THE OUTSOURCING OF DENTAL PROSTHESES IN GAUTENG

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DECLARATION

This dissertation is my own work and has not been submitted in part, or in full, to any other university for any purpose. I have not plagiarised the work of anyone else in completing the requirements for this task. The research was conducted in Gauteng in fulfillment of the requirements of the degree of Master of Technology: Dental Technology in the Faculty of Health Sciences at the Durban University of Technology under the supervision of Mr. G H Bass and Dr. J E Harrison.

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ABSTRACT

This study examined the perceptions of South African dental laboratory owners, dental technicians and dentists so as to understand their opinions and experiences regarding the outsourcing of dental prostheses in the industry. The study explored the legislative position of the South African Dental Technicians Council (SADTC). In addition, the study sought the Dental Technicians Association of South Africa (DENTASA) opinion regarding legislation and outsourcing practices in the dental laboratory industry.

This is a post-positivist qualitative study conducted in the interpretive paradigm. The study was conducted in Gauteng as this province has the greatest concentration of technicians and dentists. Simple random sampling was used to select participants for individual semi-structured interviews. Interviews were conducted with three different groups of participants – laboratory owners, technicians and dentists. In addition, a representative of the SADTC and DENTASA, respectively, was interviewed. The data collected from interviews was analysed using thematic content analysis.

Findings generated from the study revealed that where dental laboratory services are outsourced, no formal contractual relationship exists between parties. Contracts are verbal.

The study concluded that the dental technology industry does not operate within clearly defined legal frameworks when outsourcing. It was established that offshore outsourcing occurs infrequently, therefore having minimal impact on the industry and labour market. Technicians interviewed failed to see the potential negative influence that enhanced outsourcing volumes could have on the labour market. The study established that domestic

outsourcing is widely practised and dental laboratories receive significant quantities of imported work.

The study briefly considered medical device legislation as the South African dental technician industry is reported to be required to comply with the International Standard of Operation (ISO 13485) which will legislate medical device legislation.

Dentists stated, confirming a widely held dental technology industry belief that they did not believe that they were sufficiently qualified to carry out laboratory procedures. The study revealed that technicians regularly consult with patients with the consent of dentists. This is, currently, an illegal practice.

Disclosure of who is doing the laboratory work does not always occur. It was established that economic consideration was not a driver when respondents considered outsourcing offshore. Quality was considered a more important factor than price.

The study found that that no legislation exists in South Africa that regulates the dental laboratory materials used. Therefore, the possibility of inferior material filtering the South African market is real and the need for a regulatory body is indicated. Technicians felt that there is no need to regulate outsourcing in South Africa. Dentists, on the other hand, were ambivalent.

In conclusion, it is postulated that dental technology industry is in a developmental stage and there is a need for the industry to understand itself better. This research showed that the dental technology industry has an inexperienced understanding of business practices. A greater emphasis on producing a well rounded dental technician with the knowledge and understanding of general business concepts and practices which include legislation, regulations and ethics related to the industry is indicated.

ACKNOWLEDGEMENTS

ABBREVIATIONS

The Act	For the purposes of this study, this refers to the Dental Technicians Act, No.19 of 1979
BPO	Business process outsourcing
CAD/CAM	Computer Aided Design and Computer Aided Manufacturing
CDRH	Center for Devices and Radiological Health
CE	Certified European
DAMAS	Dental Appliance Manufacturers Audit Scheme
DASA	Dental Association of South Africa
DENTASA	Dental Technology Association of South Africa
DMB	Dental Mechanicians Bill
EU	Europe Union
FDA	Food and Drug Administration
GDC	General Dental Council
GMP	Good Manufacturing Practice
HPCSA	Health Professionals Council of South Africa
MDD	Medical Devices Directive
MDR	Medical Device Reporting
MHRA	Medicines and Healthcare Regulatory Agency
NADL	National Association of Dental Laboratories
NHS	Nation Health Services

SADTC	South African Dental Technicians Council
SAMC	South African Medical Council
SAMDC	South African Medical and Dental Council
SAMED	South African Medical Device Industry Association
SAMMDRC	South African Medicines and Medical Devices Regulatory Council
UK	United Kingdom
USA	United States of America
UOT	Universities of Technology

CHAPTER ONE - INTRODUCTION

1.1 INTRODUCTION

"If you deprive yourself of outsourcing and your competitors do not, you are putting yourself out of business".

Lee Kuan Yew (cited in Maya 2010: 1)

Within the field of dentistry, outsourcing is practiced by both dentists and dental technicians, making it an established practice in dentistry (Palmer 2007). This study focuses on the outsourcing of procedures in the dental industry in respect of laboratory procedures. Dentists outsource laboratory procedures either locally or abroad to dental laboratories. Laboratories, in turn, may either manufacture the prostheses themselves or outsource the production, again, either locally or abroad. All dentists are trained to do laboratory procedures yet the vast majority of them choose to outsource laboratory procedures (Malcmacher 2008). Dentists and dental laboratories have similar reasons for outsourcing. They both are motivated to concentrate on core competencies (Malcmacher 2008; Overby 2007).

Outsourcing is a process where work such as manufacturing, product design or services are subcontracted out to a third party company (Manning, Massini and Lewin 2008). Globally, outsourcing occurs in almost every sector of industry no matter how large or small a business might be. Products or services which form part of the production process that were possibly once done in-house, are purchased from an external source (Hira 2005). Many organizations have moved away from in-house operations towards practicing outsourcing in order to obtain greater efficiencies in production (McIvor, Humphreys and McAleer 1997). Businesses outsource production for reasons that range from a lack of production facilities to the belief that the outsourced company is able to produce the goods more cost effectively.

Outsourcing can occur domestically or offshore. Hira (2005: 234) defines domestic outsourcing as the "purchase of products or services from external suppliers located within the same country". Thus contrarily, for the purposes of this study, offshore outsourcing is defined as the purchase of goods or services from a foreign source.

Many companies face the make-or-buy question. This is the question of whether to spend money on production technology (make) or to acquire the product or service from another source (buy). For the purpose of this study, the term "make-or-buy" refers to a decision to manufacture the product in-house or to outsource the production of the product to a third party. Every company has limits to its resources and, therefore, needs to make critical decisions about whether or not to invest in in-house manufacturing. Thus, there is a growing awareness of the importance of the outsourcing decisions. In order for businesses to outsource, the company needs to have a clear understanding of the outsourcing decision so that the risks and benefits as well as specific determinants of conflict will be known and understood (Vining and Globerman 1999). The determinants of conflict will be discussed in Chapter Two.

Terms that are often used in association with outsourcing are 'core' and 'peripheral competencies' (McIvor 2000). Tho (2005: 46) defines core competencies as activities that an organisation is "continuously engaged in" while peripheral competencies are those activities that occur less frequently. Therefore, the decision to outsource is more easily made in respect of peripheral competencies. However, it is noted that core competencies can also be outsourced. Various companies outsource all production, often offshore, for example, *Nike*. In these instances, the core competencies of the company change from production to design and marketing (Gilley and Rasheed 2000). Tho (2005) states that a business should identify core activities that are critical to its success and dedicate maximum resources to those activities, ensuring that they are done in-house. By outsourcing

peripheral activities a business can more easily achieve its objectives by focusing on its core activities while other business functions are being carried out by outside providers (McLaughlin 2008). Any activity that can be performed in a more cost effective manner by an outside specialist and with much better quality is particularly useful to a business (Thompson, Strickland and Gamble 2005; McLaughlin 2008).

There are various other reasons for a company choosing to outsource their work instead of having it done in-house. Overby (2007) argues that the decision to outsource may vary depending on the situation but the reasons for outsourcing often include, in addition to reasons already mentioned, the following:

- "Cost savings, being able to have a tighter control of budget through predictable cost. The lowering of the overall cost to the business.
- Increased flexibility to meet changing business and commercial conditions."

(Overby 2007: 2)

Some manufacturing businesses choose to outsource offshore as they believe that, by outsourcing the manufacture of specific goods or the provision of services, they will receive greater economic returns. Typical reasons for offshore outsourcing (also known as global outsourcing) are, to:

- "Reduce labour expenses,
- Allow organisations to enter new markets,
- Be able to tap into talent that is currently unavailable domestically or
- Overcome regulations that prevent specific activities domestically."

(Pandiath 2009: 1)

However, the effects of offshore outsourcing are not always positive. Offshore outsourcing can, negatively, lead to job losses in the outsourcing

country as employees are retrenched as a result of potentially cheap offshore labour (Bass, 2009 pers. comm).

Core competencies for dentists are primarily related to patient treatment. Therefore many dentists choose to outsource their peripheral competencies, namely their dental laboratory work, their administrative[1], and advertising to skilled individuals who are experts in their respective fields (Malcmacher 2008).

As the dental technology industry grew outsourcing became an industry consideration. This occurred for two reasons. Firstly, as dental technology became more specialised, technicians found they were less competent in all related disciplines. Technicians are licensed to work in the four disciplines of dental technology, namely crown and bridge, chrome cobalt, prosthetics and orthodontics, but they invariably choose to focus in one particular discipline. This allows them to improve their skill in that particular areas thus making that discipline their area of expertise. Secondly, many laboratories found themselves unable to cope with increased volumes of work.

Today, laboratories routinely outsource prostheses to other dental laboratories that have the capacity to deliver more effectively on these procedures for the reasons outlined above. This practice allows laboratories to concentrate on their specific area of expertise (Lesh 2002). The two separate benefits of specialising is that laboratories can focus on the technology for a specific niche resulting in a broader range of products available in the market rather than duplication of services. A second benefit is the development of specialised techniques and advancing knowledge in the field. The outsourcing process advances dental laboratory growth and may

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[1] Research done by Malcmacher in 2008 was conducted in the USA. In the USA dental practices and dental laboratories, unlike South Africa, are often large and thus have significant administrative and advertising needs. Whilst the need often exists in the USA to outsource administrative and advertising practices this is not necessary so in South Africa. Advertising by dental technicians to the public is not allowed in South Africa.

enhance the future success of the business (Lesh 2002). Not all outsourcing is positive. Thus, some negative consequences of the outsourcing process within Dentistry and Dental Technology are briefly mentioned below and are discussed in greater detail in Chapter Two.

In South Africa, laboratory practices are legislated under the Dental Technicians Act[2] (Act 19 of 1979). The South African Dental Technicians Council (SADTC) regulates and monitors the profession in the interests of the public, thus ensuring that services are responsibly and ethically delivered. This includes all matters such as the ethical behaviour of technicians as well as the control of the quality of materials used in the industry. In addition, in South Africa there is a professional body looking after the interest of the industry. This is the Dental Technology Association of South Africa (DENTASA) which, in looking after the interests of the dental technology professionals, monitors their ethical behaviour and works towards maintaining an industry with the highest ethical standards. A more complete discussion on SADTC and DENTASA follows in paragraph 1.5.

According to Christensen (2005), dentists in the United States of America (USA) are not aware whether dental laboratories outsource their laboratory work to other laboratories. When dentists and patients are unaware of where the dental work is being done, this, arguably, constitutes a lack of disclosure which, in turn raises ethical issues (Christensen 2005). Dental work that is outsourced might be of an acceptable standard but the quality of the materials used in the manufacturing process is often unknown (Christensen 2005). The quality of the materials used is very important. A consequence of using inferior materials could result in patients having allergic and toxic reactions. By using an inferior material the composition of the material could be compromised during manufacturing. Other consequences of inferior materials are prostheses of low strength and poor aesthetics of the finished

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[2] Commonly known as "the Act". "The Act" will, in this research be taken to mean the Dental Technicians Act, 1979 (Act No.19 of 1979).

product. Dental laboratories in South Africa are not obligated to disclose to dentists that work is being outsourced. More concerning is that, in South Africa, the quality of materials that can be used in the industry is neither legislated nor controlled. The dental technology industry is legislated in South Africa under the Dental Technicians Act (Act No.19 of 1979). However, this act makes no reference to the quality of materials that are acceptable for use in the manufacturing of dental prostheses.

This presents a potential problem for the South African dental industry as outsourcing in South Africa has been identified as the key mechanism in the government's strategy to boost the country's economy. Business process outsourcing (BPO) and offshore outsourcing are the two types of South African outsourcing that which occur in sectors such as financial services, insurance and telecommunications including after-sales services, data capturing, accounting, benefits administration, human resource functions and website design and development (South Africa, Department of Trade and Industry 2006).

Currently, there is limited documented research, both domestic and global, with regard to the outsourcing processes in the field of Dental Technology. The researcher found no documented research in respect of outsourcing in the field of dental technology in South Africa. This suggests that this study will create knowledge that will benefit the South African dental technology industry.

1.2 UNDERSTANDING DENTAL TECHNOLOGY

Christensen (2002: 10) describes dental technology as "an attractive area for people who have artistic skills, good hand-eye coordination, and an interest in learning and advancing their abilities". More specifically, dental technology is a combination of art and science that is concerned with the manufacture of

oral and facial prostheses (artificial devices) from crowns, braces and dentures to specialities such as artificial eyes and ears (Otago University 2009).

Dental technology comprises four major disciplines, namely, crown and bridge, chrome cobalt, prosthetics and orthodontics. Prosthetics is the design and fabrication of removable and fixed prostheses. This includes crown and bridge restorations as well as dentures. Within the industry, prosthetics is seen as two separate disciplines as indicated above. Technicians rarely specialise in crown and bridge as well as in removable denture construction[3]. Orthodontics is the fabrication of removable orthodontic appliances such as retainers to correct tooth position. Cobalt chrome is the design and fabrication of fixed or removable metal based dentures. Dental laboratories can and do specialize in all or some of these disciplines. The specialized discipline favoured by a laboratory becomes the core business activity of that dental laboratory. Dental technologists (or technicians) do not interact directly with "patients but work in conjunction with dentists and other oral surgeons to provide their services" (Bass 2007: 5). Dental appliances are produced by dental technicians on instruction from the dentist via a prescription. Such appliances help enhance a patient's appearance, correct their speech and improve the patient's masticatory function (Swanson 2000).

The skill of a dental technician is important in producing acceptable dental prostheses because treatment results are dependent on this expertise. In individuals, tooth form, tooth shades and facial appearances are different. Dental technicians thus receive advanced training in order to be competent in restoring natural aesthetics in a well functioning prosthetic appliance.

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[3] In the industry, technicians who make removable dentures are known as *Plastic* technicians and the discipline of making removable prostheses is known as *Prosthetics*. Technicians manufacturing fixed prostheses are referred to as *Crown and Bridge* technicians.

A patient in South Africa, in need of a dental prosthesis, will receive such services from a dentist (Warden 2002). After evaluating the patient's dental needs, the dentist instructs the dental laboratory. An impression[4] of the patient's mouth is taken; this will be used to create a cast of the patient's mouth and on which the dental prosthesis will be fabricated. The technician interprets the written instruction and produces a functional and aesthetically pleasing prosthesis (Warden 2002). The finished product is invoiced and delivered to the dentist who then ensures that the prosthetic restoration fits properly and is fully functional in the patient's mouth.

1.3 GENERAL HISTORY OF DENTAL TECHNOLOGY

"The time for extracting a dental lesson from history is ever at hand for dentists who are wise"

Demosthenes (384-322 BC cited in Namibian Dental Association 2012: 1)

Dental technology has evolved out of a need in the dental industry. Today there remains a high degree of cooperation between the professions of dental technology and dentistry. Dentists rely on the expertise and skill of the dental technician to provide knowledge-based, well constructed and aesthetic dental appliances (CDT 2008).

The oldest civilization to have known about dentistry is believed to be the Egyptians. The first known dentist dates back to around 3 000 years ago when an Egyptian named Hesi-Re was described as 'the greatest of the physicians who treat teeth'. The presence of archaeological evidence dated between 2500 and 3000 B.C. suggested that dental treatment included medical methods of combating dental affections and mechanical means of

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[4] An impression is defined as an accurate negative reproduction of an individual's oral cavity (dentition, surrounding tissues and dental arches). The impression forms an imprint (negative mould) of the oral cavity. Positive reproductions are fabricated from the impression material which is used to make various dental prostheses (Scheller-Sheridan, 2010).

treatment such as retentive prosthesis and the art of applying artificial substitutes for lost dental structures (Clawson 1996).

Significant contributions were made to the field of dentistry by the Greeks, Romans and Etruscans. The most crucial contribution was made by the Etruscans during 100-400BC. Several dental appliances (such as crowns and bridges) that were found had similar standards of quality to those which were later discovered in Europe and America during 1870 (Wilwerding 2009).

According to Wilwerding (2009), during the early middle ages in Europe monks generally practised as physicians and dentists because they were seen as the most educated of people. Monks were prohibited from performing any type of surgery, bloodletting or extractions due to a series of edicts. Capstick (2000) explains that monks were forbidden to practise surgery as the church viewed the shedding of blood, for whatever reason, negatively. He goes on to explain that "the higher authorities of the church became concerned about the effects this was having on the religious orders, and the resulting shortage of skilled clergy available for church duties. Furthermore, the physical examination of patients and the possibility of causing a patient's death were viewed as being in direct conflict with the holy vows of piety and modesty" (Capstick 2000: 70). As a consequence dental treatments were undertaken by barbers or barber-surgeons who provided the surgical assistance to the monks (Wilwerding 2009).

In the mid 19th century, restorative dentistry had major limitations due to the shortage of painless treatments, high costs, and lack of technological knowledge when constructing prostheses for the oral cavity (Van Noort 2002). Two significant contributions addressed these limitations and had momentous impact on the development of dental technology as an industry. One of these contributions was recorded in 1839 when Charles Goodyear invented the vulcanization process for hardening rubber to be used in the

production of motor car tyres. Later, Norman Goodyear, Charles' brother, discovered that the technology could be adapted and used as a dental prosthetic material in denture construction. This material could be moulded to replicate the oral structures and thus made an excellent base for false teeth. Moreover, vulcanite rubber, as the material was known, was inexpensive and easy to work with and thus became the ideal material for mass producing cheap dentures for the general public (Van Noort 2002). Almost simultaneously in 1844, Horace Wells, a Connecticut dentist, discovered that nitrous oxide could be used as an anaesthetic. This discovery made it possible for patients to have painless extractions and paved the way for restorative dental care (Van Noort 2002). This allowed dentists to focus on the clinical aspects of dentistry, leaving the manufacturing of prostheses to others who would be known as dental technicians. The fabrication of dental prostheses in the late 19th century was performed specifically by dentists or by craftsmen such as jewellers and goldsmiths but by the 20th century, an evolution occurred where dentists, machinists and goldsmiths worked together in an increasingly defined separate industry (Hoffmann-Axthelm 1987). Machinists and goldsmiths, at the time, provided those services that evolved into the profession of dental technician. An increase in dental prostheses production saw dentists outsourcing the manufacturing work more and more to dental laboratories. The reason for this occurrence, according to Hoffmann-Axthelm (1987), was due to specialized equipment that was required and the complex nature of the procedures. The demand for specialized technicians grew and thus, more individuals entered the field directly, trained by existing technicians (CDT 2008). The first known successful commercial dental laboratory in the USA was established in 1887 (Waldman 1988). An estimated 97% of all laboratory work was being done in dental surgeries during the early 1900s but half a century later an estimated 90% of laboratory work was being completed in commercial dental laboratories (Leeper 1979). Dental technology like many other professions began as a trade (Haden, Morr and Valachovic 2001). According to Skea (2010: 3) organised dentistry was responsible for the professional

development of dental technology and as thus the "progression from a trade has lead to the current constitution of dental technology as it is practiced today".

1.4 THE HISTORY OF DENTAL TECHNOLOGY IN SOUTH AFRICA

During the 1900's dentists in South Africa were themselves manufacturing dental restorations or they 'allowed' laymen to fabricate prostheses in the practice laboratories (Grobler 1977: 411). The Medical, Dental and Pharmacy Act of 1928 regulated the dental profession. Under this Act, the dental mechanicians[5] were restricted to simply doing laboratory work. They were prohibited from communicating with the general public, as they still are today, soliciting dental work or prescribing any dental treatment. According to Grobler (1977) there was no formal education or professional certification that existed at that time, which thus allowed anybody to become dental mechanicians. Unfortunately this Act did little to prevent the growing trade of illegal mechanicians. The Dental Association of South Africa (DASA) in 1929 agreed that permitting mechanicians to register freely would help reduce the trade of illegal mechanicians. As a result a *Vigilance Committee* was established who were determined to form a register of dental mechanicians, control the conditions of apprenticeship and restrict dentists to only employ registered dental mechanicians (Grobler 1977). This was the initial phase of the formalisation of the dental technology profession in South Africa. Dental Mechanicians Bill (DMB) was formulated in 1929 (Grobler 1977). The Dental Mechanicians Act 30 of 1945 regulated the trade of unmounted artificial teeth and defined acts performed by dentists and by mechanicians. The passing of this Act was a significant movement forward in the progress of the dental technology profession. Dental Technicians were now protected by law and the profession regulated by the DMA. This meant that only registered dental

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[5] Dental technicians were referred to as dental mechanicians at this time.

technicians could practice their profession and those registered could no longer be exploited as cheap labour. A legally defined profession of dental technicians had finally been established (Grobler 1977).

