PERCEPTIONS OF ZAMBIAN DENTISTS AND DENTAL TECHNICIANS IN RESPECT OF DENTAL TECHNICAL SERVICES.

By

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A thesis submitted in full compliance with the requirements for a Master's degree in Technology: Dental Technology at the Durban University of Technology.

I, Martha Mutinta Mukena, do hereby declare that this dissertation is representative of my own work

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DECLARATION

This thesis 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 Zambia in three main cities Lusaka, Ndola and Kitwe, in full compliance of the requirements for a Master's degree in Dental Technology at the Durban University of Technology supervised by Mr. G. H. Bass and co-supervised by Prof. T. N. Gwele.

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ABSTRACT

This study is an evaluation of the perceptions of Zambian dental technicians and dentists of the dental technological services offered in Zambia. Zambia is a small nation (land size of 752,614km²) with a population of approximately 11,000,000. Patients needing oral restorative treatment have two options available to them; they seek treatment in state hospitals or through private practices. Access to prosthetic treatment is difficult due to the difficulties associated with obtaining treatment from the state as well as there being very few privately owned dental laboratories. Dental technology in Zambia dates back to 1964 and since its inception there has been no evaluation as to whether the services offered are adequate and satisfactory.

The aim of this study was to;

- Provide insights into the understanding of dentists and technicians regarding dental technical services.
- Provide insights into available dental technical services with the aim of assisting in developing future guidelines for provision of such services in Zambia.
- Identify national oral health objectives and make suggestions for the improvement and development of the services in Zambia.

This aims of the research are relevant as the research was conducted at a time when the nation is undergoing a general introspection of service delivery.

Data was collected through the medium of semi-structured personal interviews with registered and practicing dentists and technicians in the main cities of Zambia that include Lusaka, Ndola and Kitwe. Their views were transcribed and coded according to significant themes that emerged for data analysis.

The results indicate that there is reason to be concerned about the general quality of service delivery. In addition, the study showed that the working relationships between technicians and dentists require improvement. Moreover, the study established that Zambia has a critical shortage of skilled technicians and particularly ceramic technicians and ceramic dental laboratories. The data also revealed concerns that little attention by government policymakers is being afforded to dental technical services whilst attention is paid rather to clinical dental services. As a result, state owned laboratories suffer from a lack of adequate and functioning equipment as well as a lack of quality dental materials. Finally, the study showed that Zambia has no clear direct oral health policies that govern the dental technical services.

Abbreviations

CAD/CAM: Computer Aided Design/ Computer Aided Manufacturing

EHS: Early Head Start

MCZ: Medical Council of Zambia

MoH: Ministry of Health

OHP: Oral Health Policy

OR: Operation Room

PMMA: Poly Methylmethacrylate

ZDA: Zambia Dental Association

ZDS: Zambia Dental School

ZDTA: Zambia Dental Technicians Association

DEDICATION

I would like to dedicate this thesis to the Almighty God for his mercies and favour he bestowed upon me throughout this study and to my family for their support especially my late mother Mrs. Elizabeth Mukena for her inspiration.

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1.1 Introduction

It is of vital importance that dentists and technicians work together professionally as a team in order to attain patient satisfaction. This view is supported by Perry and Orfanidis (2004) who state that when there is an extra set of eyes reviewing clinical work, numerous benefits accrue. These benefits include, for example, an effective treatment plan to achieve the necessary goals and ultimate patient satisfaction. This qualitative study looked at the perceptions of Zambian dentists towards dental technical services and the utilization of such services. In this study, Zambian dentists and technicians located in three different cities (Lusaka, Ndola and Kitwe) were interviewed via semi-structured interviews in order to investigate their working relationships, as the relationship is assumed to be necessary for the efficient delivery of dental technological services.

This study aimed to achieve the following:

- Provide insights into the understandings of dentists and technicians regarding dental technical services.
- Provide insights into available dental technical services with the aim of assisting in developing future guidelines for provision of such services in Zambia.
- Identify national oral health objectives and make suggestions for the improvements and development of the services in Zambia.

The results of the study should benefit established dental technical services providers and will empower them to evaluate and improve on their service delivery.

The literature to be reviewed orientates this study in the context of the working and business relationships between dentists and technicians. This research was conducted in an interpretive paradigm. Therefore, the

methodology was interactive and interpretive in order to investigate the participants' authentic perceptions rather than generalization of what passes as truth. Semi-structured interviews were used to collect relevant data from participants and the data was analysed using thematic content analysis.

1.2 Background of the study

The profession of Dental Technology is concerned with the design and manufacture of prosthetic appliances and corrective devices for the purpose of replacing and restoring lost natural teeth and oral tissues. Dental prostheses are necessary in restorative dentistry as they help with the restoration of the patient's confidence and self-esteem. Speech, mastication and appearance are the major functions that these appliances restore. In a study conducted by Bergendal (1989) the majority of the respondents felt that losing their natural teeth and being provided with dental prostheses was a more important transformation in their lives than events such as marriage or retirement. Fiske, et al. (1998) in their study established that tooth loss has a strong impact on patients as it can be disabling and handicapping. Fiske et al. (1998:90) point out that patients felt that tooth loss had emotional effects on them such as depression, "lowered self-confidence, altered self image, dislike of appearances, altered behaviour in socialising and forming close relationships and behaving in a way that kept the tooth loss a secret". Tooth loss also contributes to detrimental changes in the patient's diet due to impaired masticatory efficiency. A study conducted by Hung, et al. (2003) has shown that tooth loss disables patients from eating health food such as fruits and raw carrots. Further the study established that patients showed reduced consumption of vitamin B12 and polyunsaturated fats, which Hung et al. (2003) feel could increase the risk of chronic diseases.

1.2.1 The Zambian dental technician:

The majority of dental technicians are state employees working out of state owned hospitals. Few technicians are to be found in private practice. Forty two technicians are state employees and only eight are in the private sector. However, both private and state dental technicians in Zambia offer the following services:

- General prosthetics, the construction of partial or full dentures (metal and plastic) to replace the partial or total loss of natural teeth.
- Crown and bridge prostheses. These types of prostheses restore individual teeth and are permanently fixed in the oral cavity.
- Maxillo- facial prostheses. These prostheses replace facial and body tissues missing due to injury, disease or congenital abnormality.
- Orthodontics. The manufacture of fixed or removable appliances for the correction of dental malocclusion.

1.2.2 An overview of the dentistry profession.

Zwemer (1993:81) defines dentistry as “the science and art of preventing, diagnosing and treating diseases, injuries and malfunctions of the oral cavity and associated structures”. Dentistry includes various specialties namely, endodontics, oral and maxillofacial pathology, oral and maxillofacial radiology, oral and maxillofacial surgery, orthodontics and dentofacial orthopedics, pediatrics dentistry, periodontics and prosthodontic. This research, however, limits the investigation into the perceptions of dentist and dental technicians only in respect of dental technological services for the supply of orthodontics and dentofacial orthopedics and prothodontic appliances. Orthodontics and dentofacial orthopedics are defined as the supervision, guidance and correction of growing and mature dentofacial structures as well as correction of abnormal form or relation of bone structures (Rudolph, 2004). Prosthodontics is defined by Jennifer and Fairpo (1987:195) as “the

design and construction of artificial dentures and crown and bridge work".

1.2.3 The history of dentistry

The history of dentistry is broad. Therefore, only a brief overview of the significant landmarks in the history of dentistry is provided for the purpose of orientating the study within dentistry. Dental ailments such as tooth decay, toothaches, periodontal disease and premature tooth loss have remained similar throughout history (Wilwerding, 2001).The changes in people's lifestyles have led to the advancement of dentistry in order to meet their changing dental needs. In ancient times, these changes were what we today take for granted. The discovery of fire affected the populations of ancient Egypt and the early Chinese civilizations. Peoples began to congregate in towns and this ultimately lead to changes in the type of foods ingested, many of which were detrimental to dental health (Wildering, 2001). Selwyn (1981) believes that dental diseases among the ancient Egyptians were also as a result of consumption of coarse gritty foods that abraded their teeth.

Discoveries in dentistry were made as dental needs increased to improve the quality of human life. Malvin (1992) believes that the first recorded evidence of a dentist was in 3000 B.C in ancient Egypt where Hesi-Re practised a form of dentistry as we know it today. Malvin (1992) also notes that the first recorded dental surgical operation was approximately 2750 B.C in Egypt. About 500 B.C Odontagra extraction forceps and techniques for reduction of a dislocated mandible were developed (Malvin, 1992). Legend has it that magic was practised as part of treatment for dental ailments. The Egyptians believed that mice were under direct protection of the sun, therefore a split body of a warm mouse was applied to the teeth of a patient suffering from toothache (Malvin, 1992). Malvin (1992) also indicates that Indian people enshrined the cuspid tooth of Buddha in a famous temple at Kandy. It was used in prayer for fertility rites and relief of pain. Etruscans of central Italy are

believed to have contributed to restorative dentistry between 100 and 400 B.C (Wilwerding, 2001).

The Talmud (352 - 472 B.C), a collection of books commenting on the five books of Moses, records the birth of dentistry among the Jewish people (Malvin, 1992). The Talmud notes that remedies of toothache were practised, and records artificial restorations were used to restore the dentition (Malvin, 1992). Jewish women were particularly more concerned about their facial appearance than men and therefore, in order to meet their needs, artificial restorations were made of gold, silver and wood (Wilwerding, 2001).

In the 12th century dental treatment was performed by church priests. However, in 1163, the Pope declared that any operation involving shedding of blood was incompatible with priestly duties, hence the emergence of barber surgeons. The barber surgeons were followed by tooth drawers who plied their practice in public (Wilwerding, 2001). There is evidence that more formal academic dental texts were developed around 1300 A.D in Oxford and Bologna (Wilwerding, 2001). Dentistry specialties were developed from 1901 to 1963 (Wilwerding, 2001).

