B2B segment is fairly traditional and has not yet openly adopted Internet-based methods of communication for conducting business. The most desirable technique was the drop and collect survey (DCS) method employing direct face-to-face contact with respondents, which research has shown enhances response rates and resulting study validity among sub-Saharan African organisations (particularly small, medium and micro enterprise) (Ibeh & Brock, 2004). Despite the attractiveness of the DCS method, the exorbitant travel costs involved made it prohibitively expensive.

On the 12/09/2005, the coded survey questionnaire along with a personalised cover letter (refer to Appendix I) and postage-paid return envelope was mailed to the postal address of every element in the sample. Two weeks later, a follow-up mailing in the form of a reminder postcard (refer to Appendix I) was mailed to every element in the sample in an effort to increase the return rate of the mail survey (Babbie & Mouton, 2001). Research has revealed that personalisation of the cover letter in mail surveys has little or no effect on response rate, response speed and item non-response (Gendall, 2005). However, from a practical point of view research suggests that personalisation should be employed unless a good reason exists to do otherwise (Gendall, 2005). Gendall (2005) asserts that "*at worst, [personalisation] will have no effect [on response rate, response speed and item non-response], but it might have a positive effect [depending upon the nature of the survey population]*" (Gendall, 2005: 380).

Cobanoglu, Warde & Moreo (2001) have found that high response rates for questionnaires increase the confidence that the sample accurately reflects the true population and that the findings can be generalised. Furthermore, unreturned questionnaires or incomplete data pose a threat to the validity of research findings and as such researchers have explored methods of increasing response rates through the use of communications technology (Cobanoglu et al., 2001). In the period that followed the mailing of the survey to the sample of diamond cutters and polishers, it became evident that the response rate would be very poor. This was to be expected, given the four reasons for a low response rate cited in the preceding section. By the 14/10/2005, just over one month after the mailing of the survey, only 10 useable replies were received. Cobanoglu et al. (2001) state that using mixed-mode surveys employing various combinations of telephone, mail, facsimile and e-mail modes of communication are acceptable methods of data gathering and usually yield a higher response rate. In an effort to obtain a healthier response rate, a combination of telephone, facsimile and e-mail was used in order to encourage a better response from the industry.

As alluded to in the preceding section, the majority of the South African diamond cutting and polishing industry consists of small and medium enterprise. Research conducted in the Western world has shown that mail surveys of small business owners have notoriously low response rates that diminish the credibility of research conducted on small firms (Dennis, 2003); this is thought to be even more true for developing countries such as South Africa (Wikipedia, 2005). Furthermore, commonly used treatments to improve response rates have been shown to be unproductive (Dennis, 2003). Dennis (2003) reports that almost one third of all articles appearing in selected small firm-oriented journals between 1991 and 1995 had response rates lower than 25 percent.

After adjusting for non-responses, the total sample surveyed came to 245 companies. Seventeen (17) useable responses were received resulting in an overall response rate of 6.94 percent. Although this response rate is incredibly low, the literature indicates that there are no rules that govern an acceptable response rate;

although higher is clearly better, it is difficult to find a systematic analysis that justifies a specified level (Dennis, 2003). Dennis (2003) argues further that implicitly, any published survey has an acceptable response rate (to the author, editor and referees if no others) regardless of how low it is. The statistical ramifications of a sample consisting of 17 diamond cutting and polishing companies are illustrated in Figure 29. The sample size that corresponds with a precision Cp of 0.46 was calculated using the following formula $n = \frac{z^2_{\alpha/2}.\sigma^2}{C_p^2 + \frac{z^2_{\alpha/2}.\sigma^2}{(N-1)}}$.

Figure 29
Sample size determination for statistical means

CSC CENTRE FOR STATISTICAL CONSULTATION STELLENBOSCH UNIVERSITY

TO ESTIMATE A MEAN

FIRST ESTIMATE THE STANDARD DEVIATION OF THE POPULATION FROM A PILOT SAMPLE

STANDARD DEVIATION 1

[*]
M-Cp M M+Cp

FOR LARGE POPULATIONS		FOR SMALL POPULATIONS	
CHOOSE THE CONFIDENCE %	95		
Alpha	5.00%		
Z =	1.959964		
CHOOSE THE PRECISION Cp	0.46	CHOOSE POPULATION SIZE N=	245
SAMPLE SIZE =	19	SAMPLE SIZE =	17

Source: Centre for Statistical Consultation, University of Stellenbosch.

In the empirical study being conducted, the population standard deviation is unknown; therefore, a sample standard deviation of one was used. A 95% confidence interval was chosen for the study. This means that we have a 95% confidence of having an interval that does in fact contain the true population parameter (Pelosi & Sandifer, 2003). In order to render a low response rate of 17 respondents workable, a precision of 0.46 was utilised which is somewhat poor.

Initially a very good precision of 0.2 would have been achieved as in the Cumbo (1999) study when it was still believed that a total of 70 responses could be obtained. A precision such as 0.46 has certain statistical ramifications: the standard deviation of any estimator (i.e. the standard error) will be larger than what it would have been if a larger sample (and a greater response rate) were possible. As a result, it will be difficult to clearly distinguish between/among two or more "treatments" as with large samples. The results and findings of the empirical study are presented in the following chapter.

CHAPTER 7: RESULTS AND FINDINGS OF THE EMPIRICAL RESEARCH AND IMPLICATIONS FOR RESEARCH AND DEVELOPMENT

7.1 INTRODUCTION

Prior to data analysis, the raw questionnaire data was coded and entered into a Microsoft® Office Excel 2003 spreadsheet. Each column was colour-coded to indicate whether it was a nominal, ordinal, interval or ratio measure. Means were calculated in Excel for each respondent over the 15 items in question six and question seven, the 10 items in question 17, as well as the 10 items in question 18 in order to determine:

- In terms of question six, the mean perceived importance of the entire feature bundle offered by the technological innovation
- In terms of question seven, the mean perceived benefit that the entire feature bundle offered by the technological innovation would have for the respondent's operations
- In terms of question 17, the mean level of satisfaction with current diamond sawing and polishing machinery
- In terms of question 18, the mean level of radicalness for each respondent

The Excel spreadsheet was then imported into the StatSoft® Statistica 7.0 computer programme for data analysis.

7.2 DETERMINATION OF ADOPTER PROFILE

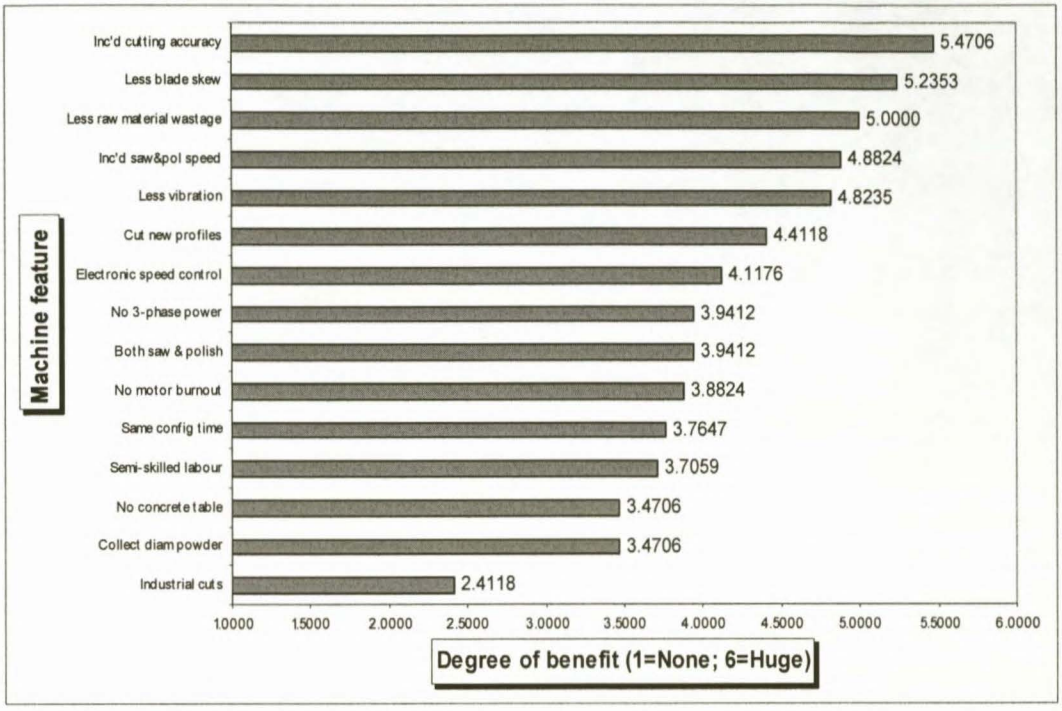
At the point of commercialisation and launch of a new product, the innovating company must target its initial distribution and promotion to the best prospect group(s) (Kotler, 2003). In order to accomplish this, the firm needs to profile its early adopters which are its prime prospects for generating strong sales (Kotler, 2003). This is to be accomplished in the first objective of the empirical research which involves identifying the factors, if any, that characterise firms as potential adopters or non-adopters of the technological innovation being designed and developed by HBD Venture No 7 (Pty) Ltd. The profiling is to be achieved through the comparison of question 7 with other variables.

Question 7 asks the respondent to rate 15 machine features (derived from Table 11) according to the perceived benefit that they would have for the respondent's operations on a 1-6 ordinal rating scale where "1" represents no benefit and "6" represents a huge benefit. For each response, a mean is calculated over the 15 items. Logic dictates that companies that perceive a greater benefit of the machine for their operations (those that score a mean of between 4 and 6) are likely to be potential early adopters. This mean will then be compared with certain segmentation variables for business markets. Business markets can be segmented according to demographic variables, operating variables, purchasing approaches, situational factors and personal characteristics (Kotler, 2003); demographic and operating variables are the most important bases for segmenting industrial markets (Kotler, 2003). By comparing certain demographic and operating variables with the results of question 7 it is hoped that a pattern can be distilled that will enable the targeting of a particular lucrative portion of the industry that displays a certain characteristic. The demographic and operating variables to be used are as follows:

- The level of satisfaction with current sawing and polishing machinery (question 17) (specifically those dissatisfied respondents that scored a mean of between 1 and 3.4 over the 10 items)
- Average cost per hour of sawing and polishing a rough diamond (question 3)
- The time that sawing and polishing combined consume as a percentage of that of the total manufacturing process (question 4)
- The cost that sawing and polishing combined consume as a percentage of that of the total manufacturing process (question 5)
- Annual polished diamond output (question 19)
- Total company sales in 2004 (question 20)
- Number of full-time employees (question 21)
- Desire for technological leadership (question 13)
- International marketing status (question 14)
- Public or private company ownership (question 15)

Figure 30 graphically illustrates the mean rating values for each of the 15 factors in question 7 in order of perceived operational benefit.

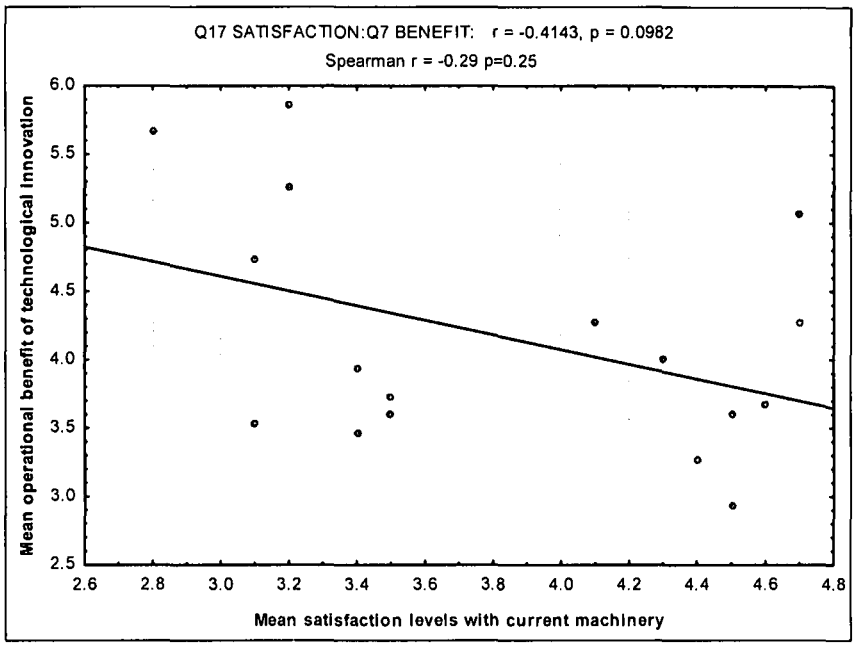
Figure 30
Average perceived operational benefit of innovative machine features



Respondents rated 12 out of a total of 15 factors in question 7 above the scale's middle point of 3.5, which implies that those 12 factors were at least of some degree of perceived benefit for respondents' operations. Of the 15 machine features listed, increased cutting accuracy (5.4706) is perceived as being the most beneficial machine feature. The next most beneficial features in order of decreasing perceived benefit for operations are: less probability of the blade cutting skew (5.2353), less wastage of the rough diamond (5.0000), increased sawing and polishing speed (4.8824), less vibration (4.8235), and the ability to cut a range of new profiles/shapes into the rough diamond (4.4118). The features that were perceived as being of lesser benefit for operations were (in order of decreasing benefit): the fact that the technological innovation does not need to be mounted on a heavy concrete table (3.4706), the ability to efficiently collect the diamond powder by-product (3.4706), and the ability to create industrial diamond cuts (2.4118).

The results presented in Figure 30 (question 7) will be compared with those presented in Figure 50 in section 7.3 (question 17). The results of the comparison between the two continuous variables are illustrated in the graph in Figure 31.

Figure 31
Regression analysis of mean operational benefit of the technological innovation and mean satisfaction levels with current machinery



It was expected that those respondents that perceived a high operational benefit of the technological innovation are likely to be those respondents that were very dissatisfied with current sawing and polishing machinery. The regression analysis computed in Figure 31 indicates that although there is a very small negative correlation between these two groups of respondents based upon the two variables, it is not significant. It is safer in this case to report the Spearman correlation of -0.29 as it is a nonparametric measure that makes no assumption of normality in the distribution of the data (Pelosi & Sandifer, 2003). In this case, the Spearman p value (the actual probability of rejecting a true null hypothesis based on the evidence in the test statistic) (Pelosi & Sandifer, 2003) of 0.25 is larger than the significance level α of 0.05 (the maximum probability tolerated for rejecting a true null hypothesis) (Pelosi & Sandifer, 2003) meaning that the correlation between the two variables is not significant. Thus, likely adopters (those perceiving a high operational benefit of the technological innovation) cannot be profiled as being those diamond cutters and polishers that are to a large degree dissatisfied with current sawing and polishing machinery.

Figure 32 graphically illustrates the proportion of respondents that fall into certain

ranges of average sawing and polishing cost per hour. Question 3 (Figure 32) and question 7 (Figure 30) (both continuous variables) are compared and the results are illustrated in the graph in Figure 33.

Figure 32
Histogram of the average cost per hour of sawing & polishing a rough diamond

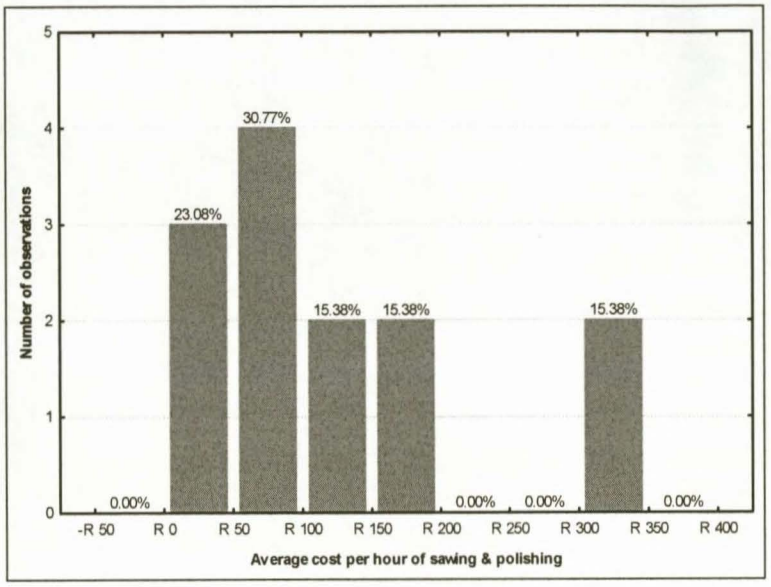
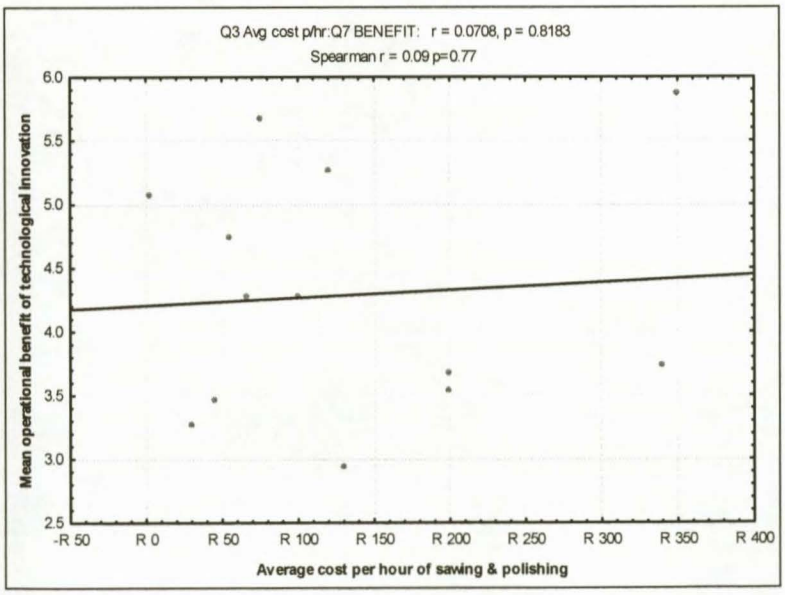


Figure 33
Regression analysis of mean operational benefit of the technological innovation and average cost per hour of sawing & polishing



It was expected that those respondents that perceived a high operational benefit of

the technological innovation (likely adopters) are likely to be those respondents that experienced a high average cost per hour of sawing and polishing; those diamond cutters and polishers that experience high processing costs were expected to perceive more benefit in a machine that can significantly reduce costs. Although there is a very small positive Spearman correlation of 0.09 between these two groups of respondents based upon the two variables (seen in the regression analysis in Figure 33), it is not significant. This is due to the fact that the Spearman p value of 0.77 is larger than the significance level α of 0.05. Thus, likely adopters cannot be profiled as being those diamond cutters and polishers that experience a high average cost per hour of sawing and polishing.

Figure 34 graphically illustrates the proportion of respondents that fall into certain ranges of time that sawing and polishing combined consume as a percentage of that of the total manufacturing process. Figure 35 presents the results of the comparison between question 4 (Figure 34) and question 7 (Figure 30) (both continuous variables).