1.5 BODIES REGULATING THE DENTAL TECHNOLOGY PROFESSION IN SOUTH AFRICA

The South African Dental Technicians Council (SADTC) is the body responsible for regulating the functions of dental laboratories in South Africa and the Dental Technology Association of South Africa (DENTASA) watches over the industry in order to serve the interests of the profession.

1.5.1 SOUTH AFRICAN DENTAL TECHNICIANS COUNCIL

The South African Medical Council (SAMC) was one of two statutory councils formed under the South African Medical and Dental Council (SAMDC) which is today known as the Health Professionals Council of South Africa (HPCSA). It was formed in 1928 in accordance with Act 13 of 1928. The SAMC was responsible for the registration of dental technicians until the formation of the Dental Mechanicians Board (in accordance with the Dental Mechanicians Act 30 of 1945), which is today known as the South African Dental Technicians Council (SADTC). Currently, the SADTC is a statutory body that falls under the Department of Health, for the purposes of regulating the dental technology industry in the interests of the public. The objectives of the SADTC, as stated in the Dental Technicians Act (Act No.19 of 1979), are to:

- "Assist in promoting dentistry in South Africa,
- Control of all matters relating to education and training of dental technicians/technologists and exercising of the practices with regard to supplying, making, altering or repairing of all dental appliances.

- Promote liaison and a high standard of education and training in South Africa and abroad with regard to the exercise of such practices.
- Promote good relations amongst all members within the dental profession and supplementary dental health service personnel.
- Advise the minister on any matters that fall within the scope of this Act as well as communicate information of public importance from the Council on the course of its performance of its functions under the Act."

<div align="right">(Dental Technicians Act 1979: 1.4)</div>

1.5.2 DENTAL TECHNOLOGY ASSOCIATION OF SOUTH AFRICA

The Dental Technology Association of South Africa (DENTASA) is not a regulatory body. It is an association of the professionals making up the industry. It is formed in the interests of its members and therefore safeguards their welfare. DENTASA represents the industry where this is appropriate, especially in matters which require liaison with regulatory bodies (DENTASA 2010). The objectives of DENTASA as stated in its constitution are:

- "To promote the interests of members of the association.
- To encourage the conciliatory settlement of disputes.
- To promote, support or oppose, as relevant, any proposed legislation.
- To build the membership base
- To provide, when deemed necessary, legal assistance to members.
- To co-operate with other associations in dealing with matters affecting members.
- To maintain a code of Ethical (sic) practice amongst its members.
- To promote equality and diversity.
- DENTASA is an advocacy group for the profession of Dental Technology."

<div align="right">(DENTASA 2011: 1)</div>

1.6 COMPARING SOUTH AFRICAN DENTAL LABORATORIES WITH INTERNATIONAL LABORATORIES

As previously stated, no literature was found on outsourcing in the South African dental technology industry. Moreover, limited literature was found relating to outsourcing in countries outside South Africa. Whilst some literature is available, it is difficult to compare the South African dental technology industry with that found in the USA, United Kingdom (UK) and the Europe Union (EU). Laboratories in South Africa differ in respect of size when compared to laboratories abroad. Thus laboratories abroad may have greater need for outsourcing when compared to South African operations.

In order to establish the profile of the South African dental technology industry, the SADTC was consulted. The SADTC retains separate registers for technicians and laboratory owners. Most of those persons appearing on the laboratory owners register are technicians, the others being dentists. As of 25 January 2012, the SADTC register for technicians reflected that there are 799 dental technicians and the SADTC register for dental laboratories reflected that there are 784 laboratory owners[6] in South Africa. In order to get the total number of technicians in South Africa one must combine the two register totals. The total number of technicians reported by the SADTC is 1583. However, as noted above the number of technicians contains some dentists. The SADTC is unable to provide the total number of dentists on the register. Consequently, the number of technicians is effectively less than the total of 1583 reported above. As the number of technicians almost equates to the number of laboratories it can be postulated that the average number of technicians per laboratory is between one and two assuming that there is one laboratory owner per laboratory. However, it is understood that this is not always the case. Consequently it is concluded that the greatest percentage

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[6] For the purpose of this study 'laboratory owner' refers to dental laboratory owner.

of laboratories in South Africa are small laboratories. This assumption compares favourably with anecdotal evidence of the makeup of the dental technology industry in South Africa (via personal comm 2012 with Bass, Lubisi and Rattan).

According to the United States of America Bureau of Labor Statistics (2010) there are 46 000 registered dental technicians throughout the USA. Luoma, Chief Staff Executive at the National Board for Certification in Dental Laboratory Technology stated that in the USA 70% of all laboratories are smaller laboratories with between one and nine dental technicians, while 78% of the 70% have four or fewer dental technicians. 13% of laboratories are considered medium sized laboratories with between 10-25 dental technicians while 17% are large laboratories having over 25 dental technicians (Louma 2011).

In the UK 45% of dental laboratories have on average between one and two registered dental technicians while the remaining 55% range widely with the number of dental technicians with the largest containing over 250 dental technicians as stated by Statham, Association Manager of the Dental Laboratory Association (2012).

In the EU, Germany, Switzerland and Austria have 80 000, 1 100 and 5 000 dental technicians respectively (Hlawacek and Orsulva 2003). However, the number of dental laboratories in the EU as well as the number of technicians per laboratory is unknown.

The importance of profiling dental laboratories has confirmed that South African laboratories employ a smaller number of technicians per laboratory when compared with laboratories in the USA and UK. Hence, the need for outsourcing of dental prostheses may differ in South Africa as opposed to laboratories internationally. Dental laboratories in the USA and UK are on average bigger in size when compared to South African laboratories as

explained above and thus they sometimes outsource services such as advertising to increase efficiencies (Leong 2008). Small South African businesses in the dental industry therefore have less need for the outsourcing of services as described above, as the cost of outsourcing these services is economically unviable.

1.7 RATIONALE OF THE STUDY

The rationale of this study is to gain an understanding of the dental technology industry in respect of the outsourcing of dental prostheses between service providers in Gauteng and abroad, thus providing a wider perspective and insight into the nuances of this practice. This study will examine the perceptions of South African laboratory owners, dental technicians and dentists. The aim of this research study is to understand the opinions and experiences expressed by the above mentioned professionals with regard to the outsourcing process that occurs within the dental industry. DENTASA is the industry's watchdog of dental technology in South Africa. DENTASA's stance regarding legislation on the outsourcing process that takes place in dental laboratories domestically and offshore needs to be identified. The legislative position of the SADTC with respect to outsourcing will be determined. This study will investigate the extent to which the SADTC regulates the Dental Technicians Act (Act No.19 of 1979). Recommendations emanating from this research can be made available to the SADTC if requested.

Within the context of outsourcing of dental laboratory services in South Africa, no contractual relationship exists between the outsourced and the outsourcer. Hence a knowledge gap exists which requires further investigation. The lack of information on outsourcing in the literature supports the notion that the study will provide valuable information in understanding outsourcing in the South African dental laboratory industry thereby increasing

efficiencies and protecting the public from potentially unethical practices. Through gaining this knowledge it is hoped:

- To provide a critical evaluation of outsourcing for the domestic dental technology industry.
- To provide the dental regulatory professional bodies with information alerting them to the positive and negative consequences of outsourcing and alert them to the efficacy of the legislative regulations governing the industry.
- To serve to stimulate further related research in the industry.
- That a number of research publications will arise from the research completed.

1.8 KEY RESEARCH QUESTIONS

1) How do the laboratory owners, dental technicians and dentists perceive outsourcing of dental laboratory procedures in respect of service delivery?

2) What is the position of DENTASA in respect of outsourcing of dental laboratory services?

3) What is the understanding of SADTC regarding the legislation as contained in the Dental Technicians Act 19 of 1979 in respect of outsourcing of dental laboratory services?

1.9 OVERVIEW OF THE DISSERTATION

Chapter One has described the South African dental technology industry with a focus on understanding outsourcing as practiced in the industry. It has been demonstrated that although the South African dental technology

industry is regulated, a gap exists with regard to ensuring the quality and service resulting from outsourcing. Chapter Two reviews and discusses the literature in respect of the global and domestic debates on outsourcing. A critique of previous methods of research in the field of outsourcing is offered. The research methodology is explained in Chapter Three. The findings of this study are discussed in Chapter Four. The conclusions and recommendations prevailing from this study are presented in Chapter Five.

CHAPTER TWO - LITERATURE REVIEW

2.1 OUTSOURCING IN GENERAL

"In order to gain that extra advantage, many organisations are turning to outsourcing as the means to ensure far greater cost disciplines, whilst improving quality of service and product delivery capability..."

Domberger (1998 cited in Kakabadse and Kakabadse 2002: 189)

2.1.1 INTRODUCTION

This chapter reviews literature and discusses outsourcing in general and specifically outsourcing in the dental technology industry. The literature reviewed on outsourcing includes a discussion on the theoretical underpinnings of outsourcing, examines the motivation for outsourcing and finally reviews the risk and concerns arising out of outsourcing. Thereafter the discussion turns to outsourcing in dental technology and examines the general issues affecting outsourcing as they relate to this industry. In addition, this section defines and creates an understanding of medical devices (including dental prostheses) as it is mooted that legislation in respect of dental prostheses will, in South Africa, in the future be classified as medical devices and the industry will be governed by applicable legislation. Finally this chapter examines the regulation of dental laboratory work, both domestically and overseas in the UK and the USA.

The following bodies regulate the dental technology industry in the following countries:

- South Africa – the SADTC
- UK - the General Dental Council (GDC)
- USA - the National Association of Dental Laboratories (NADL)

The regulatory information on domestic and global standards that exist that will help address some of the risks and concerns associated with dental outsourcing. Overseas regulatory bodies are discussed in order to establish how the industry is governed overseas and allows the researcher to make comparisons with regulations as they exist in South Africa. The literature will also discuss the conceptual framework on which the research was conducted and will, therefore, allow for the meaningful understanding of the research topic.

Outsourcing, also known as *contracting out,* is an "historical well established practice" (Kakabadse and Kakabadse 2002: 189). The practice of outsourcing can be found as early as the eighteenth century when the government in England outsourced to the private sector basic services which essentially could be classified as the responsibility of the state. These included the maintenance and operation of public highways and street lights, management of prisons, collection of taxes and ordinary and industrial refuse (Kakabadse and Kakabadse 2002). Similar trends were also evident for government service delivery in the USA, Australia and France. India became the outsourcing location for the British textile industry but over time the outsourced work reverted back to Britain because the British improved their textile production efficiency. Similarly the USA contracted out the production of clipper ships sails to Scotland, sourcing the raw materials from India (Kelly 2005). For most of the nineteenth century the delivery of mail in the USA and Australia was a responsibility undertaken by private businesses while in France the construction and management of railways and the distribution and storage of water was tendered for by prospective contractors (Kakabadse & Kakabadse 2002). According to Kakabadse and Kakabadse (2002: 189) during the industrial revolution contractual agreements were drawn up "for the provision of specific services" which were the "fundamental element of economic organisation between government and private businesses".

In the service industry, outsourcing was conventionally limited to basic support activities as seen above. It was also mainly used to increase efficiency when reorganizing organisations that had dire financial problems. Today, outsourcing is a practice that is found in all industries. It has also become increasingly clear that outsourcing is more than a passing trend (Barthelemy 2003).

2.1.2 OUTSOURCING

According to Manning, Massini and Lewin (2008) the term outsourcing is expressed as a process where work such as manufacturing or product design is subcontracted out to a third party company and involves contracting with an outsourcer. Overby (2007) states that it can include the transfer of management or day to day execution of an entire business function to an external provider while Huws, Dalhmann and Flecker (2004) refer to it as a business activity which entails the production of either goods or services purchased by an organisation from an external outsourcer rather than being carried out internally. According to Pandiath (2009), outsourcing has become one of the most powerful, organization-shaping management strategies. By creating innovative external relations, organizations are redesigning themselves and altering the way they do business. Sustaining good network relations improves the performance and productivity of companies and businesses (Pandiath 2009). The intercontinental use of outsourcing models has resulted in terms and concepts such as business process outsourcing, co-sourcing, domestic outsourcing, global outsourcing, multisourcing, nearshoring, offshoring and strategic outsourcing. Domestic, offshore and global outsourcing is relevant terms used in this study, and are defined in the next paragraph.

Domestic outsourcing, says Hira (2005: 234), is the "purchase of products or services from external outsourcers located within the same country". By contrast, offshore outsourcing is the relocation of the production of goods and

services to another country. Offshore outsourcing is also referred to as 'international', 'cross-border' or 'global' relocations of work (Huws, Dalhmann and Flecker 2004). Overby (2007) defines offshore outsourcing as a subset of outsourcing in which a corporation outsources services to a third party in a county other than the one in which the customer company originates, mainly to take advantage of lower labour costs in the product of the goods or delivery of the services. Tiwary (2008: 1) stated "as the global economy started to evolve, businesses in developing countries began offering services to perform functions that companies had been outsourcing domestically". Global outsourcing is defined by Tiwary (2008: 5) as the "delivery of services and other internal functions that can be performed by an organisation in another country".

2.1.3 A THEORETICAL FRAMEWORK FOR OUTSOURCING

"It's not always about cost today. It's about doing what you do best."

(Izabella Iizuka 2008)

It is important that the reasons for outsourcing are clarified. An outsourcing model is advisable against which the outsourcing processes are executed (Hogwood and Gunn 1984). Tiwary (2008: 5) states that "an outsource model is an outsource strategy".

Franceschini, Galetto, Pignatelli and Veretto's (2003) model on outsourcing is used as the conceptual framework on which this study is based and influenced the interview questions. This model is easily adapted to different application fields and is constructed around four stages which are explained in Figure 1:

Figure 1: Four stages of the Outsourcing Model (Franceschini *et al.* 2003)

With reference to this framework the outsourced[7] can monitor the manufacturing processes, "analyzes its efficiency and then evaluates what to outsource, considering core competencies" (Franceschini *et al.* 2003: 248). When businesses decide to outsource, the four stages of outsourcing as an industry practice needs to be considered. The Franceschini *et al* model as illustrated in *Figure 1* is described below. Each stage is discussed individually to ensure a clear understanding of the outsource model.

2.1.3.1 Internal benchmarking analysis

Before a company can consider outsourcing it must firstly establish its core and peripheral activities or competencies. A core or peripheral activity is what a company considers as its core proficiency and the strategy it aims to practise (Gilley and Rasheed 2000). According to Tiwary (2008: 1), the outsourcing concept developed when many businesses started outsourcing "everything but core business activities to other companies within the same national boundaries". Core competencies are the "skills, knowledge and technologies that an organisation possesses on which its success depends" (McIvor 2000: 24). Core competences are thus the sets of skills and systems at the nucleus of an organisation which are professionally delivered at the

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[7] For the purpose of this study the term "outsourced" refers to the customer (organisations or persons) who outsources their processes.

highest quality. They are competencies that an organisation creates uniquely and thus offer high value service for clients (Quinn 1999). Core competencies offer both the basis and the direction for the development of an organisation (Gilley and Rasheed 2000).

An organisation's resources should be carefully assessed prior to any outsourcing decision so that only activities where the organisation does not have any special capabilities or strategic need are outsourced (Black and Boal cited in Nellore and Soderquist 2000). Outsourcing peripheral competencies allows the organisation to increase its attention and resource allocation to tasks that it does best and to rely on its management systems to oversee tasks which are undertaken by the outsourcer (Gilley and Rasheed 2000). Concentrating on core competencies also improves an organisation by allowing it to become more innovative and responsive in its core domain.

Internal benchmarking is thus the process that requires management[8] to examine and compare the efficiency of different activities that the organisation performs or could perform *in-house* whilst comparing them with the cost of outsourcing them. In-house production compared with outsourcing needs to be considered against wasting of money and lack of skills of the outsourcer to provide the necessary outsourced service. Internal benchmarking can help the business find the best management and production practice and, therefore, helps in evaluating the appropriate level of efficiency of the company (Franceschini *et al.* 2003).

The choice of outsourcing as an activity could have profound consequences for the outsourced and outsourcer[9]. By determining which activities can be best performed by external outsourcers requires a good understanding of where an organisation's competitive advantage comes from (Barthelemy

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[8]For the purpose of this study the term "management" refers to those individuals responsible for decisions made regarding the outsourcing process within an organisation.
[9] For the purpose of this study the term "outsourcer" refers to organisations or persons who deliver the outsourced services (also known as a supplier or vendor).

2003). According to Porter (1990), an organisation achieves competitive advantage by being innovative, discovering new ways of doing things or discovering new technologies and being able to sustain them by constantly remaining at the cutting edge of business production and management (Falk and Hagman 2002). Having completed the internal benchmarking exercise a company can now engage in an external benchmark analysis. *External Benchmarking Analysis* is discussed in the next paragraph.

2.1.3.2 External benchmarking analysis

External benchmarking analysis allows the outsourced to evaluate and select an appropriate outsourcer (or number of outsourcers) who best meets the outsourced needs in terms of the outsourcing process (Franceschini *et al.*2003). Gilley and Rasheed (2000) and Barthelemy (2003) suggest that permitting outside specialist organisations to focus on peripheral competencies, allows organisations to improve their efficiency by concentrating more narrowly on the things it does best, that is, its core competencies.

Barthelemy (2003) suggests that, before deciding on an outsourcer to outsource to, that a company initially outsources minor peripheral competencies to a number of prospective outsourcers to determine their competency before committing major peripheral competencies to the outsourcer. In doing so, the quality of the service offered by the outsourcer can be determined. An alternative option is to interview existing clients of potential outsourcers and, in addition, industry experts to learn about technical skills and the trustworthiness of a potential outsourcer (Barthelemy, 2003). The outsourced can then choose to either operate with a single outsourcer or multiple outsourcers by making use of relevant strategies (Franceschini *et al.* 2003). The best strategy is selected using "multiple criteria decision aiding methods which uses criteria such as market positioning, price, technical quality, ability to manage outsourced-outsourcer

relationships and possible previous contracts" (Franceschini *et al*. 2003: 254). Selecting a good outsourcer is crucial for successful results accruing to the outsourcer by outsourcing peripheral competencies (Barthelemy 2003).

2.1.3.3 Contract negotiation

Contract negotiation is the "formalization of the relationship between the outsourced and the outsourcer" (Franceschini *et al*. 2003: 255). It is important to make official the type of relation that both parties have agreed upon. The agreement should establish time periods permitted for the supply of goods and services by the outsourcer and the process to be followed in deciding on disagreements that might arise from the contractual agreement (Graham 1993). According to Barthelemy (2003) a good contract is vital to outsourcing success because it helps establish a balance of power between outsourced and outsourcer. Balance of power is achieved by having an outsourcing contract that is fair to the outsourced and outsourcer in terms of their expectations regarding quality, cost and time. The value of a contract is clear if the relationship with the outsourcer deteriorates into conflict. A good contract permits both parties to set expectations, have short-term goals and provides a safety net should the relationship be unsuccessful (Barthelemy 2003).

2.1.3.4 Managing the outsourcing process (Outsourcing management)

The fourth requirement of Franceschini *et al*'s model (2003) is the management of the outsourcing process. Organisations that cannot afford to do everything by themselves use the outsourcing process as a strategy to better manage their time (Iizuka 2008). In order for the outsourcing process to be successful it requires constant and appropriate management by both parties in order to avoid problems such as poor turnaround times, quality of production and dispute resolution occurring (Franceschini *et al*. 2003). The outsourced and outsourcer must jointly set targets to ensure efficient

turnaround times are met that are acceptable to both outsourced and outsourcer and take corrective action by appropriate management.