The need to replace lost teeth led to the development of dental technology. It provided a replacement for the functional role that natural teeth play, as well as to aesthetically restore appearance in patients. Dental technology beginnings can be traced back to the 17th century, when:

- G. Purman discovered wax impression material,
- F.M.Bourdet developed the use of gold base plates,
- C. Goodyear in 1840 discovered vulcanite rubber denture base material,
- P.Faff discovered plaster of Paris in the 18th century and
-

- J.E Durning discovered impression plaster in 1844
- (Malvin, 1992)

Dental technological prostheses became scientifically advanced when bar joints and attachment dentures were developed in the 1950s. Metal-ceramics was introduced into dental technology in the 1960s (Wulfes, 2004). Further landmark advances occurred in the 1980s with the introduction of implantology prostheses and CAD/CAM[1] technologies (Wulfes, 2004).

1.2.4 The history of dentistry in Zambia

No recorded history of dental practice in Zambia was found. Efforts were made to source written history from Mindolo Ecumenical Center[2] and The Zambia National Archives[3] but these proved futile as the required publications could not be traced. However, an anecdotal history was provided to this researcher in an e-mail from Dr.Phasane Mtolo on 5th February, 2009 who is a past President of The Zambia Dental Association.

Mtolo (2009) stated that during the colonial days (the period between 1888 and 1964) when Zambia was colonized by Britain, dentistry was practised as part of general medicine. The dentistry practice provided was limited to tooth extraction. There are no records of private practice in dentistry for the period before independence from Britain in 1964. Prior to independence, there were no separate dental departments and the services were headed by a general medical doctor. Dental technical services started operating exclusively after independence in 1964. From less than ten dental surgeries in 1964, there are currently over one

[1] Computer aided design/computer aided manufacturing dental technology used in manufacturing of dental ceramics.

[2] A Colgate Palmolive Zambian official recommended Mindolo Ecumenical Centre (M.E.C) for written history of Zambia. One of the M.E.C Librarians advised that the suggested publication could not be located as it could have perhaps been removed from the shelves.

[3] National Oral health Deputy Director recommended the National Achieves for written History of Zambian dentistry but the Director National Archives advised that the suggested publication was not available with them.

hundred and twenty dental surgeries. While there is very little information about the growth of allied personnel, Mtolo (2009, pers. Comm. 5 February) indicated that the number of oral health personnel also increased such that in 2008, there were sixty one dental surgeons, three hundred and fifty dental therapists and fifty dental technicians licensed to perform dental technological duties as discussed earlier.

The world over, the oral health team comprises dentists, dental technicians, hygienists, dental therapists, and chair side attendants[4]. In Zambia, however, training of dental assistants was phased out. In a telephone conversation with a senior lecturer at the Zambia Dental School (ZDS) Mr. Martin Siyakakole on 29 December, 2009 he confirmed that the programme was phased out in 1984. The United Nations (2003) reports that Zambia has a population of 11,000,000 people. In an e-mail on 30 December, 2009 Mtolo confirmed that there are at least more than thirty established private dental surgeries and there is only one oral hygienist for the entire nation. Wintersteen (2006) believes that as oral heath teams there is need to listen to each other in order to ensure success and a change of personal perceptions about the profession.

1.3The Purpose of the study and the research questions

1.3.1 The purpose of the study

This study investigates the perceptions of Zambian dentists and dental technicians with regard to service delivery. In doing so, it is hoped to provide greater insight into Zambian dental industry in general and dental technical services in particular. Therefore, this study aims to:

- establish whether dentists believe they are adequately served by the available dental technical services.

[4] Chairside attendants are sometimes known as dental assistants/nurses.

- examine the working relationship between the dentists and dental technicians.

- ascertain the dentists' utilization of dental technological services.

- examine and develop an understanding of the perceptions of dentists regarding the quality of work produced by dental technicians.

- provide suggestions for future improvements in the industry.

1.3.2 Research questions

1. What are the perceptions of dentists and dental technicians currently practising in Zambia, of the quality of dental technical services?

2. Does the quality offered by technicians meet dentists' and dental technicians' expectations of dental technical services?

3. What are the perceptions of dentists and dental technicians of the national objectives of the Ministry of Health in respect of dental technical services?

1.4 Rationale of the study

The study is being conducted at the time when the Zambian nation is undergoing general introspection of service delivery (Nureni, 2009 pers. comm. 25 March). Dental technical services are an integrated part of the Zambian oral health system. In Zambia, dental technicians are trained and generally employed by the government in the Ministry of Health. Very few privately owned dental laboratories exist. Technicians are required to register with the Medical Council of Zambia in order to practise. The dental technical services are provided for in dental laboratories. In Zambia these laboratories are found in the medical centers of the major referral hospitals. The service is set up as an

independent department but is administered as a part of the individual hospital.

The findings of this study will be useful to established dental technical service providers to evaluate and improve on their service delivery. The study should provide insight and information to the Ministry of Health in Zambia with regard to the services offered.

1.5 Assumptions and delimitation

1.5.1 Inclusion criteria

The dentists and technicians included in this study had to comply with the following criteria.

- The dentists and technicians must be registered with the Medical Council of Zambia.
- The dentists and technicians had to be currently practising in Zambia in three main cities Lusaka, Ndola and Kitwe. The selected cities have the highest concentration of dentists and technicians in Zambia.

Respondents that complied with the inclusion criteria but did not wish to sign the letter of informed consent were excluded from the study.

1.5.2 Delimitations

The study was limited to dentists and technicians registered with the Medical Council of Zambia. Views of dentists and technicians were considered in this study in order to allow both the service provider (technicians) and the recipients (dentists) to register their views and perceptions of dental services in Zambia.

The major stakeholders in the provision of dental technical services are the dentists and dental technicians. It is important to have understanding of how these two professionals operate in relation to each other in order to focus on the context within which this study was constructed. Therefore, the next section turns to the professional relationship between the dentists and technicians.

1.6 An introduction into the professional relationship between dentists and technicians.

Dentists and dental technicians are the major partners in providing dental technical services. They are expected to work together as a team. The dentist clinically examines the patient and prescribes needed dental appliances. The dental technicians construct the appliances. Naert, Van Der Donck and Beckers (2005) believe that the dentist's main interest in dental restorations is in the strength, fit and simplicity of performance.

However, this is not an easy task as the dentists are not experts in dental technical services, therefore there is need to consult the dental technician in order for them to prescribe accurately. For instance the dentist may design a chrome partial denture that will not be possible to construct practically due to the wrong choice of components such as clasps. Involving the dental technician in the initial stages of treatment planning could help avoid such discrepancies. Christensen (1995) advises that dentist graduates are "only minimally prepared" in both fixed and removable prosthodontics and similarly dental technicians have "minimal knowledge" in clinical dentistry (1995:115). Lack of cooperation between these two parties can cause problems such as a patient's dissatisfaction due to improperly designed appliances. Therefore, dentists and dental technicians need to work hand in hand in order to provide balanced and satisfactory dental services. Christensen (1995) believes that if dentists and dental technicians work closely together greater respect and acceptance between them will significantly improve the quality of service.

1.7 Overview of the dissertation

Chapter two of this dissertation discusses the review of the existing literature. This study investigates perceptions of Zambian dentists and dental technicians therefore perceptions are discussed in this chapter.

The review of the literature further looks at the working and business relationship between dentists and technicians. Their working relationship described in the literature was examined, for example, in respect of communication and following prescribed instructions. Chapter two discusses the conceptual framework by which the notion of quality of dental technical services is understood. The notion of quality identifies the major requirements of a good dental appliance such as the fit, strength and so on. Finally chapter two discusses the Ministry of Health (MoH) national oral health policy in order to have understanding of how dentistry is governed in Zambia and identify the national objectives. Identification of the national objectives is especially important as this study hopes to provide suggestions on the improvement and development of dental technical services in Zambia.

Chapter three discusses the methodology of this research. The research paradigms are also discussed. This study is constructed in an interpretive paradigm as the study seeks to investigate the authentic perceptions of practising dentists and technicians. Their true feelings about the quality of service delivery for dental technical services are especially critical in implementation of remedial measures to improve the services. The data collection process is detailed in this chapter. Data was collected by means of semi-structured interviews. The accuracy of the data collected is addressed. The sample was randomly selected. The chapter also looks at the interpretation and analysis of the data collected. The data collected was analyzed using thematic content analysis. Trustworthiness, ethical considerations and the limitations of the study are other factors addressed in chapter three. The ethical considerations relevant to this study are discussed. Finally, chapter three discusses the problems encountered during the study.

Chapter four tabulates the findings of the study and groups the data according to common pertinent themes and sub-themes that emanated from the data. The themes and sub-themes such characteristics of

quality, lack of facilities; were identified and discussed analytically in detail.

Chapter five details the conclusions and recommendations drawn from this study.

Chapter Two: Literature Review

2.1 Introduction

This chapter provides the reader with a conceptual understanding of the notion of quality for dental technical services. In addition, the working relationship between dentists and dental technicians in Zambia is discussed in order to orientate the context in which this study will be conducted. This study was conducted in Zambia and it is thus necessary to refer to and discuss the Oral Health Policy (OHP) of the Zambian Ministry of Health in order to demonstrate how dental technical services are governed in this country.

This study is a qualitative study conducted in an interpretive paradigm. Therefore, an understanding of the concept of perceptions is necessary. This review begins with an appreciation of perceptions.