Figure 34
Histogram of the time that sawing and polishing combined consume as a percentage of that of the total manufacturing process

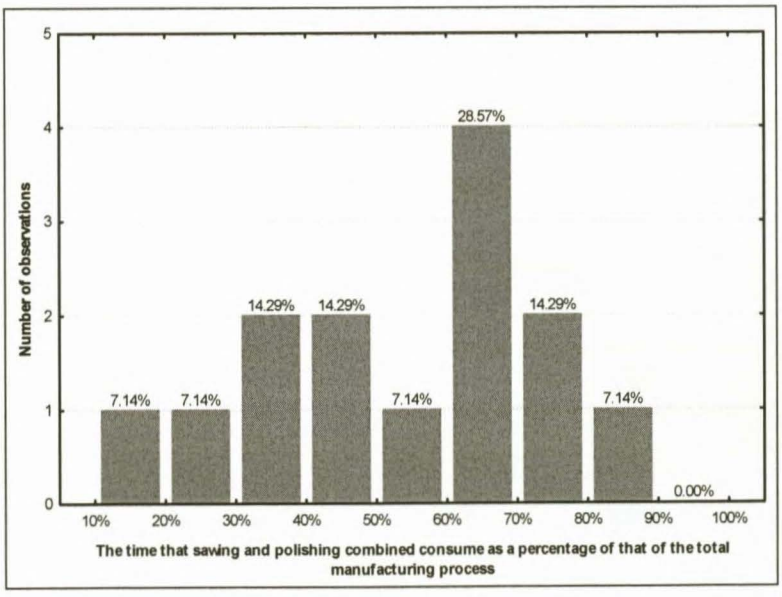
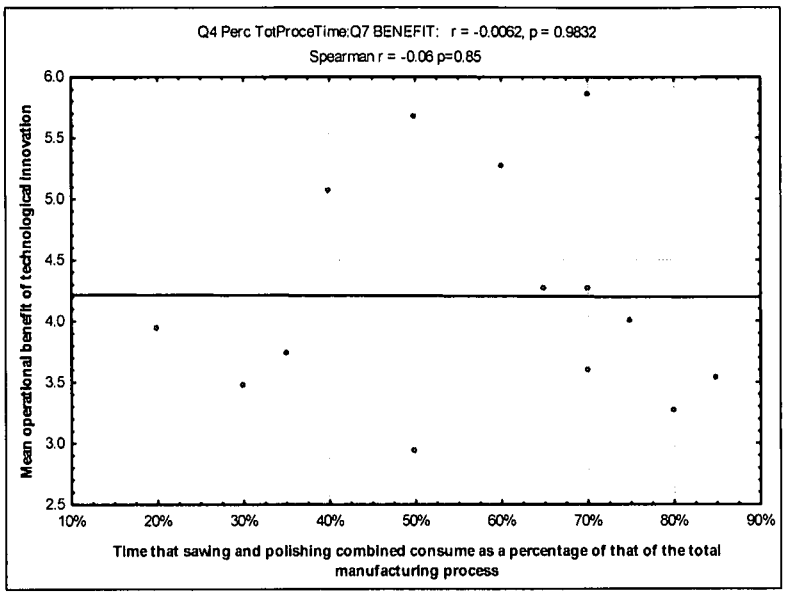


Figure 35
Regression analysis of mean operational benefit of the technological innovation and the time that sawing and polishing combined consume as a percentage of that of the total manufacturing process



It was expected that those respondents that perceived a high benefit of the technological innovation for their operations (likely adopters) are likely to be those respondents that perceive sawing and polishing to be more demanding in terms of operating time; thus, they are more likely to perceive a faster time-saving innovation as being more beneficial to operations. This expectation was not supported by the results; thus, likely adopters cannot be profiled according to the above logic. The Spearman p value of 0.85 seen in the regression analysis in Figure 35, which is much larger than the significance level α of 0.05, indicates that the very small negative correlation (not positive as expected) between the two variables is not significant.

Figure 36 graphically illustrates the proportion of respondents that fall into certain ranges of cost that sawing and polishing combined consume as a percentage of that of the total manufacturing process. The results of the comparison between question 5 (Figure 36) and question 7 (Figure 30) (both continuous variables) are illustrated in the graph in Figure 37.

Figure 36
Histogram of the cost that sawing and polishing combined consume as a percentage of that of the total manufacturing process

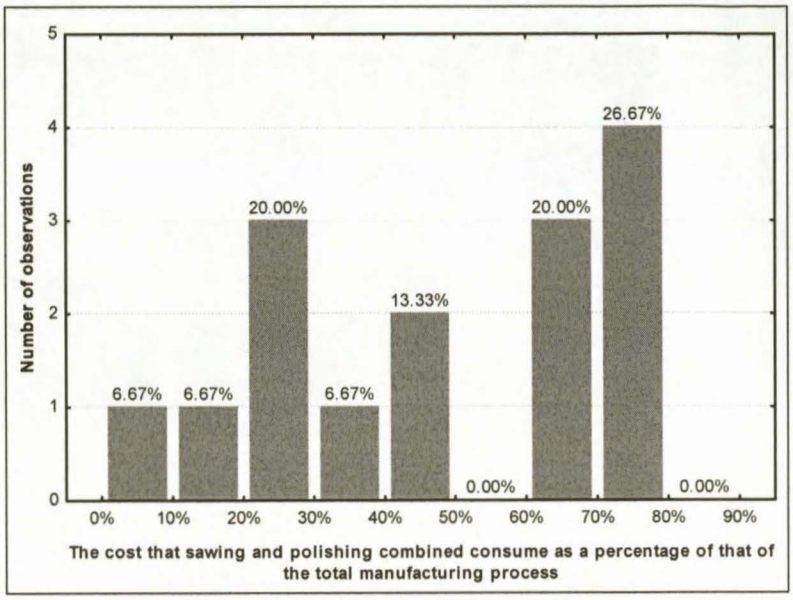
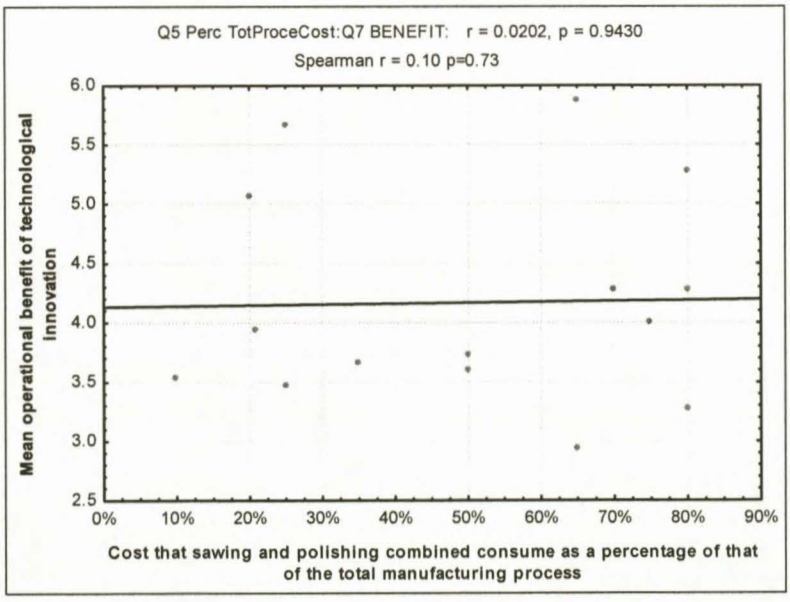


Figure 37
Regression analysis of mean operational benefit of the technological innovation and the cost that sawing and polishing combined consume as a percentage of that of the total manufacturing process



It was expected that potential adopters (those respondents that perceived a high operational benefit of the technological innovation) are likely to be those respondents that perceive sawing and polishing to be more demanding in terms of operating cost; thus, they are more likely to perceive a cost-saving faster innovation as being more

beneficial to operations. The regression analysis shown in Figure 37 indicates that there is a minute positive Spearman correlation of 0.10 between the two groups of respondents based upon the two variables. The Spearman p value of 0.73 is considerably larger than the significance level α of 0.05 indicating that the correlation between the two variables is not significant. Thus, it is not possible to profile likely adopters as being those diamond cutters and polishers that perceive sawing and polishing to be more demanding in terms of operating cost.

The proportion of respondents that fall into certain ranges of annual polished diamond output is presented in the graph in Figure 38. The results of the comparison between question 19 (Figure 38) and question 7 (Figure 30) (both continuous variables) are illustrated in the regression analysis in Figure 39.

Figure 38
Histogram of annual polished diamond output

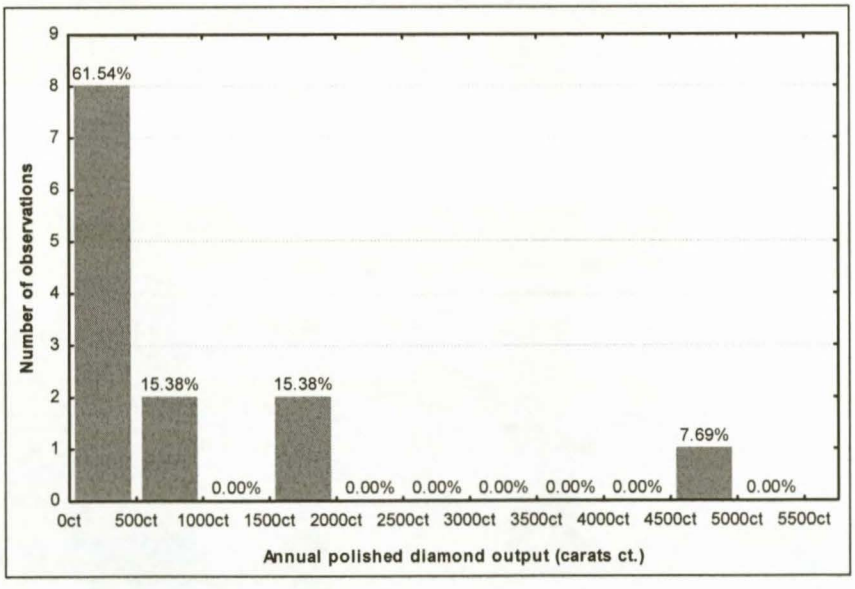
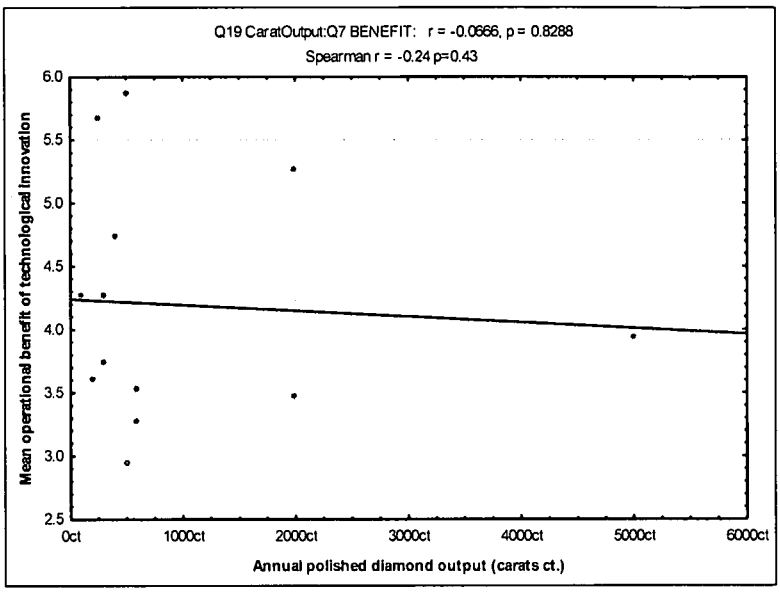


Figure 39
Regression analysis of mean operational benefit of the technological innovation and annual polished diamond output



It was expected that those respondents that perceived a high operational benefit of the technological innovation (likely adopters) could possibly be profiled in terms of their annual polished diamond output; thus, it was expected that likely adopters could be those diamond cutters and polishers with higher polished diamond outputs and the financial strength to experiment with new products that promise greater production output. The regression analysis illustrated in Figure 39 indicates a small negative Spearman correlation of -0.24 (not a positive correlation as was expected) between the two groups of respondents based upon the two variables. However, the Spearman p value of 0.43 is considerably larger than the significance level α of 0.05 indicating that the correlation between the two variables is not significant. Thus, likely adopters cannot be profiled according to their annual polished diamond outputs.

Figure 40 graphically illustrates the proportion of respondents that fall into certain ranges of total company sales for 2004. The results of the comparison between question 20 (Figure 40) and question 7 (Figure 30) (both continuous variables) are illustrated in the graph in Figure 41.

Figure 40
Histogram of total company sales in 2004

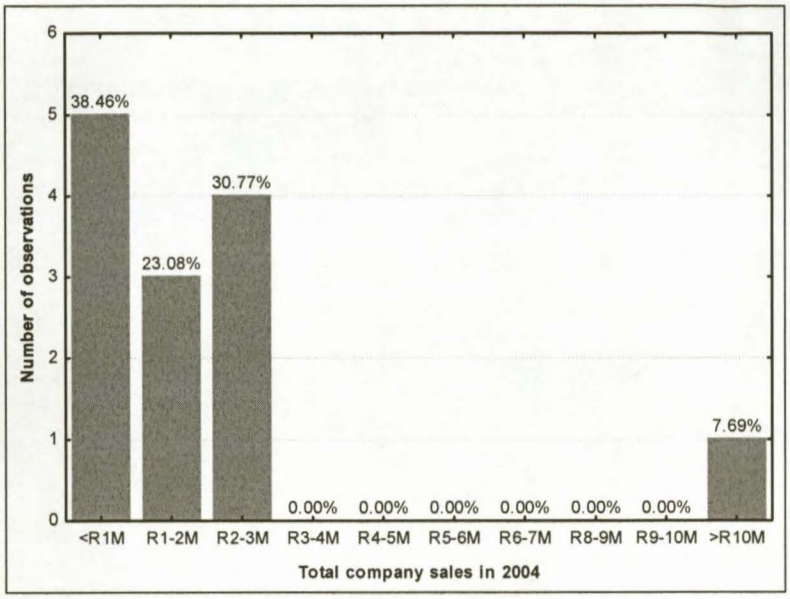
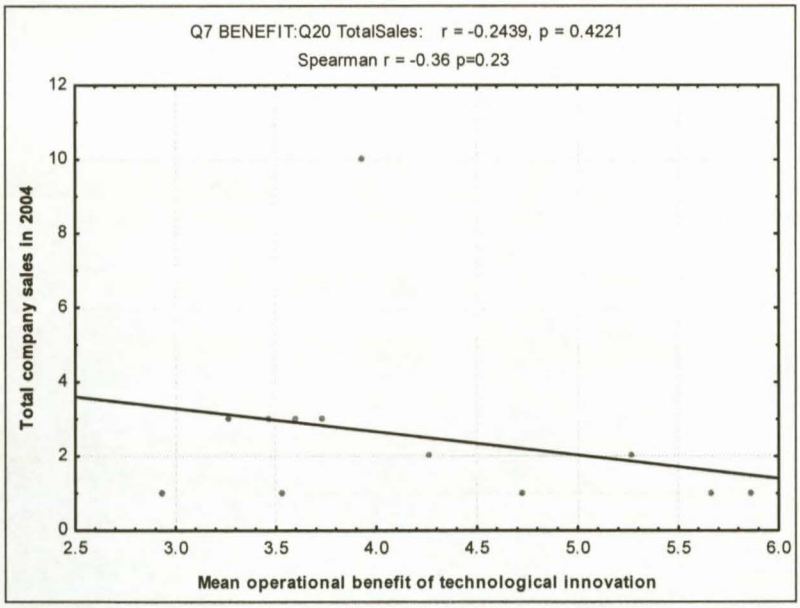


Figure 41
Regression analysis of mean operational benefit of the technological innovation and total company sales in 2004



It was expected that those respondents that perceived a high operational benefit of the technological innovation (likely adopters) could possibly be profiled in terms of their annual total sales; thus, it was expected that likely adopters could be those diamond cutters and polishers with greater financial strength to experiment with new products that promise greater production output and profits. The regression analysis

illustrated in Figure 41 indicates a negative Spearman correlation of -0.36 (not a positive correlation as was expected) between the two groups of respondents based upon the two variables. However, the Spearman p value of 0.23 is larger than the significance level α of 0.05 indicating that the correlation between the two variables is not significant. Thus, likely adopters cannot be profiled according to total company sales.

Figure 42 graphically illustrates the proportion of respondents that fall into certain ranges in terms of their employee complement. The results of the comparison between question 21 (Figure 42) and question 7 (Figure 30) (both continuous variables) are illustrated in the graph in Figure 43.

Figure 42
Histogram of full-time company employees

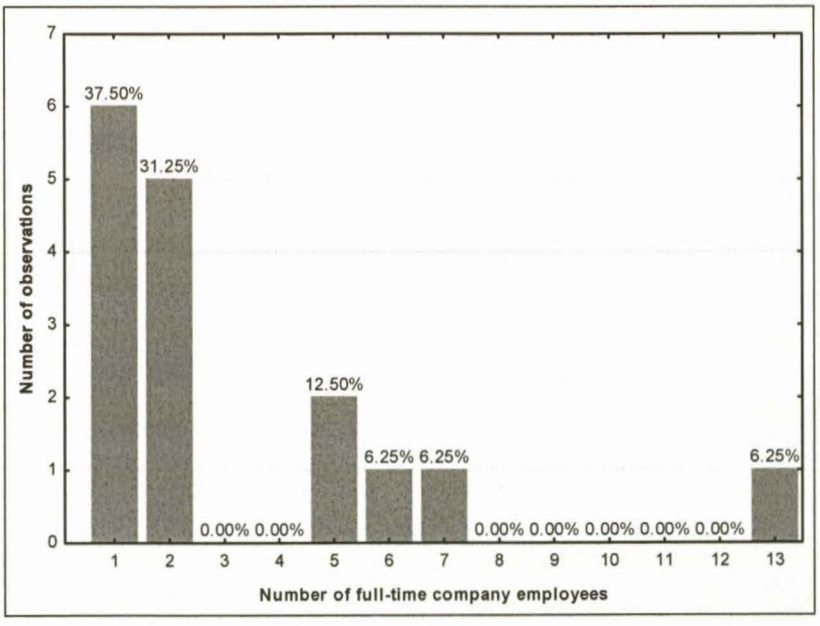
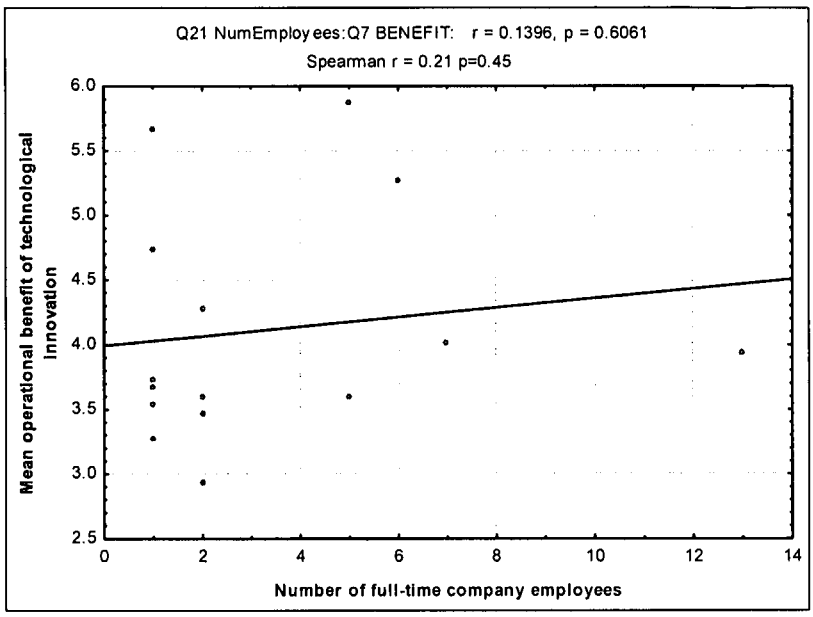


Figure 43
Regression analysis of mean operational benefit of the technological innovation and annual polished diamond output



It was expected that those respondents that perceived a high operational benefit of the technological innovation (likely adopters) could possibly be profiled in terms of their full-time employee complement; thus, it was expected that likely adopters could be those diamond cutters and polishers with a greater labour force which is an indicator of company size and financial strength. The regression analysis computed in Figure 43 indicates that there is a small positive Spearman correlation of 0.21 between the two groups of respondents based upon the two variables. The Spearman p value of 0.45 is much larger than the significance level α of 0.05 indicating that the correlation between the two variables is not significant. Thus, likely adopters cannot be profiled according to their full-time employee complement.

Figure 44 graphically illustrates the proportion of respondents that desire to be industry leaders in new technology adoption and those that do not. The results of the comparison between the nominal data from question 13 (Figure 44) and the continuous data from question 7 (Figure 30) are illustrated in the ANOVA in Figure 45.