The framework used "highlights the need for a structured benchmarking theory and best practices in outsourcing" (Franceschini *et al.* 2003: 258). These authors state that "the described methodology [framework] tries to fill the gaps that exist between common practices and best-structured approach" (2003: 258).

2.1.4 ADVANTAGES AND DISADVANTAGES OF OUTSOURCING

There are many potential benefits as well as negative consequences to outsourcing. The advantages and disadvantages are discussed below.

2.1.4.1 Advantages of outsourcing.

Different organisations have different objectives when considering outsourcing. Some want to minimize cost while others want greater flexibility with project work or faster turnaround times (Shmamoto, Fayyoumi and Redded 2010). In most cases, however, the motivating factor is a combination of factors as described below.

Cost efficiency allows for organisations to be able to have tighter control of their budget through predictable costs and therefore reduce the overall cost to the business. Cost reduction is one of the main reasons for the growth of outsourcing. Organisations assess the outsourcing option in order to establish if "current operation cost can be reduced and if saved resources can be reinvested in more competitive resources" (Jiang and Qureshi 2006: 49). According to Grog and Hanley (2004), companies prefer to buy rather than make products as long as outsourcing is cheaper than in-house production. Outsourcing can therefore be used to economise on production cost. Gilley and Rasheed (2000: 765) state that by outsourcing, the

"manufacturing cost decline and investment in equipment is reduced" which "lowers fixed cost and leads to a lower break-even point" for organisations. However, companies need to ensure that cheaper production costs do not come with an inferior quality product.

Whilst the main objective of outsourcing is to reduce costs, Iizuka (2008: 22) states that there has been a move to more than just reducing costs, with a focus on improving the quality of work produced. Non-financial gain of outsourcing has a tendency to encourage competition amongst external competitors which guarantees availability of superior quality products and services (Kotabe and Murray cited in Gilley and Rasheed 2000). By concentrating on its core competency an organisation is able to work more effectively and efficiently. A lack of in-house resources which include access to knowledge and operational expertise allows for the buy-in of wider experience, knowledge and operational best practice that would otherwise be time consuming and difficult to develop in-house. The outsourced are able to take advantage of new technology by using outside outsourcers for products and services without having to spend considerable amount of money developing peripheral technology. Thompson, Strickland and Gamble (2005: 153-154) state that "outsourcing puts the burden on outside suppliers to keep up with advancing technology as it affects their component business". They go on to state that "should the supplier fall behind on developing next generation components or technology then the outsourcing company can simply shift suppliers". Organisations that rely on outsourcing for product production are able to change outsourcers for various reasons such as when the need arises, demand of market conditions or new, more cost effective technologies become available (Gilley and Rasheed 2000). The greatest motivation for organisations to choose outsourcing is "improved financial performance" partly due to cost improvements and various non-financial performance efforts such as heightened focus on core competencies" (Gilley and Rasheed 2000: 76)

2.1.4.2 Disadvantages of outsourcing

An important reason for outsourcing is that specialist outsourcers have lower production costs than their clients. It is important to note, as previously explained, that organisations do not only outsource to cut costs but also outsource because they do not have the expertise or machinery for in-house production (Barthelemy 2003).

A disadvantage of outsourcing is that a company can lose touch with the activities and expertise that over the long run determined its success (Thompson, Strickland and Gamble 2005). Therefore when a company relinquishes its core competency it, over time, ceases to be an expert in that aspect of production. Another risk of outsourcing is that outsourcer could gain knowledge of how the outsourced product is manufactured and could possibly use this information to launch the product as their own.

There are negative perceptions that exist about offshore outsourcing. According to Ganish (2007) there is strong public opinion that outsourcing work offshore harms local labour markets. It affects both employment and individuals. According to Barthelemy (2003: 91) employees perceive offshore "outsourcing as an underestimation of their skills" and in some cases there is a tendency for them to leave their jobs even before the actual decision to outsource is made. Consequently decision making on outsourcing is complicated. Open communication is key to managing labour issues in and perceptions of outsourcing (Barthelemy 2003). Taking ethical considerations into account helps to avoid personnel issues related to outsourcing. Once employees know that outsourcing is being considered counterproductive concerns could ensue, often as a result of informal industrial conflict (Dowdell 2010; Barthelemy 2003). Outsourcing undeniably has a detrimental effect on those people faced with job disruption and employment insecurity (Ganish 2007). Although employees often keep their positions within an organisation, outsourcing does have a negative impact on their sense of job security and

loyalty (Barthelemy 2003). According to Ganish (2007) the EU has regulations that protect employees from the effects of offshore outsourcing. This is true of other countries, including South Africa (Stelzner 2010).In defence of outsourcing, Ganish (2007) suggests that companies that engage in offshore outsourcing believe it will ultimately provide greater economic benefit to all by bringing down prices.

The outsourcing model discussed above "highlights the need for a structured benchmarking theory and best practices in outsourcing" (Franceschini *et al*. 2003: 258). Franceschini *et al*., (2003: 258) go on to state that "the described methodology tries to fill the gaps that exist between common practices and best-structured approach".

The literature review now turns specifically to discuss outsourcing in the dental technology industry.

2.2 OUTSOURCING IN DENTAL TECHNOLOGY

"...technology is one of the primary drivers of outsourcing in healthcare..."

Don Hall (cited in Iizuka 2008)

2.2.1 INTRODUCTION

As explained above, outsourcing is a global concept that has been implemented throughout the world in almost every sector of business and industry. Consequently, outsourcing also exists in dentistry. Dental outsourcing includes those activities or expertises that are unavailable to either the dentist or the dental laboratory (Malcmacher 2008: 26). As was previously argued for the general business sector, outsourcing in dentistry allows for the job to be done more "efficiently at a lower cost, allowing the dental office to save time, money and energy" (Malcmacher 2008: 26). The

vast majority of dentists in the USA, although trained in laboratory procedures, choose to outsource to dental laboratories domestically or offshore (Malcmacher 2008). It is common cause that, likewise, dentists in South Africa largely outsource laboratory procedures. Malcmacher (2008: 26) states that dentists outsource their core business to focus on "providing dental services directly to the patient" because they do not have the expertise or machinery required to produce prosthetic appliances, whilst dental laboratories, on the other hand, can offer a complete service of dental laboratory procedures to dentists. Dental laboratories are motivated by a common theme to focus on core competencies (Malcmacher 2008; Overby 2007). Consequently, dentists concentrate on patient treatment whilst the administrative, advertising and dental laboratory work are dealt by skilled individuals who are experts in their respective fields (Malcmacher 2008).

2.2.2 ADVANTAGES AND DISADVANTAGES OF DENTAL OUTSOURCING

Unfortunately, there are no documented research cases or information that currently exists in South Africa regarding advantages and disadvantages of dental outsourcing. Even literature on international examples is in itself is limited. It is for this reason that I am conducting this study.

2.2.2.1. Advantages of dental outsourcing

Dental laboratories that receive laboratory work outside their area of expertise from dentists might prefer to outsource the case to an alternative dental laboratory domestically rather than declining work. According to Lesh (2002: 20) some dental laboratories "turn to outsourcing to meet customer demand" and to take advantage of "revenue" that would be otherwise lost to competing laboratories that "provide premium restorations".

In South Africa, economic reasons may exist for laboratories to outsource that work which is not the core competency of the laboratory. Laboratories outsourcing work to other laboratories earn additional income by taking a referral commission of up to a generally accepted norm of 15% of the invoice price of the appliance being outsourced (Ockerse 2012 personal communication). The practice of receiving a referral commission is confirmed via telephonic conversations 2012 with Boodhun, Naidoo and Rattan who all stated that currently laboratories referring work do not receive a set legislated percentage commission but an agreement is reached with the outsourced laboratory on a suitable amount to be paid as a referral commission.

In addition, dental laboratories outsource domestically to other dental laboratories in instances where they do not have the necessary skill or equipment for the job. Hence, capital equipment cost is another reason why outsourcing is to be considered (Malcmacher 2008). According to Hedge (2006: 47) "computers play an increasing role in dentistry and have become invaluable" to the dental technology industry. An example of this within the industry is the use of Computer Aided Design and Computer Aided Manufacturing (CAD/CAM) system which is able to perform various operations accurately and speedily, and has therefore been adopted in many dental laboratories. Dental technicians can easily use a CAD/CAM system to design a product as well as control the manufacturing process (Sabo 2006). CAD/CAM systems are very expensive and not many laboratories can afford to purchase the entire system. To justify such an expense, the dental laboratory must ensure sufficient work will be available to generate profits and ensure that repayments occur over a short period of time. In most cases dental laboratories in South Africa operate as a 'one man laboratory', therefore there would be insufficient time and labour to carry out large volumes of work. According to Lesh (2002) there is a fear of purchased technology becoming obsolete while still incurring high repayments on the equipment. Outsourcing helps laboratories to sample new products and equipment, generates a demand and develops their business exclusive of

hefty "capital investment risks" (Lesh 2002: 18). Technology upgrades take place on a regular basis and what is now considered top of the range is soon outdated in a matter of months. Thus, in these circumstances the option to purchase becomes unfavourable and outsourcing becomes a viable alternative.

Offshore outsourcing that occurs in dental laboratories in foreign countries often have lower labour costs and are therefore able to offer better pricing. This option becomes attractive as it provides an option for patients who cannot afford to pay full fees (Gills 2006: 25).The current ease of intercontinental communication enables companies to control activities "at great physical distance without the necessity of meeting or travelling around the world" and thus offshore outsourcing becomes more manageable (Dekkers 2000: 4086). In summary, the offshore outsourcing process is easily manageable; the patient benefits from lower costs while the outsourced does not incur any capital risks.

2.2.2.2 Disadvantages of dental outsourcing

Most USA dentists are not aware whether the domestic dental laboratories outsource their laboratory work (Gills 2006; Christensen 2005). In some USA states, dental laboratories are obligated to inform the dentists that work is being outsourced. When dentists and patients are unaware of where the dental work was done, this can be seen as a lack of disclosure with concomitant negative ethical implications.

The quality of the materials used in the production of dental prostheses is very important because some patients could have allergic reactions to inferior materials. "In-house" production and domestic outsourcing must be regulated and enforced by dental governing bodies (Christensen 2005). Ensuring health and safety of the patient and dental technician should be the number one priority of the entire dental team. According to Robbertze (1991) the

SADTC expressed concern regarding quality control of materials used in the manufacturing of dental prostheses. They listed substances such as Chromium, Crystalline silica (dust), Beryllium and Carbon tetrachloride as being high risk chemicals. They encouraged laboratory owners to register their laboratories with the Department of Manpower to ensure that their employees could receive workmen's compensation should they be affected from the above mentioned carcinogens. Even though offshore work might be of an acceptable standard, the quality of the material is often unknown (Christensen 2005). Foreign countries do not have the same strict laws such as the USA regarding the quality of materials used, infection control and sanitation (Gills 2006). For the Food and Drug Administration (FDA) this is of great concern because they are unaware if materials used are FDA approved (Napier 2005).

Another disadvantage of using offshore laboratories in foreign countries is that technicians cannot easily communicate with foreign technicians due to language barriers. It is therefore not known if the prescriptions will be interpreted correctly (Gills 2006; Christensen 2005). Christensen (2005: 654) states that "often corrections in restoration colour, contour, anatomy and occlusion cannot be completed rapidly" and as such, outsourcing becomes less efficient. It should also be noted that even those individuals who do speak the same language, as in domestic outsourcing, sometimes misinterpret the meaning of what has been written or spoken.

2.2.3 REGULATION OF DENTAL LABORATORY WORK BY DENTAL REGULATING BODIES

There are several guidelines and regulations set out by international dental regulating bodies that all interested parties must always adhere to when outsourcing dental laboratory work. The information obtained regarding dental outsourcing regulations contributes towards this literature review.

The following associations are the main regulating bodies of the dental technology industry for their respective countries and are also concerned with outsourcing of dental laboratory work. In South Africa the SADTC governs and regulates the dental technology industry which is discussed in *sub-sections 2.2.3.1.* In the UK and USA, the main regulatory body representing the dental technology industry and dental technicians is the General Dental Council (GDC) and National Association of Dental Laboratories (NADL) respectively. The functioning of GDC and NADL and their role in the regulations pertaining to the commissioning and manufacturing of dental prostheses are discussed below. Thereafter the discussion briefly turns to the Global Harmonization Task Force (GHTF) and the role it plays in the regulation of medical devices. Whilst the GHTF is not a regulatory body it is an important entity that provides direction on the regulation of medical devices to regulatory bodies in the EU, USA, Canada, Australia and Japan. Consequently, reference to the GHTF is of relevance to this discussion given, as reported earlier in this dissertation, that this type of regulation is mooted to being introduced into the South African dental technology industry.

This sub-section then concludes with a discussion on medical devices as dental prostheses are categorised as medical devices.

2.2.3.1 South African Dental Technicians Council

In South Africa, the medical device market is poorly regulated and insufficient information exits regarding medical devices including dental prostheses. South Africa does not have a comprehensive system of medical device regulations. It is strongly advisable that the product used during manufacture should be FDA approved or even better, carry the CE (Certified European) mark (South Africa. Department of Health 2007). In South Africa, dental technicians and their laboratories are certified and regulated by the SADTC and are liable for misconduct in contravention of regulations pertaining to the

Dental Technicians Act 19 of 1979 (South Africa. Department of Health 1979). No specific regulations exist for regulating the outsourcing of dental prostheses.

2.2.3.2 General Dental Council (GDC)

In the UK, the General Dental Council (GDC) is the organisation that regulates dental professionals, and consequently, outsourcing. Members are responsible for the decisions they make when commissioning and manufacturing dental prostheses and are expected to fulfil these responsibilities and are held accountable (GDC 2011). Not all technicians are registered with the GDC. When dentists receive dental appliances made by registered dental technicians, individual members are responsible for their part of the procedure in the production of the appliance (GDC 2011). For those members that arrange for dental appliances to be made and receive them from dental technicians who are not registered, the registered member receiving the appliance is liable to face GDC fitness of practice inquires (GDC 2011). Members of the GDC who also sub-contract dental appliances outside the UK are held professionally liable for safety and quality of the appliance, and information such as the name and address of the manufacturer should also be disclosed to the patient (GDC 2011). According to the GDC (2010: 1) custom-made devices are subject to the Medical Devices Directive (MDD) regulations. Custom-made devices are any device specifically made in accordance with a duly qualified medical or dental practitioner's written prescription with specific design characteristics and intended for the sole use of a particular patient, whether National Health Services (NHS), private or independent. All manufacturers of custom-made dental appliances must register with the Medicines and Healthcare Regulatory Agency (MHRA) and provide them with a description of the devices concerned and their business address (GDC 2010).

2.2.3.3 National Association of Dental Laboratories (NADL)

The National Association of Dental Laboratories (NADL) is a national advocacy and professional organization in the USA. The Food and Drug Administration (FDA) is an agency that ensures the quality of materials used within the USA (FDA 2010). Dental laboratories manufacture dental prostheses that include prosthetic and therapeutic devices. The agency requires both foreign and domestic dental laboratories to comply with Quality System[10]/good manufacturing practices (Napier 2005).

The U.S. Food and Drug Administration, Center for Devices and Radiological Health has the "authority to inspect foreign dental laboratories and has authority to hold shipments at port" (Napier 2005: 2). All foreign dental laboratories are required to register with the FDA, including U.S. brokers or agents defined as "initial distributors" under FDA registration classifications that represent foreign dental laboratories. Domestic dental laboratories are not required to register because they use FDA approved materials for dental prostheses manufacture (Napier 2005a). The current requirement for proper disclosure through labeling is used to inform the dental client where a restoration is made. Under labeling requirements, a laboratory must specify point of origin, the location of the dental laboratory and by whom the dental prostheses is manufactured. According to Napier (2005) it is important for dentists to inquire of their dental laboratory if they are FDA compliant and utilize a quality assurance process. There are no formal regulations that obligate dentists and dental laboratories to disclose the point of origin information to the dental patient. On the other hand, there is no restriction on dentists and dental laboratories to voluntarily share such information with the patient (Napier 2005).

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[10] The *Quality System* regulation helps assure that medical devices are safe and effective for their intended use.

The FDA needs to be able to trace the materials used in dental prostheses which are manufactured in foreign countries. It is very difficult to establish if the imported dental prostheses used FDA approved materials. According to Napier (2005a) dental laboratories in the USA use the Dental Appliance Manufacturers Audit Scheme (DAMAS) which requires them to have affidavits from third party outsourcers which includes outsource partners on material content. Napier (2005a: 2) also states that DAMAS is based on international standards for the manufacturing of medical devices, and the DAMAS certification "ensures the lab environment operates in such a way as to ensure product and patient safety. It provides a formula for improved documentation of many aspects of dental lab activity". DAMAS standards mirror the FDA's quality system and good manufacturing practice (GMP) standards, with which all domestic dental laboratories must comply (Napier 2005). Through voluntary, administrative and regulatory means compliance can be achieved and the FDA is able to police foreign imports to protect consumers (Napier 2005a). The objective of the FDA regarding outsourcing of dental prostheses (including all other dental devices) is to identify:

- "Domestic and foreign manufacturers who are not in fulfillment with the Quality System regulation,
- Manufacturers and importers that do not report information to the FDA in compliance with the Medical Device Reporting (MDR) regulation,
- Manufacturers and importers not in compliance with the Medical Device Tracking regulation and organizations not in compliance with the Registration and Listing regulation."

(FDA 2006: 1)

The discussion now turns to an understanding of the work of the GHTF and the role it plays in the regulation of medical devices. This discussion is relevant in the South African dental technology industry to regulate prostheses as medical devices, even though these regulations in South

Africa are in their initial stages. The discussion on the GHTF is included so as to inform subsequent discussions on medical devices in the South African context.

2.2.3.4 Global Harmonization Task Force (GHTF)

The Global Harmonization Task Force was created in 1992 in "an effort to achieve greater uniformity between national medical device regulatory systems" (GHTF 2010: 1). GHTF is an organisation comprising representatives from national medical device regulatory authorities and the regulated industry in the European Union, USA, Canada, Japan and Australia. In 2006, membership included the Asian Harmonization Working Party (AHWP), International Organization for Standardization (ISO), and International Electrotechnical Commission (IEC). The GHFT is an advisory organisation that helps inform regulatory practices in membership countries. In its advisory capacity the GHFT aims to enhance "patient safety and increasing access to safe, effective and clinically beneficial medical technologies around the world" (GHTF 2010: 1).

The GHFT achieves its objectives:

> via the publication and dissemination of harmonized documents on basic regulatory practices. These documents provide a model for the regulation of medical devices that can be adopted and implemented by national regulatory authorities. The GHTF also serves as an information exchange forum through which countries with medical device regulatory systems under development can benefit from the experience of those with existing systems and/or pattern their practices upon those of GHTF founding members.
>
> (GHTF 2010: 2)

The GHFT is thus an important body and whilst South Africa is not a member, its guidance will help inform legislation on medical devices being developed in South Africa.

The discussion now turns to an understanding of legislation and practices concerning medical devices which will inform the current situation of the dental technology industry in South Africa in respect of medical device legislation.

2.2.3.5 Medical Devices

A medical device is an "instrument, apparatus, implement, machine, contrivance, implant" used for the purpose of diagnosis, prevention, monitoring, treatment or alleviation of disease or compensation for an injury, handicap, replacement or modification of the anatomy of man or other animals" (FDA 2010). Medical devices include a wide range of products varying in complexity and function. Examples consist of tongue depressors, medical thermometers, blood sugar meters, total artificial hearts, fibrin scaffolds, stents, X-ray machines and oral devices (FDA 2010). The FDA, NADL, Medical and Healthcare products Regulatory Agency (MHRA) include dental prostheses as medical devices which are regulated by the FDA Center for Devices and Radiological Health (CDRH). The MHRA regulates medical devices in the UK under European legislation. In the EU, all medical devices must be identified with the CE mark.

In South Africa, the legislation that must be complied with is more vague and the dental technology industry is still trying to understand medical device legislation in how it affects the industry and how the industry becomes compliant. In South Africa all medical devices need to be ISO 13485 compliant. Grabowski (2011) explains that the Consumer Protection Act, 2008 (CPA) indicates that one cannot export medical devices to foreign countries from South Africa if the appliance is not ISO 13485 compliant.