2.2 Perceptions

Perceptions may be defined as “an affection or state of the mind which is immediately successive to ascertain affections of the organs of sense, and which is referred by us to something external as its cause” (Upham, 2007:27). Collins and O’Brien (2003) believe that perceptions are mediated by the senses that may change depending on how one acquaints oneself with the environment in which one interacts. Perceptions are what individuals believe are correct given the circumstances prevailing at the time. However, our perceptions change with ongoing life experiences. Thus, perceptions influence our every day experiences and continually influence our behaviour in our interactions with others. Perceptions, thus determine our behavioural patterns of our interactions in life.

Having established an understanding of perceptions and the importance thereof, the discussion now turns to an overview of the working relationships between dentists and dental technicians and an understanding of quality as it relates to dental technical services.

2.3 Relationships between dentists and technicians

Dentists and technicians need to operate in unison in order to attain patient satisfaction. Holland (2004) and Christensen (1995) believe that the dentist-dental technician working relationships should be built on mutual understanding. Perry and Orfanidis (2004:126) stress that “when dentists and laboratories work efficiently together the benefits appear”. These benefits include an effective treatment plan to achieve patient satisfaction. However, oral health team members often make the mistake of involving the technician only after the dentist has completed oral procedures and not prior to the construction of the prosthesis (Dawson, Cranham & Pace, 2008). Ferry (2005) also feels that technicians lack contact with other members of the dental team hence they feel left out. Dawson, Cranham and Pace (2008) further advise that if the technicians are allowed to be part of the diagnostic and treatment planning process right from the beginning, better restorative practices will make the patients happier. Browne (2005) and Bellows (2006) both agree that the technician needs to be involved in the clinical procedures in order for them to be able to make the right clinical choices in the design and construction of prostheses.

Studies have been conducted to determine the business relationship between dentists and technicians in different countries (Hatzikyriakos et al., 2006; Gregory, 1995; Farah et al 1991; and Morgenthal, 1977).

Morgenthal (1977) conducted a study in Boston, United States of America, to determine dentists’ reasons for selecting particular dental laboratories. The main objectives were to examine the specific laboratory related needs and attitudes of dentists. The study shows that

most dentists indicated that quality was the most important reason for choosing a laboratory, followed by technical capacity, schedule of work, and lastly, price. Respondents also cited referral from their fellow dentists and proximity of the laboratory to their dental surgery as factors that motivated them to select laboratories. Dentists indicated that they would change laboratories based on issues of quality; a laboratory was changed if the quality of work declined. Morgenthal (1977:8) specifically states that “poor fit” and “generally sloppy work” were characteristic of many responses. Poor delivery was identified as “work not returned on time” and “warning calls [from technicians] to facilitate patient rescheduling”. Poor communication, as identified by dentists, was seen as a “failure of technicians to call if in doubt, instead [technicians] had know-it-all attitude” (Morgenthal, 1977:8). In addition, it was established that technicians’ lack of following the dentist’s prescribed prescription resulted in “technicians [doing] things their own way” (Morgenthal, 1977:8). High prices for technical services were also cited alongside complaints about decline in quality. Morgenthal (1977) suggests that significant findings related to differences in dentists’ attitudes towards their laboratories were based on the type of practice, ego and the practice location - whether urban or rural.

Farah et al. (1991) in Michigan, conducted a study to survey the business and laboratory relations with dentists. The purpose of the study was to profile laboratory activities, identify problem areas and develop recommendations to dentists which might help establish more efficient relationships. The survey was designed to gather information in areas such as the business related activities; specifically the account size of the laboratories, laboratory procedures and material selection in relation to infection control, types of preparations and impression trays for crown and bridge/ceramic, material selection and design of complete/partial dentures and communication. Conclusions drawn from the study show that dentists do not pay attention to the needs of their technicians. Farah et al. (1991:23) quote technicians as saying that “dentists need to listen”. Their study indicates that there was insufficient interaction between both

parties. Only 20 percent of technician respondents indicated that dentists visited them and so communication was reported to be poor. The study cited the distance between the dental laboratory and the dentists as the possible cause of poor communication between the two parties. Technicians also complained about dentists not complimenting them when they did good work. They felt that the dentists only called them when they had complaints. Dawson, Cranham and Pace (2008:45) believe that “you must give the laboratory what they need in order to get the results that you desire”. It is therefore suggested that providing positive reinforcement by means of good communication would increase the quality of the services provided by the technician.

Gregory (1995) conducted a study that looked at the dentists’ utilization and their perceptions of laboratories. The study was conducted in the United States of America. The main objectives of the study were to survey both the technical and business aspects of dental laboratories. Some areas of interaction with the dentists were considered such as the quality of preparations, definitive designs of cases and adequate time allocation by dentists for the laboratories to produce the work. Communication between dentists and technicians was also investigated as well as the business relation that is important to dentists in terms of selection of dental laboratories and continued working relationship with the dental laboratories. Utilization in this study focused on the trend of the dentists to changing laboratories and the causes thereof. This study was similar to Morgenthal’s (1977) study.

It was observed that the dentists/technician long term relationships were not common, that is, relationships lasting longer than ten years. The study revealed that 40 percent of the relationships lasted not more than two years. Referrals by their colleagues were highly valued by the dentists when selecting a laboratory. Dentists that employed a dental technician in their practice were observed to have been still sending their work to more than one laboratory. The majority of dentists were reported to be comfortable with and encouraged laboratories to criticize their

design and preparations. Dentists had little or no desire to attend programmes of common interest with their laboratories. Unlike complaints made by technicians against their dentists in Morganthal's study, the dentists in this study expressed satisfaction with the following: the following of instructions, completion dates, shade selection, case design and specific alloy selection. The study also showed that remakes[5] were done free of charge, which would suggest that relationships would be better, as a potential source of conflict was removed. Although the participants rated laboratory reputation as least important, Gregory (1995) feels that reputation is an important factor in a dentist's choice of laboratory, just as reputation is generally, in business, considered an important factor in selecting a service provider.

Another study, conducted by Hatzikyriakos et al. in 2006 in Greece attempted to establish the effectiveness of communication and cooperation between dentists and dental laboratories. The study specifically looked at the consideration for services from dental technicians in fabrication of fixed prostheses. Communication about shade selection, infection control protocols, delivery of work and identification of each other's problems, were some of the weaknesses identified.

Afsharzand, Rashedi and Petropoulos (2006) conducted a study in Philadelphia, United States of America, which focused on communication between the dental laboratory technician and the dentist. The main purpose was to look at specific areas of work authorization forms for fabrication of fixed partial dentures. The study found that there was lack of communication between the dentists and technicians with regard to the areas mentioned above. Therefore, the study concluded that quality of service delivery was being compromised.

[5] A remake of a prosthesis is redoing the prosthesis from the beginning for a second time due to unacceptable problems with the first prosthesis. The reason for the remake could be due to either dentist or technician error. It is usually very difficult to positively identify the cause requiring a remake.

The above study was done twenty nine years after Morgenthal's (1977) study, yet Afsharzand, Rashedi and Petropoulos (2006) found that communication between dentists and technicians remained poor. Perry and Orfanidis (2004:127) emphasized that "it's a confidence builder for the patient, knowing two parties [dentist and technicians] are equally interested in his or her oral health".

Therefore, the literature suggests that, internationally, the issue of communication between dentists and technicians is problematic. Dawson, Cranham and Pace (2008:45) point out that "when this critical chain of communication breaks down, issues arise that can negatively impact all parties involved [including the patient]". The dentists' intentions must be communicated to the technician in order to attain results that meet everyone's expectations (McArdle, 2002). Howe (2004) believes that communication breakdown can lead to loss of patients. He feels that if the dentists and technician gave each other feedback on their work, a better working relationship can be attained. Maynard (2005) similarly feels that interaction between the dental team members is important in order for them to appreciate each other's views based on their knowledge. Shaffer (2008) believes that a dental team spirit, where all members are equally valued, builds a successful working relationship. Effective communication among the dental team also enhances quality service delivery and minimizes unnecessary costs (Mindak, 1996).

The literature on the relationship between dentists and dental technicians in respect of dental technical services has been reviewed. The various technical and business factors, utilization of dental technical services by dentists, focused on the choice of the laboratories made and the rate of changing laboratories. The literature reviewed thus far indicates that there remains a lack of analytical data as to whether dentists have sufficient quality of dental technical services available to them.

No studies on this subject matter have been conducted in Zambia, nor were any African studies on the same subject matter identified.

Therefore, it is important to understand what was established outside Africa is not necessarily applicable to Africa.

2.4 Notion of quality of dental technological services

Dental prostheses are fabricated to restore both aesthetics and the function of the lost natural teeth. When fitted in the mouth most of these prostheses contact the remaining natural teeth and delicate oral tissues. Therefore it is of vital importance that the dental technician reproduces the requirements that constitute good quality prosthesis during construction. These characteristics include good fit, aesthetics, strength and biocompatibility. The increased worldwide demand for aesthetic restorations has led to improvement of dental technical services such as ceramics and the development of adhesive techniques[6]. Therefore a good restoration should comply with the criteria of good adaptation in the oral cavity, strength, aesthetics and biocompatibility (Naert, Van Der Donck and Beckers, 2005). This is also true for the Zambian dental technical services.

There is a need to have a more detailed understanding of individual characteristics of quality technical services identified as good fit, aesthetics, strength and biocompatibility. The discussion now turns to an understanding of fit followed by a discussion on aesthetics, strength and biocompatibility.