Figure 44
Histogram of desire for industry leadership in new technology adoption

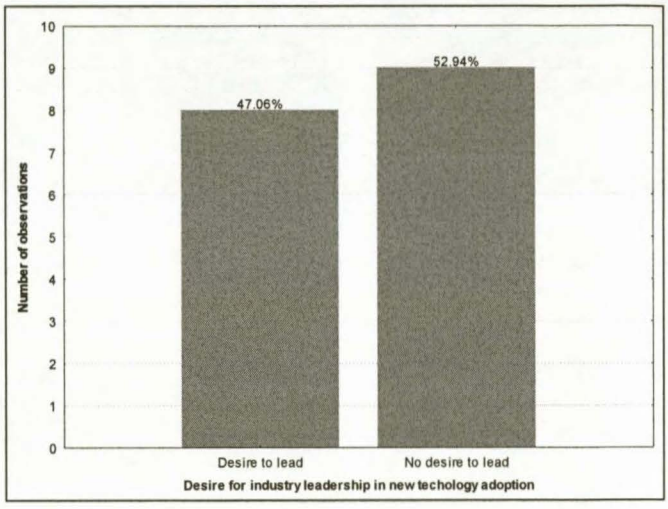
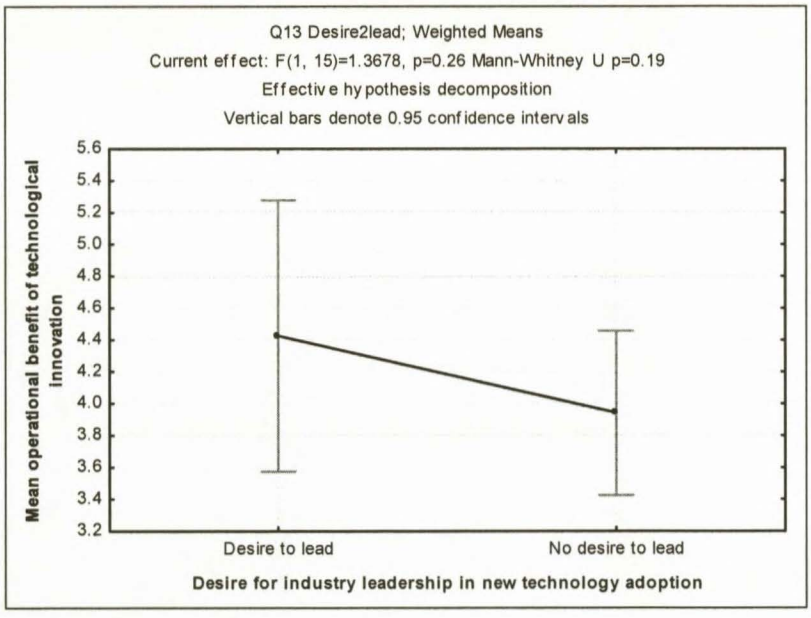


Figure 45
ANOVA between mean operational benefit of the technological innovation and desire for industry leadership in new technology adoption



It is evident from the data presented in Figure 44 that the number of respondents that desire to be industry leaders in new technology adoption is almost equal to that of respondents who have no desire to be so. It was expected that the possibility existed that those respondents that perceived a high operational benefit of the technological innovation (likely adopters) were likely to be those respondents that desired industry leadership in new technology adoption; customers with a desire to lead in new technology adoption were expected to perceive greater benefit in such an innovative

product. The ANOVA computed in Figure 45 indicates that the mean operational benefit for those respondents who desire to lead (4.4250) is only slightly greater than the mean for those respondents who do not desire to lead (3.9407). The Mann-Whitney test was used due to the fact that the data provided by question 13 are nominal and not normally distributed around the respective means. The Mann-Whitney test is a nonparametric technique that is used to compare the distributions of two independent populations when the samples are small and there is no assumption of the data being normally distributed (Pelosi & Sandifer, 2003). The Mann-Whitney p value of 0.19 is larger than the significance level α of 0.05 indicating that the means for question 7 do not differ significantly for the two categories of desire for industry leadership in new technology adoption. Thus, likely adopters (those perceiving a high operational benefit of the technological innovation) cannot be profiled as being those diamond cutters and polishers that desire to be industry leaders in new technology adoption.

Figure 46 graphically illustrates the proportion of respondents that market their polished diamonds internationally and those that do not. The results of the comparison between the nominal data from question 14 (Figure 46) and the continuous data from question 7 (Figure 30) are illustrated in the ANOVA in Figure 47.

Figure 46
Histogram of international marketing status

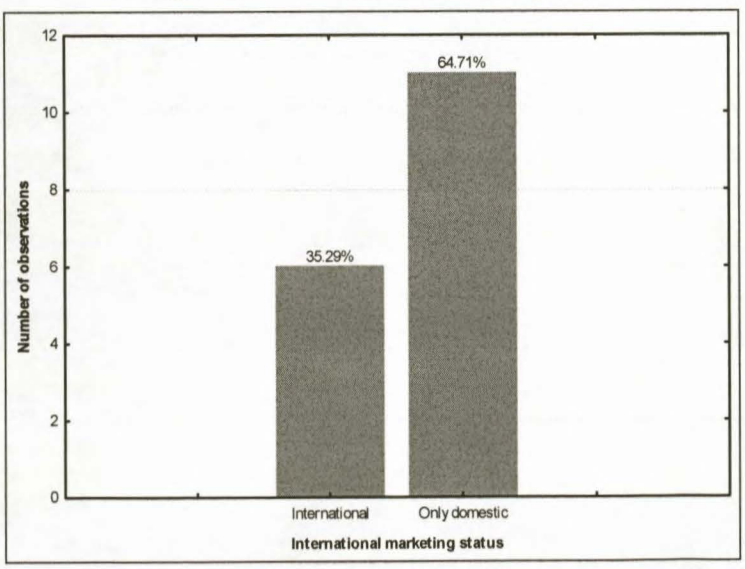
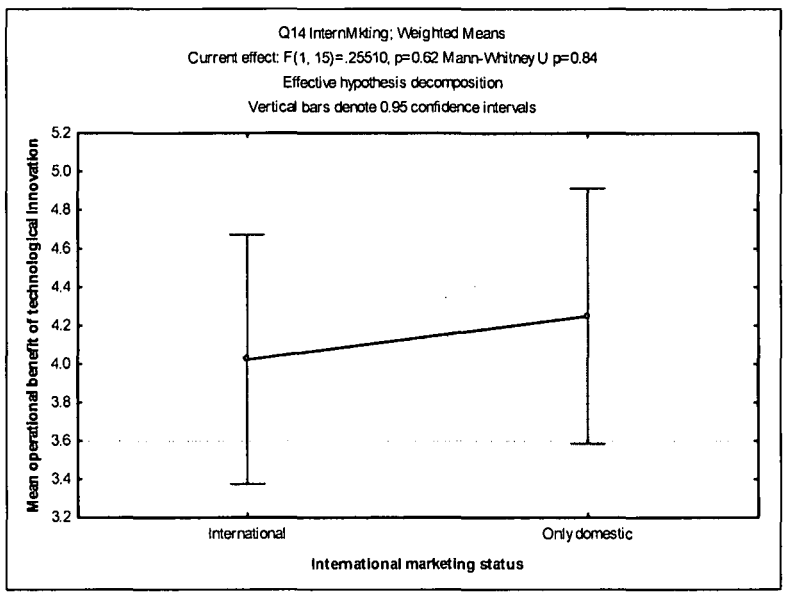


Figure 47
ANOVA between mean operational benefit of the technological innovation and desire for industry leadership in new technology adoption



It is evident from the data presented in Figure 46 that the greater portion of the sample (64.71 percent) markets its polished diamonds only locally. It was expected that those respondents that perceived a high operational benefit of the technological innovation (likely adopters) were likely to be those respondents that marketed their polished diamonds internationally; local companies competing in foreign markets are under greater pressure to maximise their efficiency so as to remain competitive. The ANOVA computed in Figure 47 indicates that the mean operational benefit for those respondents who market internationally (4.0222) is slightly smaller than the mean for those respondents who only market domestically (4.2485); this contradicts the aforementioned expectation. The Mann-Whitney test was used due to the fact that the data provided by question 14 are nominal and not normally distributed around the respective means. The Mann-Whitney p value of 0.84 is much larger than the significance level α of 0.05 indicating that there is no significant difference in the means for question 7 for the two categories of international marketing status. Thus, likely adopters (those perceiving a high operational benefit of the technological innovation) cannot be profiled as being those diamond cutters and polishers that have an international marketing presence.

No ANOVA is computed for the data in question 15 due to the fact that all of the

respondents in the sample were private companies.

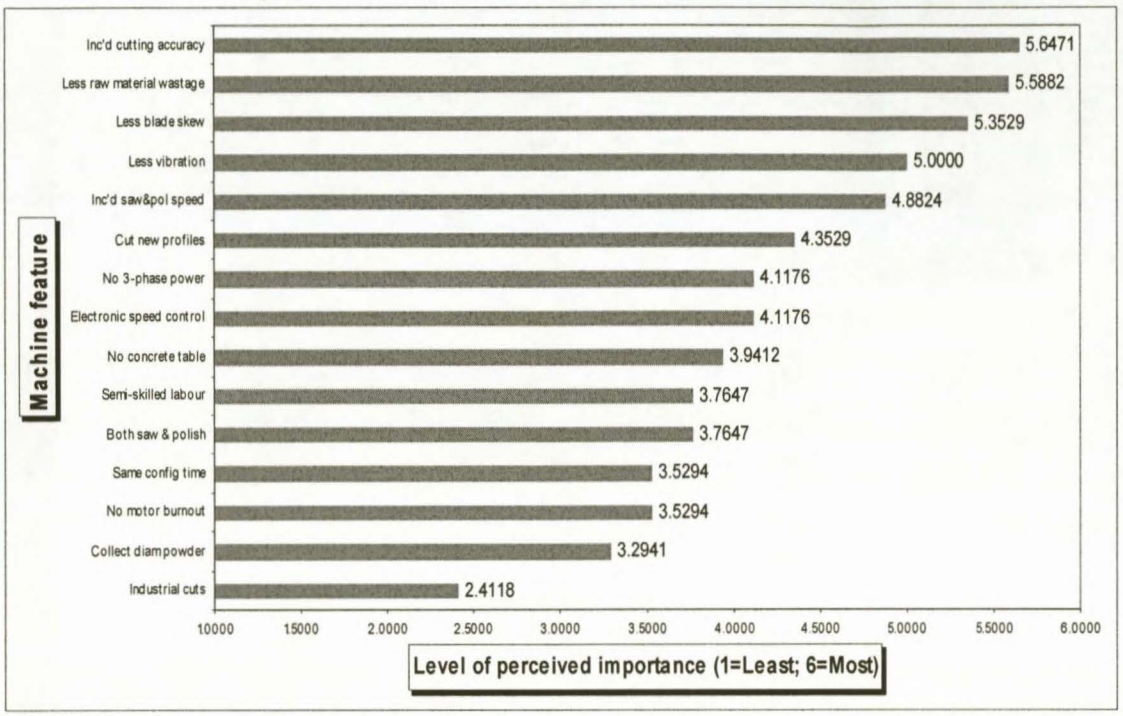
7.2.1 Managerial implications

The first research objective concerning the profiling of promising early adopters of the technological innovation by comparing the mean operational benefit of the new product with various demographic and operating variables proved unsuccessful. The study was unable to profile a lucrative/attractive portion of the industry at which HBD Venture No 7 (Pty) can target its initial distribution and promotion. This is unfortunate, as such knowledge would have been helpful at the point of commercialisation and launch of the new and improved diamond sawing and polishing machine. It is possible that in the event that a healthier response rate had been achieved for the empirical study, that certain patterns would have become apparent amongst variables that would have allowed for the identification of a profile of likely adopters.

7.3 DETERMINATION OF OPTIMUM BENEFIT BUNDLE

The second objective of the empirical research is to determine the optimal benefit bundle desired by diamond cutters and polishers that will improve the probability of success in terms of the marketability of the technological innovation being designed and developed by HBD Venture No 7 (Pty) Ltd. Question 6 presents respondents with 15 factors dealing with the system attributes/features and machine capabilities of the technological innovation. Respondents are required to rate each of the 15 items on a 1-6 ordinal scale (1 = least important; 6 = most important) in order to determine the perceived importance of each factor in potential customers' decision to adopt a new and improved diamond sawing and polishing machine. Analysis of the mean response of each variable will facilitate the design of a machine that caters for the market's expressed needs through an understanding of the factors that respondents consider to be most important for incorporation into the machine design. Figure 48 graphically illustrates the mean rating values for each of the 15 factors in order of perceived importance.

Figure 48
Average perceived importance of innovative machine features

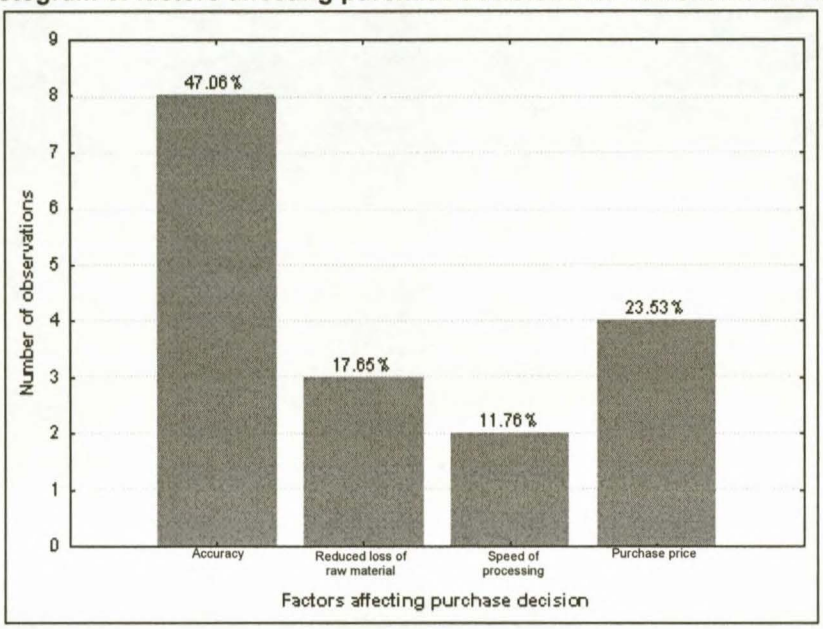


Respondents rated 13 out of a total of 15 factors above the scale's middle point of 3.5, which implies that those 13 factors were at least of some degree of importance when considering the adoption of a new and improved diamond sawing and polishing machine. Of the 15 machine features listed, increased cutting accuracy (5.6471) is perceived as being the most important machine capability that will affect the purchase decision. The next most important machine features in order of perceived importance are: less wastage of the rough diamond (5.5882), less probability of the blade cutting skew (5.3529), reduced vibration (5.0000), increased sawing and polishing speed (4.8824), and the ability to cut a range of new profiles and shapes into the rough diamond (4.3529). The features that were perceived as being of lesser importance were (in decreasing order of importance): the fact that the driving mechanism will never burn out when the blade strikes a hard spot in the rough diamond (3.5294), the ability to efficiently collect the diamond powder by-product (3.2941), and the ability to create industrial diamond cuts (2.4118).

The results of question 2 corroborate the above findings. Question 2, a nominal measure, asked respondents to choose from a list of five options the most important

factor that influenced the purchase decision when purchasing the machinery that the respondent currently uses for diamond sawing and polishing. The histogram seen in Figure 49 reports the percentages of respondents that selected each option. It must be noted that option five, an "other" response category inserted to ensure that the options were exhaustive (Babbie & Mouton, 2001), was never selected.

Figure 49
Histogram of factors affecting purchase decisions for current machinery



About forty-seven percent (47.06%) of all respondents cited accuracy as the most important factor that influenced their past purchases of diamond sawing and polishing machinery. This is appropriate, given that increased cutting accuracy (Figure 48) is perceived as being the most important capability of the technological innovation that will affect potential customers' adoption thereof. Purchase price is the next most important factor that influenced customers' purchases of current diamond sawing and polishing machinery; it was selected by 23.53 percent of the sample under study.

Questions 22 and 23, both open-ended questions, asked respondents to list reasons that would prevent them from or convince them to purchase a new and improved diamond sawing and polishing machine.

The predominant reasons that would prevent potential customers from adopting a

new and improved diamond sawing and polishing machine are listed below. These reasons must be noted and avoided/countered where possible during the design and development of the innovative machine.

- High purchase price and availability of finance
- Expenses involved in new skills training
- Shortage and inconsistency in procurement of rough diamonds at profitable prices
- Industry instability
- Noisy
- Poor reliability
- Too specialised and difficult to maintain
- Little practical advantage over current machines

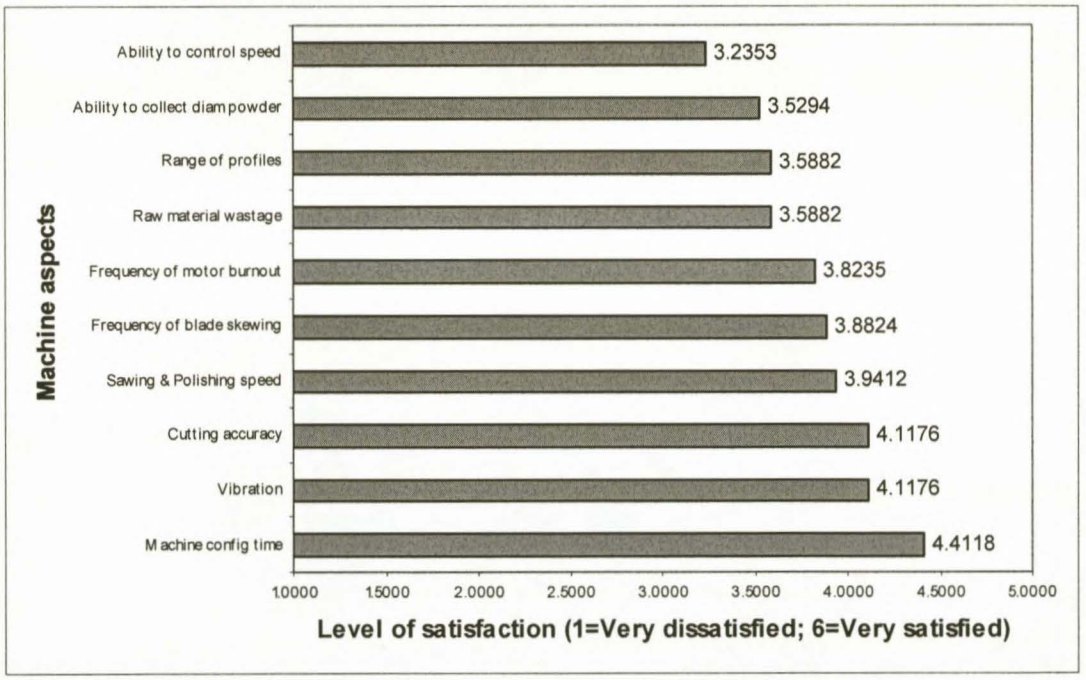
The predominant reasons that would convince potential customers to adopt a new and improved diamond sawing and polishing machine are listed below. These reasons must be noted and catered for where possible during the design and development of the innovative machine.

- Ease of operation and user-friendliness
- Cost effectiveness
- Increased productivity
- Consistent supply of rough diamonds
- Availability of purchase funds
- Increased accuracy
- Efficiency
- Less wastage of the rough diamond
- Fair/attractive purchase price
- Machine quality
- Improved sawing speed
- Good stability and reliability
- Minimal vibration and noise
- Ability to cut a variety of shapes/profiles
- True integration of sawing and polishing and performance delivery

- Acceptable size of the machine

Question 17 presents respondents with 10 aspects concerning their satisfaction with their current diamond sawing and polishing machinery. Respondents are required to rate each of the 10 items on a 1-6 ordinal scale (1 = very dissatisfied; 6 = very satisfied) in order to determine current machine users' level of satisfaction with existing machinery. Analysis of the mean response of each variable will facilitate the exploitation of the competitive disadvantages of current machinery and protection against the strengths thereof. Figure 50 graphically illustrates the mean rating values for each of the 10 machine aspects on a satisfaction continuum.