2.3 CONCLUSION

Chapter Two has examined the relevant literature on outsourcing as well as outsourcing in Dental Technology. The lack of literature pertaining to outsourcing was noted. This chapter discussed the theoretical underpinnings of outsourcing while also examining the advantages and disadvantages of outsourcing. A discussion on outsourcing in dental technology industry then followed. The chapter ended with a review on regulations that are in place regarding dental laboratory work by the regulatory bodies and dental technology associations in South Africa, UK, and USA. The chapter closed with reference to the GHTF and its role in medical device legislation. Thereafter, the classification of dental prostheses as medical devices was discussed so that a clear understanding of what constitutes a medical device is understood.

The discussion now turns to Chapter Three where the research design used in order to answer the research questions is explained and discussed.

CHAPTER 3 - RESEARCH METHODOLOGY

"All qualitative researchers are philosophers in that universal sense in which all human beings...are guided by highly abstract principles"

(Bateson 1972: 320)

3.1 INTRODUCTION

This study investigates the attitudes and understanding of laboratory owners, dental technicians and dentists in respect of outsourcing of prosthetic appliance production as is relevant to the dental technology industry. The study also probed the understanding of the legislation existing in South Africa that governs outsourcing by establishing the views of the legislative body of the industry, namely the SADTC as well as the views of DENTASA, the association of dental technicians looking after the interests of its members who comprise the dental technology industry. This is a qualitative research study conducted in an interpretative paradigm. This chapter describes the research design used in this study and states the methodology developed in order to answer the research questions. Qualitative research and the different research paradigms are discussed in greater detail in *section 3.2*.

This study makes use of qualitative data that was obtained through semi-structured interviews from a sample of laboratory owners, dental technicians and dentists. For the purpose of this study the laboratory owners, dental technicians and dentists were required to have a minimum of five years work experience in their relative fields. The study limitations will be further elaborated upon later in this chapter. This study also interviewed representatives of DENTASA and SADTC whose portfolios include dealing with matters relating to outsourcing either domestically or offshore. The representatives were nominated by DENTASA and SADTC to represent their

respective positions and for their expertise in the subject matter of this research. The methods used for data collection and analysis are described below in detail. The sampling methods employed for the purpose of this study are identified and described, and the motivation in support of these methods will be discussed. Any ethical considerations arising out of this study are also explained and discussed.

This chapter concludes with a discussion on trustworthiness. Trustworthiness is a fundamental criterion used in judging qualitative research (Lincoln and Guba 1985). According to Lincoln and Guba (1985) there are four aspects to trustworthiness, and their model is described.

3.2 THE RESEARCH PARADIGM

Paradigms provide a foundation for addressing the research question and direct the researcher with regard to methodology and analysis (Cohen, Manion and Morrison 2009). Interpretive research collects detailed qualitative data in order to obtain an in-depth understanding of how people create meaning in their lives (Terre Blanche and Durrheim 2006).

Paradigms are different ways of looking at the world (Terre Blanche and Durrheim 2006). According to Lincoln and Guba (1994: 107), "paradigms as basic belief systems are based on ontological, epistemological and methodological assumptions". Hitchcock and Hughes (cited in Cohen, Manion and Morrison 2009: 5) suggest that "ontological assumptions give rise to epistemological considerations, these in turn, give rise to methodological considerations, and these, in turn, give rise to issues of instrumentation and data collection". Research is defined by a number of different dimensional theories, namely, ontology, epistemology and methodology which are discussed below.

Terre Blanche and Durrheim (2006: 561) define *ontology* as the "theory of the essence of things, their true nature". They go on to explain that ontology is the "the philosophical understanding of what aspects of human existence are available to the study". In knowing the form and nature of realism one can understand the meaning of ontology (Lincoln and Guba 1994). Cohen, Manion and Morrison (2009: 7) pose the question of whether social reality is "external to individuals – imposing itself on their consciousness from without – or is it the product of individual consciousness?" Philosophy describes this as the "nominalist – realist debate" (Cohen, Manion and Morrison 2009: 7). The nominalist believes that it is the researcher's perception that gives meaning to reality while the realist thinks that reality exists independently of the researcher's perceptions (Cohen, Manion and Morrison 2009).

Terre Blanche and Durrheim (2006: 6) define *epistemology* as the "nature of the relationship between the researcher and what can be known"'. According to Bailey (2007: 50) there are two sets of epistemological beliefs; the first belief suggests that a "social reality exists independently of the researcher" while the second belief advocates "multiple realities and that a relationship exists between the researcher and what can be learned from the research". Finally, to complete our understanding, research methodology is discussed in the next paragraph.

According to Terre Blanche and Durrheim (2006: 6), *methodology* specifies "how researchers may go about practically studying whatever they believe can be known". Lincoln and Guba (1994) state that the methodology used must be appropriate and in line with the research study. They add that there are factors that need to be taken into consideration when selecting a particular methodology. These will relate to the nature of the study and determine whether the research is quantitative or qualitative in nature. The difference between quantitative and qualitative research is described in detail in the following paragraphs as well as its application to the different research paradigms that exit.

Research paradigms with orientation to the social sciences occur within the four unique frameworks; these include the positivist, interpretive, constructionist and critical paradigms (Bailey 2007; Terre Blanche and Durrheim 2006). From the classification given above there are two general paradigms. These paradigms are referred to as positivism and post-positivism. Cohen, Manion and Morrison (2009: 7) suggest that subscribing "to the former is to be a positivist, to the latter, anti-positivist".

Positivism resides in the domain of quantitative research. Denzin and Lincoln (2005:10) state that quantitative research "emphasize the measurement and analysis of casual relationships between variables, not processes". Similarly Terre Blanche, Kelly and Durrhiem (2006: 272) suggest that quantitative research "makes sense in situations where we know in advance what the important variables are and are able to find reasonable ways of controlling and measuring them". Quantitative methods have predetermined categories using standardised measures to make broad and generalised assessments (Cohen, Manion and Morrison 2009). Bailey (2007: 51) explains that a "positivist paradigm is associated with a dominant model of scientific research". According to Denzin and Lincoln (2005) quantitative research is an objective, logical and observed process. Positivism is the study of people's objective experiences of the external world which "relies on controlling and manipulating reality" in order to gather data (Terre Blanche and Durrheim 2006: 7). Likewise Cohen, Manion and Morrison (2009) state that positivism embraces an objective approach of the social world as being rigid, authentic and external using conventional techniques such as surveys and experiments. Objectivity is defined as "the pathology of cognition that entails silence about the researcher, their interests, desires and how these are socially situated" (Denzin and Lincoln 2005: 129). Objectivity in social sciences detaches the researcher from the respondent (Olson 1995).Cited in Onwuegbuzie (2002: 519) Combe's view on objectivity is that the "social observations should be treated as entities in much the same way as physical scientists treated physical phenomena...the observer could be separated

from what is being observed". Breuer, Mruck and Roth (2002: 1) state that "objectivity is what makes the difference between valid scientific knowledge and other outcomes of human endeavours and mind". Mellon (cited in Olson 1995: 4), states that "objective researchers try to eliminate bias while subjective researchers recognize and acknowledge it".

In comparison, post-positivism is concerned with qualitative research. The aim of qualitative research is to "discover meaning and uncover multiple realities" (Polit and Hungler 1995:296). Qualitative research allows for the researcher to engage in "open-ended, inductive exploration" (Terre Blanche, Kelly and Durrhiem 2006: 272). According to Durrheim (2006: 47) qualitative methods "allow the researcher to study selected issues in depth, openness and detail as they identify and attempt to understand the categories of information that emerge from the data". Cohen, Manion and Morrison (2009: 8) emphasis that a post-positivist approach is more subjective, having an outlook of the "social world being of a much softer, personal and humanly created kind will select from a comparable range of recent and emerging techniques such as accounts, participant observation and personal constructs". Subjective research allows a researcher to understand the context of a situation (Olson 1995). The division between subject and object is reduced when the object is an "active participant in the knowing process" (Olson 1995: 3). Subjectivity explained by Vidich and Lyman (cited in Denzin and Lincoln 2005: 13) state that qualitative research has "been judged on how we conceptualize our reality and our images of the world". Similarly, Olson (1995) states that the subjective researcher tries to understand the situation through the eyes of the respondent. In subjective research the "theory may be generated by the evidence during the study" (Olson 1995: 4).

Under the umbrella of the post-positivist paradigm reside the three other paradigms which were briefly mentioned above. These paradigms are referred to as interpretative, constructionist and critical paradigms. In the interpretive paradigm, one looks for meaning through systematic assessment

in order to find understanding and interpretation for occurrences (Neuman, 2000). Constructionist research evaluates "suspicious and politicised epistemological stances that the researcher uses in order to deconstruct versions of reality" (Terre Blanche and Durrheim, 2006: 7). The critical paradigm described by Neuman (cited in Bailey 2007: 52) is a paradigm often used to "empower the people in a setting and to work toward meaningful social change".

3.3 POSITIONING THIS STUDY IN A RESEARCH PARADIGM

Qualitative research addresses questions by using methods that "try to describe and interpret people's feelings and experiences" (Terre Blanche, Kelly and Durrhiem 2006: 272). Wildemuth (1993) suggests that the researcher selects a method based on the questions concerned. Research assumed with an interpretive paradigm "centres on social relationships as well as the mechanics and the processes" through which participants "navigate and create their social worlds" (Bailey 2007: 52). The ontological belief of research in the interpretive paradigm is that no one social reality exists but rather a number of realities (Bailey 2007). The interpretive paradigm involves an understanding of participant's daily "experiences" and an increased consciousness of the "multiple meanings given to the routine and difficult events by those in the settings" (Bailey 2007: 52). The ontology of this research takes the laboratory owners, dental technicians and dentists' subjective experiences as being real. The persons interviewed for this research interact intimately with the subject matter making real and relevant decisions based on their life experiences. The interviewees make up a diverse group with different life experiences and hence the responses are subjective to the experiences of the individual within the field of dental technology and the practice of outsourcing.

The epistemological stance taken toward this study revealed that by interaction with the participants and being alert to what they had to say it is able to make sense of the participant's experiences. The interaction that takes place is conducted through a qualitative, particularly interpretative, methodological approach (Terre Blanche, Kelly and Durrheim 2006).

The interpretive paradigm makes use of qualitative methods of research. Interpretivism uses "methodologies such as interviewing or participant observation (Terre Blanche and Durrhiem 2006: 7). An interpretive approach focuses on "harnessing and extending the power of ordinary language and expression" thus helping us to understand the "social world we live in" (Terre Blanche, Kelly and Durrhiem 2006: 274). For the purpose of this study an interpretive approach was selected as this research involved the perceptions (which are the subjective responses of those interviewed) of specific groups and associations with regard to outsourcing of dental prostheses in Gauteng, South Africa. Terre Blanche and Durrheim (2002) states it is important to ensure that research purposes and techniques are arranged rationally in the research framework provided by the interpretative paradigm. By conducting semi-structured interviews with laboratory owners, dental technicians and dentists, qualitative data was generated and qualitative data analysis techniques were employed to produce creditable findings.

Consequently, this research is a post-positivist study, which excludes any quantitative analysis, conducted in an interpretive paradigm producing qualitative data.

3.4 KEY RESEARCH QUESTIONS

The research questions are repeated in order to remind of the focus of this research.

1) How do the laboratory owners, dental technicians and dentists perceive outsourcing of dental laboratory procedures in respect of service delivery?

2) What is the position of DENTASA in respect of outsourcing of dental laboratory services?

3) What is the understanding of the SADTC regarding the legislation as contained in the Dental Technicians Act 19 of 1979 in respect of outsourcing of dental laboratory services?

In order to understand participants' perceptions, their position and understanding regarding the outsourcing process within the dental technology industry, it was necessary for me to conduct individual interviews. The methods used for data collection and analysis are described below in detail. The sampling methods employed for the purpose of this study are identified and described, and the motivation in support of these methods will be discussed. Ethical considerations arising out of this study will also be explained and discussed.

3.5 DATA COLLECTION

3.5.1 Collection of qualitative data

Interviewing in the interpretive paradigm allows the researcher to create rich and comprehensive descriptions of a few cases that construct an understanding of phenomena in specific contexts (Terre Blanche and Durrheim 2006). Data was collected through a series of individual semi-structured interviews. The data collected was transcribed and analysed using thematic content analysis. The duration of each interview was between 20 to 45 minutes and was conducted personally by the researcher.

The use of semi-structured interviews allowed respondents free choice in discussion which, in turn, allows their understandings of the outsourcing process in dental technology to emerge naturally. According to Cohen, Manion and Morrison (2009) semi-structured interviews are less formal and allow the interviewer the freedom to modify the sequence of questions by changing, adding or explaining them. It also allows the interviewer to adapt the interview according to the responses of the participants rather than adhering to a rigidly structured list of questions (Kelly 2006). Conducting semi-structured interviews was preferred to other qualitative research methods as it allows the interviewer to probe a number of key issues which are raised in discussion and can be fully analysed during conversation (Cohen, Manion and Morrison 2009). By contrast, in structured interviews set questions are asked and recorded on a standardized schedule and thus was not considered appropriate as the research attempted to understand the issues that concerned the industry from the voice of the industry.

The semi-structured interviews employed in this study consisted of a number of predetermined questions[11] that were used to prompt the discussion and ensure that all aspects of the research questions were covered. The guideline questions allowed for more in-depth probing and responses.

It is crucial to consider the research objectives when designing the interview schedule. The questions asked must effectively reflect what the researcher is trying to determine. This process may be initiated by stating the variables to be measured (Cohen, Manion and Morrison 2009). The theoretical framework serves to form a link between the questions and the implementation of the study (Kaniki 2006). The work of Franceschini *et al* (2003), as discussed in Chapter Two, was used as the theoretical framework for this study and thus formed the basis for the interview questions. Themes to be identified were orientated around the theoretical framework chosen for

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[11] See Annexures 4, 5, 6 7 or 8 for the various interview schedules.

this study. For example, by asking[12] whether there was any contractual relationship between the outsourced and the outsourcer, it was possible, by analysing responses, to identify a theme concerning contractual relationships between the industry participants.

3.5.2 Sampling used to generate qualitative data

Sampling in qualitative research involves measuring of attributes and relationships in a population (Polit and Hungler 1995). Representativeness is one of the main concerns that affect sampling. Creating purposeful samples helps ease this concern (Terre Blanche and Durrheim 2006). According to Polit and Hungler (1995) purposeful sampling is also referred to as theoretical sampling. Homogeneous sampling is a strategy that is drawn from theoretical sampling that allows a focused enquiry (Polit and Hungler 1995). Representative samples ensure a true reflection of measurements that can be generalised to the population (Polit and Hungler 1995). Terre Blanche and Durrheim (2002) state that in order to obtain representativeness the researcher needs to extract random samples.

Sample size is dependent on the purpose and rationale of the study, type of sampling strategy used, how much detail needs to be gathered and duration of the interviews being conducted. Sample size should be considered along with the idea of theoretical saturation (Cohen, Manion and Morrison 2009; Polit and Hungler 1995). Theoretical saturation "is the point at which no new insights are obtained, no new themes are identified and no new issues arise regarding a category of data" (Bowen 2008: 140). According to Kelly (2006: 289) six to eight data sources are adequate based on interviews that are several hours in length and 10 to 20 data sources for those shorter in length. Polit and Hungler (1995: 299) state that for "homogenous samples fewer than 10 cases" may be sufficient.

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[12] See Annexure 4, question 1.8.

In this study a total of 20 interviews were conducted. The persons interviewed comprised of three groups. Six laboratory owners, six dental technicians and six dentists were interviewed. In addition, a member of the executive committee representing DENTASA and SADTC respectively, were interviewed. The reason for interviewing only one member per association was that both DENTASA and the SADTC declined to be interviewed as part of a focus group. Both organisations then agreed that each association nominate the most appropriate member, on account of their expertise of the subject matter, to represent its position for the purposes of this research. The representative from DENTASA was interviewed in order to determine the association's position in respect of outsourcing of dental laboratory services. The SADTC representative was interviewed in order to gain an understanding regarding the legislation as contained in the Dental Technicians Act 19 of 1979 in respect of outsourcing of dental laboratory services.

This study was limited to registered[13] laboratory owners, dental technicians and dentists with at least five years of dental industry experience in Gauteng, South Africa (refer to *section 3.8* for a further discussion on the limitations concerning this study). A list of registered laboratory owners and dental technicians in Gauteng was purchased from the SADTC. Unfortunately, the list was outdated and much of the information was incorrect. An improved list of laboratory owners and dental technicians in Gauteng was obtained through DENTASA. These lists were combined to form a complete list from which to create the sample. In total there were 154[14] possible laboratory owner respondents and 37 dental technician respondents in Gauteng. A list of dentists (out of a total of 1 450 possible respondents) in Gauteng was

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[13] Dentists are registered with the HPCSA and dental technicians with the SADTC.
[14] It is noted that the total number of technicians on this list differs from the figures given by the SADTC as the total number of dental technicians in South Africa is 799 and the total number of laboratory owners is 784. As some of the laboratories are owned by dentists it is unknown how many technicians in total are registered in South Africa as the SADTC cannot provide this information. The researcher has proceeded using the lists available in good faith.

obtained from MedPages, which is a voluntary medical directory for South Africa.

Simple random sampling was used for this study. Random sampling, although basic in design was found to be suitable for this study. This method is non-bias and allows for each participant of the research population having an equal opportunity of being selected (Terre Blanche and Durrheim 2002). Participants were selected using the table of random numbers to facilitate the randomization process (Polit and Hungler 1995). The acquired lists of laboratory owners, dental technicians and dentists that were used for sampling are referred to as 'sampling frames' and each participant in the frame is referred to as an element (Terre Blanche and Durrheim 2002). After a sampling frame was developed, each element on the frame was numbered in descending order. A table was randomly constructed according to each sampling frame (Terre Blanche and Durrheim 2002). Three different tables[15] were drawn up, one for each sample group. A number was randomly selected as a starting point from each table. Additional selections were made using a preset pattern of selection. This method of selection ensured that each participant had an equal chance of selection and eliminated bias selection. Each table number corresponds with the element that appears on a respective sampling frame used for that specific sampling group. Each number thus corresponds to a number next to a name on the combined sample list (Terre Blanche and Durrheim 2002). Three groups were sampled. Six laboratory owners, six dental technicians and six dentists were selected. The numbered participants were invited telephonically to participate in the study. If they refused to participate the process was repeated until the total number of participants required for the study was obtained.

It is considered unethical for participants to participate in any study without being fully informed of the nature of study (Kelly 2006). Hence, consent to

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[15] See Annexure 10 for an example of simple random sampling.

participate in the study was required from all potential participants. Informed consent is "an ethical requirement for all research studies" (Kelly 2006: 294). Informed consent, as it pertains to this study, is described below.

A letter[16] providing information on the nature of the research requesting compliance and consent to participate[17] in the study were distributed via e-mail before the interview dates and a copy was also handed to each participant on the day of the interviews. The letter covers the standard components of consent which are that confidentially would be assured, by "provision of appropriate information" as well as clearly detailing the "participants' competence and understanding, voluntariness in participating and freedom to decline or withdraw after the study has started" (Wassenaar 2006: 72). All participants acknowledged their desire to participate in the study by signing the informed consent forms provided.

Triangulation of data is a method providing trustworthiness of data. Data triangulation requires accumulating data in as many ways, forms and from as many resources as possible (Terre Blanche and Durrheim 2002). Campbell and Fiske (cited in Cohen, Manion and Morrison 2009: 141) describe triangulation as a powerful way of representing simultaneous "validity particularity in qualitative research". The researcher attempted to include a focus group including two laboratory owners, two dental technicians and two dentists for data triangulation. Unfortunately, this focus group did not eventuate. The process of initiating contact and conducting interviews with laboratory owners, dental technicians and dentists proved to be very difficult. For example, after attempting contact with 47 dentists, 20 laboratory owners and 15 dental technicians, the researcher could only secure one individual to represent each group who would be willing to attend the focus group at the designated time. Many of the prospective participants were reluctant to take

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[16] Annexure 1 Letter of Information to participants
[17] Annexure 2 Participant Consent Form

time away from their businesses or give of their own time outside working hours for the benefit of this research. However, after confirming a date, time and venue that was suitable for the three agreeable participants and after sending several text message reminders prior to the proposed interview and on the morning of the interview, only one participant was present. Consequently, the researcher was unable to conduct any meaningful focus group interview and the session was cancelled.