2.4.1 Fit

The definition of fit varies a great deal in literature (Holmes et al., 1989). Rudolph (2004) describes fit in relation to dental restorations as adaptation of, for example, a denture to its basal seat, a clasp to a tooth and an inlay to a prepared cavity. It is vital that the fit of dental

[6]Adhesive bonding technique in dentistry refers to the method that restorations are bonded to the natural teeth using adhesive materials such cements to the natural tooth (enamel/ dentin). The technique has clinical application in operative and preventive dentistry as well as for aesthetic purposes.

restorations be accurate in order to attain benefits such as good stability, retention good oral hygiene, patient comfort and confidence and good function. Various authors (Koke et al., 2004; Contreras et al., 2002; Naert et al., 1995; Leong et al., 1994 and Schwartz, 1984) all agree that good fit contributes to the success and life span of a restoration. Sykora and Sutow (1993) advise that a denture with accurate fit provides adequate retention. Ill fitting dental restorations may cause deposition of food particles in unwanted areas; Coelho, Sousa and Dare (2004) observe that ill fitting dentures limit the natural self-cleaning action of the tongue, lips and cheeks hence they encourage food particles to lodge and as a result the affected areas may in the long term be sites of bacterial growth. Trapped food particles can also cause bad breathe which is referred to as halitosis in dentistry; in some patients the breathe is as bad as the smell of rotten eggs (Zigurs, Vidzis & Brinkmane, 2005).

When an artificial dental restoration is fabricated the patient expects to obtain optimal benefits such as aesthetics, comfort and function. *Dental Health for Adults* (2007) records that the loss of natural teeth can cause speech difficulties as well as decrease the patient's confidence. Therefore, an ill fitting oral appliance is likely to cause more discomfort to the patient rather than the desired effect of comfort and confidence. Coelho et al. (2004) believe that ill fitting dentures may cause impaired occlusion due to non-balancing arising from factors such as over closure of the jaws.

In denture construction, poor fit can be caused by various technical and mechanical faults in the fabrication process such as dimensional instability of the dental material used, namely acrylic resin. Sykora and Sutow (1993) conducted an investigation where they observed that a significant "posterior palatal border opening" (1993: 23) appeared after processing of dentures influenced by deflasking, trimming and polishing and immersion in water. They also concluded that the shape of the palate had an effect on the results. Ill fit may also be caused by wrong design of the restoration. Coelho et al. (2004) believe that "over

extended denture flanges" (2004: 138) is a form of ill fit that causes traumatic ulcerations to the oral tissues. They further observe that fibrous inflammatory hyperplasia may occur around the periphery or flanges of an over extended denture. Coelho et al. (2004) say that over extension of the denture bases does contribute to imbalanced occlusion. Over closure is also said to have effects on the fit of the restoration. Coelho et al. (2004) observe that over closure of jaws produces folds at the angles of the mouth allowing saliva to collect and "the skin subsequently becomes macerated, fissured and secondarily infected" (2004: 139). Jamina and Moligoda (1998) experimentally established that denture thickness may influence dimensional changes during the curing process of acrylic which may adversely affect the fit of the denture. Both Balkenhol et al. (2009) and Liberman et al. (1997) believe that polymerization[7] shrinkage contributes to ill fit. Other factors may include the manner in which the impression and the die are handled. Naert et al. (2005) observe that distortion to either the impression or the die may cause discrepancies to fit of a crown. Many if not all of these problems can be lessened if not eradicated if good communication exists between the dentists and technicians.

Another important aspect of dental restorations associated with the fit is the surface smoothness. Berger et al. (2006) state that since micro-organisms are part of the oral cavity, dentures surfaces should be smooth in order to promote a healthier oral environment as it reduces plaque and biofilm accumulation hence preserving the patient's oral health. The prosthesis should be smooth to avoid injuring the delicate oral tissues. Dundar and IIhan Kal (2007) believe that chronic irritation to oral tissues due to poor fit of dental restorations may lead to frictional keratosis. Berger et al. (2006) indicate that a rough surface of acrylic dentures may cause plaque accumulation and staining; they believe plaque and other biofilms are the cause of dental caries and periodontal

[7] Polymerisation is defined as "the chaining together of similar molecules to form a compound of high molecular weight (Rudolph, 2004:496*)"*.

disease. They further observe that bacterial accumulation is usually prominent around irregular tooth surfaces and along the gingival margins. Streptococasis anguis, bacteriodes gingivalis and *Candida albicans* are observed to highly adhere to rough surfaces of acrylic resins compared to smooth ones (Berger et al., 2006). This view is also supported by Bollen, Lambrechts and Quirynen (1997) and Kagermeier-Callaway, Willernshausen and Frank (2000).

Dental restorations with ill fit can also cause microleakage[8]. Anusavice (2003) describes microleakage as a contributing factor to compromised quality of dental restoration. He believes that penetration of acids and micro-organisms is etiology for caries, staining and distortion. Hazelton et al. (1995) and Hekimoglu, Anil and Yalcin (2004) agree. To Beuer et al. (2008) microleakage is a contributing factor to endodontic inflammation. Att et al. (2009) agree and further say that it affects the long term clinical success of a restoration.

Dental patients are mostly affected by their appearance especially when they have lost teeth and oral tissues. Therefore, there is a need to have an understanding of aesthetics in relation to dental restoration thus the discussion now turns to aesthetics.

2.4.2 Aesthetics

A person's physical appearance is of great importance in dentistry as the patients' quality of life can change when losing their natural teeth. *Dental Health for Adults* (2007) states that missing teeth can cause speech difficulties and, thus, make one to be self-conscious about one's appearance. Furthermore, missing teeth in the dental arch can be detrimental to the remaining teeth causing drifting, bone loss and impair the bite (*Dental Health for Adults*, 2007). Elias and Jutkowitz (1997) states that aging dentition presents with problems such as "wear and

[8] *Microleakage is defined as "*the seepage of fluids, debris and microorganisms along the interface between a restoration and the walls of a cavity preparation (Rudolph, 2004:396")

attrition of natural teeth, teeth discolouration; loss shifting, spreading, drifting, or migration of one or more teeth; ridge resorption; bite collapse; loss of vertical dimension and excessive freeway space; and wrinkled or collapsed facial characteristics" (1997:673). The correction of all these problems requires the manufacture of oral prostheses by dental technicians in cooperation with dentists.

In addressing the above, good communication between members of the oral health team is of vital importance if the patient is to benefit from a good prosthesis. In addition, an oral health team should adhere to basic reconstruction principles such as achieving aesthetics, harmony in respect of the shade, size, shape form and arrangement of the natural teeth (Elias and Jutkowitz, 1997). Ramfjord (2007) believes that restorative dentistry is meant to restore and preserve the health and function comfort of the natural teeth as well as offer satisfactory appearance. He further advises that all dental restorations should comply with requirements for periodontal physiology and health such as placement of margins of the restoration and avoiding over contouring. Elias and Jutkowitz (1997) also believe that dental restorations should be able to restore speech and mastication in harmony with the adjacent anatomy such as the T.M.J[9] and supporting musculature without compromising the patient's periodontal health.
A quality dental appliance is also believed to be durable and strong enough to withstand the oral forces. The discussion now turns to an understanding of strength.

2.4.3 Strength

The strength of a restoration is determined by its ability to withstand the oral forces and resist failure such as fracture. During mastication, forces of different magnitude are exerted on teeth. The value of the force depends on what section of the mouth the teeth are located in. Zonfrillo and Pratesi (2008) believe that masticatory forces range from 880N on

[9] Temporal mandibular joint

the molars through to 450N on the premolars and 220N on the incisors depending on the local situation. Lawn et al. (2007) advise that molar crowns could be subjected to loads between 100 and 1000N "for more than a million cycles in aqueous environments" (2007:1672). These forces are distributed to both remaining natural teeth and the appliance; hence dental restorations should be strong enough to withstand significant masticatory loads.

Poly methylmethacrylate[10] (PMMA) has been named by many authors as the most commonly used material in dentistry (Negrutiu, et al. 2009; Schricker et al, 2006; Hamza, et al., 2004 and Hernandez et al., 2004). However, it has several limitations. Hernandez et al. (2004:108) observe that "PMMA has a relatively poor resistance to stress under impact, bending and fatigue modes" and it discolours as well as experiences occlusal wear. Hamza et al. (2004) believe that PMMA fractures during clinical use due to its low resistance to impact, flexural or fatigue and poor manufacturing techniques. Schricker et al. (2006) agree with this view. Another major limitation observed with PMMA is its absorption of oral fluids. Although improved dentist/technician relationships will not overcome this inherent negative characteristic of PMMA it is, nevertheless important to understand that poor manufacture can contribute to the absorption of oral fluids. Thus, poor manufacturing techniques that create porosity in the PMMA result in unacceptably weak and unhygienic appliances (Negrutiu, et al. 2009).

Kulinich et al. (2006) believe that the success of metal ceramics is dependent upon factors such as chemical reactions between the metal and the ceramics, which are dependent on fabrication techniques. Kulinich et al. (2006) recommend that heat treatment can increase the bond strength between the ceramic layer and the metal. Restoration failure can also be due to errors in the design such as the shape of the connectors of a bridge. The connector region of a bridge is the weakest

[10] Commonly know in the industry as acrylic or colloquially as 'plastics'.

point with the greatest potential of fracture, regardless of the type of material employed. The highest tensile stress in a bridge is generated onto the connectors (Motta, et al. 2008). Therefore, connectors should be designed in such a way that ensures sufficient strength to resist these forces.

Biocompatibility is one of the most important factors that affect the quality of dental appliances with regard to success of the restorations. This discussion now turns to an understanding of biocompatibility of dental appliances.

2.4.4 Biocompatibility

Biocompatibility is associated with the ability of dental materials to be used in the mouth without causing toxic effects to oral tissues. Panyayong et al. (2002) feel that an ideal dental material should not be complicated to manipulate, offer protection to the remaining teeth against physical, chemical, bacteria and thermal injuries. Panyayong et al. (2002) emphasize that the material's constituents should not be toxic, irritate oral tissues or the pulp. Gawkrodger (2005:479) states that materials such as acrylic resin and dental alloys can cause "stomatitis, burning, tingling, chelitis, oral lichenoid lesions, lip and facial swelling". Arslan et al. (2008) consider that corrosion of in vivo biomaterials such as implants may cause harm to the body tissues. An ideal dental material for use in the oral cavity should be of low toxicity, very good biocompatibility and chemical inertia (Arslan, et al. 2008; Shan-hui, et al. 2007). .