Figure 50
Average level of satisfaction with current sawing & polishing machinery



Respondents rated 9 out of a total of 10 machine aspects above the scale's middle point of 3.5, which implies that those 9 factors tended towards the satisfactory side of the scale. However, on average respondents were not very satisfied with any of the 10 current machine aspects; the highest mean rating was 4.4118 for machine configuration time, indicating only a mild degree of satisfaction. This bodes well for the technological innovation as the data reveals that current machinery on average has no powerful competitive advantage that delights the market. HBD Venture No 7

(Pty) Ltd will not have the problem of persuading a very satisfied market on any of the 10 machine aspects. The following machine aspects display the lowest levels of customer satisfaction amongst users and should be focused upon during machine design as they represent the weakest characteristics of current technologies (listed in ascending order of satisfaction):

- Ability to control the sawing speed (3.2353)
- Ability to collect the diamond powder by-product (3.5294)
- The range of profiles/shapes that can be cut (3.5882)
- Amount of wastage of the rough diamond (3.5882)
- The number of times the motor burns out (3.8235)

The following machine aspects display higher levels of customer satisfaction amongst users. Although machine users, on average, are not resoundingly satisfied with any of the 10 machine aspects, these are the aspects that they are more satisfied with. Thus, it may be prudent to focus more development funds on the machine aspects listed in the preceding paragraph. These machine aspects are arranged in ascending order of satisfaction:

- The sawing and polishing speed (3.9412)
- The accuracy of cutting (4.1176)
- Amount of vibration (4.1176)
- The length of time it takes to configure/set up the machine (4.4118)

7.3.1 Managerial implications

The findings of the research suggest that HBD Venture No 7 (Pty) Ltd should focus the bulk of development costs and efforts on ensuring that the following six features are integrated into the machine and perform particularly well:

- Increased cutting accuracy
- Less wastage of the rough diamond
- Less probability of the blade cutting skew
- Reduced vibration
- Increased sawing and polishing speed

- Ability to cut a range of new profiles and shapes

The ability to both saw and polish using one machine received a mean rating of 3.7647 which is only slightly above the scale middle point of neutrality in terms of perceived importance. This should not be interpreted as meaning that the integration of sawing and polishing into one machine is of no significance to the market. It can be reasoned that the market is simply very sceptical towards the idea of an invention that can both saw and polish using one machine. As alluded to in prior sections, much of the industry is very traditional and views sawing and polishing and the machinery associated therewith as being separate from one another. A number of respondents indicated on their questionnaires that they believed the ability to both saw *and* polish using one machine to be "not possible". It can be hypothesised that a live demonstration of a working prototype could sway the respondents' perceptions and could lead them to rate the attribute as being more important. Also, a telephonic interview with a large diamond cutter and polisher revealed that such an integrated machine might be more popular amongst smaller cutters and polishers. This is due to the fact that larger manufacturers work on a sequential production line. Diamonds are first sawn on benches of sawing machines and then move on to the polishing stage on separate machines in another portion of the facility. An integrated machine is perceived as being impractical on such a sequential production line.

The ability to cut industrial diamonds received a low mean rating for perceived importance of 2.4118. This should not be interpreted as meaning that such a feature is entirely unimportant. It simply suggests that the respondents interviewed are not currently interested in the market for cutting industrial diamonds. If a reasonably priced machine that could cut industrial diamonds in a revolutionary way was available, one might find that a number of diamond cutters and polishers would consider entering the industrial diamond market. Despite this possible market opportunity, Kaiser EDP (2005b) has found that industrial diamond processing is not attractive to South Africa for a number of reasons. Firstly, industrial diamond processing is increasingly dominated by synthetic diamond inputs which are produced in developed countries such as the United States (Kaiser EDP, 2005b). Secondly, the need for scale and low factor costs restricts competitiveness and

differentiation opportunities for a relatively high cost location such as South Africa (Kaiser EDP, 2005b). Therefore, the industrial diamond cutting feature may have more attractiveness as an export opportunity to developed countries.

Respondents viewed the fact that the driving mechanism will never burn out when the blade strikes a hard spot in the rough diamond as being neither important nor unimportant (a mean rating of 3.5294). This may indicate that the sample under study did not experience motor burnout as being a big problem.

Respondents perceived the ability to efficiently collect the diamond powder by-product (3.2941) as being of lesser importance. As a result, it may be prudent to assign less development expenditure to building this feature into the machine.

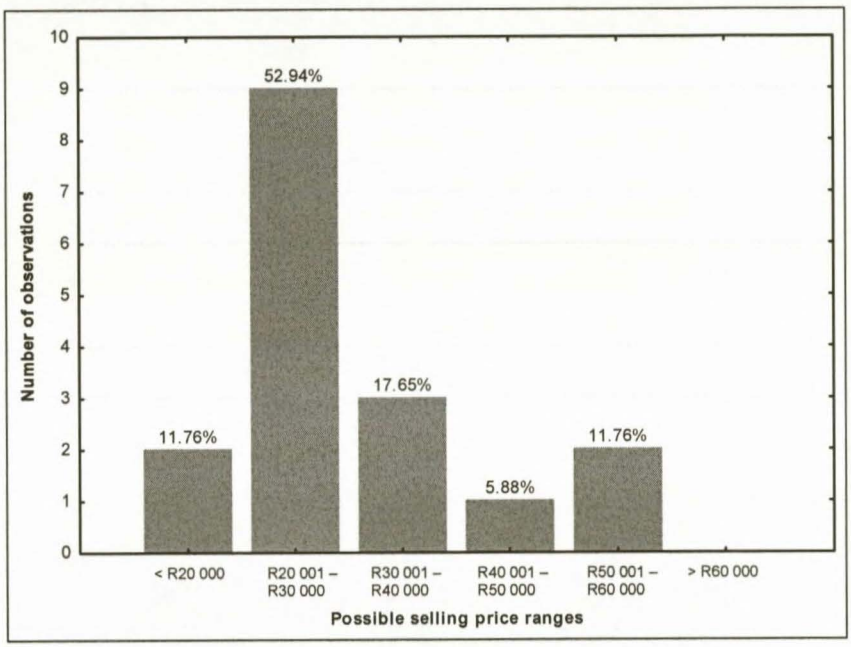
Figure 49 indicates that accuracy is the most factor that influenced respondents' past purchases of diamond sawing and polishing machinery. The technological innovation being designed and developed by HBD Venture No 7 (Pty) Ltd should strive thus to supersede the accuracy offered by current machinery. This will serve to improve the innovation's chances of marketable success. Furthermore, the histogram indicates that purchase price is an important determining factor in past purchase decisions. Consequently, careful efforts should be made to ensure that the innovation is competitively priced.

Figure 50 indicates that the current machine aspect that received the lowest level of satisfaction amongst users was the ability to control the sawing speed. This, according to the data, represents the greatest competitive disadvantage of current machinery and should be exploited in the design of the technological innovation.

By synthesising the above results, HBD Venture No 7 (Pty) Ltd will be able to determine the optimal benefit bundle desired by diamond cutters and polishers that will improve the probability of success in terms of the marketability of the technological innovation. The results of question 8 will enable the company to know what the maximum selling price is that they will be able to charge for the completed

machine. This, in turn, will provide an indication of the amount of money that can be safely spent on engineering the chosen features into the machine so as to ensure a healthy profit margin. Question 8 presents respondents with six possible selling price ranges for the technological innovation and asks them to select the maximum amount that they would be willing to pay for a complete new and improved diamond sawing and polishing machine. The results are presented in the histogram in Figure 51.

Figure 51
Histogram of maximum selling prices that customers are willing to pay

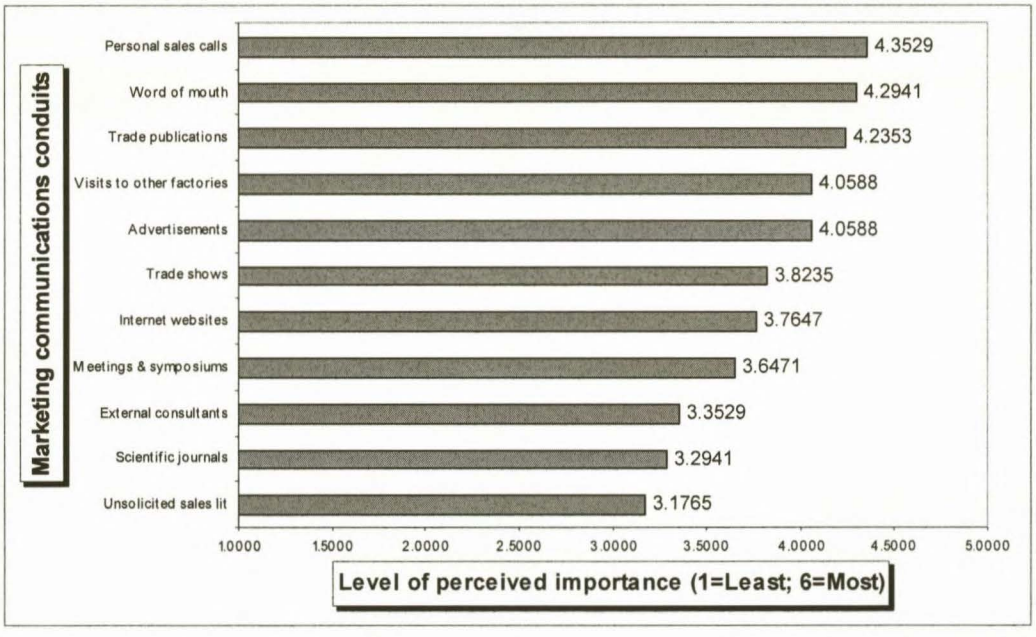


Results show that the majority of respondents (52.94 percent) indicated that the maximum amount that they would be willing to pay for one complete new and improved diamond sawing and polishing machine is between R20 001 and R30 000. Thus, HBD Venture No 7 (Pty) Ltd must ensure that the final product falls within this price range so as not to alienate the largest portion of the market. By pricing the product in this range, the company will only be excluding 11.76 percent of potential buyers (those who are only willing to pay R20 000 or less). The company's product will thus be within the budget of 88.23 percent of potential buyers.

7.4 DETERMINATION OF MOST EFFECTIVE MARKETING COMMUNICATIONS

The third objective of the empirical research is to determine the most effective conduits for marketing communications in order to generate product awareness and promote the technological innovation being designed and developed by HBD Venture No 7 (Pty) Ltd. Question 16 presents respondents with 11 possible conduits for marketing communications that would enable them to become aware of and learn about a new technology in the diamond cutting and polishing industry. Respondents rated each of the 11 items on a 1-6 ordinal scale (1 = least important; 6 = most important). Figure 52 graphically illustrates the mean rating values for each of the 11 marketing communications conduits in order of perceived importance.

Figure 52
Average perceived importance of marketing communications conduits



The mean rating values presented in Figure 52 reveal that personal sales calls from manufacturers is rated as being the most important source of marketing information with a mean level of perceived importance of 4.3529. Peer discussions (word of mouth) and trade publications are close contenders for the most important source of product information with mean rating values of 4.2941 and 4.2353 respectively. External consultants (3.3529), scientific journals (3.2941) and unsolicited sales literature (3.1765) are rated below the scale's middle point of 3.5 and are thus perceived as being less important by the sample under examination.

7.4.1 Managerial implications

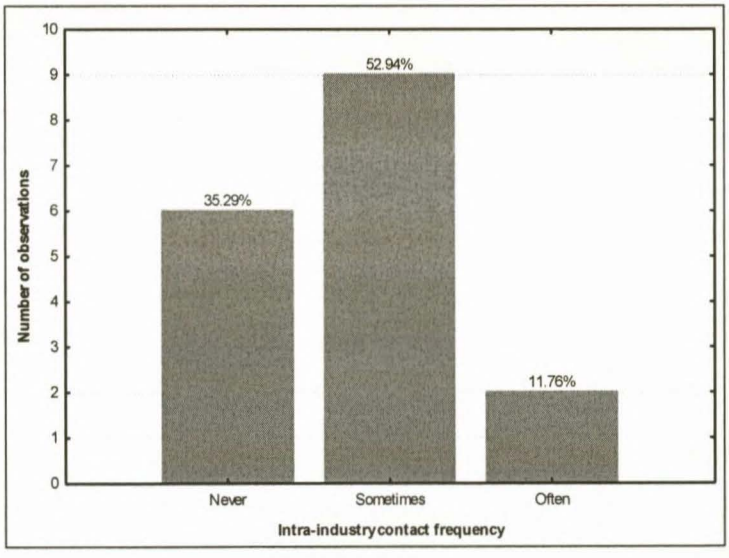
The findings presented in Figure 52 suggest that personal sales calls should represent the impetus of the marketing communications efforts to be conducted by HBD Venture No 7 (Pty) Ltd. This finding is in line with the theory that states that industrial marketing communications are more focused than those employed in a B2C context with an emphasis on personal selling over advertising (Morris et al., 2001; Shimp, 2003). Furthermore, Garber & Dotson (2002) have found that personal selling is best suited to facilitating adoption in the new product adoption model (as seen in Figure 19). This is due to the lengthy and involved buying decision in industrial markets which produces a need for personal contact, with the sale taking on the appearance of a social negotiation process. Personal selling as a marketing communications tool is expected to be particularly successful in the diamond cutting and polishing industry given the interest expressed by diamond cutters and polishers during telephone conversations and in correspondence in having a personal demonstration of the technological innovation (K. Rademeyer, personal communication, 14 October 2005).

Personal sales calls should then be supplemented firstly by efforts to improve word of mouth and secondly by article/editorial content in trade publications. The use of these two marketing communications conduits is closely linked to the market preparation and market attack techniques of Beard & Easingwood (1996), discussed in chapter five which deals with the marketing of innovations. Word of mouth can be stimulated by providing pre-launch information (a market preparation technique) to the media (Beard & Easingwood, 1996). Furthermore, an important market attack technique to employ is to leverage the power of opinion leaders by placing high profile stories in trade publications that incite opinion leaders to investigate and evaluate the innovation.

Word of mouth communication is defined as oral, person-to-person communication between a receiver and a communicator whom the receiver perceives as non-commercial, regarding a brand, product or service (Arndt, 1967 cited in Buttle, 1998); it is a very effective form of free advertising that is spread by sources who are

assumed by receivers to be credible and independent of corporate influence (Buttle, 1998). Opinion leaders are known in the marketing literature to be very important in improving word of mouth marketing communications. Marketer-controlled communication flows to opinion leaders who in turn communicate it through word of mouth to their peers, thereby influencing their attitudes and behaviours (Buttle, 1998). It will be prudent for HBD Venture No 7 (Pty) Ltd to convince opinion leaders of the merit of the technological innovation due to the fact that when customers seek out authoritative information on a product, they seek the input of an opinion leader or influential (Buttle, 1998). The speed at which word of mouth will spread within the diamond cutting and polishing industry as well as the amount of information sharing that occurs can be inferred from the histogram presented in Figure 53.

Figure 53
Histogram of intra-industry contact frequency



When asked how frequently companies within the diamond beneficiation industry contacted one another to enquire about high technology equipment that the respondents have or have not installed, 35.29 percent of respondents indicated that they were never contacted by other companies. 52.94 percent indicated that other companies contacted them only sometimes, while a very small proportion of the sample indicated that they were contacted often (11.76 percent). Due to the fact that frequent intra-industry contact occurs in the case of only 11.76 percent of companies, word of mouth regarding the technological innovation can be expected to spread

somewhat slowly. However slowly it may occur, word of mouth will spread within a large proportion of the industry (64.70 percent) serving to inform the market and promote the new and improved machine.

Having established the most appropriate marketing communications conduits for the promotion of the technological innovation, it is useful to point out those spearhead factors that should serve as the main themes in marketing communications campaigns. The marketing campaign should focus upon the following selling points:

- The ability of the technological innovation to effectively control the sawing speed (Figure 50)
- The increased cutting accuracy provided by the technological innovation (Figures 48 and 49)
- The reduced raw material wastage associated with the operation of the technological innovation (Figure 48)
- Less probability of the blade cutting skew while using the technological innovation (Figure 48)
- Reduced vibration in the sawing and polishing process (Figure 48)

7.5 DETERMINATION OF MARKET POTENTIAL

The fourth research objective is to determine the market potential for the technological innovation at various possible selling price ranges. As defined in chapter 6, market potential refers to the attractiveness of the target market to the industrial marketer (Song & Parry, 1996).

Question 8 asks the respondent to select a nominal category that indicates the maximum price range that the respondent is willing to pay. This information provides HBD Venture No 7 (Pty) Ltd with an understanding of the selling price ceiling for the completed diamond sawing and polishing machine. This is a very important factor to know so that when the final selling price is set, the company avoids estranging a large portion of the target market. As seen in the histogram in Figure 51, the majority of respondents (52.94 percent) indicated that the maximum amount that they would

be willing to pay for one complete new and improved diamond sawing and polishing machine is between R20 001 and R30 000. Thus, HBD Venture No 7 (Pty) Ltd must ensure that the final product falls within this price range so as not to alienate the largest portion of the market. By pricing the product in this range, the company will only be excluding 11.76 percent of potential buyers (those who are only willing to pay R20 000 or less). The company's product will thus be within the budget of 88.23 percent of potential buyers.

Question 9 asks the respondent to specify the number of machines that the respondent would expect to purchase for *each* of the potential price ranges during the first year that they arrive on the market. It was expected that the respondent would specify a certain number of units in his chosen maximum price range and, depending on his needs, would increase the purchase quantity for the lower price ranges. Despite the clear instructions, none of the respondents answered the question as instructed. They only specified the number of machines they would buy for the price range they selected in question 8. All other price ranges were left blank and were thus interpreted as zeroes. In order to err on the side of caution, if a respondent specified a certain number of machines for the R30001.00 to R40000.00 price range for example, it was assumed that the respondent would buy the same number of machines and not more if the selling price was set in the lower price ranges. This information will enable HBD Venture No 7 (Pty) Ltd to know conservatively how many machines it can expect to sell to a randomly selected sample of 17 diamond cutters and polishers during the first year after product launch.

Table 13 indicates the number of machines that HBD Venture No 7 (Pty) Ltd can expect to sell during the first year that they arrive on the market to a random sample of 17 respondents (which represent 6.94% of the total population of 245 companies):

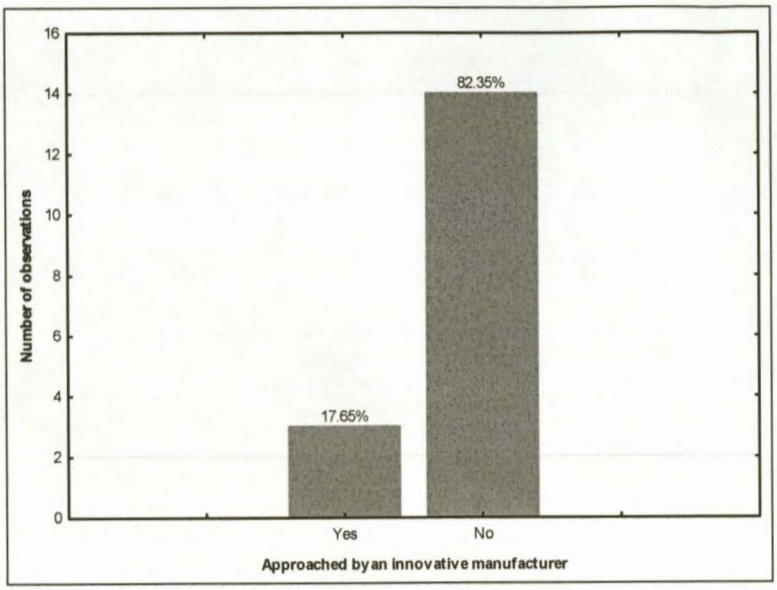
Table 13
Expected sales volumes for various price ranges based on the sample

Selling price range	Sales volume	Turnover at lower limit	Turnover at upper limit
Less than R20 000	41 units	R41 @ R1p/unit	R820 000 @ R20 000p/unit
R20 001 to R30 000	34 units	R680 034 @ R20 001p/unit	R1 020 000 @ R30 000p/unit
R30 001 to R40 000	6 units	R180 006 @ R30 001p/unit	R240 000 @ R40 000p/unit
R40001.00 to R50000.00	2 units	R80 002 @ R40 001p/unit	R100 000 @ R50 000p/unit
R50001.00 to R60000.00	1 units	R50 001 @ R50 001p/unit	R60 000 @ R60 000p/unit
More than R60000.00	0 units	-	-

Question 10, which is a ratio measure, asks respondents to specify the payback period on the machine according to the price range selected in question 8. This information gives HBD Venture No 7 (Pty) Ltd a rough idea of the credit terms that will need to be extended in order to generate the necessary sales. Technically, it is not precisely meaningful to compute an average over all of the responses in question 8 as they are anchored to different expected selling price ranges. Despite this logical problem, computing an average does provide the best rough information possible as to the general credit period that will need to be extended to customers. The average payback period is 16 months.