Nevertheless it is argued that the different groups interviewed should provide sufficient data for triangulation and thus answered the research questions (Cohen, Manion and Morison 2009). Triangulation allows the researcher to gain a better understanding through viewing the data from different perspectives (Kelly 2006). Cohen, Manion and Morison (2009) and Denzin, (cited in Patton 1990), argues that the use a variety of data sources in a study is adequate in providing data triangulation. Thus the exclusion of the focus group did not affect the trustworthiness of this research as the use of three different groups as sources of information were considered adequate in providing data triangulation. Consequently, the data collected for this research can be considered trustworthy. A greater understanding of trustworthiness and triangulation of data is discussed in section 3.7 below.

3.5.3 Analysis of qualitative data

Interviews were recorded using a Sony digital voice recorder. To ensure that the data recording tool was working correctly and to assess the effectiveness of the interview schedule pilot interviews were conducted with a participant representative of each individual group, namely laboratory owners, dental technicians and dentists. After interviewing, the recordings were used for data transcription. Meaning to data is generated by either counting frequencies of occurrence (of ideas, themes, pieces of data and words) or noting patterns and themes which may stem from repeated themes (Cohen, Manion and Morrison 2009). This research will be looking for emerging

themes. The transcribed data was analyzed using the NVivo 8 software program to identify themes. The form of data analysis must be suitable for the type of data collected (Cohen, Manion and Morrison 2009). The data analysis employed in this study is referred to as thematic content analysis (Terre Blanche and Durrheim 2006).

3.6 ETHICAL CLEARANCE

Ethical clearance from the ethics committee of the Faculty of Health Sciences was obtained. An ethics clearance certificate was thereafter issued. A copy of the ethics clearance certificate is included as an annexure[18].

3.7 TRUSTWORTHINESS

3.7.1 Ensuring trustworthiness

It is important to establish quality criteria against which qualitative research (Polit and Beck 2007) are evaluated. The nomenclatures used when evaluating quantitative and qualitative research are different. Validity and reliability is associated in quantitative research (Ulin, Robinson and Tolley 2004). Trustworthiness is used as the fundamental criterion used to judge qualitative research (Lincoln and Guba 1985). In order for a study to be seen as trustworthy it has to be credible. It should be carried out fairly and ethically, allowing the "audience to check its findings and the process by which the findings were obtained" (Roberts and Greene 2002: 781). Bailey (2007) argues that the conceptual understanding of trustworthiness can be divided in the understanding of four concepts. The four concepts "possess an embedded set of evaluative criteria" that is closely related and interdependent (Lincoln and Guba cited in Bailey 2007: 81). Consequentially it is argued that in order for data to be trustworthy is must be credible,

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[18] Annexure 9 Ethical clearance certificate from Durban University of Technology

transferable, dependable, and confirmable (Lincoln and Guba cited in Bailey 2007). These concepts are now described below.

Credibility is known as the truth value, and "refers to the confidence in the truth of the data and its interpretations of them" (Polit and Beck 2007: 539). Credibility described by Miles and Huberman (cited in Bailey 2007: 182) "implies believability, authenticity and plausibility of results." Lincoln and Guba (cited in Bailey 2007: 182) state that trustworthiness is expressed by how willingly the reader can believe or trust the research. Credibility can be judged through appropriate methods of data collection and analysis as well as accurate representation of data in the final manuscript (Bailey 2007).

Kelly (2006) states that the degree to which the interpretive paradigm can be applied to situations, other than the one being explored, relates to transferability. Transferability is the "generalizability of data that is the extent to which findings can be transferred to or have applicability in other settings or groups" Lincoln and Guba (cited in Polit and Beck 2007: 539). The knowledge acquired in one study can be relevant and applicable in context were one is able to apply certain concepts that were originally developed (Holloway and Wheeler 2002). In order for the data to be trustworthy it must be dependable.

In qualitative research trustworthy data must be dependable. Dependability can be further understood as reliability of data. Reliability is, however, a term used rather in relation to data obtained in quantitative research. Dependability is understood as the "stability of data over time and over conditions" (Polit and Beck 2007: 539). In order for the result to be dependable it should be accurate and consistent (Holloway and Wheeler 2002). Due to the subjective nature of the social sciences (the domain of qualitative research) the data obtained can better be described as data that can be confirmed, or in other words, confirmability of data (Bailey 2007).

Confirmability ensures that data will represent information that the participants provide. This is achieved by "reflecting the participant's voice and conditions of inquiry and not the biases, motivations or perspective of the researcher". When confirmability exits, readers are able to trace data to their original sources (Polit and Beck 2007: 539).

3.7.2 Trustworthiness of data generated by this study

The evaluation criteria, as described in Bailey (2007), were considered during the course of this research in order to ensure trustworthiness. Reliability was achieved by obtaining data from interviewing three sample groups, namely, laboratory owners, dental technicians and dentists. When data is drawn from different perspectives representing three different interest groups, the researcher is able to triangulate the 'true' state of the affair by examining where the different data overlap (Silverman 2008). Hence, data gathered for this study can be said to have satisfied the requirement for the triangulation of the data obtained.

According to Terre Blanche and Durrheim (2002: 298) "pilot studies are used to identify possible problems with proposed research by using a small sample of respondents before the main study can be conducted". Questions were carefully formulated to ensure authenticity, richness and depth of the respondents' views. Open-ended questions were also used for the purpose of this study (Cohen, Manion and Morrison 2009). In order to assess the effectiveness of the interview schedule pilot interviews were conducted with each sample group and the results were analysed. The results obtained from the pilot study are consistent with the data obtained in the main study. Cohen, Manion and Morrison (2009) state that conducting pilot interviews have numerous benefits, including enhancing the reliability and validity of the research.

To ensure creditability of the data, the researcher actively participated in the transcribing process of individual interviews. This was done by verifying the transcriptions whilst listening to the recordings. And even though the recordings were of high quality there were slight discrepancies between recordings and transcriptions that the transcriber had difficulty understanding. The transcripts were corrected where necessary.

In summary the data collected for this study is said to be trustworthy as there was active participation of the researcher in the data collection and analysis. In addition, pilot studies were conducted prior to the commencement of the study and finally, the varied sample groups interviewed ensured triangulation of data emanating from the study.

3.8 DELIMITATIONS

According to Bowen (2008: 140) an appropriate sample is "composed of participants who best represent or have knowledge of the research topic". This study was therefore limited to laboratory owners, dental technicians and dentists with at least five years of dental industry experience. Newly qualified personnel with less than five years' experience are considered to have insufficient experience in the industry and, hence, would not be able to make a sufficiently informed contribution to the study.

Secondly, the study was limited to respondents practicing in Gauteng. Respondents were selected from Gauteng because this province has the highest concentration of dental laboratories, dental technicians and dentists in South Africa. Gauteng is known as the economic engine of the southern African region and the gateway to doing business with the rest of Africa and the world (Akinboade and Pillay 2009).

Participant interviews for this study were conducted prior to the South African Consumer Protection Act, 2008 (CPA) was legislated and therefore respondents were not questioned about the CPA or its perceived effects on the industry. It was deemed possible that, as the Act was not yet implemented, its effects would still need to be tested and could consequently influence the interview negatively as the respondents would be largely uninformed on the CPA.

3.9 CONCLUSION

This chapter examined the methodology and established the research paradigm used in this study. The difference between qualitative and quantitative research was discussed. This study was identified as a post-positivist qualitative study carried out in the interpretive paradigm. It was argued that qualitative data would be generated through individual semi-structure interviews and that 20 interviews would generate sufficient creditable data. Sample size and the method by which participants were selected was discussed and explained. It was argued that the data to be generated would be trustworthy and creditable and that triangulation of data would be achieved. The delimitations of the study were established. The need for informed consent and other ethical considerations was discussed and attention was drawn to the official ethical clearance received for the study. The discussion now turns to Chapter Four which outlines, describes and discusses the findings generated by this study.

CHAPTER FOUR - FINDINGS AND ANALYSIS

4.1 INTRODUCTION

The dental technology industry as practised in South Africa was discussed in Chapter One with special attention to the understanding of outsourcing. Chapter Two reviewed existing literature interrelated to the global and domestic discussion regarding the practice of outsourcing while Chapter Three explained the research methodology used. This chapter focuses on discussing the findings of this study.

Interview data was transcribed verbatim. Analysis of the data generated from this qualitative study has resulted in the identification of themes and sub-themes, which are listed in Table 1 and discussed in detail below. Themes identified were determined with reference to the conceptual framework chosen for this research study. Relevant quotes from the data were used to guide the results generated in order to illustrate and reinforce the findings. In order to ensure anonymity pseudonyms are used when quoting from interviews conducted. The data generated and the discussion that follows in this chapter provided answers to the three key research questions[19].

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[19] For ease of reference the key research questions are repeated below:

1) How do the laboratory owners, dental technicians and dentists perceive outsourcing of dental laboratory procedures in respect of service delivery?

2) What is the position of DENTASA in respect of outsourcing of dental laboratory services?

3) What is the understanding of the SADTC regarding the legislation as contained in the Dental Technicians Act 19 of 1979 in respect of outsourcing of dental laboratory services?

Table 1: Themes and sub-themes

The following themes and sub-themes were identified in this study:

Main theme	Sub- themes
4.2.1. Knowledge and understanding of laboratory owners, dental technicians and dentists of the outsourcing process	4.2.1.1 Attitudes towards outsourcing 4.2.1.2 Factors contributing to outsourcing 4.2.1.3 Knowledge and understanding regarding contractual negotiations and outsourcing management 4.2.1.4 Attitudes towards ethical behaviour during the outsourcing process 4.2.1.5 Awareness relating to disclosure of information 4.2.1.6 Understanding outsourcing regulations 4.2.1.7 Understanding of regulations that govern quality control on materials used when dental work is outsourced domestically and abroad
4.2.2. DENTASA's knowledge and understanding of outsourcing regulations	4.2.2.1 Attitudes towards outsourcing 4.2.2.2 Understanding of regulations that govern quality control on materials used when dental work is outsourced domestically and abroad
4.2.3. SADTC's understanding on outsourcing regulations	4.2.3.1 Awareness relating to disclosure of information 4.2.3.2 Understanding of regulations that govern quality control on materials used when dental work is outsourced domestically and abroad

4.2 ANALYSIS OF FINDINGS

4.2.1 Theme1: Knowledge and understanding of laboratory owners, dental technicians and dentists of the outsourcing process

Prior to selecting the appropriate outsourcer to outsource work to, it is important to establish a business' core activities. This is known as *internal benchmarking* (Franceschini *et al.* 2003). Having established one's core activity, the selection process for the most suitable outsourcer can take place. This process is known as *external benchmarking* (Franceschini *et al.* 2003).

Dental technology has three major disciplines and dental laboratories can legally choose to specialize in all or some of these disciplines. The majority of dental laboratories choose to specialise in order to provide quality service. The specialized discipline favoured by a laboratory becomes the core competency of that dental laboratory.

> *You have to specialise to become the best of the best. Trying to do all disciplines requires too much time, energy and the knowledge to do all of them, much better to specialise in a certain area.* [T5]

Practicing dental technology is not limited to "dental technicians but is shared with dentistry" (Skea 2010: 105). According to the Act, dentists are allowed to own a dental laboratory as well as practise dental technology. Nevertheless, all dentists felt that although they had received formal basic training in dental laboratory procedures (such as prostheses production) while at university as part of their curriculum, they were unable to carry out their own dental laboratory work in addition to clinical procedures. They choose to focus on the clinical aspect of dentistry (their core competency) and outsource their dental cases to dental laboratories.

I'm not keen to do work after hours, because that's when you'd have to do it, you could not do it during the day, during office hours. Because your clinical time of your patients is [minimal], I mean we have half-an-hour appointments. I'm not happy to go and do prosthetic [laboratory] work. [D3]

Previously it was compulsory for dentists to show competency of the various levels of laboratory procedures as part of their clinical learning however in recent times the requirements have been reduced considerably (McGarry and Jacobson 2004). Similarly Christensen (1995: 115) felt that "most dentists know little about laboratory technology having received minimal laboratory technology instruction in dental school and having had meagre or no hands-on experience after graduation". This was evident by the dentists' responses; when asked if they had any background knowledge or any experience doing dental laboratory work while at university, one response was:

We did basic work but not hands-on. I've never done it hands-on. [D4]

In response to being asked if dentists utilized any frameworks when deciding to outsource, many of them stated that they were unacquainted with theoretical outsourcing frameworks that exist. Similarly this was the situation with laboratory owners as well.

No. You go to conferences and things like that, you hear what other people are doing, and you take it from there. [LO2]

However, interviews significantly revealed that a majority of laboratory owners and dentists were actually following some of the steps described in the literature without knowing it, as argued below.

In South Africa[20] there are many dental laboratories that outsource work that is outside their field of expertise. The average number of dental technicians employed in a dental laboratory in South Africa is one per laboratory (SADTC 2010). Insufficient numbers of registered technicians employed in a laboratory as well as insufficient volumes of specialised work affect the type of work that can be done in-house. Therefore, outsourcing often occurs out of need. A majority of laboratory owners believed that the outsourcing of specialised work should only occur when they were unable to do it in-house. Likewise dental technicians agreed with laboratory owners in that laboratories outsource for real practical reasons.

> *You can't do everything. You can't specialise in everything.*　　　　[T2]

The reasons vary but, in the main, work is outsourced when the laboratory does not have the expertise.

> *Today, we do a lot of implant work, a lot of labs in the past have sent us their difficult stuff to do, mesio bars, hybrids that sort of thing, because if you don't know what you're doing you can make big mistakes and it can cost you a lot of money.*　　　　[LO6]

> *It's[21] certainly not something that any of us have got enough experience in to do.*　　　　[T4]

Similarly, a minority of dentists responded with certainty that they did not have adequate skill or expertise to complete their own dental laboratory procedures.

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[20] The reader is referred if necessary to *Chapter One*, *section 1.6*, where the profiling of South African dental laboratories as compared to overseas laboratories is discussed.
[21] T4 was referring to expertise in the *Chrome* discipline

I wouldn't feel confident in giving a patient a denture like that. Maybe if we had more training, more experience, but I don't think so. It is just too time-consuming as well. [D5]

Another reason for outsourcing is the lack of the necessary materials and the equipment in the laboratory as stated below by laboratory owners and dental technicians:

A number of laboratories only outsource highly specialized cases such as complicated orthodontic appliances because they don't have the material or they don't have the equipment. [LO5]

As a small lab it's not worth while buying expensive equipment. The process becomes very expensive for a single laboratory to buy its own equipment. I think it makes much more sense for a guy to outsource. [T5]

Specific disciplines of dental technology require several pieces of specialised equipment in order to complete dental laboratory procedures and due to a lack resources, a number of small laboratories[22] in South Africa choose to outsource all or part of the specialised laboratory procedures. Previously all specialized work that required, for example, CAD/CAM[23] technology was outsourced offshore to EU countries. However, currently there are several CAD/CAM systems available in some South African laboratories. However, many laboratories prefer to outsource CAD/CAM work, due to the costs of purchasing CAD/CAM systems, to production centres mainly situated in Gauteng. The majority of laboratory owners interviewed believed that investing in expensive equipment is not economically feasible. They felt it

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[22] For purpose of this study, in this chapter the words '*dental laboratory or laboratories*' will be referred to as laboratory or laboratories.
[23] The reader is referred, if necessary to *Chapter Two, Section 2.2.2.1* where *CAD/CAM technology* is defined and discussed.

would take a long time to pay off machinery as large work volumes are needed in order to make systems economically worthwhile. In addition, there are maintenance and insurance costs, and regular software upgrades that need to be considered. A more sensible option is to outsource specialized work domestically to the production centres that are available.

Outsourcing specific work like Zirconia copings [is indicated because] equipment is too expensive, milling machine or a milling unit costs are around a million rand and cheaper versions are too labour-intensive, having your own milling unit takes up to much time. [LO4]

Dentists felt owning a laboratory would cost a large amount of money, require qualified dental auxiliary staff and expensive equipment.

You need equipment, you need funding, you need qualified people also to assist you in the lab, But you [as a dentist] just take the impression, you send it, it doesn't cost much, I mean compared to having your own lab. [D1]

Laboratory owners, dental technicians and dentist understanding and knowledge of the outsourcing process with reference to the sub-themes will now be discussed in greater detail.

4.2.1.1 Attitudes towards outsourcing

In the dental industry there are various methods of outsourcing. Domestically dentists outsource to dental laboratories and dental laboratories outsource to other local dental laboratories. Outsourcing also occurs offshore (abroad) where dentists outsource work to foreign dental laboratories and domestic dental laboratories outsource to foreign dental laboratories. In addition,

dental appliances are outsourced from foreign dentists and dental laboratories to South African dental laboratories.

Prior to conducting interviews, while reading for this study it was hypothesised that, like laboratories in the USA and UK, laboratories in South Africa outsourced significant amounts of work abroad. This was found not to be the case. This study revealed that South African laboratories employ relatively few technicians in comparison to the number of technicians employed in the USA and UK. In addition, laboratory owners prefer to outsource work domestically because it allows for easy monitoring and control of the work being outsourced. They are able to address problems that occur more swiftly than when work is outsourced offshore.

Receiving work from countries outside of South Africa was not previously considered part of this study but was raised during the interview process by laboratory owners.

> *We've got contracts with the UK [United Kingdom] and African countries. Clinics outside of South Africa, they send us work.*   [LO6]

Laboratory owners indicated that receiving outsourced work from abroad, as well as being seen as a source of job creation in the South African labour market, is a source of foreign exchange earnings which impacts positively on the South African economy.

> *I'm all for it... money that comes into the country...I think it creates jobs...so I think if you can get money into the country by any legal way, do it.*   [LO5]

Many dentists, whilst agreeing that work coming into South Africa is positive for the economy, also believe that the best way to sustain the labour market in South Africa is by supporting South African laboratories.

> *I feel that South Africans need to be looked after. We need to support our own local guys. It obviously does affect our labour market because not supporting our local people will mean less jobs for our local people and more jobs for people abroad.* [D4]

Thus, this study revealed that the international dental industry chooses to outsource their work to South Africa as South African dental laboratory work is of a high quality. The exchange rate also makes outsourcing to South Africa a viable option. Labour costs in South Africa are much lower than in the UK and the EU where much of the offshore work originates. It is therefore cost effective for laboratories from abroad to send their work to South Africa without compromising standards.

> *We found our quality has always been of a much higher standard than what they're used to.* [LO6]

While a majority of dentists understood the benefits of South African laboratories receiving offshore work,

> *I think it makes us proud, as South African[s], to say...we actually are on par in terms of skill with the overseas market. At the same time they trust our work, and also it helps then to build our economy.* [D6]

a minority of them were non committal if their work was outsourced offshore by their South African laboratories and were unaffected by where the work was done:

> *I don't mind if labs want to outsource abroad because it doesn't affect me.* [D3]

A majority of dental technicians' attitudes towards outsourcing were that they are unaffected by work being outsourced either nationally or abroad and

outsourcing did not impact negatively on their employment. While the majority of dental technicians might have never considered the effects of unemployment that outsourcing could potentially bring, a minority of them did feel that outsourcing abroad was not to be encouraged.

I've got a problem with it because they actually taking work away from a qualified technician inside this country. That's why I also feel very strongly about it. [T5]

If it affects you directly obviously you won't, you won't like it. [In] the textile industry in South Africa the work's been outsourced to different countries and lots of people have lost their jobs. It is happening in America and in Europe and it is affecting them directly, so if it was happening here to that extent and it was affecting jobs then it wouldn't be a good thing. [T1]

In all cases dental technicians preferred to do the work in-house but when the workload increases greatly or the laboratory in which they work does not have the necessary equipment or materials then outsourcing is indicated. The overall feeling was that domestic outsourcing (as opposed to offshore outsourcing) was beneficial to local dental laboratories.

I don't really have a problem if you trust the other technician or the lab. I think it's a good thing, especially if there's networking between labs, I think the one hand helps the other. [T6]

Interestingly, a minority of dental technicians stated that when specialized work was outsourced it allowed them to use the available time to develop their level of skill and expertise by focusing on their own and new skills.

Their production can actually go up, and people don't realise that. They think you're taking away their work, but you're not, so the time

that he was sitting doing copings, he can now help with the volumes by doing ceramic work, you're actually enriching them by getting [giving] them more skills. [T5]

The findings of this sub-theme will be discussed further in the conclusion and recommendations. The dissertation now turns to the perceptions of laboratory owners, dental technicians and dentists in regard to factors that contribute to outsourcing.