Acrylic resin denture base material has been found, by different authors to be the most toxic material used in the oral cavity (Kim et al., 2007; Jorge et al., 2003; Barron et al., 1993 and Lefebvre et al., 1991). Lefebvre et al., (1991) in their study of light-polymerized acrylic resin found that the denture resin has toxic effects on oral epithelial cells. Barron et al. (1993) conducted a study to test the toxicity of visible light-polymerised resin on RNA and DNA synthesis of the oral epithelial cells

in vivo. They concluded that DNA synthesis is more sensitive to the resin, which could cause pathological effects to the mucosa. Jorge et al. (2003) believe that acrylic denture base materials are cytotoxic due to leaching of constituents like residual monomer. They further state that the residual monomer may be responsible for symptoms such as mucosal irritation and sensitization of oral tissues. Kim et al. (2007) believe that specific resins may be suitable for only certain uses in order to minimize toxicity. Good communication between the dentist and the dental technician can be helpful in making the suitable choice of material for individual cases.

Having reviewed what constitutes a quality restoration namely fit, aesthetics, strength and biocompatibility, the discussion now turns to a discussion on the Zambian Ministry of Health National OHP. This is necessary in order to have an understanding on how dental technical services are governed in Zambia in order to attain the required quality.

2.5 Oral health policy - Zambia

2.5.1 An overview of the oral health policy

In Zambia dental technical services are governed as part of oral health services. In a telephone conversation on 8 January 2010, Deputy Director, Oral Health Dr. Itone Muteba stated that, currently there is no oral health policy applicable in Zambia. Consequently, there is no policy for dental technical services either. Oral health services are managed by the Ministry of Health and are limited to hospitals in major towns, provincial headquarters and district centres. Currently there is no policy that governs oral health in Zambia. However, there is a proposed draft policy, which is being used as a guideline for administering oral health services.The draft policy was drawn up by the Ministry of Health in 2006. It was revised in 2008 and is still undergoing the process of approval by parliament.

Given the apparent lack of policy in respect of oral health it is nevertheless, important to establish the stance of government on the issues underpinning service delivery for oral health services. Different authors (Fisher-Owen et al., 2008; Benzian, Nackstad and Barnard, 2005; Myburgh, Hobdell & Lalloo, 2004 and Thorne, Kazanjian & MacEntee, 2001) have different perspectives on the scope of what oral health policies should govern. Benzian, Nackstad and Barnard (2005) observe that oral health is a right that should be an integral part of general health and be accessible and affordable to all communities. Therefore, Governments and stakeholders should maximize their efforts to provide befitting, safe and affordable oral health services for their citizens (Benzian et al., 2005). Fisher-Owen et al. (2008) feel that policy makers must consider oral health as important for health of the whole body and for quality of life as oral conditions such as periodontal diseases affect systemic conditions such as stroke in the same way that systemic diseases affect oral health. The African region has been observed to be facing critical oral diseases such as carcinoma, hence oral health policy makers must devise intervening strategies such as "advocacy, equity, quality, partnership, operational research, communication and capacity building" (Myburgh, Hobdell & Lalloo, 2004:129). Several authors agree that the mouth and teeth are an important part of health related quality of life (Lamy et al., 1999; McGrath & Bedi, 1998 and Winkler et al., 1999). On the other hand Thorne, Kazanjian and MacEntee (2001) feel that despite all the emphasis put on the value of oral health, policy makers establish minimal standards for oral health, especially with regard to patients that need long term care.

The Zambian draft Ministry of Health Oral Health Policy (OHP) proposes to address several issues of oral health. These issues, as contained in the draft policy, are now discussed further.

2.5.2 Access to oral health services

The situation analysis incorporated in the draft policy identifies that access to oral health services in the country is generally low. Formicola

et al. (2008) feel that in cases where access to oral services is poor, there is a need for policy makers to change their policies in collaboration with the institutes that offer the services. The Zambian draft OHP indicates that to increase access, the policy proposes to ensure that

- oral health is given priority by Government
- the services are evenly distributed
- it promotes exemption of user fees to the less privileged
- it advocates for an increase in budget allocations
- it strengthens integration of and the promotion oral health services in general basic care

(Zambia, 2006)

The oral health draft policy has shown that it promotes the delivery of services yet access to these services remains low. Therefore, it is suggested that if the community is not enlightened about the services they do not access them. The discussion now turns to an understanding of the draft policy with regard to awareness of oral health services.

2.5.3 Oral health awareness

Several views have been expressed by various people with regard to oral health policy on promotion of oral health to different cross-sections of people such as children, elderly people living in institutions and the less privileged in society. Dental caries has been observed to be widespread in early childhood and has high prevalence among preschool-aged children (Mofidi, Zeldin & Rozier, 2009). Mofidi et al. (2009) believe that there is a need to create a lifetime oral health foundation among Early Head Start (EHS) children through promoting oral health in classrooms, educating and monitoring parents to be actively involved in their children's oral health and "developing collaborative relationships within communities to ensure that EHS children have access to oral health care" (Mofidi et al 2009:245). Elderly people have been identified as a significant group at high risk of complicated oral diseases (Chalmers, Robinson & Nankivell, 2005; Chalmers, King, Spencer, Wright & Carter 2005). Therefore, it is

postulated that dental personal should train persons looking after the aged with care support strategies that are “practically oriented and ‘hands-on” in order to attain success in oral health care (Chalmers, et al. 2005:76). The Zambian draft OHP is silent on addressing the oral needs of the aged.

Many oral health educational programmes are formulated and implemented separately from other health programmes resulting in duplicated and conflicting messages being delivered to the public. Hence, it would be more beneficial for oral health policies to have a collaborative approach unlike promoting disease specific programmes that may be limited to the socio-environment setting (Sheiham & Watt, 2002). The Zambian draft OHP is more inclined to public oral health and does not indicate whether it will work in collaboration with other health programmes. The Zambian draft OHP emphasizes the following in respect of oral health awareness, namely:

- to give high priority to oral health public education and put more emphasis on Public Oral Health Education
- to provide oral health education programs through the public media
- to revamp school oral health activities

(Zambia, 2006)

Quality service delivery is also dependant on the human resources therefore the discussion moves to an understanding of how the Zambian government manages oral health human resources to enhance quality services.

2.5.4 Human resources

Human resources management is a very important component of any services delivery unit as it ensures that staff are trained and equipped for their profession. Oral health delivery is affected by factors such “social, economic[al], political and technological developments” therefore there is need to ensure that dental education produces graduates who are

practically confident and competent to meet these challenges (Field & Jeffcoat, 1995:192). Fiske et al. (2000) feel that all allied health personnel need additional training in order for the primary oral health care concept to be supported. The Zambian draft OHP does not address incorporating oral health training for allied personnel such as medical records technicians and nutritionists.

The Zambian draft OHP proposes to improve the necessary knowledge, competencies and skills for delivering quality oral health services at all levels of health care through the following:

- ensuring that the recommended number of trained personnel at each level of oral health care is provided .
- to review training for dental technicians by emphasizing community based activities
- to support and facilitate the local training of dental surgeons.
- to facilitate and support staff development initiatives for the dental training school lecturers.
- to recommend specific appropriate qualifications, training and career structures for all oral health personnel
- support oral health community educators by working with the non-governmental organizations involved in oral health activities.
- strengthen collaboration and co-ordination with the Zambia Dental Association on staff training, recruitment and management issues.

(Zambia, 2006)

Training of dental technicians in Zambia is limited to the diploma level, however the draft policy is silent on advancement of the training.

The reviewed literature has consistently shown that communication is problematic between dentists and technicians. Therefore, the design and location of oral health infrastructure need to be not only user friendly and accessible to the general public but also promote interaction between the dentists and technicians. The discussion now turns to an

understanding of how the Zambian government proposes to govern the oral health infrastructure with regard to design and location.

2.5.5 Infrastructure design and location

Before oral health care system is established, policy makers need to ensure that there is sufficient well established infrastructure to assess the specific oral health needs of the community. Further, inadequate infrastructure reduces effectiveness of the policy (Albert, McManus & Mitchell, 2005).

The Zambian draft OHP clearly indicates that it proposes to create a conducive working environment, which supports effective implementation of the oral health services as follows:

- ensuring that the design and location of dental surgeries and laboratories conform to recommended standards and specifications.
- enforce periodic inspection of dental surgeries and laboratories
- support repair and rehabilitation of public health infrastructure

(Zambia, 2006)

The Zambian draft policy does not clearly show whether it is committed to expanding the services available so as to increase accessibility. Further it is silent on establishing fully fledged oral health centres.

Oral health service delivery involves the use of delicate sophisticated machinery as well as volatile materials. Therefore, there is a need to establish how the Zambian government proposes to deal with these aspects of service delivery. The discussion now turns to an understanding of the draft policy as it relates to the provision of equipment and materials.

2.5.6 Equipment and materials

In this modern world technology is dynamic. It is important that oral health services providers have equipment and materials that meet the

latest technological standards. Advances in dentistry have been made in bioengineering, saliva diagnostics and gene manipulation. These advances have lead to development of new methods of detecting diseases affecting the oral and craniofacial tissues as well as regenerating enamel and dentin (Birch & Ismail, 2002).