Question 11 provides a definitive indication of whether or not there are any other innovative manufacturers of diamond sawing and polishing machinery that are also currently developing innovative technologies. The results of question 11 will provide an insight as to whether or not HBD Venture No 7 (Pty) Ltd is a pioneer in this type of new product development. As seen in Figure 54, the majority of respondents (82.35 percent) indicate that they have never been approached by a manufacturer wishing to market a new and improved diamond sawing and polishing machine.

Figure 54
Histogram indicating competition from other innovators



7.5.1 Managerial implications

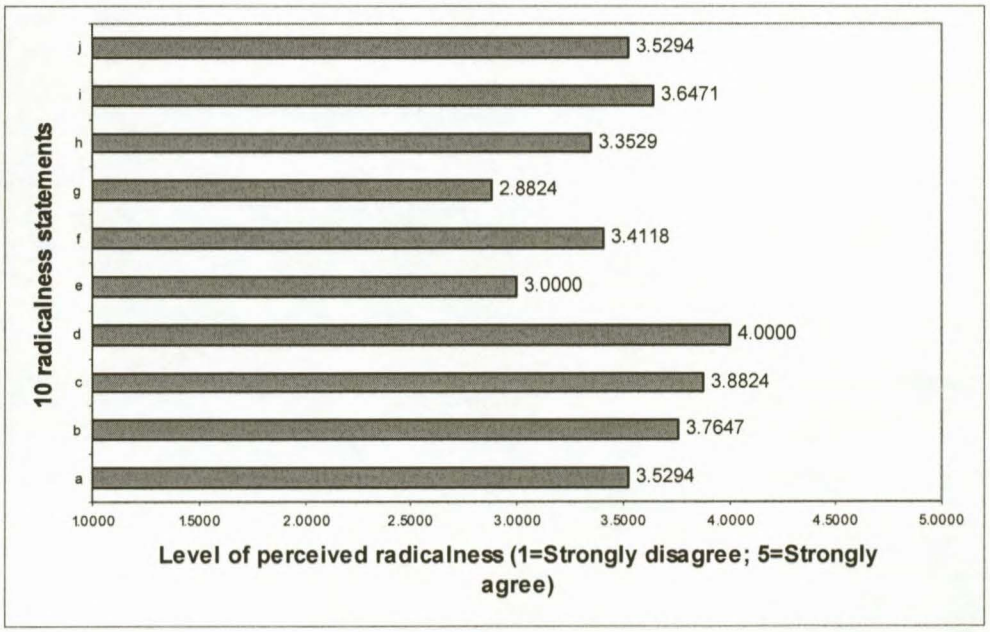
The empirical research suggests that HBD Venture No 7 (Pty) Ltd should price its final product between R20 001 and R30 000. Doing so will ensure that it is within the willing purchase price ceiling of 88.23 percent of potential buyers. A test of purchase intentions suggests that the company can expect to sell 34 units in the above price range to a random sample of 17 diamond cutters and polishers. If one assumes that the remaining 93.06 percent of the industry population displays at least similar purchase intentions, the company can expect to sell a significant number of machines within the first year of market introduction. However, all but one of the respondents indicated that they would require a minimum of a six month credit period in order to pay for the purchase. This is useful information in determining the expected cash flow of HBD Venture No 7 (Pty) Ltd.

Figure 54 indicates that HBD Venture No 7 (Pty) Ltd is by and large a pioneer in the development of a new and improved diamond sawing and polishing machine. The company can expect thus to receive very little competition from other innovative designers. Furthermore, HBD Venture No 7 (Pty) Ltd is well poised to launch its new product onto the market.

7.6 DETERMINATION OF RADICALNESS

The final objective of the empirical study is to determine the radicalness of the technological innovation's impact and its effect on the organisational adoption thereof. Perceived radicalness is an important construct to determine in an empirical study concerning the adoption of a new technological innovation due to the fact that the literature (Littler, 2001; McDade et al., 2002) states that as the impact of new high-technology products increases from incremental to semi-radical to radical, organisational preference for the new technologies increases; however, the percentage of firms that adopt the new technology decreases. The ten-item impact measure which uses a five-point Likert scale for responses contained in question 18 is used to determine the radicalness of the technological innovation's impact and its effect on the organisational adoption thereof. By determining a mean for each respondent over the ten items and then by obtaining an average of that value, one will be able to determine if the innovation is perceived by diamond cutters and polishers as incremental (average between 1 and 2.33), semi-radical (average between 2.34 and 3.66) or radical (average between 3.67 and 5). The mean rating values of the ten statements which are presented in Table 12 are illustrated in the graph in Figure 55.

Figure 55
Average perceived radicalness of the technological innovation



The average of the mean ratings for each respondent over the ten items is calculated at 3.5000. As this falls between 2.34 and 3.66, the technological innovation is perceived as being semi-radical by the sample under study.

McDade et al. (2002) assert that a radical new high-technology product representing a major technological advance arouses high levels of both technological risk (will the product meet the needs and capabilities of firm users?) and financial risk (if the technology does not meet user needs and capabilities, how expensive would the mistake be?) in the mind of the potential customer. These two factors serve to reduce the rate of product adoption (McDade et al., 2002). However, incremental and semi-radical innovations (such as HBD Venture No 7 (Pty) Ltd's innovative new and improved diamond sawing and polishing machine) offer reduced levels of technological and financial risk due to the fact that "*products in these categories are more likely to be compatible with the users' experience, have a lower level of complexity for users making [them] easier to understand, and [to have] less need for training*" (McDade et al., 2002: 452). These factors translate into an easier transition for the customer from old to new technology for semi-radical new products versus radical ones. The fact that the innovative diamond sawing and polishing machine is perceived as being semi-radical by potential customers is beneficial for the manufacturer. HBD Venture No 7 (Pty) Ltd should benefit from a greater adoption rate and will need to implement fewer strategies to reduce technological and financial risk.

The following quote from McDade et al. (2002) elaborates on and clarifies the above argument: "*Decision-makers, while tempted by the technological advantage or prestige associated with radical new high-technology products, clearly take into consideration the practical aspects associated with the adoption of a new high-technology product. Sunk costs, willingness of the organization to change, and complexity of the organization, among other considerations, are very real circumstances that can strongly influence the adoption decision of the decision-maker, and ... are considerations that outweigh firm preferences for more radical products*" (McDade et al., 2002: 452).

7.6.1 Managerial implications

The above findings bode well for HBD Venture No 7 (Pty) Ltd and the new and improved diamond sawing and polishing machine; organisational decision-makers appear to be comfortable with and willing to adopt semi-radical products (McDade et al., 2002). When industrial marketers are faced with the launch and marketing of radical product innovations, there are a number of strategies that can be employed in order to reduce perceived risk and induce adoption. HBD Venture No 7 (Pty) Ltd may choose to implement one or a number of these strategies in order to further stimulate product adoption; although it is not mandatory to do so, the effects may be beneficial.

In the case of radical product innovations, risk reduction can be accomplished in the following ways (McDade et al., 2002):

- "Prototype" the adoption in a small portion of the adoptive firm. This strategy seeks to target a small segment of the firm in order to prove the competence of the new product to a sample audience, and is particularly useful when introducing radical new products to larger firms
- Integrate the product piecemeal into the firm if possible
- Offer support to smaller buying firms through financing or partnering by offering extended payment terms at a low rate of interest as well as implementation and training assistance. This strategy reduces the adverse effects of limited slack resources on the part of the adopter.

The finding that the technological innovation is perceived by potential customers as being semi-radical has important ramifications for the firm's strategy towards market orientation discussed in chapter 4. Studies have revealed a strong positive relationship between the possession of a market orientation and a new product's market performance (Atuahene-Gima, 1995). Furthermore, market orientation is shown to have a strong positive effect on proficiency of predevelopment activity, proficiency of launch activity, service quality, product advantage, marketing synergy, and teamwork (Atuahene-Gima, 1995). Although market orientation is found to be an important factor in the success of new products, its influence varies depending upon

the degree of product newness (incremental versus radical) (Atuahene-Gima, 1995). It has been shown that market orientation has a greater positive influence on the performance of incremental product innovations than on more radical product innovations (Atuahene-Gima, 1995); the finding that the technological innovation is perceived as being semi-radical but tends more towards the radical pole of the spectrum, may suggest that a market orientation is less important in this case. This finding does however not imply that a market orientation is irrelevant. Thus, although HBD Venture No 7 (Pty) Ltd should not disregard the importance of a market-oriented approach in the development of its semi-radical new product, a market orientation may be less important for the success of the technological innovation (Atuahene-Gima, 1995); consequently, such products may be sold based more upon the sophistication and complexity of their technological attributes (Atuahene-Gima, 1995). This is significant for HBD Venture No 7 (Pty) Ltd because it indicates that while the company should not entirely ignore investment in a market oriented approach, it will not need to invest the same amount of resources as in the case of an incremental new product. This is logical because firms are less likely to face strong competition for more radical new products than incremental new products and thus require a smaller degree of market orientation for success (Atuahene-Gima, 1995). HBD Venture No 7 (Pty) Ltd must thus decide on the level of market orientation that is warranted given the cost of building such an orientation while considering compatibility with factors such as the organisation's innovation strategy, the environment and the degree of newness of the product (Atuahene-Gima, 1995).

7.7 RESEARCH SUMMARY

The first research objective sought to profile early adopters which are prime prospects for generating strong sales at the point of commercialisation and launch of the technological innovation. This profiling was to be accomplished by comparing the mean benefit that the new product would have for respondents' operations with various demographic and operating variables. This proved to be unsuccessful and the study was unable to profile a lucrative/attractive portion of the industry at which HBD Venture No 7 (Pty) Ltd can target its initial distribution and promotion.

The second research objective is to determine the optimal benefit bundle desired by diamond cutters and polishers that will improve the probability of success in terms of the marketability of the technological innovation. The findings suggest that the bulk of development costs should be focused on the following six machine features: increased cutting accuracy, less raw material wastage, less probability of the blade cutting skew, reduced vibration, increased sawing and polishing speed, and ability to cut a range of new profiles and shapes. Accuracy and purchase price were found to be the most important factors that influenced respondents' past purchases of diamond sawing and polishing machinery; consequently, these two factors should receive careful attention. Current machine users are most dissatisfied with their machinery's ability to control the sawing speed; accordingly, this represents the greatest competitive disadvantage of current machinery and should be exploited. It is recommended that HBD Venture No 7 (Pty) Ltd set the selling price between R20 001 and R30 000; this will place the product within the budget of the majority of potential buyers. Furthermore, it provides an indication of the amount of money that can be safely spent on engineering the chosen features into the machine so as to ensure a healthy profit margin.

The third research objective is to determine the most effective conduits for marketing communications in order to generate product awareness and promote the technological innovation. The findings suggest that personal sales calls should represent the impetus of the marketing communications efforts. They should also be supplemented by efforts to improve word of mouth and by article/editorial content in trade publications.

The fourth research objective is to determine the market potential for the technological innovation at various possible selling price ranges. Findings suggest that HBD Venture No 7 (Pty) Ltd can expect to sell 34 completed machines in a R20 001-R30 000 price range to a random sample of 17 diamond cutters and polishers. The minimum credit period required by a respondent in order to pay for the purchase is six months.

The final objective of the research is to determine the radicalness of the technological innovation's impact and its effect on the organisational adoption thereof. The technological innovation was perceived by the sample under study as being semi-radical. This bodes well for HBD Venture No 7 (Pty) Ltd as theory states that organisational decision-makers appear to be comfortable with and willing to adopt semi-radical new products.

7.8 LIMITATIONS OF THE STUDY

The greatest limitation of the study is the very low response rate achieved. Cobanoglu, Warde & Moreo (2001) have found that higher response rates for surveys increase the confidence that the sample accurately reflects the true population and that the findings can be generalised. As a result, the low response rate achieved for this empirical research diminishes the credibility and generalisability of the findings.

Another limitation of the study is the fact that the response database consisted mainly of small non-Sightholding cutters and polishers, which skews the applicability of the findings towards this portion of the industry. None of the large Sightholders to which questionnaires were sent chose to participate in the study. This is unfortunate, given the sizeable efforts that Government is expending in order to uplift and improve the industry. It was hoped that industry members would display more interest in an initiative designed to contribute towards improved diamond beneficiation in South Africa. According to Table 3, the total domestic and international sales of diamonds by local cutters and polishers amounted to 719 758.23 carats for 2003. By viewing the histogram of respondents' annual polished diamond output in Figure 38, it becomes evident that the cutters and polishers that answered the questionnaires were very small in terms of diamond output and constitute a very small portion of the industry in terms of total industry carat output.

7.9 AREAS FOR FUTURE RESEARCH

The following areas could prove interesting for further research concerning the marketing of a technological innovation to the South African diamond beneficiation

industry:

- Given a larger research budget, the measuring instrument could be reapplied to the South African diamond cutting and polishing industry utilising a drop and collect survey (DCS) method employing direct face-to-face contact with respondents. The DCS method has been shown to enhance response rates and resulting study validity among sub-Saharan African organisations, and should allow the researcher to obtain responses from Sightholders and other larger operators.
- Adopt a purely qualitative research approach using qualitative methods of gaining access to research subjects (e.g. snowball sampling), qualitative methods of data collection (e.g. participation observation, semi-structured interviewing) and qualitative methods of analysis (e.g. analytical induction, narrative analysis) in order to describe and understand the environment and needs of South African diamond cutters and polishers.
- Conduct an international study in order to determine the market potential for an innovative diamond sawing and polishing machine in various key diamond processing hubs worldwide.
- Set up a longitudinal panel study using the same sample of diamond cutters and polishers in order to examine how their perceptions of an innovative sawing and polishing machine change over time as the rough diamond supply environment is transformed through the new legislation.

7.10 CONCLUSIONS

The five research objectives of the empirical study set out in chapter six have been attended to and the findings of this study will serve to assist South African innovators of new and improved diamond beneficiation machinery (specifically the technologically innovative diamond sawing and polishing machine being designed by HBD Venture No 7 (Pty) Ltd) to achieve a successful product design as well as commercial marketing success by enhancing their understanding of the perceptions, needs and purchase intentions of the population of South African diamond cutting and polishing firms that influence the adoption and diffusion of an innovative technology.

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Appendix A

ZA000251

HS CODE	Carat mass	Value (US$)
7102.21		
7102.31		

Number of Parcels _____

_____
Date of Issue

_____
Date of Expiry

_____
Name of Exporter

_____
Signature of Inspector

_____
Name of Importer

Exporter's Copy

SABN

REPUBLIC OF SOUTH AFRICA

ZA000251

SOUTH AFRICAN DIAMOND BOARD

KIMBERLEY PROCESS CERTIFICATE

Issued in terms of Regulation 1(1)(f) of the Diamonds Act, 1986 (Act No. 56 of 1986)

HS CODE	Carat mass	Value (US$)
7102.21		
7102.31		

Country of origin _____

Number of Parcels _____ Stamp of SA Diamond Board

It is hereby certified that the unpolished diamonds in this consignment have been handled in accordance with the provisions of the Kimberley Process International Certification Scheme for unpolished diamonds

_____ _____ Address of Importer

Date of Issue Name of Exporter

_____ _____ _____

Date of Expiry Name of Importer _____

Signature of Registering Officer _____

SABN

ZA000251

_____
Name of Importing authority

_____
Date of Receipt by Importing authority

_____
Signature of Importing official

Stamp of Importing authority

Import Confirmation: This is to certify that the unpolished diamonds accompanied by this Certificate were imported into _____ and verified in compliance with the Kimberley Process Certification Scheme for Unpolished Diamonds.

Copy of certificate to accompany Confirmation.

SABN

Source: SADB, 2004: 23.

Appendix B

S.A. DIAMOND BOARD

Kimberley Process Certification Scheme

Number of Kimberley Process Certificates issued for the calender year 2003

Table 4

COUNTRIES	Exports	Re-exports	TOTAL EXPORTS	Imports	Re-imports	TOTAL IMPORTS
Angola	0	1	1	0	0	0
Australia	0	1	1	2	1	3
Belgium*	614	17	631	59	11	70
Botswana	1	4	5	1	0	1
Canada	4	1	5	3	0	3
China	1	1	2	0	0	0
Congo	0	1	1	2	0	2
Cyprus	0	1	1	0	0	0
D.R.C. Congo	0	3	3	8	0	8
Dubai	14	0	14	4	0	4
Germany	2	0	2	0	0	0
Guinea	0	2	2	2	0	2
Hong-Kong	35	0	35	0	0	0
India	20	0	20	0	0	0
Israel*	440	20	460	78	36	114
Mauritius	14	2	16	0	4	4
Namibia	3	1	4	0	0	0
Russia	5	1	6	0	0	0
Sierra-Leone	0	1	1	0	0	0
Singapore	1	0	1	0	0	0
Switzerland	34	2	36	2	2	4
Tanzania	0	2	2	5	0	5
Ukraine	3	0	3	0	0	0
United Arab Emirates	5	0	5	0	0	0
United Kingdom	35	7	42	40	2	42
United States	85	11	96	18	8	26
France	0	0	0	1	0	1
Ireland	0	0	0	35	0	35
Lesotho	0	0	0	3	0	3
Korea	0	0	0	7	0	7
GRAND TOTAL	**1,316**	**79**	**1,395**	**270**	**64**	**334**

* Belgium and Israel are the main importers of unpolished diamonds from South Africa and account for 45% and 32% respectively of the overall total Kimberley Process Certificates issued by the Board.

Source: SADB, 2004: 21.

Appendix C

TABLE 1 – ESTIMATED[e] WORLD ROUGH DIAMOND PRODUCTION[+], 2003

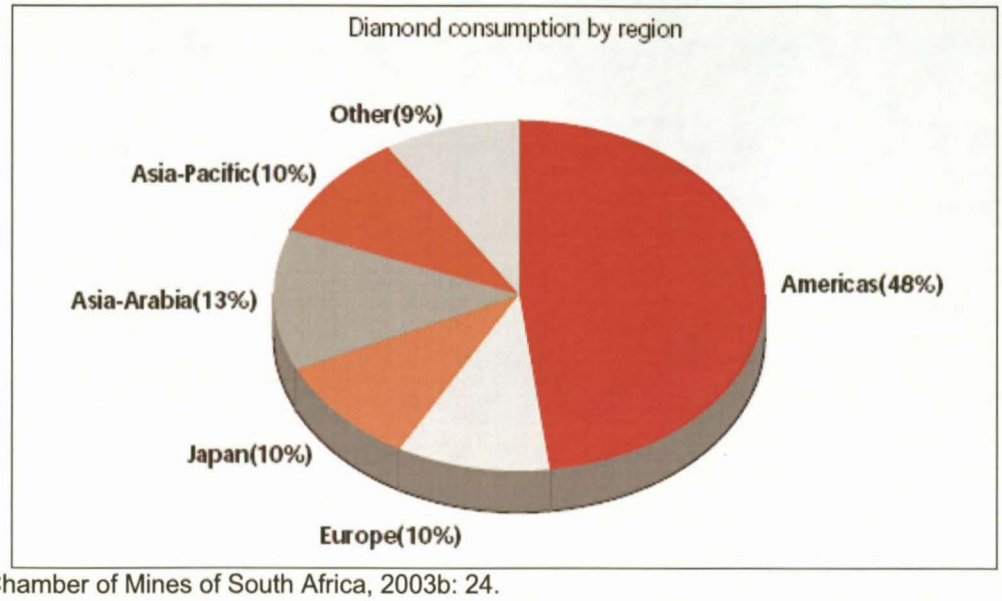
COUNTRY	PRODUCTION				
	MASS			VALUE	
	CARATS	%	RANK	$ MILLION	RANK
Australia	31 000 000	22,1	1	400	8
Botswana	30 412 155	21,7	2	2 300	1
DR of Congo[e]	25 000 000	17,9	3	600	6
Russia[e]	19 000 000	13,6	4	1 640	2
South Africa[e]	12 800 000	9,1	5	950	4
Canada	11 200 000	8,0	6	1 300	3
Angola[e]	5 700 000	4,1	7	900	5
Namibia	1 460 000	1,0	8	450	7
Ghana[e]	950 000	0,7	9	25	13
South America[e]	750 000	0,5	10	70	10
Guinea[e]	400 000	0,3	11	75	9
Central African Republic[e]	350 000	0,3	12	55	12
Sierra Leone[e]	300 000	0,2	13	70	11
Tanzania	166 263	0,1	14	20	14
China[e]	150 000	0,1	15	15	15
Subtotal	139 610 418		99,7	8 870	
Other*	389 582	0,3		30	
TOTAL	***140 000 000***	***100***		***8 900***	

Sources: [e] *Estimates by the author, company reports and Natural Resources Canada*

Notes: *All production values, including that for South Africa are estimates*
[+] *Gem and industrial diamonds*
[*] *Ivory Coast, India, Lesotho and un-sourced artisanal production from Africa*

Source: DME, 2004b: 33.