4.2.1.2 Factors contributing to outsourcing

Initially when laboratory owners outsourced work they felt that the only way to find the most appropriate laboratory to which to outsource was based on trial and error.

You know its trial and error. You send one job to them and, if it goes all right ...then its fine, but the minute something starts backfiring... then you know. [LO4]

Similarly this was the case with dentists. This could explain the indifference of dentists to where their laboratory work was processed. If laboratories were unable to meet the standards set by the dentists then the dentists were in no way obligated to continue using them, they could change laboratories as they saw fit.

You'll start using somebody, if you don't like it, you change. You know what you want from a lab. And you'll find a lab that works for you. [D3]

As laboratory owners, dental technicians and dentists became more familiar with the outsourcing process they all revealed that by identifying key factors that contribute to efficient outsourcing of dental laboratory procedures an

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informed decision can be made in selecting the most appropriate outsourcers (dental laboratories).

Laboratory owners identified, as did Franceschini *et al.* (2003), factors such as a good relationship with clients and service delivery (which covers good turnaround times, quality and reliability) as being major contributors to an efficient outsourcing process.

> *It comes down to your relationship with your client, the kind of work that you're pushing out and the service that you give him, your standard has got to be high and your service delivery has got to be good.* [LO5]

It is the belief of laboratory owners that the key factor of a lasting relationship with one's outsourcer can be achieved by having good communication.

> *Good communication, it's the only thing that works.* [LO2]

Dentists felt that good communication is achieved by having regular contact with the laboratories with which they deal.

> *Keeping in constant contact with the lab...helps the most. It just helps for a better product in the end. You've just got to be on good terms with your lab.* [D5]

Dentists believe that trust is essential in the dentist/laboratory relationship. They trust the laboratory to meet the required standards set immaterial whether the work is outsourced or produced in-house.

Well I trust my laboratory to make what I require to the standards that I require, and they in turn, trust whoever they outsource it to, to do a good job. [D4]

Dental technicians noted quality and service delivery for their employer's clients as being important factors in maintaining good relations with those persons outsourcing to the laboratories in which they worked. In stating that efficient service delivery was important, dental technicians identified what they believed constituted efficient service delivery. These include producing quality work, meeting deadlines and being reliable.

Choosing to outsource should be based on quality and service. Price is important but if quality and service is not good, laboratories will not send their work if this is the case [T5]

There are reputable technicians...people (laboratory owners) who have built up a name over years, people who are reliable. [T6]

Whilst dentists were unconcerned as reported earlier where their work was being processed they did raise a potential concern in that outsourcing could result in delays. They, like dental technicians, also felt it was crucial for laboratories to have good turnaround times. Delays resulted in appointments having to be re-scheduled. They stated this was frustrating for both themselves and their patients.

You know you sit and have to wait for a job and you're running a day late, whatever, so that's the problem that may arise when it comes to them sending it somewhere else. [D6]

According to laboratory owners the selection of an outsourcer is determined by the quality of work produced and not pricing differentials (Franceschini *et al.* 2003).

> *I would rather pay more for something and get a better product than pick up some guy round the corner here says oh, no, I can do it for half price and it looks like shit. I would rather have that relationship than a cheap product, a fly-by-night cheap product.* [LO4]

Conclusions and recommendations for this sub-theme will be discussed in detail in Chapter Five*.* The discussion now turns to the perceptions of laboratory owners, dental technicians and dentists in regard to knowledge and understanding of contractual negotiations and outsourcing management.

4.2.1.3 Knowledge and understanding regarding contractual negotiations and outsourcing management

All three groups of interviewees similarly stated that there are no formal, written contracts between laboratories and clients in respect to the outsourcing of dental laboratory procedures. Dental technicians felt that there was no need for a formal contract.

> *There's no contract between us [dental laboratory] and them [client]*
> [LO5]

> *Things should be kept simple. Basically, you do the work, you get billed for it and you pay it on whatever their terms are and vice-versa with the dentists, no need for contracts.* [T4]

> *No contractual agreement. I like a particular lab's work for plastics and chromes and I like somebody else for crown and bridge work.* [D3]

However, there was recognition that verbal agreements did exist.

> *Any agreement that we do have with that lab is probably verbal anyway. Mostly everything is done verbally with the lab. I've had a relationship with the lab for quite a few years now, so it is been quite easy to deal with them.* [D5]

A minority of laboratory owners did, however, feel that the lab-slip book[24] that is used between laboratories and dentists when outsourcing work to provide instructions for the laboratory doing the work, might be understood to be a contract.

> *The work slip that they send... It's like kind of a contract in a way that, you know, we have to do the work and they have to pay us.* [LO5]

This may be of concern to the dental technology industry because informal arrangements can lead to abuse and quality problems which are discussed later in the chapter. Written contracts are important because they formalise the type of relationship between the outsourced and outsourcer as being official (Franceschini *et al.* 2003).

Apart from not having any formal written contracts between laboratory owners and their clients when work was outsourced, there is no formal procedure to follow when addressing issues that might arise during the outsourcing process. Methods to address contractual disputes are considered central to business relationships (Franceschini *et al.* 2003). Laboratory owners explained that when problems occurred with the end-products, they informally established what the problem was and who was responsible. If necessary the dentist or outsourced laboratory would be consulted and then a way forward would be determined. In cases where work

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[24] A lab-slip book, as it is colloquially known in the dental technology industry, is a written instruction between the two contracting parties indicating the scope of work to be performed.

needed to be re-done, they looked at the circumstances and convey the decision to the relevant parties.

> *Each one is taken on its merits. I think if we felt any dentist was abusing the system, then – and it has happened in the past – we will then put our foot down and say no we will charge for the re-make.*
> [LO6]

When problems occur with a dental prosthesis in the first year, laboratory owners usually remake the appliance at no charge irrespective of who is to blame for the remake to be necessary. Whilst free remakes are a norm in the industry the dental technology industry is not happy that the onus falls on them to always cover the cost of the remake as this is a costly affair. Not only does it require extra time from the technician, it also requires additional material to be used and impacts on the workload for the day.

> *There's nothing worse than a remake...Cost, time, money. Time is money and money is time. To do something twice, it kills you, and I don't just mean money-wise, I'm talking about as a technician you like to know your stuff works.*
> [LO4]

Laboratory owners will redo work even in instances where they are not liable or responsible for the remake in order to keep good relations.

> *If it has to be remade it's a case of we'll do it in good faith. I'm not going to point fingers to you and say that you as a dentist had taken a bad impression, or me as a technician has done bad work. It's kind of a give and take, it's like you know what, keep the peace, we'll just redo it for you.*
> [LO5]

Dental technicians likewise agree with laboratory owners.

In my opinion it's usually the technician who will accept his responsibility or his mistake even if it was that of the dentist, because he doesn't want to lose him as a client, he wants to keep him happy as a client, so as a service he will redo most of the work for free. [T2]

Likewise dentists, not surprisingly as, the laboratory was carrying the cost of the remake, felt that laboratories were very accommodating and happy to redo the work, no matter who was at fault.

If a patient's not happy with the cosmetic results of it or functional results, they're quite happy to redo something or take it back and adjust it. Because it's no good to me or the patient if they're not going to use it. [D3]

This research established a fact unreported in the literature, namely, that the majority of laboratories informally offer a guarantee on their products.

Between my lab and dentists we gave them a one-year guarantee. In that one year if anything happens, I (the technician) will remake it for you. It doesn't matter whose fault it is. [T3]

The lack of contractual agreements and formal procedures for addressing problems that exist will be discussed further in Chapter Five. The dissertation now turns to the findings regarding attitudes towards ethical behaviour during the outsourcing process.

4.2.1.4 Attitudes towards ethical behaviour during the outsourcing process

During interviews an ethical concern was raised in the way dentists and laboratories were interacting when outsourcing appliances for manufacture. According to the Dental Technicians Act 19 of 1979, dental technicians are not allowed to have patient contact. This study revealed that both technicians and dentists disregard this requirement of the Act and that technicians consult with patients on a regular basis with the consent of dentists, either in the company of the dentist or without the dentist being present. The SADTC states that it is the "responsibility of a dental technician to behave ethically at all times" SADTC (2010: 3). Technicians may come across to dentists as being helpful and accommodating when providing such assistance. While this may be true it transfers a "measure of clinical responsibility from the dentist to the technician" (Skea 2010: 93).

> *There have been times where, if it's a really difficult case, he's [technician] actually stepped up and come to the practice and seen the patient with me, so that makes a difference.* [D6]

Findings revealed some dentists send patients to dental laboratories for adjustments to be made to their dental prostheses or to take the patient's shade for the manufacture of prosthetic appliances.

> *If I have a real problem with the patient, he's [chrome lab technician] quite happy for me to send the patient directly to him so he can do the adjustments or the reline in his offices [dental laboratory]. We have a professional relationship...I like the fact that he's got specialised equipment so for shade guiding because then my patient goes straight to his lab and they have the shades done and they're inevitably always happy with the shade.* [D3]

Technicians provide their expertise and service of shade taking free of charge. No consideration is paid as to how much time is lost while the technician is away from the laboratory or when patients are sent over to the laboratory (Skea 2010). The findings of this sub-theme will be discussed in detail in Chapter Five.

There are no formal written contracts between contracting parties that are used in industry when work is outsourced into or out of the laboratory, this being either domestically or offshore. Conclusions arising from this sub-theme will be further discussed in Chapter Five. Having, discussed the use of contracts in outsourcing and outsourcing management from laboratory owners, dental technicians and dentists perspective the discussion now turns to awareness relating to disclosure of information.

4.2.1.5 Awareness relating to disclosure of information

A majority of laboratory owners confirmed that they disclose to their clients when work is outsourced. They highlight that they had trustworthy relationships for several years with their clients and felt that by not informing dentists as to who produced the work, they are being dishonest and unethical.

> *Yes, they definitely are informed. I'm not going to pretend that I can do it all. There's no such thing as sending the work out and pretending that I've done it. Then it becomes unethical.* [LO5]

One laboratory owner suggested that, in a minority opinion, although he did inform dentists sometimes, at his discretion, he did not really believe that this was necessary as dentists were less knowledgeable on technical matters and that they were not worthy of being consulted.

> *It's at our discretion...but yes we do tell them...to be quite honest dentists are not that knowledgeable...majority of them, they don't give a damn where I get the Zirconia from as long as they get Zirconia.*
>
> [LO6]

Although laboratory owners disclose to dentists when work is being outsourced, they also expressed their fears about this practice. Their fear is that dentists could deal directly with the laboratory supplying the outsourced service.

> *I will tell him exactly what's going on, but yes there is a fear that either he will go directly to that client [dental laboratory].* [LO4]

All laboratory owners were in agreement that there was not much that one could do when they were bypassed for the outsourced laboratory or when the outsourced laboratory wooed their clients from them because they were not bound by any formal contract with their clients thus preventing these practices. Most of the laboratory owners expressed that it would be unethical for dental practitioners to behave in this manner.

> *Dentists can drop you straight away, no problem and go to the lab you outsource work to, cutting you out. There's no loyalty in this game, unfortunately unless there's a personal connection, like personal friend of yours or something. There is a whole range of reasons for dentists dropping a lab such as price, quality or service. I think if you as a technician/lab owner know that a fellow technician/lab owner has client X, you will have – it will be like a gentlemen's agreement. Dentists should respect labs that outsource in the same way.* [LO3]

Similarly a majority of dental technicians felt that dentists should be informed when work is outsourced. Where there is trust and mutual respect between

laboratories and their clients, disclosure does not become a problem. While a minority of them felt that the choice to disclose information to dentists should be client-specific, the decision to inform dentists when outsourcing was dependent on who the dentists were and the kind of relationship laboratories had with them.

> *Are you asking should he be informed that the work is being outsourced? ...Yes and no...As long as the end product fits in the mouth and he's happy, I don't think it matters really what went on behind the scene.* [T2]

It is interesting to see that dental technicians have the following opinions regarding disclosure of information. Their comments raise ethical considerations in the way laboratories conduct business as it is ethical in business that full disclosure is made (Bass, 2011).

> *Everyone that sends work here thinks we do every single job that goes out. We don't, but if that's what they think then that is the perception you must keep. If they think we sending to someone else to do, creates a very, very negative vibe.* [T4]

Whilst a minority of dentists were unconcerned as stated earlier where their work was being processed when outsourced locally or abroad.

> *It [outsourcing] doesn't really affect me, I don't mind [if the laboratory does not inform me].* [D4]

A majority of dentists confirmed that laboratories did inform them when outsourcing occurred.

> *Yes, we are always made aware but if we were not I think I should be informed...Just so that if there [were] any problems along the way I would know.* [D6]

The importance of disclosure was emphasised as that influences the trust relationship between dentists and technicians.

> *That makes me very uncomfortable [non disclosure]. You develop a relationship with your technician and the lab so when it comes to them outsourcing other stuff, there again trust comes in. I would actually respect more if a technician tells me.* [D6]

Clear conclusions drawn from the participants' responses regarding disclosure when work is outsourced to other dental laboratories will be discussed in *Chapter Five*. The discussion now turns to the understandings of outsourcing regulations.

4.2.1.6 Understanding outsourcing regulations

Laboratory owners and dental technicians both felt it unnecessary to regulate domestic outsourcing. They believed as long as dental laboratories and technicians were registered with the SADTC, the outsourcing process that occurred within the dental technology industry should be regulated in the same manner as the SADTC generally regulates the production of prostheses.

> *It's not regulated, as far as I know, and I should know. There's no regulation to outsourcing...the only legislation that might come into play is that dental technology work has to be done in a registered dental laboratory.* [LO6]

Outsourcing is done purely between labs and it's purely an arrangement they make between themselves, there's nothing that [should be] regulated by the Board [SADTC]...It is an in-house kind of agreement. [T4]

The majority of dentists responded that they were unaware of any rules or regulations that exist with regard to the dental technology industry in terms of dental technicians and the outsourcing process (domestically or abroad).

I don't know, legally no, I don't know about the rules with regard to technicians and outsourcing. I have no knowledge of that. [D1]

As reported earlier, laboratory owners similarly felt that dentists were less knowledgeable on these issues.

I'm not, no I'm not aware, basically I'm not aware of any rules – is there any rule, I wouldn't even know? [D5]

Laboratory owners stated that in their experience, they had not encountered any problems regarding legislation when outsourcing specialized work domestically or abroad or when they have received offshore work from abroad.

No rules regarding outsourcing domestically except that work has to go to a registered laboratory and technician. [LO3]

The overall opinion of dental technicians was that outsourcing of dental laboratory procedures should be self regulated.

> *They [technicians] seem to be the best option. As it is, the Council [SADTC] does not have the capacity or capability to regulate the outsourcing process that occurs.* [T5]

Dental technicians felt that offshore outsourcing needed regulation for ethical reasons. They expressed concerns with sending work to countries where they perceived that people were being exploited by being over worked and/or under paid. In addition, they expressed concern where the quality of materials used might be inferior or harmful. While reading for this study, one of the main concerns regarding offshore outsourcing of work was the quality of materials used in foreign countries[25]. According to Christensen (2005) offshore work may perhaps be of an acceptable standard but the quality of the material is often unknown. It is important to know whether the materials being used for the production of dental prostheses when outsourcing are of an acceptable standard. The materials used in prosthesis production must be safe, non-toxic, durable and bio-compatible once inserted into the patient's mouth.

> *If for instance, I send out work to some dodgy country and they use child labour or inferior products or like in China with all their poisonous[26] materials that have been uncovered, that's a problem.*
>
> [T6]

Similarly dentists believe there should be regulations in place when work is outsourced offshore. But they felt it should be the responsibility of the outsourcing laboratory to be aware of what's going on outside South Africa.

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[25] The reader is referred if necessary to Chapter Two, *section 2.2.2.2,* Disadvantages of dental outsourcing.

[26] According to the American Dental Association (2009), no poisonous dental materials were discovered being used in China. The ADA laboratory conducted extensive testing on dental crowns and found that no poisons were released from dental crowns. Nevertheless, the perception remains that poisonous materials are being used.

Definitely there has to be regulations in place. You don't know what quality is coming back from there [from foreign countries]. I think the lab that's outsourcing it, they the ones who should be responsible and be aware of what's going on there. [D2]

This analysis of the data finds respondents' knowledge of outsourcing regulations wanting and raises the question as to whether the same is true of their knowledge of regulations that enforce quality control on materials. This is particularly important given their responses that position the dental technician as the key controller of quality in the use of approved materials for use in South Africa[27].

The discussion now turns to the perceptions of laboratory owners, dental technicians and dentists with regard to accountability for quality of materials used during outsourcing.

4.2.1.7 Understanding of regulations that govern quality control on materials used when dental work is outsourced domestically and abroad

Laboratory owners stated that there are no regulations regarding the quality of dental materials used in the manufacturing process. And no one is responsible for regulating or enforcing quality control for dental materials used in the dental technology industry.

The SADTC don't really monitor what we use, I am sure controls should be in place. Whether they are or not, I don't really know. Materials that generally have the ISO rating are high quality

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[27] Reader to refer to *Chapter Two, Section 2.2.3 Regulation of dental laboratory work* (including dental materials used) *by dental regulating bodies*.

materials…we try and stick to materials that we (sic) have the ISO
certification. [LO5]

The overall response from laboratory owners, regarding who should be responsible for controlling or monitoring the quality of materials used, was that dental technicians are responsible.

I think we do quite a lot of research ourselves in terms of that, and
then from there we make a decision. [LO5]

Dental technicians felt that dentists should be responsible for enforcing and monitoring the standards set for quality of materials used,

Ultimately the responsibility lies with the dentists because they place
the work. [T1]

while a minority of them suggested that it should be up to each individual laboratory to regulate and monitor the quality of materials they use.

You have to choose if you want to be low quality and use inferior
products or if you want high quality and use high quality materials.
Your quality is reflected in the materials you use. [T4]

It is evident that most dentists are ignorant of any regulations that may exist regarding the quality of materials. They stated they trusted the laboratories to make appropriate decisions when deciding the best quality materials to use.

You ask any dentist, he won't know. We don't know, unless we go to
the lab and we ask them. We're not interested in that. Long as the
stock [dental prostheses] fits and the patient is happy. [D1]

No idea about quality of the material that the lab are outsourcing to...
no it does'nt (sic) bother (me) because so far I've never really had a
problem and I trust the lab to make a good enough decision to know
what's the best and to choose it.   [D4]

Laboratory owners, whilst showing disinterest in having knowledge of the quality of materials used in laboratories, nevertheless stressed the importance of using quality materials. All of them stated they would choose quality over cost of materials.

I would pay more for quality materials rather than skimp, get exactly
what I want, than go the cheap route.   [LO4]

Several laboratory owners felt that dentists were willing to compromise quality of products by themselves using inferior products and receiving cheap prostheses from laboratories. Whilst laboratory owners were quick to blame dentists it must be noted that the honesty of laboratory owners remains untested and this could be investigated in future research.

[There are] Dentists out there that accept useless quality, because the
dentist is also just after the money, so he sees the patient, spends five
minutes with him, [will] take the horrible impression, send it to a
horrible lab, have a horrible crown done, [and] slap it back in the
mouth. It looks horrible but he doesn't care because he makes his
money, the lab doesn't care because they make his money... there's
unscrupulous people, both technicians and dentists out there.   [LO4]

Dentists are always looking for the best price and therefore your
quality goes down the drain... cheapest price and the quality is going
to get compromised.   [LO5]

The view on material quality expressed by laboratory owners was confirmed, in a minority view, by dentists.

> *As a dentist I feel that maybe we should take on a bit more responsibility for finding out who and what the laboratory is using, you know, just for the betterment of our patients.* [D4]

According to dental technician remarks, within the domestic dental industry there were outsourced laboratories that are perceived to use inferior products and materials but brand it as a better quality, if not the best, brand on the market. If this perception is true, this type of behaviour is dishonest and inappropriate. However, it was beyond the scope of this study to research the question further. The respondent made the following statement.

> *You do get inferior materials coming out of the East, out of China and people use it [In South African dental laboratories]. Their profit margin goes up, at the cost of the patient because he doesn't know what he's getting.* [T5]

Christensen (2005) emphasises the importance of regulating and enforcing in-house production and domestic outsourcing by the dental governing bodies. Such enforcement will subsequently ensure that the quality of materials used in the production of dental prostheses will also be monitored and controlled.