The draft OHP proposes to ensure that the national oral health requirements are met by providing the latest and up to date equipment and materials through

- ensuring that dental surgeries and laboratories meet the recommended standards on equipment and materials.
- ensuring that purchases and donations in kind conform to the recommended standards on equipment and materials
- ensuring that there is a replacement and rehabilitation plan for equipment
- promoting the production of local equipment and materials
- encouraging active promotion of in-house maintenance of dental surgeries and dental laboratories
- encouraging representation of oral health professionals on the local tender committee when purchasing dental equipment/materials.

(Zambia, 2006)

In dental service delivery, quality assurance is an issue of great importance. The conceptual framework for understating the notion of quality of dental appliances in this study, has demonstrated various issues of oral health that may be detrimental to the patient's health as a result of poor quality services. Therefore the discussion now turns to an understanding of the Zambian government's stand on issues underpinning the quality of oral health services.

2.5.7 Quality assurance

The *Medical Device Daily* (2007) reports that in Florida, in the United States of America it was observed that dental restorations such as

crowns and bridges are under-regulated in terms of dental technician certification and dentists disclosing the sources of their work. Therefore, it was recommended that policy makers should certify technicians, ensure dentists document the source of their work and mandate dental registrations in order to enhance quality control (*Medical device daily*, 2007).

Zambian dental technicians are certified in order to practise. To enhance quality control and maintain high standards in delivery of oral health services the Zambian draft OHP indicates that it proposes to

- develop and enforce quality assurance standards and procedures
- enforce safety measures and guidelines for patients and oral health staff
- encourage the establishment of oral health quality assurance committee at each institution
- strengthen the monitoring and evaluation of oral health services.

(Zambia, 2006)

The draft OHP is silent on dentists documenting their source of work which could compromise certification of technicians as this might encourage non certified technicians to operate illegally.

2.6 Conclusion

The existing literature on perceptions of dentists towards dental technical services and the utilization thereof has been discussed. The discussion covered the perceptions of both the dentist and technicians towards each other in relation to various technical and business factors. The literature reveals that utilization of dental technical services by dentists focused on the choice of the laboratories for a number of varied reasons. These ranged from the fact that some dentists valued the communication with their technicians whilst others decided that quality

was of prime importance. Limiting factors of the studies reviewed were that the studies were conducted in countries outside Africa. Moreover, the studies were conducted in a quantitative paradigm and thus the opinions of the participants were lacking. The studies conducted did not consider whether dentists had sufficient dental technical services available to them so that they could offer a wide range of services to their patients.

The notion of quality for dental technical services, working relationships between dentists and dental technicians and the Ministry of HOP has been discussed and we have concluded that the policy promotes goodwill with regard to a number of critical issues that affect oral health service delivery such as access, awareness, human resources, infrastructure, equipment and quality control. The concept of quality has revealed the importance of paying attention to issues that affect the patient's health. These factors were described as fit, aesthetics, strength and biocompatibility. The reviewed literature has also shown critical areas of concern that affect the oral health team adversely such as lack of communication, interaction and mutual understanding. In the existing literature gaps have been identified and this research will attempt to establish data in respect of the relationships between dentists and dental technicians in Africa.

The discussion now turns to a description of the methodology used in this study.

Chapter Three: Research Methodology

3.1 Introduction

This study was conducted within an interpretive paradigm. Qualitative data was generated by means of semi-structured interviews. Random sampling was used to select the participants for this study. The methodology of the data collection, interpretation and analysis is explained and discussed below. Finally, a conceptual understanding of the trustworthiness of the data collected, ethical considerations and the limitations of the study are detailed and discussed.

3.2 Study design

3.2.1 Research paradigms

Collins and O'Brien (2003:256) define a paradigm as "a set of beliefs accepted without question and used as a frame for seeing the world". Similarly Brennan (1992:233) indicates that a paradigm is "a model of reality or a system of facts, theories and philosophies that is widely accepted and becomes the framework for thinking about a scientific problem". Collins and O'Brien (2003) further suggest that a paradigm dictates the researcher's reasons for carrying out the research, the types of questions to be asked in the research, their methodology and the relationship between the researchers and their participants (epistemology), as well as the final reporting. Thus, one can consider a paradigm as a set of beliefs into which research problems are aligned or categorized.

Research paradigms can broadly be categorized into either quantitative or qualitative research. Quantitative and qualitative research can be described as a collection of data that represents the different types of information collected in the research process (Samdahl, 1999). Quantitative and qualitative research approaches have over the years

caused much discussion (Onwuegbuzie, 2002). Different philosophers such as Creswell (1994); Glesne and Peshkin (1992); Lincoln and Guba (1985); Merriam (1988) and Marshall and Rossman (1980) discuss these research approaches in different ways.

Merriam (1988) and Creswell (1994) believe that in qualitative design assumptions, the researcher is concerned with the process more than the outcome. They further suggest that another area of importance in qualitative research is that it involves field work in that the researcher physically interacts with participants; hence, it is descriptive and inductive.

Marshall and Rossman (1980) suggest that arguments supporting qualitative inquiry show that human behavior is influenced by the setting within which it occurs; therefore research techniques subject the researcher to understanding the framework within which the researched interpret their own realities such as feelings, thoughts and actions.

Lincoln and Guba (1985) look at the contrast between positivist and naturalist beliefs and assumptions, as positivist paradigms relate to quantitative research while the naturalist paradigm relates to qualitative research. Lincoln and Guba (1985) also argue that quantitative and qualitative approaches are incompatible although Patton (1990) and Reichardt and Cook (cited in Glesne and Peshkin 1992) believe that the two approaches can be combined by skilled researchers successfully.

The debates have lead to purists supporting, and so believing in, either quantitative or qualitative methods of data collection. In quantitative research, assumptions are made that are consistent with a positivist philosophy while qualitative research purists reject positivism (Onwuegbuzie, 2002). Lincoln and Guba (1994 cited in Toma 1996:3) state that “scholars have scientific core assumptions in three different areas and these may be classified into paradigm-based groups”. These core assumptions are understood to be where the researcher positions

herself in respect of the ontology, epistemology and methodology of the research process. Ontology is understood as “what one believes one can come to know about the world” (Lincoln and Guba cited in Toma 1996:3). Thus one talks “of the ontology of a theory, and a philosopher is sometimes said to be committed to such-and-such an ontology” (Collins & O’Brien, 2003:250). Epistemology is understood to be “the branch of philosophy that develops theories concerning what counts as knowledge” (Collins & O’Brien, 2003:125). In research, the research strives for objectivity and a relationship is said to exist between the researcher and the matter being studied (Lincoln and Guba cited in Toma 1996). In the positivist approach to research, the researcher requires complete objectivity to ensure an unbiased neutral representation of reality is achieved. In most post-positivist approaches, such objectivity is not believed to be possible.

A researcher will believe in an appropriate method of conducting his/her research (Lincoln and Guba cited in Toma 1996). This is the methodology of the research. Methodology is defined as “the application of principles, practices and procedures to a problem, project, course of study, or given discipline” (Collins & O’Brien, 2003:220). Thus a researcher’s chosen research paradigm can be understood to be established from the assumptions made in respect of the ontology, epistemology and methodology of the research problem which consequently positions the researcher within an appropriate paradigm.

It is important to understand different paradigms, and it is for this reason that the following brief discussion is given. There are many different research paradigms. This study will be conducted in an interpretive paradigm; which will be discussed further in paragraph 3.2.3. In order to clarify an understanding of the interpretive paradigm, this paradigm will be contrasted with the positivist paradigm. The positivist paradigm underpins most research in the Health sector as it is concerned with “scientific and technological advancement” (McKenna, 2004:34; Sale, Lohfeld & Brazil, 2002 and Baum, 1995). The constructionist paradigm

will be briefly described in order to help this researcher position this study in the appropriate paradigm as it deals with scientific studies of social experiences of people (Terre Blanche, Durrheim and Painter, 2006). A brief discussion on subjectivism and objectivism follows.

3.2.2 Positivism

In positivist research the ontology deals with “stable external reality such as generalisable laws”, the epistemology is “objective and detached”, and the methodology is “experimental, quantitative” in nature and deals with “hypotheses” (Terre Blanche, Durrheim and Painter, 2006:6).

The positivist paradigm is also referred to as ‘default paradigm’ with assumptions that are often used as “the criteria against which all research is assessed” (McKenna, 2004:34). Quantitative research is conducted within a positivist paradigm with the nature of reality (ontology) viewed as single, tangible and fragmental (Lincoln & Guba, 1985).

3.2.3 Interpretive

Interpretive paradigms are said to be “the systematic analysis of socially meaningful action through the direct detailed observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their social worlds” (Neuman, 2000:71). The ontology of an interpretive research deals with the “internal reality” of personal experiences, the epistemology is “sympathetic, subjective, examines,” and it employs methodologies that are “interactive, interpretive and qualitative” in nature (Terre Blanche, Durrheim and Painter, 2006:6). Thus the researchers who work in an interpretive paradigm do so because they believe that the assumptions made will be constructed and the purpose of the study contextualized rather than generalized.

3.2.4 Constructionist

A consideration was given as to whether this study would be positioned within a constructivist paradigm. In order to understand whether the study was influenced by constructivist thought, an understanding of the paradigm is necessary.

Constructionist paradigms have to do with socially constructed reality such as discourse or power through critical analysis of texts and the methodology used involve deconstruction, textual analysis and discourse analysis in nature (Durrheim and Dixon, 2001).

Denzin and Lincoln (2005:184) believe that the constructionist paradigm attempts to “connect action to praxis and builds on antifoundational argument while encouraging experimental and multivoiced texts as well as values transactional knowledge”. Similar to an interpretive paradigm, a constructionist paradigm deals with qualitative research and does employ interviews but the difference is that constructionists focus mainly on discourses (Terre Blanche, Durrheim and Painter, 2006).

Baum (1995:459) believes that “qualitative research techniques” dealing with service delivery in the health sector are “well suited in interpretative methods”. Whilst it can be argued that elements of this research fall within the constructivist paradigm this researcher, nevertheless concluded that this research fits more comfortably within an interpretive paradigm.