Appendix D



Source: Chamber of Mines of South Africa, 2003b: 24.

Appendix E

REPUBLIC OF SOUTH AFRICA

PRECIOUS METALS AND DIAMONDS
GENERAL AMENDMENT BILL

(As introduced in the National Assembly as a section 75-Bill; explanatory summary of Bill published in Government Gazette No. of) (The English text is the official text of the Bill)

(MINISTER OF MINERALS AND ENERGY)

[B - 2005]

GENERAL EXPLANATORY NOTE:

[ ] Words in bold type in square brackets indicate omissions from existing enactments.

_____ Words underlined with a solid line indicate insertions in existing enactments.

BILL

To amend the Mining Rights Act 20 of 1967 and the Diamonds Act 56 of 1986 so as to provide for the rationalization of the regulation of matters pertaining to the downstream development of precious metals and diamonds; to promote equitable access to, and local beneficiation of South Africa's precious metals and diamonds and to provide for matters connected therewith.

BE IT ENACTED by the Parliament of the Republic of South Africa, as follows:—

18

Amendments to the Diamonds Act 56 of 1986:

Amendment of section 1 of the Diamonds Act 56 of 1986

22. Section 1 of the Diamonds Act, 1986 is hereby amended-

(a) by the insertion of the following definition after the definition of "business premises"

"'chief executive officer' means the chief executive officer of the Regulator appointed in terms of section 14 (1)".

(b) by the insertion of the following definition after the definition of "dealer":

"'diamond beneficiation licence' means a licence for the cutting, polishing or setting in tools, or setting in jewellery not exceeding ½ a carat of unpolished diamonds'";

A 'diamond beneficiator' is a person licenced in terms of section 26 of this Act;

A 'Diamond Trading House' is the premises at which the holder of a Diamond Trading House licence may facilitate local buying and selling of unpolished diamonds;

'Diamond Exchange and Export Centre' is as contemplated in section 26A1"; and

Diamond Industry means any individual or association involved in the production, selling, buying, dealing, jewellery making, tool-setting import and export of diamonds locally or internationally.

(c) by the deletion of the definitions of the words 'diamond exchange', 'cutter', 'licence', 'licensee' 'toolmaker' and 'executive officer'

(d) by the addition of the following definition after the definition of 'inspector:-

"Kimberly Process' means the process defined in the Regulations promulgated under section 95 of the Act and published under Government Notice No. R.1361 of 1 November 2002".

(e) by the substitution for the definition of Minister of the following definition:

'Minister' means the Minister of Minerals and Energy **[Affairs and Public Enterprises]**;

(f) by the substitution for the definition of polished diamond of the following definition-

"'polished diamond' means a diamond which has, in accordance with the requisites of its class or form, been subjected to so many processes of polishing **[that it is in the opinion of the Board a polished diamond;]** as is prescribed by regulation and includes unpolished diamonds not exceeding half a carat set in jewellery as contemplated in section 26 of this Act".

Substitution of the expression 'executive officer'

23. The expression 'executive officer' is substituted for the expression 'chief executive officer' wherever it appears in the Act.

Addition of section 2A after section 2 of the Act 56 of 1986

24. Section 2A is hereby added after section 2

"2A In considering applications for any of the licences or permits provided for in this Act, the Regulator-

(a) must have regard to the orderly promotion of, equitable access to, and local beneficiation of South Africa's diamonds."

(b) may have regard to the requirements of the broad based socio economic empowerment charter as espoused in the mining charter developed in terms of section 100 of the Minerals and Petroleum Resources Development Act ."

Deletion of sections 3 to 13 of Act 56 of 1986

25. Sections 3 to 13 of the Act 56 of 1986 are herby deleted.

Addition of section 13A after section 13 of the Act 56 of 1986

26. Section 13A is hereby added after section 13

" Establishment of South African Diamond Regulator.

There is hereby established a Regulator to be known as the South African Diamond Regulator and which shall be a juristic person."

Addition of section 13B after section 13A of the Act 56 of 1986

27. Section 13B is hereby added after section 13A

The objects of the Regulator shall be –

(a) to implement, administer and control all matters relating to the exploitation, trade, local beneficiation and export of diamonds;

(b) to administer the Kimberly Process Certification Scheme; and

(c) to perform such other functions as may be expedient for the Regulator to achieve their functions.

Addition of section 13C after section 13B of the Act 56 of 1986

28. Section 13C is hereby added-

General functions of the South African Diamond Regulator shall include:

(a) developing implementation strategies and guidelines for the strategic issues or matters provided for in the Act;

(b) implementing and controlling all such strategies and guidelines;

(c) ensuring the performance of the core functions of the Diamond Regulator as provided for in this Act;

(d) administering a prescribed Kimberley Process Certification Scheme for unpolished diamonds.

(e) entering into any agreement with any person, including the State, for the performance of any particular act or particular work or the rendering of particular services;

(f) providing insurance cover for the Regulator against any loss, damage, risk or liability the Regulator may suffer or incur;

(g) in general perform such acts or establish such structures or legal entities as may be necessary or expedient for the achievement of its objects and the provisions of this Act";

Addition of section 13D after section 13C of the Act 56 of 1986

29. Section 13 D is hereby added-

"13D (1)The Executive Officer shall establish an executive committee which shall consist of the Chief executive officer and senior officials in the service of the Regulator

(2)The functions of the executive committee shall be to ensure the performance of the functions of the Regulator as provided for in the

Act and that the regulations and guidelines are developed and implemented.

The Chief Executive Officer shall be the Chairman of the Executive Committee."

Amendment of section 14 of Act 56 of 1986

30. Section 14 of the Diamonds Act, 1986 is hereby substituted-

"(1) The work **[incidental to the performance of the functions]** of the **[Board]** Regulator shall, **[subject to the directions of the Board]**, be performed by a**[n]** Chief executive officer appointed by the Minister **[after consultation with the Board]** on such conditions of service and at such remuneration and service benefits as the Minister may determine, and the Chief executive officer shall be assisted in the performance of his functions by-

(a) persons appointed by the **[Board]** Regulator on such conditions of service and at such remuneration, allowances, bonuses, subsidies, pension and other service benefits as the [**Board**] Regulator may, after having obtained such professional advice as it may deem fit, with the concurrence of the Minister determine; and

(b) officers or employees placed at the disposal of the **[Board]** Regulator under section 14 (3) (a) of the Public Service Act, 1984 (Act 111 of 1984).

[(2) The Board shall compensate the State for every payment made by the State in accordance with a condition of service applicable in respect of an officer or employee referred to in subsection (1) (b).]

(3) For the purposes of this Act, an officer or employee referred to in subsection (1) (b) shall be deemed to be a person in the service of the **[Board]** Regulator.

(4) Whenever the chief executive officer is for any reason unable to perform his functions, the **[chairman of the Board]** Minister may designate a person in the service of the [**Board**] Regulator to act as chief executive officer until the chief executive officer is able to resume his functions.

Amendment of section 16 of Act 56 of 1986

31. Section 16 of the Diamonds Act, 1986 is hereby substituted-

22

The funds of the **[Board]** Regulator shall consist of-

[(a) moneys obtained by virtue of the provisions of this Act];

(c) moneys which may accrue to the Board from any other source].

"1A moneys appropriated by parliament in terms of the Public Finance Management Act.

(2) The **[Board]** Regulator shall utilize its funds to defray the expenses incurred by the **[Board]** Regulator in the performance of its functions under this Act, but shall utilize any money or other property donated or bequeathed to the **[Board]** Regulator in accordance with the conditions of the donation or bequest concerned.

(3) The **[Board]** Regulator shall open an account with any institution registered as a bank in terms of the Banks Act, 1965 (Act 23 of 1965), and shall deposit in that account the moneys received by it in terms of subsection (1).

(4) The **[Board]** Regulator may invest any money received in terms of subsection 1A and not required for immediate use with the Public Investment Commissioners or such other institution as the Minister may determine.

Amendment of section 17 of Act 56 of 1986

32. Section 17 of the Diamonds Act, 1986 is hereby amended by the substitution for the expression "Board" of the expression "the Regulator" wherever it appears.

Amendment of section 18 of Act 56 of 1986

33. Section 18 of the Diamonds Act, 1986 is hereby amended by the substitution for paragraph (a) of the following paragraph:

"(a) he is a producer who has won or recovered that diamond from a mine as defined in section 1 of the **[Minerals Act, 1991]**, Mineral and Petroleum Resources Development Act 2002, Act 28 of 2002, in accordance with any **[licence]**, permit, **[lease]** right or other **[authority]** authorisation granted to him or her under the **[Minerals Act, 1991]** Mineral and Petroleum Resources Development Act, 2002, or which remains in force under **[section 47]** Schedule 2 of the said Act;".

Amendment of section 19 of Act 56 of 1986

34. Section 19 of the Diamonds Act, 1986 is hereby substituted

"(1) No person shall sell any unpolished diamond unless-

(a) he is a producer;
(b) he has manufactured that diamond, if it is a synthetic diamond; or

(c) he is a dealer; **[; or**

(d) he is the holder of a permit referred to in section 40 (1) (a) or (2).]

Amendment of section 20 of Act 56 of 1986

35. Section 20 of the Diamonds Act, 1986 is hereby substituted

"No person shall purchase any unpolished diamond unless-

(a)] he is a licensee; ; or

(b) he is the holder of a permit referred to in section **[40 (1) (b).]** 26 (e)."

Insertion of section 20A of Act 56 of 1986

36. Section 20A of the Diamonds Act, 1986 is hereby inserted-

"20A (1)No licencee may be assisted by non-licencee or permit-holder referred to in section 26 (e) during the viewing, purchasing or selling of unpolished diamonds at any place where unpolished diamonds are offered for sale in terms of this Act, except at a Diamond and Exchange and Export Centre.

(2) No holder of a Diamond Trading House referred to in section 26 (f) or any person authorised in terms of this Act to sell unpolished diamonds may allow the assistance prohibited in section 20A (1).

Amendment of section 22 of Act 56 of 1986

37. Section 22 of the Diamonds Act, 1986 is hereby amended-

(a) by the substitution for the expression "cutter, tool maker", wherever it appears of the expression "beneficiation licencee".

(b) by the substitution for the expression "Board", where it appears in paragraph (c) of the expression "Regulator"

24

Amendment of section 23 of Act 56 of 1986

38. Section 23 of the Diamonds Act, 1986 is hereby amended-

(a) by the substitution for the expression "cutter, tool maker", wherever it appears of the expression "beneficiation licencee".
(b) by the substitution for the expression "Board", where it appears in paragraph I of the expression "Regulator"

Amendment of section 24 of Act 56 of 1986

39. Section 24 of the Diamonds Act, 1986 is hereby substituted

"No person shall export any unpolished diamond from the Republic unless-

(a) he is a producer;

(b) he has manufactured that diamond, if it is a synthetic diamond; or

(c) he is a dealer; or

(d) he is the holder of a permit referred to in section **[40 (1) (a) or (c) or (2)** 26 (e).

Amendment of section 25 of Act 56 of 1986

40. Section 25 of the Diamonds Act, 1986 is hereby amended—

(a) by the substitution for subsection (1) of the following subsection:

"(1) Any person who by chance finds or picks up any unpolished diamond at any place where he or his employer is not permitted to prospect, dig or mine for diamonds in terms of the **[Minerals Act, 1991]** Mineral and Petroleum Resources Development Act, 2002, shall forthwith take that unpolished diamond to the nearest police station and deliver it to the member of the South African Police Service on duty who holds at least the rank of a sergeant";

(b) by the substitution for paragraph (a) of subsection (2) of the following paragraph:

"(a) is satisfied that a person is the owner of that unpolished diamond referred to in subsection (1) or is entitled to be in possession thereof, he shall deliver that unpolished diamond to such person; or";

(c) by the insertion of the word 'unpolished' before the word 'diamond' where it occurs in subsection (3); and

(d) by the insertion of the word 'unpolished' before the word 'diamond' wherever it appears in subsection (4).

Amendment of section 25A of Act 56 of 1986

41. Section 25A of the Diamonds Act, 1986 is hereby deleted. [search]

Amendment of section 26 of Act 56 of 1986

42. Section 26 of the Diamonds Act, 1986 is hereby amended –

(a) by the substitution for the expression "Board", where it appears in section 26 of the expression "Regulator"

(b) by the substitution for paragraph (a) of the following paragraph-

"(a) a diamond dealer's licence valid for a period not exceeding three years entitling the holder to carry on business as a buyer, seller, or importer or exporter of unpolished diamonds: Provided that unpolished diamonds intended for export must first be offered at a Diamond Exchange and Export Centre before being registered for export, and shall be subject to the export duty as contemplated in section 62 (2) of the Act".

(c) by the substitution for paragraph (b) of the following paragraph-

"(b) a diamond **[cutting]** beneficiation licence valid for a period not exceeding five years entitling the holder to polish diamonds and to set in jewellery a diamond not exceeding half a carat for the purpose of business or trade[;]: Provided that the Minister may from time to time determine by regulation, a percentage of unpolished diamonds that must be cut and polished locally and provided that any remaining percentage shall if exported be subject to export duty contemplated in section 62 (2) of the Act".

(d) by the substitution for the paragraph (c) of the following paragraph-

" (c) a diamond **[tool-making]** beneficiation licence valid for a period not exceeding five years entitling the holder to set unpolished diamonds in tools, implements or other articles or to crush or to alter those diamonds for the purpose of such setting or for the purpose of trade. Provided that the Minister may from time to time determine by regulation, a percentage of unpolished diamonds that must be set as aforesaid, locally and

provided that any remaining percentage shall if exported be subject to export duty contemplated in section 62 (2) of the Act".

(e) by the addition after paragraph (d) of the following paragraph-

"(e) a temporary diamond buyer's permit valid for a period not exceeding one week as prescribed by regulation entitling a non-South African citizen to buy unpolished diamonds from the Diamond Exchange and Export Centre and to register those unpolished diamonds for export as provided for by law: Provided that such unpolished diamonds shall be immediately registered for export and be subject to the export duty as contemplated in section 62 (2) of the Act.

(f) by the addition after paragraph (e) of the following paragraph-

"(f) a Diamond Trading House licence as prescribed by regulation, valid for a period not exceeding five years entitling the licensee to facilitate the buying and selling of unpolished diamonds locally on the approved premises as contemplated in section: Provided that the Regulator shall determine and annually review the total number of Diamond Trading House licences necessary in South Africa and provided that each of South Africa's nine Provinces shall be entitled to have at least one holder of such licence if the application requirements of this Act are complied with.

Amendment of sections 27, 28, 29, 30, 31, 32, 33, 34, 35, 37, 38, 39, 48, 49, 50, 51, 53, 54, up to 76, 78, 79, 80, 85, of Act 56 of 1986

43. Sections 27, 28, 29, 30, 31, 32, 33, 34, 35, 37, 38, 39, 48, 49, 50, 51, 53, 54, up to 76, 78, 79, 80, 85, are hereby amended by the substitution for the expression "Board", where it appears in the relevant sections of the expression "Regulator".

Amendment of section 32 of Act 56 of 1986

44. Section 32 of the Diamonds Act, 1986 is hereby deleted.

Amendment of section 36 of Act 56 of 1986

45. Section 36 of the Diamonds Act, 1986 is hereby amended by the substitution for the expression "14" of the expression "30.

Amendment of section 37 of Act 56 of 1986

46. by the substitution for subsection (1) (g) (i) of the following subsection:
" (i) has at any time been convicted of any offence other than an offence committed prior to 27 April 1994 associated with political objectives which in the opinion of the **[Board]** Regulator renders him unsuitable; or"

27

Amendment of section 39 of Act 56 of 1986

47. Section 39 is of the Diamonds Act, 1986 is hereby amended by the substitution for subsection (1) of the following subsection-

"(1) Any person aggrieved by a decision taken by the **[Board]** Regulator under **[a preceding provision of this Chapter]** this Act may, in the prescribed manner and within the prescribed period appeal against the decision to the Minister."

Deletion of sections 40, 41, 42 and 43 of Act 56 of 1986

48. Sections 40,41,42 and 43 of the Diamonds Act, 1986 are hereby deleted

Deletion of sections 44, 45, 46, and 47 of Act 56 of 1986

49. Sections 44, 45, 46, and 47 of the Diamonds Act, 1986 are hereby deleted.

Insertion of section 45A

50. Section 45A of the Diamonds Act, 1986 is hereby inserted after section 44.

"45A (1) In addition to the conditions under which licences are granted under this Act, the Minister may prescribe further conditions applicable to Diamond Trading Houses by regulation."

(2) No diamonds may be registered for export at and or exported from a Diamond Trading House."

Amendment of sections 44, 45, 46 and 47 of Act 56 of 1986

51. Sections 44, 45, 46 and 47 of the Diamonds Act, 1986 are hereby amended by the substitution for the expression "Diamond Exchange" of the expression "Diamond Trading House" wherever it appears in the relevant sections.

Amendment of section 48 of Act 56 of 1986

52. Section 48 of the Diamonds Act, 1986 is hereby amended-

(a) by the substitution for subsection (1) of the following subsection
"(1) No producer, manufacturer of synthetic diamonds [,] or dealer, **[or holder of a permit referred to in section 40 (1) (a) or (2)]** shall sell any unpolished diamond elsewhere than on-"

(b) by the substitution for paragraph (b) of subsection (1) of the following paragraph-

"(b) any premises [**registered**] licensed as a diamond **[exchange]** trading centre as referred to in section 49 in terms of this **[Chapter]** Act;

(c) by the substitution for subsection (2) of the following subsection-

"No licensee **[or holder of a permit referred to in section 40 (1) (b)]** shall receive or purchase any unpolished diamond elsewhere than on-"

(d) by the insertion of paragraph (bA) in subsection (1) after paragraph (b)

"(bA) Any Diamond Exchange and Export Centre established by the Regulator in terms of this Act.

(e) by the substitution for paragraph (b) of subsection (2) of the following paragraph-

"(b) any premises [**registered**] licenced as a diamond **[exchange]** trading centre in terms of this Chapter;

(f) by the insertion of paragraph (bA) in subsection (2) after paragraph (b)

"(bA) Any Diamond Exchange and Export Centre established by the Regulator in terms of this Act."

Insertion of section 48A

53. Section 48A of the Diamonds Act, 1986 is hereby inserted after section 48.

"(48A) Save as is provided for under section 77A all unpolished diamonds intended for export purposes must first be offered at a Diamond Exchange and Export Centre in the prescribed manner".