4.2.1.8 Conclusion of Theme 1

The conclusions drawn from this study are discussed in Chapter Five upon which recommendations will be made. The discussion now turns to Theme *2* where DENTASA's knowledge and understanding of outsourcing regulations will be discussed.

4.2.2 Theme 2: DENTASA's knowledge and understanding of outsourcing regulations

DENTASA 12 is an executive committee representative of DENTASA[28] whose portfolio is SADTC liaison. Therefore, his/her portfolio includes dealing with matters relating to outsourcing either domestically or offshore. DENTASA 12 was nominated by DENTASA to represent its position for the purposes of this research. In response to being asked if the outsourcing process that occurs domestically between dental laboratories is legal, DENTASA 12 stated:

> *Yes, because the Act[29] clearly states that a South African dentist has to send work to a South African technician*   [DENTASA12]

However, this researcher's perusal of the Act found no evidence to support this statement. It is clear in the Act that a dentist must either do the work themselves or outsource to a dental laboratory. However, no mention in the Act suggests that this technician must be a South African technician. DENTASA 12 stated dental laboratory work that was outsourced abroad to foreign countries was illegal.

> *That's illegal*   [DENTASA 12]

However, as indicated above, no evidence was found in the Act to support the notion that outsourcing work abroad was illegal.

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[28] Please note that the findings of this interview have not been confirmed by DENTASA. As indicated above, the responses as reported here, given their controversial nature, may not necessarily reflect the views of DENTASA although they were made by their nominated representative. Several attempts were made via email, followed up by telephonic conversations, to verify the data transcriptions of the interview conducted with DENTASA 12. There has been no response from DENTASA regarding verification of results.

[29] Commonly known as "the Act". "The Act" will, in this research be taken to mean the Dental Technicians Act, 1979 (Act No.19 of 1979).

The discussion now turns to DENTASA's attitudes towards outsourcing.

4.2.2.1 Attitudes towards outsourcing

DENTASA 12 stated that a number of laboratories in South Africa receive work from foreign countries. According to DENTASA12 work outsourced into South Africa is not illegal by the country from which the work originates.

> *There are people [laboratory owners] that I've spoken to that say they received work from abroad. In England at the moment...as long as the dentist will take full responsibility, they don't have an issue where it's done. What they would really like is for whoever's doing it here should be registered there.* [DENTASA 12]

DENTASA 12 is referring to General Dental Council[30] (GDC) regulations regarding the manufacture and commission of dental prostheses outside the UK and EU (GDC 2010a). DENTASA 12 expressed a personal opinion that better control of quality and other business related issues would be affected if local dental laboratories were registered in the foreign countries from which they receive outsourcing work. However, to date DENTASA had not considered the matter.

DENTASA 12 stated, as reported earlier in respect of laboratory owners, technicians and dentists, that receiving work from offshore countries is beneficial to the economy, affecting the labour markets in South Africa positively. Therefore DENTASA fully supports working coming into South Africa.

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[30] Refer to Chapter Two, *section 2.2.4.3*

Foreign patients are advantageous to us, because its giving us work. They're bringing in foreign currency. We are selling them a professional service .   [DENTASA 12]

However, on the other hand outsourcing work to foreign countries affects local labour markets negatively, causing job losses.

It is going to kill dental technology. DENTASA feels what is the point of industry employing qualified dental technicians who have spent plenty of money to get an education and end up taking the next 10 years to pay off student loans only for employers to turn around and say hey, screw you, I'll outsource. I don't need you. What are you going to do be the highest qualified pizza girl[31] in the country?

[DENTASA 12]

DENTASA 12 stated that in order to keep the dental technology industry sustainable in this country and prevent it from collapsing, foreign countries such as China or Philippines or India should not be sent work.

Do you want to keep the industry sustainable in this country, or would you rather let foreign countries such as China or Philippines or India take it and then you don't have an industry, because it will collapse.

[DENTASA 12]

DENTASA 12 stated that according to the South African Medicines and Medical Devices Regulatory Council (SAMMDRC), dental prostheses are considered medical devices[32]. Similarly in the USA governing bodies such as the FDA Center for Devices and Radiological Health (CDRH) who is

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[31] The use of "pizza girl" in no way implies that the researcher agrees with the comment as stated. Whilst the researcher understands that the use of these words may be offensive to some, they are nevertheless reported verbatim.
[32] Refer to Chapter Two*, Section 2.2.3.5* for information regarding dental prostheses and medical devices.

responsible for regulating medical devices along with the NADL, Medical and Healthcare products Regulatory Agency (MHRA) all include dental prostheses as medical devices (FDA 2010).

> *Everybody thought that [medical devices] does not apply to us. It does apply to us. We make medical devices Class 1[33] and 2[34]. All medical devices have CE approval or FDA approval.*

> [DENTASA 12]

The South African Medical Device Industry Association (SAMED) verifies that in terms of the Global Harmonisation Task Force[35] (GHTF) dental prostheses are classified as medical devices. This implies that any legislation pertaining to medical devices will now apply to dental (prostheses or appliances) devices unless stated otherwise. Dentists and technicians must be aware and adhere to all legislation related to the outsourcing of medical devices. The discussion now turns to knowledge of regulations that govern quality control on materials used in the manufacturing process.

4.2.2.2 Understanding of regulations that govern quality control on materials used when dental work is outsourced domestically and abroad

The industry representative (DENTASA 12) was unaware whether dental material quality is regulated in South Africa.

> *The quality of dental materials used to be regulated by the Department of Trade and Industries when we were under the Department of Trade and Industries, but since we under the Department of Health I am not*

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[33] Class 1 refers to removable dental prostheses such as orthodontic retainers, removable dentures, etc.
[34] Class 2 refers to fixed dental prostheses, for example crown and bridge, implant retained crowns.
[35] Refer to Chapter Two, *section 2.2.3.4*

aware, it might be the South African Medicines and Medical Device
Regulatory council.   [DENTASA 12]

4.2.2.3 Conclusion of Theme 2

A discussion on the findings of Theme 2 regarding DENTASA will be
examined in Chapter Five followed by conclusions and recommendations.
The discussion now turns to Theme 3 were findings reveals understanding
on outsourcing process from the SADTC's perspebtive.

4.2.3 Theme 3: SADTC understanding on outsourcing regulations

SADTC17 was delegated by the SADTC to speak on its behalf. Subsequent
to the interview taking place, the South African Dental Technicians Council
verified the data collected from SADTC 17 regarding the outsourcing of
dental prostheses domestically and offshore with reference to the Act[36] All
views expressed by SADTC 17 were as a representative of the SADTC.

According to SADTC there is no legislation in the Act that forbids outsourcing
of work to and from South Africa. The Act also does not specifically prohibit
the outsourcing of prostheses outside the country. Nonetheless, there may
be other legislation which may have implications on these matters of
outsourcing of dental work beyond the borders of the country.

> *There's nothing in the Act that forbids outsourcing of work from here,*
> *there's no mention of it at all, so there's no – anyone (sic) can stop us*
> *from outsourcing work. If a country, Namibia, Botswana wants to send*
> *work here, that's fine, there won't be any problem.*   [SADTC 17]

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[36] Dental Technicians Act, No.19 of 1979.

In response to being asked if council members felt if there should be any rules or regulations regarding outsourcing, SATDC 17 replied:

No, there's never been a request from the professional, whoever, to do or to look at the Act regarding the outsourcing of work, never ever.

[SADTC 17]

Arising out of the SADTC understanding of legislation as contained in the Act the following sub-themes are identified in this study: awareness relating to disclosure of information, and understanding of regulations that govern quality control on materials used when dental work is outsourced domestically and abroad.

4.2.3.1 Awareness relating to disclosure of information

SADTC 17 responded that he/she was uncertain whether dental laboratories need to disclose to dentists if they outsource work domestically or offshore. He/she believed that providing the quality is up to standard, disclosure is not necessary.

I don't think so [SADTC 17]

The lack of clear clarification on the question asked will be discussed further in the conclusion and recommendations. The dissertation now turns to a discussion with the SADTC understanding of regulations that govern quality control on materials used in the manufacturing process.

4.2.3.2 Understanding of regulations that govern quality control on materials used when dental work is outsourced domestically and abroad

It is concerning that there is no reference in the SADTC's Act to quality of material. The SADTC is currently not responsible for ensuring the quality of dental materials manufactured in South Africa or overseas. The lack of legislative regulations in respect of the quality of materials used will be discussed further in the conclusion and recommendations.

> *It is not within the scope of the council's duties to monitor quality of materials, they do not have the knowledge to do such monitoring. I doubt the Council has the know-how to sort out a thing like that. They haven't got the know-how to do that. I think some other organisation will have to look at that, but not the Dental Council.*
>
> [SADTC 17]

SADTC 17 indicated that the SADTC has never had a case where the quality of materials used have been queried. SADTC 17 suggested that if there are problems from professionals these must be sorted out between themselves. He/she stated, perhaps anecdotally, that laboratories only use the best materials in this country.

> *I think we do use only the best materials in this country. I've never heard of a lab using inferior materials, never. They might be cheaper but I think in terms of quality they are fine. We haven't had any complaints at Council regarding a lab using inferior materials I think that is quite a tough one to go and prove that that guy is using inferior materials.* [SADTC 17]

SADTC 17 stated that council was unaware of who was responsible for enforcing quality control on materials suggesting it should be the responsibility of dental outsourcers to regulate and enforce quality control on materials used for the manufacturing of dental prostheses in South Africa.

4.2.3.3 Conclusion of Theme 3

The SADTC understanding of the Act in respect of outsourcing of dental laboratory services was that there are no regulations in the Act that forbid outsourcing of work. The SADTC indicated that disclosure of information to dentists was not necessary. The understanding of regulations that govern quality control on materials used, when dental work is outsourced domestically and abroad is discussed in greater detail in the conclusion and recommendations. The study concludes with a discussion on the research finding in Chapter Five.

CHAPTER FIVE - CONCLUDING DISCUSSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This study investigated the perceptions of laboratory owners, dental technicians and dentists as well as the regulatory bodies that govern the dental technology industry in South Africa. The study looked specifically at the practice of outsourcing the manufacture of dental prostheses in order to gain insight and understanding into this practice. Semi-structured interviews were conducted with participants in Gauteng. Gauteng was chosen as the area in which to conduct the study as it is the economic engine of the Southern African region and the gateway to doing business with the rest of Africa and the world (Akinboade and Pillay 2009). Moreover, Gauteng has the greatest concentration of dental laboratories, dental technicians and dentists in South Africa and was thus considered to be the ideal location in which to conduct the study. Three different groups of participants were interviewed. Each group consisted of six laboratory owners, six dental technicians and six dentists. In addition, an executive member of each of dental technology's governing bodies, namely the SADTC and DENTASA were interviewed in order to hear the voice of the custodians of the industry. The study explored the legislative position of the SADTC with respect to outsourcing and examined the extent to which the SADTC regulates the Dental Technicians Act (Act No.19 of 1979). Furthermore, the study attempted to understand DENTASA's stance regarding legislation on the outsourcing process that takes place in dental laboratories domestically and offshore. It concluded that the participants provided creditable results which are reflective of the industry at this time and the subject matter of this study.

The study referred to the three key research questions[37] on which this study was conducted and provided evidence in answering these questions.

The conceptual framework adopted for the study, as discussed in Chapter Two, was the model conceptualised by Franceschini *et al.*, (2003). This outsourcing model influenced the interview questions. The Franceschini *et al* model was chosen because it could be easily adapted to suit the industry under study.

This study continues with a discussion on the findings of this research and ends by formulating recommendations for the dental technology industry.

5.2 DISCUSSION OF FINDINGS

This study concluded that the dental technology industry does not operate within clearly defined legal frameworks when outsourcing either locally or abroad. The study established that dental outsourcing is not legislated in South Africa. Nevertheless, whilst respondents understood the necessity for the regulation of outsourcing practices they were largely unaware of any legislation and therefore believed that sufficient legislation exists to regulate domestic and offshore outsourcing. This belief stems from their understanding that outsourcing was occurring in South Africa without problems and therefore the necessity for legislation (or additional regulation) was unnecessary. Therefore, it is the industry's contention that sufficient controls for outsourcing were in place.

According to Ganish (2007) work that is outsourced abroad generally harms local labour markets. Findings revealed that within the South Africa dental technology industry outsourcing of work to offshore countries occurs

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[37] The reader is referred if necessary to Chapter One*, section 1.8, or* Chapter Three*, section 3.4.*

infrequently, therefore having minimal impact on the South African labour market. By contrast, this study established that domestic outsourcing is widely practiced in the industry. All work done in laboratories is sourced from dentists. Initially, the study did not consider this as an outsourcing practice as it was considered an industry norm. However, it became clear that this type of outsourcing should also form part of the subject matter of this research and consideration was given to the practice. Other forms of outsourcing studied include laboratories outsourcing to other laboratories either locally or abroad as well as offshore dentists or laboratories sending their prosthetic work to South Africa for manufacture.

The study revealed that dental laboratories receive significant quantities of work from neighbouring countries outside South Africa and abroad, a fact not widely appreciated hitherto by the industry. Laboratory owners and dentists, understandably, view receiving offshore work as positive for the South African economy and labour markets. South African dentists, again understandably, stated they would prefer to support domestic dental laboratories rather than outsource work to countries abroad as the standard of work in South Africa is excellent and that the South African economy should be supported in preference to the overseas markets even if foreign markets were cheaper which they are perceived to be. Findings revealed that dentists in South Africa are receiving work from overseas patients because of cheaper clinical costs in South Africa. They believed that dental laboratories are gaining from the work generated by dentists treating foreign patients. As stated above, this helps to boost the South African economy.

Barthelemy (2003) stated that outsourcing has a negative impact on those individuals affected by employment insecurity. Once dental technicians know that outsourcing is under contemplation counterproductive concerns ensue which is often a result of informal industrial conflict (Barthelemy 2003; Dowdell 2010).

This was not found to be true of South African dental technicians. Dental technicians in South Africa are unaffected by work being outsourced as the amount of work being outsourced is, as reported above, significant but minimal in quantity. Therefore the work being outsourced is not affecting South African Dental Technology labour markets to any extent. The dental technicians stated that the dental laboratories in which they are employed did not outsource work offshore nor were they aware of South African dentists outsourcing work abroad. They therefore believed that it did not impact on their jobs negatively. Notwithstanding the fact that low volumes of work are being outsourced and that work being outsourced is not negatively affecting markets in South Africa, technicians interviewed failed to see the potential negative influence that enhanced outsourcing volumes could have on the labour market and consequently failed to see the need for the control of offshore and domestic outsourcing.

The South African Consumer Protection Act, 2008 (CPA) became law in 2011. This was after interviews for this study were conducted and the legislation and the ramifications of the CPA during interviews were not considered for the study. According to the CPA a dental prosthesis would fall under the category classification of devices that are custom designed, custom manufactured and custom fitted for a specific patient. From 2012 the South African dental technician industry reportedly will have to comply with the International Standard of Operation known as ISO 13485 which represents the requirements for the design and manufacture of medical devices. The CPA regulations state that without the ISO 13485 compliance, the local industry will not be able to export work from South Africa. Nevertheless the CPA will still allow South African dentists and laboratories to outsource work to foreign countries (Grabowski personal communication 2011). The ISO 13485 will enable dental laboratories to market themselves globally and export work to any country in the world. Consequently, dentists and technicians must be prepared to adhere to all legislation that relates to the outsourcing of medical devices as defined by the ISO 13485 standard.

The scope of this study did not allow this issue to be studied in further depth and this is an issue that should be investigated further in future studies.

Laboratory owners and dental technicians have similar perceptions that outsourcing of dental laboratory procedures in respect of service delivery should only be undertaken in circumstances where work cannot be done in-house. Dentists recognize outsourcing of dental laboratory procedures in respect of service delivery as being an essential service provided by the dental technology industry. All three groups of respondents stated when deciding to outsource work, the decision was made without reference to any formal practices as suggested in the literature (Shmamoto, Fayyoumi and Redded 2010; Iizuka 2008; Tiwary 2008; Ganish 2007; Jiang and Qureshi 2006; Thompson, Strickland and Gamble 2005; Grog and Hanley 2004; Barthelemy 2003; Franceschini *et al.* 2003; Falk and Hagman 2002; Dekkers 2000; McIvor 2000; Nellore and Soderquist 2000; Quinn 1999; Hogwood and Gunn 1984). They confirmed that no theoretical thought is conducted and practices relating to outsourcing are instinctive.

However, the study revealed that consideration was given to the theoretical understanding of outsourcing as an industry practice. Tacitly, the respondents did conduct internal benchmarking analysis. They were able to identify their core competencies and what peripheral competencies needed to be outsourced. According to Thompson, Strickland and Gamble (2005) an organisation can lose contact with the activities and expertise that over the long run determined its success, when work is outsourced. Similar findings revealed this is a very real threat to the dental technology industry in South Africa.

The study concluded that the procedures being outsourced in South African dental laboratories are those that require specialized laboratory procedures. Dentists identified patient care (the clinical aspect of dentistry) as their core competency and therefore, not surprisingly, in the main, outsource their

peripheral competencies, one of which is dental laboratory procedures, to dental laboratories. Dentists recognised that the basic training they received in dental laboratory procedures was insufficient and they also did not have the required skill, expertise, time and dental laboratory equipment in order to complete dental laboratory work themselves. The finding revealed that dentists do not perceive themselves as sufficiently skilled in laboratory procedures. This confirms a widely held dental technology industry belief that dentists should not be licensed, as they currently are, to carry out laboratory procedures (Briscoe, Boodhun and Steyn via email communication 2011).

Using general business principles which were informally learned, dentists and laboratories used external benchmarking analysis to assess and choose the most appropriate outsourcers (dental laboratories) to whom to outsource work. The responses from all three groups interviewed were similar with regard to identifying key factors that contribute to proficient outsourcing. They identified factors such as having good relationships with clients, regular contact, good communication, trust, efficient service delivery which includes good turnaround times, producing quality work, meeting deadlines and being reliable as playing an important role. They agreed that the factors, as identified above, serve as a guideline when selecting appropriate outsourcers (dental laboratories) to whom to outsource work.

Contract negotiation legitimatises the type of relationship that exists between the parties involved in the outsourcing process. Contracts are used to formalise agreements with consideration to time frames, expected targets while outsourcing management considers the most appropriate way to deal with any problems that may arise during the outsourcing process (Franceschini *et al*. 2003). The majority of laboratory owners stated that there are no formal written contracts with clients that are used in industry when work was outsourced domestically or offshore. The remaining minority felt

that lab-slip[38] books were the contract between themselves and their dental laboratory. However, this view is questioned as an instruction to carry out work cannot be seen as encompassing all elements understood in formal contracts. The scope of this study did not allow this issue to be studied in further depth and should be investigated further in future studies. Understandably, dental technicians were not aware of formal, written contracts between laboratories and clients (dentists and other dental laboratories) when outsourcing nor did they understand the need for such contracts. The lack of understanding for formal contracts is a matter that training institutes should consider when training technicians in business practices. Dentists likewise stated that they had no formal, written contracts with dental laboratories when outsourcing. Contracts are necessary where contracting parties need to identify who is at fault, or parties need to be held accountable when problems occur. Within the dental technology industry in South Africa, when issues arise regarding end-products it was found that laboratories re-make the dental prostheses at no charge, even in instances where they feel that they should not be held accountable for the remake. Similarly dentists were also in agreement with laboratory owners that when problems occur laboratories are prepared to do re-makes regardless of who is liable. This *de facto* practice appears to negate the necessity for formal contracts and is practiced in order to prevent laboratories losing clients. However, lack of formal contracts remains a concern. Formal contracts between parties should be considered as the current informal industry practice could be legally challenged when disputes arise. Informal arrangements as described above can lead to abuse and can also lead to quality problems.

According to the Act, dental technicians are not allowed to have patient contact. This study revealed that technicians consult with patients on a

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[38]A lab-slip book, as it is colloquially known in the dental technology industry, is a written instruction between the two contracting parties indicating the scope of work to be performed.

regular basis with the consent of dentists either in the company of the dentist or without the dentist being present. Dentists, as can be seen in the quotation below, send patients to dental laboratories for adjustments to be made to their dental prostheses or for the shades for crown and bridge work to be taken.