3.2.5 Subjectivism and objectivism

Subjectivism is said to be a set of beliefs that deals with predominant subjective experiences and is an essential part of all evaluation and law. It may embrace the nature and existence of every object to depend exclusively on one’s subjective understanding of subjectivism. (Samdahl, 1999). In qualitative research methodology, the subjectivity of a researcher has a personal involvement and it helps the researcher determine what to study, the hypothesis and methodology as well as derive an interpretation of the data collected (Ratner, 2002).

In contrast, Ratner (2002) believes that with objectivism the researcher describes the subject under investigation that one may not be able to see or talk about. One only sees and talks about the values one dictates as the subject may exist beyond the values, but it can never be identified as is; only as values outline our understanding of it (Ratner, 2002). Objectivity is said to invalidate subjectivity because the researcher is an inactive beneficiary of external information, devoid of activity. On the other hand the researcher's subjectivity is said to invalidate the likelihood of objectivity (Ratner, 2002).

Having explained paradigms it important to position this project in a paradigm thus the discussion turns to positioning this study in a research paradigm.

3.2.6 Positioning this study in a research paradigm

This research was conducted in an interpretive paradigm. Smith (1993 cited in Denzin & Lincoln, 2002:153) states that "interpretive(s) see criteria not as abstract standards, but as open-ended evolving list of traits that characterize what we think research should do and be like". Cohen, Manion and Marrison (2005:22) feel that the interpretive paradigm "is characterized by a concern for the individual" and it helps the researcher "get inside the person and to understand from within". The interpretive paradigm enables the researcher to have an understanding of "a specific context as it is without generalizing or replicating" (McKenna, 2004:35). Thus this study is positioned in an interpretive paradigm as it seeks to investigate the true personal feelings, experiences and thoughts of the Zambian dentists and technicians towards dental technical services. The study hopes to find out the participants' feelings without generalizing or socially constructing the findings.

Quantitative research is usually more open to generalization whereas qualitative research has limited generalization (McKenna, 2009 pers. comm. 23 March). Therefore, in order to avoid generalization of what

passes as truth, perceptions of respondents were investigated through a methodology that is qualitative, interactive and interpretive. This was achieved through the use of semi-structured interviews. Qualitative methodology was chosen for this study because it attempts to "obtain intricate details about phenomena such as feelings, thought processes, and emotions that are otherwise difficult to extract through conventional research methods" (Strauss & Corbin, 1998:11). Glesne and Peshkin (1992) argue that the researcher is detached in quantitative research whereas in qualitative research the researcher is personal. Qualitative research also enables the researcher to have an "in-depth, open and detailed understanding of the information that emerges from their data" (Terre Blanche, Durrheim and Painter, 2006:47). On the other hand quantitative research "embodies standardized quantitative measures, and uses the data to make broad and generalizable comparisons" (Terre Blanche, Durrheim and Painter, 2006:47).

The nature of this study is subjective in that it was looking at perceptions of dentists and technicians which are their reality. The questions under investigation may not have brought out one single truth but may reveal multiple realities. It is believed that in subjectivism all viewpoints are simply another way of approaching a thing. For example, one individual's view is that Santa Claus is a myth and another's view is that he is a real person. Both viewpoints have equal truth value, which can be argued is none at all (Ratner, 2002). The concern in this interpretive research is, therefore, not with an objective, generalisable truth but rather with the truth as interpreted by the dentists and dental technicians interviewed in this study in respect of their perceptions of the truth of their interaction with dental technical services in Zambia as well as their interaction with the laws governing oral health this country.

The research sample size is one of the most important factors in designing a study. Sandelowski (2009) believes that in qualitative research sample size may affect the quality of the data collected and

ultimately the intended outcome of the study if not selected carefully. Thus the discussion now turns to how the sample size of this study was determined.

3.3 Sample size

The study setting consisted of three main cities of Zambia, namely Lusaka, Ndola and Kitwe. Ndola and Kitwe, which are in the copperbelt province of Zambia, are five and five and half hours drive away from Lusaka respectively. These cities were selected as they have the highest concentration of dentists and technicians in Zambia. Few technicians and dentists exist outside these three main cities.

In qualitative research the exact figure of the sample size may not be determinable prior to data collection. Kvale (1996:101) suggests that with qualitative data collection using semi-structured interviews one needs to "interview as many subjects as necessary to find out what you need to know" as the number is dependent on the purpose of the study. The fundamental issue in determining sample size is the type of data being collected and the extent to which generalizable claims will be made. Cohen, Manion and Marrison (2007:101) believe that the question of selecting a sample size has no "clear-cut-answer" because the sample size is determined by the purpose of the study and the kind of population under consideration. The suggested number of interviews indicated in this research was derived through proportional consideration of the number of respondents in each of the three cities. As at 2008 there were 61 dentists and 50 dental technicians in Zambia (Mtolo, 2008). Lusaka has the highest concentration of dentists (23) and technicians (eight) and thus the greatest number of respondents to be interviewed was to come from this city. Hence, a target number of twenty participants, including six dentists and six technicians in Lusaka and two dentists and two technicians in Ndola and Kitwe were selected for participating in the study.

In the end, however, the total number of participants was nineteen as one from Kitwe could not participate because he had to travel out of the country for studies. The city only has two technicians therefore he could not be replaced. Moreover, it was considered unnecessary to consider interviewing another technician not from Kitwe as this would have served little purpose as it is the belief of this researcher that data saturation was attained after the said nineteen interviews.

It is important to understand research sampling as there are many ways of sampling. This discussion now moves onto the sampling method used to generate data in this study.

3.3.1. Sampling to generate data

An interpretive approach demands that rich data[11] is collected and that deep analysis takes place. Coyne (1997) suggests that in qualitative research sampling is not an easy subject as there are variations of qualitative sampling methods provided for in the literature. In this study, although prior to the start it was believed that 20 interviews would be necessary, the exact number of respondents to be interviewed was not fixed as the final number to be interviewed would be determined by data saturation. Glaser and Strauss (1967) describe saturation of data in qualitative research as a rigorous method of data analysis whereby the researcher finds no additional data but rather the occurrence of similar responses repeatedly. However, Ryan and Bernard (2004 cited in Guest, Bunce & Johnson, 2006) advise that data saturation depends on factors such as the quantity and complexity of the data, the researcher's experience and fatigue and the number of people to analyse the data. Respondents chosen to be interviewed were randomly selected by the use of a table of random numbers[12]. Polit and Hungler (1999) describe this process as one where the researcher uses a set of random numbers

[11] Data that incorporates details such as tone of voice (Bogdan & Biklen, 1982 cited in Lincon & Guba,1985).
[12] See Appendix 8 for the Random sampling table

matching the population then finds a starting point by closing their eyes and letting their finger fall at any digit from which they move horizontally or vertically to pick the numbers within the specified range. In this study random numbers that appeared in the table were from zero to sixty one for dentists and zero to 50 for dental technicians, though not all 50 were present in Zambia as some were out of the country for various reasons. The numbers were randomly ordered in the table, - that is no number ran consecutively. Once the starting point was determined, the numbers adjacent to the starting number, either horizontally or vertically, were selected. The random draw gave each sample an equal and independent chance of being selected (Terre Blanche, Durrheim and Painter, 2006). The numbers were then matched to the names that appear on a control list that was compiled from the Medical Council of Zambia register. The members were randomly selected. If the technician/dentist was resident in Lusaka, Kitwe and Ndola they were included in the study and if they were not they were excluded. The procedure was repeated until six dentists from Lusaka, six technicians from Lusaka, two dentists from Ndola, two technicians from Ndola, two dentists from Kitwe and two technicians from Kitwe[13] were selected. In the case where a respondent, having been selected for interviewing declined, the next respondent was selected from the random table. Once selected, the participants were telephoned, and when they agreed to be interviewed, letters of introduction[14] and informed consent forms were distributed to them. Respondents were asked to return a written consent[15] should they agree to be interviewed. *Table 1* below shows the respondents interview sample.

[13] As reported earlier, one of the only two technicians was available for interviewing.
[14] See Appendix 1 and 2 for letters of information and consent to dentists and technicians respectively.
[15] See Appendix 3 for written informed consent.

RESPONDENTS INTERVIEW SAMPLE						
CITY	DENTISTS			TECHNICIANS		
	Total in city as per lists received	Total established in city	Selected for interviewing	Total in city as per lists received	Total established in city	Selected for interviewing
Lusaka	26	23	6	13	8	6
Ndola	8	6	2	5	2	2
Kitwe	7	5	2	4	2	1
Total	41	34	10	22	12	9

Table 1 **The respondents interview sample**

This study was conducted through the use of interviews therefore the next section of this discussion defines interviews in general

3.4 Data collection

3.4.1 Interviews

Research interviews and their significance have been described in many different ways by different philosophers (Kvale (2007); Denzin & Lincoln (2005); Britten (1995) and Patton (1990). Kvale (2007) describes the research interview as means by which knowledge is constructed in the inter-action between the researcher and the respondent. Qualitative research interviews can also be viewed as a "construction site for knowledge" (Kvale, 2007:7). Interviews help us to investigate what is in and on the respondents' mind (Patton, 1990). Patton (1990:278) believes that interviews are a means of finding out an individual's perspective rather than "put[ting] things in someone's mind" hence uncover things that cannot be observed such as feelings, thoughts and intentions. Denzin and Lincoln (2005) feel that interviews are a means to reach areas of the respondent's reality such as experiences and attitudes, that would otherwise remain unreachable. Interviews are a convenient means of uncovering distances in space and time of events

that the respondents experienced (Denzin & Lincoln, 2005). Britten (1995) views qualitative interviews as a flexible and powerful apparatus of discovering new areas of research. McNamara (2008) states that an interview assists the researcher to find out the story behind the respondents' experience. Data was collected through individual semi-structured interviews. Semi-structured interviews allow for synchronous conversations enabling the respondents to answer spontaneously and the interviewer is able to probe for answers resulting from the conversation. As a result structured interviews were found inappropriate for this study because the contents and procedures are predetermined. Cohen et al. (2005) say that in structured interviews the order and wording are determined by a schedule. Semi-structured interviews were chosen as it is a data collection process that is "flexible and dynamic" (Robinson, 1998:21). It allows for in-depth discussions to take place within the context of the subject matter whilst allowing for additional discussions arising out of the interview process. Cohen, Manion and Morrison (2007) suggest that during qualitative interviews new insights and changes may arise in the participants. Terre Blanche, Durrheim and Painter (2006) believe that an interview is a natural process that facilitates interaction with the participants. Semi-structured interviews give the researcher an opportunity to know the participants intimately in order to understand how they think and feel.