Amendment of section 50 of Act 56 of 1986

54. Section 50 of the Diamonds Act, 1986 is hereby amended by the substitution for the expressions "cutter, toolmaker" and "cutter" of the expression "beneficiator", wherever they appear in section 50 (1), (2) and (3).

Deletion of section 51 of Act 56 of 1986

55. Section 51 of Act 56 of the Diamond Act, 1986 is hereby deleted.

Insertion of section 52A of Act 56 of 1986

56. Section 52A of Act 56 of the Diamond Act, 1986 is hereby inserted-

(1) No authorised person referred to in section 52 may be assisted by no-licencee or permit-holder referred to in section 26 (e) during the viewing, purchasing or selling of unpolished diamonds at any place where unpolished diamonds are offered for sale in terms of this Act, except at a Diamond and Exchange and Export Centre.

(2) No holder of a Diamond Trading House referred to in section 26 (f) or any person authorised in terms of this Act to sell unpolished diamonds may allow the assistance prohibited in section 52A (1).

Amendment of section 56 of Act 56 of 1986

57. Section 56 of Act 56 of the Diamond Act, 1986 is hereby amended by the substitution for the expression "two" in subsection (2) of the expression "five".

Amendment of section 57 of Act 56 of 1986

58. Section 57 of Act 56 of the Diamond Act, 1986 is hereby amended-

(a) by the substitution for the expression "cutter or toolmaker" of the expression "or beneficiator" in subsection (1);
(b) by the substitution for the expression "two" of the expression "five" in subsection (3).

Amendment of section 58 of Act 56 of 1986

59. Section 58 of Act 56 of the Diamond Act, 1986 is hereby deleted

Amendment of section 59 of Act 56 of 1986

60. Section 59 of the Diamonds Act, 1986 is hereby deleted-

Amendment of section 60 of Act 56 of 1986

61. Section 60 of the Diamonds Act, 1986 is hereby amended by-

(a) the substitution of the expression "exporter" for the expression "person", and

(b) the insertion of the expression "unpolished" after the expression "that".

Amendment of section 61 of Act 56 of 1986

62. Section 61 of the Diamonds Act, 1986 is hereby amended—

(a) by the substitution of subsection (1) of the following subsection:

"(1) Any **[exporter]** person who desires to **[register]** export any unpolished diamond **[for export]** shall register that unpolished diamond at a prescribed Diamond Exchange and Export Centre and furnish the registering officer with a return on the prescribed form in respect of that unpolished diamond." And

(b) by the substitution for subsection (2) of the following subsection:

"(2) In the return furnished in terms of subsection (1) the **[exporter]** person exporting such unpolished diamond shall specify the value of the unpolished diamond as was offered by such person at the Diamond Exchange and Export Centre and declare that the value so specified is to the best of his knowledge and belief the fair market value of that unpolished diamond."

Amendment of section 62 of Act 56 of 1986

63. Section 62 of the Diamonds Act, 1986 is hereby amended-

(3) Subject to the exemptions as contemplated in **[the provisions of]** section**[s]** 63 **[and 64]**, the **[Board]** Regulator shall levy an export duty on every unpolished diamond exported from the Republic.

(4) The export duty referred to in subsection (1) shall be determined and provided for in a separate Act of Parliament **[shall amount to 15 per cent of the fair market value of an unpolished diamond in the Republic as at the date on which that diamond is registered for export in terms of this Chapter]**.

Amendment of section 63 of Act 56 of 1986

64. Section 63 of the Diamonds Act, 1986 is hereby amended-

(a) by the deletion of subparagraphs (i), (ii) and (iii) of paragraph (a) of subsection (1).[marginal, s.59, foreign, (only synthetic + discretion remain)].

(b) by the insertion of the following subparagraphs in paragraph (a) of subsection (1).

"(iA) that unpolished diamond has been allocated or offered to a local beneficiator pursuant to the provisions of section 77A.

(c) by the substitution for paragraph (c) of the following paragraph:

"(c) if the Minister with the concurrence of the Minister of Finance, determines that it **[is]** may be so exempted."

(d) by the substitution for the expression "exporter concerned" in subsection (2) with the expression "person exporting"

Deletion of section 64 of Act 56 of 1986

65. Section 64 of the Diamonds Act, 1986 is hereby deleted.

Amendment of section 65 of Act 56 of 1986

66. Section 65 of the Diamonds Act, 1986 is hereby amended—

(a) by the deletion of the word "may" in subsection (1).

(b) by the substitution for paragraph (a) of subsection (1) of the following paragraph:

"(a) must examine any unpolished diamond registered for export in terms of this **[Chapter]** Act and verify any particulars furnished in respect thereof; and"

(c) by the substitution for paragraph (a) of the following subsection:

"(b) may retain such diamond in order to have the value thereof assessed in the prescribed manner or by any person designated by the **[Board]** Regulator for that particular valuation or for valuation in general."

(d) by the substitution for subsection (2) of the following subsection:

"(2) The person who has assessed the value of an unpolished diamond referred to in subsection (1) (b), shall furnish the registering officer with a certificate in which he specifies the value of that unpolished diamond and the name of a person who is prepared to purchase that unpolished diamond at the value so specified."; and

(e) by the substitution for the expression "exporter" of the following expression " person exporting"

Amendment of section 66 of Act 56 of 1986

67. Section 66 of the Diamonds Act, 1986 is hereby amended by the substitution for the expression "chapter" in subsection (3) of the following expression " Act".

Amendment of section 67 of Act 56 of 1986

68. Section 67 of the Diamonds Act, 1986 is hereby amended by the substitution for the expression "exporter concerned" in subsection (2) of the following expression " person exporting".

Amendment of section 68 of Act 56 of 1986

69. Section 68 of the Diamonds Act, 1986 is hereby amended-

(a) by the substitution for subsection (1) of the following subsection-

"(1) Any export duty levied or any fine imposed in terms of this **[Chapter]** Act shall be paid by the **[exporter concerned]** person exporting, to the Regulator for the benefit of the State Revenue Fund.

(b) by the substitution for subsection (2) of the following subsection-

"(2) The Regulator shall issue to the **exporter** person exporting, a receipt in respect of any export duty or fine paid by the exporter."

Amendment of section 69 of Act 56 of 1986

70. Section 69 of the Diamonds Act, 1986 is hereby amended-

(a) by the substitution of the expression" Chapter" with the word "Act" and the word "exporter" with the expression "person exporting" wherever they appear in subsection (1).

(b) by the insertion of the expression 'unpolished' before the word 'diamond' wherever it appears in paragraphs (a), (b), (d) and (e) of subsection (1).

(c) by the deletion of the expression "certificate of deferment or a receipt for the payment of export duty" in paragraph (b) of subsection (1).

(d) by the insertion of paragraph (eA) after paragraph (e) in subsection (1)

"(eA) the prescribed 'Kimberley Process Certificate' accompanies the packet to be so released for export."

Insertion of section 69A in Act 56 of 1986

71. Section 69A is hereby inserted after section 69.

"69A (1) Within three months from the date on which any diamond has been released for export in terms of section 69, the person who has exported that unpolished diamond must submit to the Regulator certified documentation from the South African Reserve Bank as proof that the

proceeds of the relevant transaction have been repatriated to South Africa.

(2) If the certified documentation is not submitted as required in subsection (1), or it is found from the documentation submitted in terms of subsection (1) or any other source, that the value at which that unpolished diamond was exported exceeds the value at which that unpolished diamond was sold, the export duty referred to in section 62 (2) shall be payable on the value at which it was registered for export notwithstanding the exemption granted in terms of section 63."

Amendment of sections 70, 72, 73, 76, in Act 56 of 1986

72. Sections 70, 72, 73, and 76 are hereby amended by the substitution for the word "Chapter" of the word "Act" wherever it appears in those sections.

Insertion of section 77A in Act 56 of 1986

73. Section 77A is hereby inserted-

"77A In order to promote regular supply and equitable access to, and local beneficiation of unpolished diamonds, the Regulator

(1) must with the approval of the Minister determine the terms and conditions under which all producers, associations or organisations of producers offer unpolished diamonds to local beneficiators. In determining the terms and conditions in subsection (1), the Regulator must after consultation with the Director-General, within six months from the commencement of this Act, and thereafter annually identify and categorise producers, associations or organisations of producers, and annually and after investigation and consultation with the local diamond industry, take into consideration the amount of South Africa's rough diamond production; the quality, quantity and class of each producers' annual production and its suitability to local beneficiation; the local demand of unpolished diamonds; classes of unpolished diamonds economically cuttable locally; and any other relevant factors: Provided that the Regulator may exempt from export duty, the local production determined not economical to polish locally.

(2) may enter into a partnership with a producer or class of producers or licencees.

(3) may establish a juristic person/s which also shall have the power to enter into agreements with any producers, associations or organisations of producers and to perform any other related functions.

34

Amendment of section 83 in Act 56 of 1986

74. Section 83 is hereby amended-

(a) by the insertion in for paragraph (a) of the following expression '20A' after the expression 'section';

(b) by the deletion of the expressions "44" in paragraph (b);

(c) by the substitution for paragraph (d) of the following paragraph-

"(d) fails to comply with a provision of section 26 (f) 36 (1), 38 (2), 48(b)(A), **[51]**, 52A, 56 or 57;"

(d) by the deletion of the expression "43 (3)" in paragraph ((e).

Amendment of section 84 in Act 56 of 1986

75. Section 84 is hereby amended-

(e) by the substitution for paragraph (a) of the following paragraph-

"contravenes a provision of section"45A, 48A, 60**[;]** or 69A"

(f) by the deletion of the expression 64(3) in paragraph (d)

(g) by the deletion of the expressions "43" in paragraph (e),

Amendment of section 86 in Act 56 of 1986

76. Section 86 is hereby amended-

(a) by the deletion of the expressions "or permit" after the word licence in paragraph (c) (i).

(b) by the insertion of subsection (bA)-

"with intent to defraud sells any synthetic diamonds without disclosing that it is a synthetic diamond".

Amendment of section 93, 94 in Act 56 of 1986

77. Section 88 is hereby amended by the deletion of the expression "permit" wherever it appears under 88.

Deletion of section 93 of Act 56 of 1986 [Levies]

78. Section 93 is hereby deleted.

Amendment of section 94, in Act 56 of 1986

79. Section 94 is hereby amended by the substitution for the expression "Board" wherever it appears of the expression "Regulator".

Amendment of section 95 of Act 56of 1986 [Regulations]

80. Section is 95 is hereby amended-

(a) by the insertion of the following paragraph (aA) before paragraph (A)

"the guidelines and implementation of broad based socio economic empowerment".

(b) by the substitution for the expression "Board" in paragraph (i) of the expression 'Regulator"

(c) by the insertion of the expression "or Regulator's " in paragraph (j) after the expression 'Board's';

(d) by the substitution for subsection (2) of the following subsection'

"(2) Regulations made under subsection (1) may prescribe penalties for any contravention thereof or failure to comply therewith, **[not exceeding a fine of R2 500 or imprisonment for a period of six months.]**"

Amendment of section 97 of Act 56of 1986

81. Section is 95 is hereby amended by the substitution for the expression 'Board' of the expression 'Regulator' in paragraph (a) of subsection (2).

Amendment of section 98 of Act 56of 1986

82. Section is 98 is hereby amended by the deletion of subsections (4) and (5).

Addition of the transitional provisions

83. Section 98A to 98D are hereby added as transitional provisions-

"98A (1) Any application for a diamond dealer licence, diamond cutting licence, diamond tool making licence, or a researcher's licence in terms of 26 or an application for a permit lodged in terms of section 40 for permit but not finalised before1st April 2005 must be regarded as having been lodged after 1st April 2005.

(2) Any application for the registration of premises as a diamond exchange lodged in terms of section 45 but not finalised before 1st **April 2005** must be regarded as having been lodged after 1st **April 2005** in terms of section 26 (f) of this Act.

98B (1)Any certificate, permit, licence, exemptions or any other form of authorisation issued before **1st April 2005** continues in force for a period not exceeding two years as from **1st April 2005** subject to the terms and conditions under which it was granted or issued or was deemed to have been granted or issued.

(2) Any person who wishes to continue any activity in relation to which a certificate, permit, licence or any other form of authorisation issued under this Act has lapsed in accordance with subsection 1 above may apply for a relevant certificate, permit or licence or authorisation provided for in this Act.

(3) Any application referred to in subsection (2) lodged at least 30 days before the end of two years referred to in subsection (1) above but not finalised by **1st April 2005** shall remain valid for a period of no more than six months within which it must be granted or rejected.

98C (1) Any premises registered as a diamond exchange before **1st April 2005** will remain registered as such for a period not exceeding one year.

(2) Within the period contemplated in subsection (1), an application may for made in the prescribed manner to the Regulator in terms of section 26 (f) for the licencing of such diamond exchange as a Diamond Trading House.

98D(1) Any agreement entered into between the Regulator and any producer, dealer or any association or organization of producers or dealers in order to ensure a regular supply of unpolished diamonds to cutters or tool-makers, and which is in force by **1st April 2005**, shall remain in force for a period not exceeding one year as from **1st April 2005.**

(2) Within one year as from 1st April 2005, the Regulator shall in accordance with section77A determine terms and conditions under which all producers shall promote local regular supply.

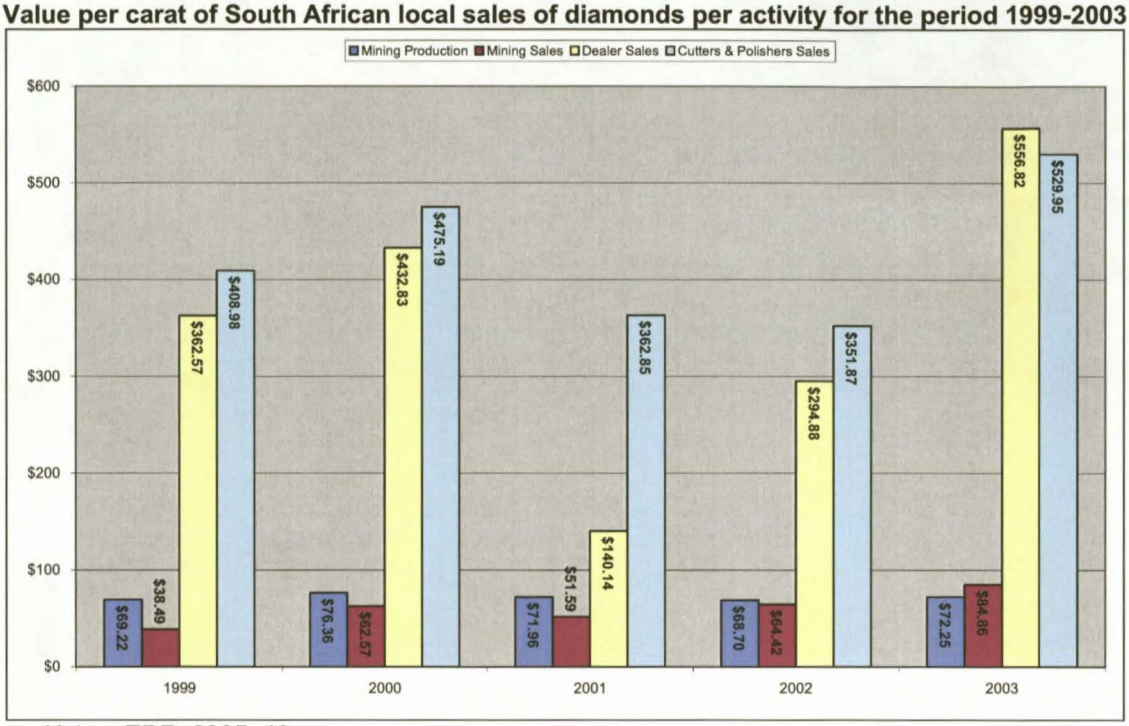
Short title and commencement

84. This Act is called the Precious Metals and Diamonds General Amendment Act, 2005 and comes into operation on a date to be fixed by the President by proclamation in the Gazette.

Source: DME, 2005.

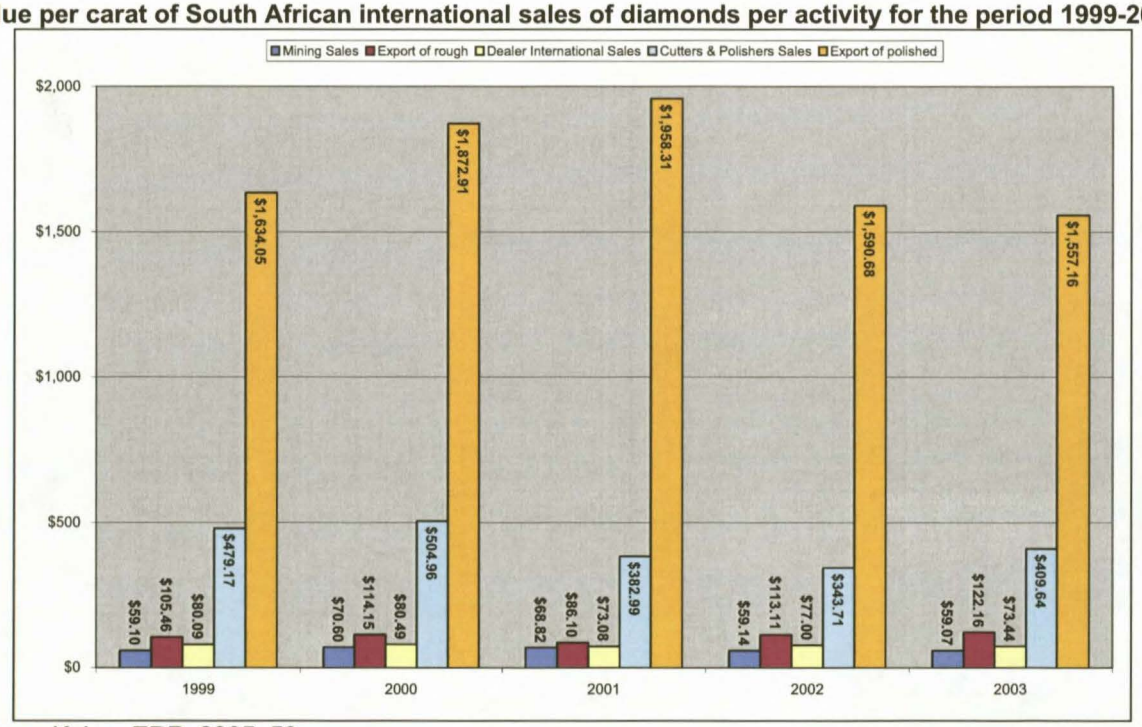
Appendix F

Value per carat of South African local sales of diamonds per activity for the period 1999-2003



Source: Kaiser EDP, 2005: 49.

Value per carat of South African international sales of diamonds per activity for the period 1999-2003



Source: Kaiser EDP, 2005: 50.

Appendix G

Definition of a cut diamond - the 4 C's

A diamond's beauty, rarity, and price depend on the interplay of all the 4Cs - cut, clarity, carat, and color.

Colour

Colour depends on factors such as trace elements in the chemical structure of the diamond, plastic deformation caused by pressure and temperature, and other factors such as the presence of radio-active minerals during deposition. Varying levels of nitrogen causes colours ranging from white, or colourless, to yellow.

Diamonds are typically graded for colour on an alphabetical scale: D-F colourless, G-J near colourless, K-M faint yellow, N-P very light yellow, and S-Z light yellow.

D	E	F	G
Exeptional White +	Exeptional White	Rare White +	Rare White

Clarity

Clarity refers to the total number, size, placement and nature of inclusions and/or surface irregularities. Flawless diamonds are free of inclusions when viewed under 10- power magnification. Internally flawless diamonds are those without any internal inclusions. Several grading scales are used but, in general, diamonds with extremely small inclusions are referred to as WS-1 and WS-2. VS-1 and VS-2 possess small inclusions, IS-1 and IS-2 have inclusions that can be seen easily under 10-power magnification but are not visible to the naked eye. If the inclusion is visible to the naked eye, it is referred to as I-1, 1-2 or 1-3.