If I have a real problem with the patient, he's[39] quite happy for me to send the patient directly to him so he can do the adjustments or the reline in his offices[40]   [D3]

Dentists stated that dental technicians are so obliging that they usually assist in the dental practice, they come into contact with patients under the approval of the dentists. Dental technicians may come across to dentists as being helpful and accommodating when providing such assistance but this is considered an unethical practice. If dentists are sending patients to technicians in contravention of the law then either this practice should cease and be monitored by the SADTC or the law needs to be changed to allow such practices to occur. The question, therefore, arises as to why this type of behaviour is so readily acceptable and tolerated by both the dental technology and dental industries? The current situation should not be allowed to continue and it is a matter that needs to be addressed by the relevant authorities.

It is not unusual for dentists worldwide not to be informed when their work is outsourced. Christensen (2005) confirms that in the USA dentists generally are not informed by dental laboratories when this happens. Nevertheless, literature reveals that disclosure is an important factor (Gills 2006; Christensen 2005). This study did indicate that the majority of laboratory owners in Gauteng felt that disclosure was necessary. However, a minority of the laboratory owners interviewed believed that disclosure was optional. The

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[39] The chrome lab technician
[40] The dental laboratory

majority of dental technicians similarly felt that dentists should be informed when their laboratory work is outsourced by a laboratory to other dental laboratories for whatever reason. They believed that there are laboratories that have led their dentists to believe that all dental work was being carried out by their own technicians in-house and that none of the dental laboratory procedures were being outsourced. However, non-disclosure appears to be occurring in a minority of cases. By not informing dentists, dental technicians felt that the quality of the end produced could be questioned, not necessarily because the work was substandard, but because an element of mistrust might cloud the employment relationship. This could lead to laboratories losing future business. Laboratory owners and dental technicians felt that, while it is important to inform dentists when outsourcing, they nevertheless harboured fears that dentists could go straight to the laboratory to which the technician was outsourcing and thereby incur financial losses to themselves. According to the dentists interviewed, laboratories did inform them when dental work was being outsourced. While several dentists interviewed were not concerned if dental work was outsourced, others felt that if laboratories were unable to do the work, they should be informed prior to further outsourcing. The SADTC felt that dental laboratories were not obligated to inform dentists when work was being outsourced. The views of the person interviewed as representative of SADTC are factually recorded. However, it is suspected that interviewing the entire Council of the SADTC might offer a different response given the SADTC's stated role in protecting the interests of the public in matters concerning the dental technology industry. DENTASA, on the other hand, stated that dental laboratories have a responsibility to inform both dentists and patients when work is outsourced.

The study found that economic consideration was not a driver when respondents considered outsourcing offshore. Quality was considered a more important factor than price. The study revealed that currently there is less offshore outsourcing occurring in South Africa than previously thought. This change in emphasis has come about by the availability of advanced

technology in South Africa. Previously, South African laboratories would outsource specialised work such as Zirconia sub-structures to EU countries because the CAD/CAM technology to manufacture Zirconia substructures was not readily available in South Africa. This is no longer the case. South Africa now has production centres where such work can be produced domestically. Consequently, this type of work no longer needs to be outsourced abroad.

Laboratory owners and dental technicians have similar opinions regarding outsourcing regulations. Both stated that as long as laboratories and technicians are registered with the SADTC, there is no need to regulate outsourcing in South Africa as it is occurring without problems. The opinions of the industry in respect of legislation appears to be driven by the industry's lack of confidence in the regulatory body to enact legislation that is in the interests of the industry from the perspective of the manufacturers as well as the public (Steyn via email communication 2011). Dentists interviewed in this study were unaware of any outsourcing legislation and remained largely unconcerned which is surprising given that they are ultimately responsible for the quality of the product to be inserted in the patient.

Dental technicians, whilst largely unconcerned for their jobs, felt that outsourcing to developing and/or emerging economies should be regulated for ethical reasons. They believe that certain offshore countries exploit the individuals that work for them although their opinions seem driven by hearsay rather than fact. The study also found that there is a perception that offshore countries use inferior materials in order to offer their services more cheaply. Therefore, dental technicians felt that it was unethical to use inferior quality materials that could be harmful to patients. However, a study done in New Zealand revealed that quality of work, produced offshore in China was of equal quality to work produced in New Zealand (Waddell *et al.* 2010). A further discussion on the quality of materials used in prosthesis production is discussed below.

One of the main concerns regarding quality of dental materials is whether the material is of an acceptable standard (Christensen 2005). Maintaining quality control is important because using inferior materials can adversely affect the patient as well as the technician producing the prosthesis. Dental prostheses manufactured using inferior materials can cause patients to have severe allergic or toxic reactions. Whilst the dental technology industry in the UK and the USA are well regulated, this is not necessarily the case in South Africa. In South Africa there are no dental regulatory bodies or any particular organisation that is responsible for regulating and enforcing quality control on materials used for the manufacturing of dental prostheses. This includes dental materials fabricated in South Africa as well as those purchased from abroad. According to laboratory owners and dental technicians interviewed, they have the most experience working with dental materials. Both groups felt as dental technicians, it would be most appropriate for them to regulate and enforce quality control. Responses revealed that laboratory owners and the dental technicians did not fully understand the questions being asked. It appears that no consideration was given to possible long term effects of using dental materials on patients or dental technicians. Quality is just not about whether the material will break in the mouth. Quality of materials used can impact on the health of the patient as well as that of the manufacturer. For example, a patient who wears an acrylic denture may be exposed to unacceptable levels of residual monomer over a period of time (Anusavice 2003). Beryllium is a material previously used in chrome cobalt alloys. Beryllium was found to be toxic to the manufacturer as it leads to cancer in technicians (Anusavice 2003).

Dentists, on the other hand, were surprisingly unconcerned with who should be responsible for regulating and enforcing quality control on dental materials. They stated they trusted the laboratories to make appropriate decisions when deciding on the best quality materials to use. The majority of dental technicians felt that the SADTC should not be responsible for regulating the quality of dental materials used for dental prostheses

production because they as a dental governing body do not have the capability to do so. The dental technicians' comments show the naively of their responses and are consistent with their opinions of the SADTC as discussed above. The dental technology industry in the USA and the UK are able to trace the materials used in dental prostheses which are manufactured domestically and in foreign countries. Whilst the SADTC had shown concern regarding quality control of dental materials this no longer seems to be the case (Robbertze 1991). The representative of the SADTC interviewed for this study stated that the SADTC is not responsible for enforcing the quality of materials. The DENTASA representative interviewed stated that DENTASA is unaware of who is responsible for regulating and enforcing quality control on dental materials in South Africa. The representative stated that previously the Department of Trade and Industries was responsible for regulating quality of dental materials used but now that the dental technology industry falls under the Department of Health, DENTASA is unaware who is responsible. The fact that the dental industry in South Africa is unaware, and apparently unconcerned, as to a body that should monitor and regulate the quality of materials used in the manufacture of prostheses is a concern. The possibility of inferior material filtering the South African market is real and therefore the need for a regulatory body is indicated. Recommendations in this regard will be made below.

5.3 RECOMMENDATIONS

Resulting from this study the following recommendations are suggested.

- A standard formal written contract should be used between parties when choosing to outsource work domestically or abroad. It should include special clauses that pertain to disclosing of information to all related parties, the best method to address problems that may arise and what actions should be taken against liable parties.

- Training institutions for technicians and dentists should emphasise the need for and the understanding of formal contracts as good business practices.

- Disclosure of information amongst all parties should be compulsory and not voluntary. Any fears regarding disclosure should be openly discussed prior to outsourcing domestically or abroad.

- The dental technology curriculum at Universities of Technology (UOT's) or dental universities should be reviewed. There is a need for graduates (technicians and dentists) to be better educated in business practices.

- CPD workshops should be considered by the industry to address the lack of knowledge of the existing qualified technicians in business practices.

- UOT's training dental technicians should place greater emphasis on 'ethics' and 'ethical behaviour', in the business practice curriculum.

- Legislation should be reviewed with the aim of legalising commonly occurring practices within the industry where technicians are consulting patients with the tacit approval of dentists.

- Existing legislation governing outsourcing in the dental technology industry needs to be revised or established so that the industry is fully aware and informed of outsourcing legislation.

- Legislation in respect of the quality of materials used for the manufacture of dental prostheses should be established.

- A regulatory body for the quality of dental materials used in prosthetic manufacture needs to be established.

- The SADTC should have the capabilities to regulate and enforce legislation in respect of the quality of dental materials used for the manufacture of dental prostheses.

- Legislation allowing dentists to practice dental laboratory procedures should be reviewed.

5.4 AREAS FOR FUTURE STUDY

The following is suggested for future studies:

- To investigate issues of trust amongst dentist and dental laboratories regarding the standards set to ensure quality service delivery.
- To investigate reasons for reliance on verbal agreements as opposed to formal written contracts.
- To investigate the lack of formal written contracts between clients and service providers within the dental industry.
- To examine what constitutes unethical business behaviour within the dental technology industry.
- To investigate why practices such as patient contact is so readily acceptable and tolerated by both the dental technology and dental industries.
- To investigate whether dental technicians are the best individuals for regulating and enforcing quality control on materials used for the manufacturing of dental prostheses.
- To investigate the types of guarantees offered by offshore dental laboratories when completing outsourced dental work.

5.5 FINAL CONCLUSION

The motivation for this study was to provide an understanding of the dental technology industry in respect of the outsourcing of dental prostheses between service providers in Gauteng and abroad, so as to gain a wider perspective and insight into the nuances of this practice. By examining the perceptions of South African laboratory owners, dental technicians and dentists it was possible to understand their stance regarding the outsourcing process that occurs within the industry. The study concluded that, in general,

the dental technology industry and their attitudes towards outsourcing reflect little common understanding between industry's perception of outsourcing and the literature. It is postulated that the dental technology industry is at a stage where they need to truly attempt to understand outsourcing industry better. Teaching institutions are producing practically skilled dental technicians. However, there is a need to train technicians with a better knowledge and understanding of general business concepts and practices as well as legislation, regulations and ethics related to the industry. Globally, few studies on outsourcing have been conducted. Hence, it is postulated that this study will contribute to a greater understanding of business practices within the industry particularly as they relate to the practice of outsourcing.

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ANNEXURES

Letter to Request Participation in Masters Research.

I am presently registered at the Durban University of Technology for a Masters Degree through the Department of Dental Sciences. I am required to complete a research dissertation in order to obtain this qualification.

The title of my thesis: **An Investigation into the outsourcing of dental prostheses in Gauteng.**

The aim of this study is to conduct an investigation into the Dental Technology industry in respect of the outsourcing of dental prostheses between service providers in Gauteng and abroad in order to gain a wider perspective of the nuances of this practice.

I am requesting that you allow me to interview you as part of the research. I will need to interview you once for approximately 45 minutes. Interviews will be recorded and recordings will be used for data transcription. The recording will be retained for a period of five years, should further research studies take place and thereafter be disposed of. Participants will remain confidential at all times unless you specifically wish to be named. Data collected will be used exclusively for the purpose of this study and will not be rendered to any other person for any reason. If you choose to withdraw from the research at anytime, you will be free to do so. Upon your withdrawal, data that may have been gathered through your participation will be destroyed.

Please note that my research has been approved by the research committees of the Department of Dental Sciences and the Faculty of Health Sciences. My supervisors during the course of this study are Mr. G. Bass and Miss J E Harrison and should you require further information concerning this study, you are welcome to contact them at the Durban University of Technology.

Participant Consent Form

Supervisors:

Mr. G. Bass

M.Ed (Higher Education), B.Comm, NHD: Dental Technology (Status)

Deputy Dean: Faculty of Health

031 373 2033

Ms. J. E. Harrison

BA (HDE) (Wits); M.Ed (Tech Natal)

(031)373 2478

Please complete below and return via email to the following address: thirushap@dut.ac.za or alternatively thirushapillay@gmail.com

I am willing to participate in Ms Pillay's research into the outsourcing of dental prostheses in Gauteng. I understand that final participants will be selected on a random sampling basis.

Name: _____ **Contact:** _____

Address: _____ _____

Signature: _____ **Date:** _____

(Should you agree to participate in this research you will be asked to sign the attached letter at the interview.)

Researcher:

Ms Thirusha Pillay	Tel:	031 373 2439
Department of Dental Sciences	Cell:	0845959904
Mansfield Campus	Fax:	0866134845
Durban University of Technology	Email:	thirushap@dut.ac.za
P.O. Box 1334, Durban, 4000	or	thirushapillay@gmail.com

Consent to Participate in the Research Study

To be completed immediately prior to interview

1. I agree to participate in Ms Pillay's research concerning the outsourcing of dental prostheses in Gauteng.
2. I understand that Ms Pillay will interview me and record my views.
3. I accept that the results of the research will be used towards a Master of Technology degree through the Durban University of Technology.
4. I understand that I will remain anonymous throughout the report unless I wish to be named.
5. I understand that on conclusion of the research the data collected will be discarded.
6. I understand that I am entitled to withdraw from the research at any time and that my contribution to the research will be discarded.
7. I agree that the research process has been fully explained to me.

Name: _____

Signature: _____   **Date:** _____

Please indicate if you wish to be acknowledged by name in the research report.

(Please tick appropriate box)

YES	
NO	

Researcher:

Ms Thirusha Pillay
Department of Dental Sciences
Mansfield Campus
Durban University of Technology
P.O. Box 1334
Durban
4000

Tel: 031 373 2439
Cell: 084 59599 04
Fax: 0866134845

Interview Schedule for Dental laboratory owners

Semi-structured interviews will be conducted with participants from the dental industry. Guidelines for the interview questions are based on the conceptual frame work of Franceschini *et al* (2003).

1. Dental laboratory owners

1.1. Do you outsource dental prostheses? If so does this process occur domestically, offshore or both?

1.2. Have you considered the implications of outsourcing? Please qualify your answers.

    1.2.1 In terms of informing the dentists?

    1.2.2 In terms of the labour markets in South Africa?

    1.2.3 In terms of future training of technicians in South Africa?

    1.2.4 In terms of the quality of material used?

1.3. Is the dental technology industry regulated in terms of outsourcing? Please qualify your answer.

1.4. Which discipline of dental technology do you specialize in? (Internal benchmarking analysis).

1.5. What type of dental laboratory work do you outsource? (Internal benchmarking analysis).

1.6. Prior to outsourcing, have you evaluated the production of dental prostheses in-house, to establish which would be more efficient? Please qualify your answer (Internal benchmarking analysis).

1.7. What type of outsourcing relationship does your laboratory have with the outsourcer? (External benchmarking analysis)

1.8. Is there any contractual relationship between you and the outsourcer? (Contract negotiations).

1.9. Is there a formal procedure which one follows in order to address issues that might arise during the outsourcing process? Please qualify your answer (Outsourcing management).

Interview Schedule for Dental technician employees

Semi-structured interviews will be conducted with participants from the dental industry. Guidelines for the interview questions are based on the conceptual frame work of Franceschini *et al* (2003).

2. Dental technician employees

2.1. Is the dental technology industry regulated in terms of outsourcing? Please qualify your answer.

2.2. Does the laboratory you are employed at outsource dental prostheses? If so does this process occur domestically, offshore or both?

2.3. Have you considered the implications of outsourcing? Please qualify your answers.

3.2.1 In terms of informing the dentists?

3.2.2 In terms of the labour markets in South Africa?

3.2.3 In terms of future training of technicians in South Africa?

3.2.4 In terms of the quality of material used?

2.4. What are your views on the outsourcing of dental prostheses instead of the work being done in-house, if the technician has the required skills?

Interview Schedule for Dentists

Semi-structured interviews will be conducted with participants from the dental industry. Guidelines for the interview questions are based on the conceptual frame work of Franceschini *et al* (2003).

3. **Dentists**

    3.1 Is the dental technology industry regulated in terms of outsourcing? Please qualify your answer.

    3.2. Does the laboratory you are employed at outsource dental prostheses? If so does this process occur domestically, offshore or both?

    3.3. Have you considered the implications of outsourcing? Please qualify your answers.

    3.2.1 In terms of informing the dentists?

    3.2.2 In terms of the labour markets in South Africa?

    3.2.3 In terms of future training of technicians in South Africa?

    3.2.4 In terms of the quality of material used?

    3.4. What are your views on the outsourcing of dental prostheses instead of the work being done in-house, if the technician has the required skills?

Interview Schedule for SADTC

Semi-structured interviews will be conducted with participants from the dental industry. Guidelines for the interview questions are based on the conceptual frame work of Franceschini *et al* (2003).

4. South African Dental Technicians Council (SADTC)

4.1. What are the rules and regulations regarding the outsourcing of dental prostheses domestically and offshore?

4.2. Has the issue of outsourcing domestically or offshore ever being raised by council members? Please qualify your answer.

4.3. Has council considered improving on rules and regulations that might exist regarding outsourcing of dental prostheses? Please qualify your answer.

4.4. Is the SADTC responsible for ensuring the quality of dental materials used to manufacture dental prostheses with regard to offshore outsourcing? Please qualify your answer.

Interview Schedule for DENTASA

Semi-structured interviews will be conducted with participants from the dental industry. Guidelines for the interview questions are based on the conceptual frame work of Franceschini *et al* (2003).

5. Dental Technology Association of South Africa (DENTASA)

5.1. Is the dental technology industry regulated in terms of outsourcing?
Please qualify your answer.

5.2. Has DENTASA considered the implications of outsourcing?
Please qualify your answer for each.
5.2.1 In terms of informing the dentists?
5.2.2 In terms of the labour markets in South Africa?
5.2.3 What is the impact of outsourcing on the South African economy?
5.2.4 In terms of future training of technicians in South Africa?
5.2.5 In terms of the quality of material used?

5.3. Have there ever being issues raised by members of the association regarding the outsourcing of dental prostheses domestically or offshore? Please qualify your answer.

Ethical Clearance Certificate

DURBAN
UNIVERSITY of
TECHNOLOGY

Faculty of Health Sciences

ETHICS CLEARANCE CERTIFICATE

Student Name	Thirusha Pillay	Student No	20505071
Ethics Reference Number	FHSEC 036/09	Date of FRC Approval	17/08/09
Qualification	M Tech : Dental Technology		
Research Title:	The outsourcing of Dental Prostheses in Gauteng		

In terms of the ethical considerations for the conduct of research in the Faculty of Health Sciences, Durban University of Technology, this proposal meets with Institutional requirements and confirms the following ethical obligations:

1. The researcher has read and understood the research ethics policy and procedures as endorsed by the Durban University of Technology, has sufficiently answered all questions pertaining to ethics in the DUT 186 and agrees to comply with them.
2. The researcher will report any serious adverse events pertaining to the research to the Faculty of Health Sciences Research Ethics Committee.
3. The researcher will submit any major additions or changes to the research proposal after approval has been granted to the Faculty of Health Sciences Research Committee for consideration.
4. The researcher, with the supervisor and co-researchers will take full responsibility in ensuring that the protocol is adhered to.
5. *The following section must be completed if the research involves human participants:*

	YES	NO	N/A
❖ Provision has been made to obtain informed consent of the participants	✓		
❖ Potential psychological and physical risks have been considered and minimised			✓
❖ Provision has been made to avoid undue intrusion with regard to participants and community	✓		
❖ Rights of participants will be safe-guarded in relation to:			
- Measures for the protection of anonymity and the maintenance of Confidentiality.	✓		
- Access to research information and findings.	✓		
- Termination of involvement without compromise	✓		
- Misleading promises regarding benefits of the research	✓		

_____   26/03/09
SIGNATURE OF STUDENT/RESEARCHER   DATE

_____   26/08/09
SIGNATURE OF SUPERVISOR/S   DATE

_____   27/08/09 -
SIGNATURE OF HEAD OF DEPARTMENT   DATE

_____   28/09/09
SIGNATURE. CHAIRPERSON OF RESEARCH ETHICS COMMITTEE   DATE

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Simple Random Sampling

RANDOM LABORATORY OWNERS

140	105	51	131	11	19	114	38	7	46	20	43
87	1	70	45	59	108	126	100	23	117	72	96
138	40	58	132	81	126	76	89	122	145	124	15
85	3	134	45	47	112	139	107	68	118	49	66
63	101	5	94	10	120	60	44	29	9	64	41

143	67	110	137	2	127	109	35	6	33	27	36
93	52	121	92	91	50	61	90	14	22	48	73
80	130	74	30	103	133	32	125	28	98	24	13
4	8	65	16	86	106	55	69	34	21	39	136
128	31	88	113	77	129	82	18	12	119	26	37

79	104	95	42
56	102	144	57
25	54	62	53
99	84	142	115
116	75	83	78
97	141	71	111
135			

0 first choice

0 second Choice

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