VVS2	VS1	VS2	SI1

Carat

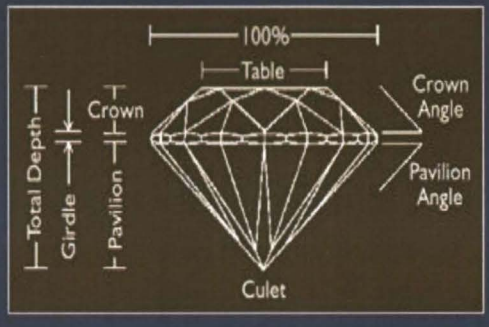
Carat is the measure of the Weight of a diamond. The carat is a standard metric weight of 0,2 grams or 1/142 of a standard ounce. Conventionally, each carat is divided into 100 points with, for example, a half carat being 50 points and written as 0,50. Carat is named after the carat seed.

0.05 Carat | 0.10 Carat | 0.25 Carat | 0.50 Carat | 0.75 Carat

Cut

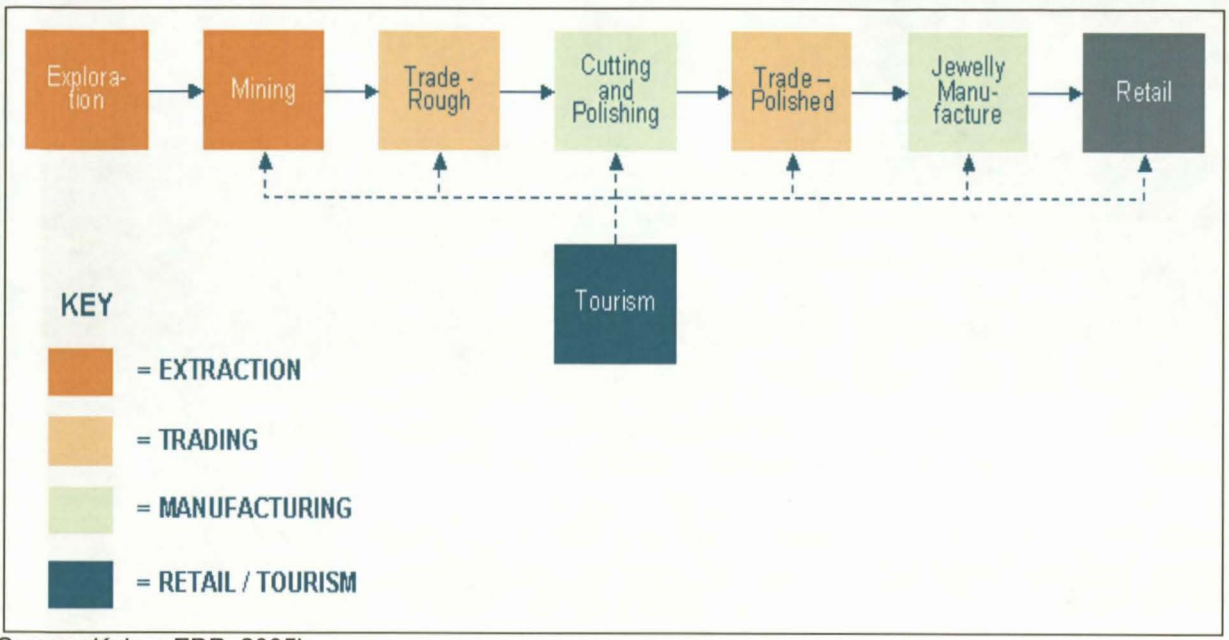
Cut refers to a number of parameters including:

- Depth Percentage - the relationship between the depth and the average diameter of a diamond;
- Table - the relationship between the flat, top surface and the average diameter;
- Girdle - the variance and relative width at minimum and maximum positions;
- Culet - the bottom surface of a diamond as viewed through the Table;
- Polish - the quality of the surface of a diamond; and
- Symmetry - the general balance or form of the diamond.



Source: SADB, n.d.

Appendix H



Source: Kaiser EDP, 2005b.

Appendix I

Universiteit Stellenbosch
Departement Ondernemingsbestuur
Fakulteit Ekonomiese en Bestuurswetenskappe

Ryan Tonkin
P.O. Box xxxx
Matieland
Stellenbosch
7602

xx-xx-2005

xxxxxxx Diamonds Pty (Ltd)
xxxxxxx xxxxxx xxxx
xxxxxxx St.
xxxxxxxxxxxx
xxxx

To whom it may concern

The diamond beneficiation industry in South Africa is currently undergoing considerable industrial, regulatory and legislative reform. The Precious Metals and Diamonds General Amendment Bill and other government initiatives will result in considerable growth in the industry with an increased number of diamond cutters and polishers becoming active in the country. In order to meet Government's call for increased processing of locally produced rough diamonds, diamond manufacturers like yourself will be continually looking for ways to improve production output and quality of polished diamonds with greater efficiency and effectiveness. In a recent diamond value-addition study commissioned by government to determine the potential for increasing diamond processing activity in South Africa, one of the 53 recommended intervention options for industry prosperity was the improvement of "*productivity within the cutting and polishing industry – referring to labour, management, processes and technology*".

Innovative, newly developed diamond sawing and polishing machines with significant advantages over current technologies may assist in achieving more effective and profitable operations. To assist in understanding your needs as a cutter and polisher of rough diamonds, I am conducting research that attempts to identify important sought-after attributes of a new sawing and polishing machine. This information will enable up-and-coming manufacturers of new diamond sawing and polishing machinery to meet your requirements and assist in improving polished diamond yields in your manufacturing facility.

Your company was chosen at random from a list of companies involved in diamond cutting and polishing. We hope that you will help us by completing and returning the enclosed questionnaire in the return-addressed envelope provided (**return postage is already paid**). Please note that your response is critically important to the success of this study.

All responses will be kept strictly confidential. The questionnaire has been coded to enable me to remove your company's name from the mailing list when your response has been received. In addition, please rest assured that neither your name nor that of your company/organisation will be published in the study results.

I would like to take this opportunity to thank you in advance for your kind assistance. If you have any queries or comments, please contact me on 082 xxx xxxx or alternatively via the Internet at xxxxxxxx@sun.ac.za (e-mail).

Yours sincerely

Ryan Tonkin
Masters of Commerce (MComm) student
Department of Business Management
University of Stellenbosch

Supervisor: Prof. N.S. Terblanche
Departmental Chairman
Department of Business Management
University of Stellenbosch

UNIVERSITEIT•STELLENBOSCH•UNIVERSITY
jou kennisvennoot•your knowledge partner
Faculty of Economic and Management Sciences
Department of Business Management

Dear diamond cutter and polisher

I need to ask your kind assistance. Two weeks ago I mailed you a copy of a questionnaire entitled "**Innovative diamond sawing and polishing machinery**". I am contacting you to ask you to kindly complete the questionnaire. If you have completed and returned it, please accept my sincere appreciation. The questionnaire is designed to gather information to assist in understanding your needs as a manufacturer of polished diamonds. I am attempting to identify important sought-after attributes of a new sawing and polishing machine to enable up-and-coming manufacturers of such machinery for the diamond industry to meet your requirements and assist in improving polished diamond yields and efficiency at your manufacturing facility.

Since your company was chosen at random, your participation is critical to the success of this study. The information you provide will be kept **strictly confidential**. The code on the questionnaire allows us to remove your company's name from future mailings. If you have any questions, please contact me on 082 xxx xxxx or xxxxxxxx@sun.ac.za. Thank you in advance for your kind participation.

Yours sincerely

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Survey Questionnaire

Innovative diamond sawing and polishing machinery

Innovative, newly developed **diamond sawing and polishing machines** with significant advantages over current technologies have the potential to assist in achieving more effective and profitable operations. However, in order to produce high quality innovative machinery, machine manufacturers must fully understand the needs of their customers. This questionnaire is designed to identify the factors that are important to users of this technology as well as the sought-after attributes of a new and improved diamond sawing and polishing machine. The need for higher efficiency and effectiveness is brought about by changes occurring in the marketplace. The diamond beneficiation industry in South Africa is currently undergoing considerable industrial, regulatory and legislative reform. In order to meet Government's call for increased processing of locally produced rough diamonds, diamond manufacturers like yourself will be continually looking for ways to improve production output and quality of polished diamonds with greater efficiency and effectiveness.

This study regards the generic manufacturing process of a polished diamond to consist of these 7 stages:

- Marking
- Sawing
- Cutting/Bruting
- Polishing/Blocking
- Rondisting
- Crossworking
- Brilliandeering

For the purposes of this research, an *innovative diamond sawing and polishing machine* is defined as:

one integrated and improved machine, **not** incorporating laser technology, that is able to accomplish both of the following tasks:

- Sawing of the rough diamond to separate it into two parts
- Blocking/polishing of the rough diamond to apply its first eight facets ("agtkant")

1) Do you currently have diamond sawing and polishing machinery in place? (please tick the appropriate box)

☐ No (please go no further and just return the questionnaire)

☐ Yes (please describe in the space below)

_____
_____
_____
_____
_____
_____

2) What is the most important factor that influenced your purchase decision when buying the machinery that you currently use for diamond sawing and polishing? (please tick **one** of the boxes below)

☐ Accuracy

☐ Reduced loss of raw material

☐ Speed of processing

☐ Purchase price

☐ Other (please specify) _____

_____

3) What would you estimate your average cost (incl. electricity, labour and all other overheads) per hour of sawing **and** blocking/polishing a rough diamond to be? (please specify in the box below)

R ☐ per hour

4) In terms of **time** taken to produce a polished diamond, what percentage of the total 7-stage manufacturing process described in the introduction would you consider sawing **and** blocking/polishing combined to consume? (please specify in the box below)

☐ %

5) In terms of **cost** incurred to produce a polished diamond, what percentage of the total 7-stage manufacturing process described in the introduction would you consider sawing **and** blocking/polishing combined to consume? (please specify in the box below)

☐ %

6) How important would the following factors be in your decision to purchase a new and improved diamond sawing and polishing machine? [please circle one number per statement that indicates your order of importance *(1=least important; 6=most important)*]

	Least Important					Most Important
a) Same amount of configuration/setting up time as current machines	1	2	3	4	5	6
b) Less vibration	1	2	3	4	5	6
c) Less wastage of the rough diamond	1	2	3	4	5	6
d) Increased sawing & polishing speed	1	2	3	4	5	6
e) Increased cutting accuracy	1	2	3	4	5	6
f) Less probability of the blade cutting skew	1	2	3	4	5	6
g) The motor (driving mechanism) will never burn out when the blade strikes a hard spot in the diamond	1	2	3	4	5	6
h) Ability to control the sawing speed electronically	1	2	3	4	5	6
i) Ability to efficiently collect the diamond powder by-product	1	2	3	4	5	6
j) Ability to both saw & polish diamonds using one machine	1	2	3	4	5	6
k) Ability to cut a range of new profiles/shapes	1	2	3	4	5	6
l) No need to be mounted on a heavy concrete table	1	2	3	4	5	6
m) Only requires semi-skilled labour	1	2	3	4	5	6
n) Does not need 3-phase electrical power	1	2	3	4	5	6
o) Ability to create industrial diamond cuts	1	2	3	4	5	6

7) To what extent do you believe that the following features of a new and improved diamond sawing and polishing machine would benefit your business? [please circle one number per statement that indicates your belief *(1 = No benefit; 6 = Huge benefit)*]

	No Benefit					Huge Benefit
a) Same amount of configuration/setting up time as current machines	1	2	3	4	5	6
b) Less vibration	1	2	3	4	5	6
c) Less wastage of the rough diamond	1	2	3	4	5	6
d) Increased sawing & polishing speed	1	2	3	4	5	6
e) Increased cutting accuracy	1	2	3	4	5	6
f) Less probability of the blade cutting skew	1	2	3	4	5	6
g) The motor (driving mechanism) will never burn out when the blade strikes a hard spot in the diamond	1	2	3	4	5	6
h) Ability to control the sawing speed electronically	1	2	3	4	5	6
i) Ability to efficiently collect the diamond powder by-product	1	2	3	4	5	6
j) Ability to both saw & polish diamonds using one machine	1	2	3	4	5	6
k) Ability to cut a range of new profiles/shapes	1	2	3	4	5	6
l) No need to be mounted on a heavy concrete table	1	2	3	4	5	6
m) Only requires semi-skilled labour	1	2	3	4	5	6
n) Does not need 3-phase electrical power	1	2	3	4	5	6
o) Ability to create industrial diamond cuts	1	2	3	4	5	6

8) What is the **maximum** amount that you would be willing to pay for one complete new and improved diamond sawing and polishing machine with all the features listed in question 6? (please tick the appropriate box. If you tick the first or last answer, please also specify the amount)

☐ Less than R20000.00 (please specify amount R_____)

☐ R20001.00 to R30000.00

☐ R30001.00 to R40000.00

☐ R40001.00 to R50000.00

☐ R50001.00 to R60000.00

☐ More than R60000.00 (please specify amount R_____)

9) For <u>each</u> of the following potential price ranges for the machine, **how many** new and improved diamond sawing and polishing machines would you expect to purchase during the <u>first</u> year that they arrive on the market? **(please specify the number of machines for <u>each</u> price range)**

<u>Price range</u>	<u>Number of machines</u>
Less than R20000.00	
R20001.00 to R30000.00	
R30001.00 to R40000.00	
R40001.00 to R50000.00	
R50001.00 to R60000.00	
More than R60000.00	

10) Using the price range you selected in question 8, what would you expect your payback period to be on the new and improved diamond sawing and polishing machine (under normal operating conditions)? (please specify the number of months in the box below)

[ ] months

11) Has a manufacturer of a new and improved diamond sawing and polishing machine ever approached you concerning the purchasing of such a machine? (please tick the appropriate box)

☐ Yes

☐ No

12) How often do companies within your industry contact you to enquire about high technology equipment you have or have not installed? (please tick the appropriate box)

☐ Never

☐ Sometimes

☐ Often

13) Does your company wish to be the industry leader in adopting new technology? (please tick the appropriate box)

☐ Yes

☐ No

14) Do you market your polished diamonds internationally? (please tick the appropriate box)

☐ Yes

☐ No

15) Is your company publicly or privately owned? (please tick the appropriate box)

☐ Public company

☐ Private company

16) If you were to consider purchasing a new and improved diamond sawing and polishing machine, how important would the following sources of information be in becoming aware of and learning about such a technology? [please circle one number per statement that indicates your order of importance *(1=least important; 6=most important)*]

	Least Important					Most Important
a) Advertisements	1	2	3	4	5	6
b) Trade shows	1	2	3	4	5	6
c) Visits to other factories	1	2	3	4	5	6
d) Personal sales calls from manufacturers	1	2	3	4	5	6
e) Meetings and symposiums	1	2	3	4	5	6
f) Trade publications	1	2	3	4	5	6
g) Scientific journals	1	2	3	4	5	6
h) Peer discussions (word of mouth)	1	2	3	4	5	6
i) Unsolicited sales literature	1	2	3	4	5	6
j) Internet websites	1	2	3	4	5	6
k) External consultants	1	2	3	4	5	6

17) Please indicate your level of satisfaction with your **current** diamond sawing and polishing machinery on the scale below by circling one number per statement *(1=very dissatisfied; 6=very satisfied)*

	Very Dissatisfied					Very Satisfied
a) The number of times the blade skews while sawing	1	2	3	4	5	6
b) Amount of vibration	1	2	3	4	5	6
c) Amount of wastage of the rough diamond	1	2	3	4	5	6
d) The number of times the motor burns out	1	2	3	4	5	6
e) The length of time it takes to configure/set up the machine	1	2	3	4	5	6
f) The sawing and polishing speed	1	2	3	4	5	6
g) The accuracy of cutting	1	2	3	4	5	6
h) Ability to control the sawing speed	1	2	3	4	5	6
i) Ability to collect the diamond powder by-product	1	2	3	4	5	6
j) The range of profiles/shapes that can be cut	1	2	3	4	5	6

18) Please indicate the degree to which you agree/disagree with the following statements regarding the new and improved diamond sawing and polishing machine which has the capabilities outlined in question 6 (please circle one number per statement)

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a) The product technology contains new knowledge	1	2	3	4	5
b) The product technology is a major technological advance	1	2	3	4	5
c) The product technology is an improvement over existing technology	1	2	3	4	5
d) The product technology will require a great amount of new learning for most adopters (i.e. high adoption and/or switching costs)	1	2	3	4	5
e) The product technology will not be compatible with established product technologies	1	2	3	4	5
f) The product technology has a strong relative advantage over established product technologies	1	2	3	4	5
g) The product technology will destroy existing competencies (user skills) of most adopters	1	2	3	4	5
h) The product technology will be the first of its kind to significantly advance the state-of-the-art	1	2	3	4	5
i) The product technology will establish a new dominant design or product standard	1	2	3	4	5
j) The product technology will result in the best combination of price and key performance parameters in the industry	1	2	3	4	5

19) What would you estimate your company's annual polished diamond output to be? (please specify the number of carats in the box below)

[ ] carats

20) What were the **total sales** (not gross profit i.e. before cost of sales) for your company in 2004? (please tick the appropriate box)

- ☐ Less than R1 000 000
- ☐ Between R1 000 001 and R2 000 000
- ☐ Between R2 000 001 and R3 000 000
- ☐ Between R3 000 001 and R4 000 000
- ☐ Between R4 000 001 and R5 000 000
- ☐ Between R5 000 001 and R6 000 000
- ☐ Between R6 000 001 and R7 000 000
- ☐ Between R8 000 001 and R9 000 000
- ☐ Between R9 000 001 and R10 000 000
- ☐ Greater than R10 000 000

21) How many full-time employees work for your company? (please specify in the box below)

[ ] full-time employees

22) Given that the technology is proven effective and available, what would **prevent** you from purchasing a new and improved diamond sawing and polishing machine? (list reasons below)

_____
_____
_____
_____
_____
_____

23) Ultimately, what would **convince** you to purchase a new and improved diamond sawing and polishing machine? (list reasons below)

_____
_____
_____
_____
_____
_____

Many thanks for your help! Please fold the completed questionnaire and return it by mail in the envelope provided. The postage is prepaid

Appendix J

Average Sightholder rough diamond purchase prices per cutting centre based upon non-industrial De Beers DTC sales for 2003

Cutting Centre	Sales (US$)	Carats	Average Price
Belgium*	$1,881,865,247.50	27,202,655	$69.17
India	$1,618,120,183.00	40,317,991	$40.13
Israel*	$885,383,565.00	2,735,563	$323.66
United States of America	$210,309,726.66	208,722	$1,007.60
Hong Kong	$63,440,010.00	485,414	$130.69
United Arab Emirates	$59,365,096.00	1,966,364	$30.19
Russia	$21,073,399.00	19,311	$1,091.26
Japan	$18,173,536.00	19,877	$914.30
Thailand	$12,294,012.00	65,401	$187.98
Gem Goods sold in London to all other cutting centres except South Africa	**$4,949,886,209.16**	**74,098,592**	**$66.80**
Gem Goods Sold to South African Sightholders	**$532,333,777.81**	**831,326**	**$640.34**
Total Gem Goods Sold	**$5,482,199,986.97**	**74,929,918**	**$73.16**

* The Belgian and Israeli averages are likely to be distorted by their outsourcing relationships with India and China

Source: Adapted from Kaiser EDP, 2005b: 5.

Appendix K

A comparison of estimated international diamond cutting and polishing costs per carat in 2003

	USA	Belgium	Israel	South Africa	Thailand	China	India
Total manufacturing cost (US$ per carat**)	100	40 – 60	30 -100	55 - 100	15	1.5 – 12	0.5 – 8
Average salary per month (US$)	4500	2500	1500 - 2000	709	120 - 135	50 - 120	80 - 140
Range of rough sizes	2 carats to 10.8 carats+	4 grains* to 10.8 carats+	3 grains to 10.8 carats+	3 grains to 10.8 carats+	8 grains to 10 carats	2 grains to 20 carats	0.01 carats to 10.8 carats+

* 1 grain = 0.25% of a carat (i.e. 50 milligrams)
** 1 carat = 200 milligrams

Source: Adapted from Kaiser EDP, 2005b: 37.