This discussion now turns to the interview process.

3.4.1.1 The interview process

In this study the views of Zambian dentists and technicians were collected through interviews to ascertain their individual perceptions of dental technical services. The interviews enabled the participants to share their personal views on dental technical service delivery in Zambia and express themselves freely on how they feel about the quality of these services. Furthermore the participants were able to register other articulate issues faced in their day to day running with regard to technical services. Bass (2007) believes that qualitative research interviews are a

guide to which the researcher can adapt their approach in line with responses obtained. He further argues that the necessary data is generated without two interviews being similar in the same study. Therefore, it can be argued that interviews were more appropriate for this study compared to questionnaires that would not allow for probing and clarification as in face to face interviews.

Open-ended questions were used because they allow the respondents to answer in a way and style they are comfortable with without the researcher being an influence (Bailey, 1997). Bailey (1997) suggests that open-ended questions reduce the chances of the respondents giving socially acceptable views. Interview guides were used because they provide a guide for the subject and topic areas of the research within which the researcher can explore and probe to obtain the desired data (Patton, 1990). Other advantages of using research guides include enabling the researcher to plan on how to utilize available time and help develop a logical and comprehensive means of delimiting issues to be investigated in advance (Patton, 1990). The interviews lasted between twenty and forty minutes for both dentists and technicians. The questions to be asked, that served as a guideline to be asked of the dentists[16] and the technologists[17] in the semi-structured interview, are attached. Interviews were ceased once data saturation was achieved.

Cohen, Manion and Marrison (2007) believe that in interviews bias is bound to creep in. They believe this to be true because each participant explains things in their own way. It is for this reason that the discussion now turns to accuracy of the data collected

3.4.2 Accuracy of the data collected

Interview data may be affected by errors, on the side of the respondent as well as the interviewer. Bailey (1997) suggests that errors such as

[16] Appendix 4 – guideline questions to dentists
[17] Appendix 5– guideline questions to technicians

purposeful lying, non intentional mistakes and misunderstanding of the question may be made by the respondent. Other sources of error on the part of the respondent include embarrassment due to sensitive issues being discussed and an inability to recall (Bailey, 1997). In this study an assumption was made that the respondents had no cause to give false and misleading responses during the interviews. In order to address these errors the respondents were first briefed. The research topic was introduced to them and assurance was given that it was not a matter of the correct or incorrect answer but that their honest opinions were important. In order to ensure an understanding of the questions being asked, questions were re-phrased when deemed appropriate.

The interviewer's errors include the manner in which questions are formulated, questioning technique, recording and deliberate cheating (Bailey, 1997). In order to avoid these errors, pilot interviews to test the process were conducted. These helped to assess the clarity of the questions and test the reliability of the digital recorder that this researcher used. There were instances during the main interviews where the interviews were interrupted by unavoidable background noise. In such instances the researcher took notes. In addition, to ensure that essential data was captured this researcher made sure that notes were compiled immediately after every interview. Research interview conversations are synchronous. Therefore, respondents may also be a source of bias and intimidation to the interviewer resulting in recording of wrong and influenced views (Mqadi, 2009).

Research data can be captured in various ways however each method has advantages and disadvantages. This discussion now turns to capturing of the data for this study.

3.4.2.1 Capturing the data

Qualitative interview raw data may be recorded in various ways such as notes jotted at the time of the interview, notes written down after the interview and audio-taping of the interviews (Britten, 1995). Britten

(1995) feels that notes written during the course of the interview may be a source of interference whereas notes taken after the interview may miss out some important information. Hove and Anda (2005) are in support of this view. Although Britten (1995) and Hove and Anda (2005) believe that audio taping can cause discomfort to the respondent, it should be clear that in this study interviews were audio-taped and the respondents were comfortable as confidentiality was emphasized and adhered to throughout the process. An Olympus digital recorder was used. All the respondents agreed to be recorded and a signed consent[18] form to use the recorder was obtained from them before the interview. Tape-recording was vital to capture the views of the respondents for transcription and analysis. Mays and Pope (1995); Johnson (2002 cited in Saks & Allsop, 2007) and Hove and Anda (2005) all agree that audio-taped data can be transformed into written form more accurately as the interviewer concentrates on the conversation undisturbed, furthermore the data is retrievable. Johnson (2002 cited in Saks & Allsop, 2007) believes semi-structured interview data must be audio-taped as it can be presented verbatim to preserve the meaning.

In order to arrive at the meaning and implication of the data collected, analyzing it was important. For this reason the next section looks at the data analysis process used for this study.

3.5 Data analysis

3.5.1 Interpreting the data

Bryman and Burgess (1994: 173) observe that a high proportion of qualitative data is text based composed of verbatim transcripts of respondents' views that are in "detail and in micro form" as the respondents give account of their personal experiences. Jones (1985:56) feels that analysis of qualitative data is a process that is

[18] Appendix 3 Copy of consent letter signed by all respondents.

interpretive and creative, that is not easy to make explicit yet “a great deal of qualitative data analysis is rather less mysterious than hard, sometimes, tedious, slog”. Miles and Huberman (1994) state that when compiling qualitative research data, one faces challenges such as that all collected views may look promising to the relevance of the study. There is therefore need for the researcher to identify views that matter the most and condense them through the use of conceptual frameworks and research questions as a guard against the workload (Miles and Huberman, 1994). Dey (1996) points out that qualitative data analysis is an interactive process that enables the researcher to derive interpretations. Geertz (1973) and Denzin (1989) all agree that interpreting the data helps explain the findings by bringing out their importance thus putting together coherent answers to the main research questions. Interpretation of the data helps with managing the data to extract meaning in order to arrive at conclusions and generate or confirm conceptual schemes and theories that describe the data (Spiggle, 1994).

Interviews were transcribed and analysed using thematic content analysis. Thematic analysis looks at identifiable themes and patterns of experiences (Aronson, 1992). Braun and Clarke (2006) and Aronson (1994) both describe thematic analysis as the process of searching through qualitative data for recurring patterns of meaning. Thematic analysis was chosen for this research as it is the foundation for any qualitative data analysis that researchers may engage with (Holloway and Todres, 2003). Thematic analysis is a flexible process as the analysis is a continuous process that can begin right from the interview stage through to final data analysis (Patton, 1990). The process enables the researcher to move back and forth across the data.

The discussion now turns to the transcription and coding of the data collected.

3.6 Transcription and coding of the data

Individual interviews were transcribed by a professional transcriber. Henning (2004) describes a transcriber as a technical assistant who is able to type up data faultlessly from electronic interview recordings. The interviews were typed verbatim in order to preserve meaning.

NVivo 8.0 software was used to analyse the raw data. Strauss and Corbin (1998: 87) believe that qualitative data analysis tools help the researcher ascertain bias to some extent and also with labelling of concepts and properties of the data. The data was then grouped according to the pertinent themes that emerged in the form of codes in order to check for the similarities and differences. Common experiences of dentists and technicians such as those relating to communication, delivery time, quality of work, accessibility of services, filling out prescriptions, attitudes and any similar patterns of experiences in the participants were drawn as themes and analysed. A careful reading of the literature on the perceptions of and use of dental technical services also helped underpin the construction of key themes from the data. Bowen (2008) states that coding helps us scrutinize and compare data with codes so as to arrange the views, and pinpoint concepts grouped together.

To ensure anonymity, the data collected from the interview process was coded with the letters ZD and a number for the dentists, and ZT and a number for the technicians. For instance transcripts from a hypothetical dentist Boas and technician Barak were coded ZD1 and ZT2 respectively.

Validity of the research data is very important. In qualitative research validity is referred to as trustworthiness (Lincoln and Guba, 1985). This discussion now turns to the trustworthiness of the data.

3.7 Trustworthiness of the data

It may be important to mention that validity of data relates to whether the data collected replicates reality. Lincoln and Guba (1985) believe that in qualitative research data should be assessed through trustworthiness rather than validity. They describe trustworthiness as the means through which an inquirer persuades their audiences to believe that their findings are worth paying attention to. The main issues of concern in terms of research data include the truth value, applicability, consistency and neutrality of the data. Lincoln and Guba (1985) say that in qualitative research these terms are referred to as credibility, transferability, dependability and confirmability respectively. They further discuss them as follows:

- Credibility - establishing confidence in truth.
- Transferability - determining the extent to which research findings apply to other contexts/respondents.
- Dependability - determination of the repetition of findings in an inquiry, if it were replicated with similar respondents and context.
- Confirmability - establishment of the degree to which research findings are determined by the respondents and conditions posed by the inquiry not by biases, motivations, interests or perspectives of the researcher.

Golafshani (2003) suggests that validity in qualitative research determines the truthfulness of the results. Terre Blanche, Durrheim and Painter (2006) suggest that validity measures a good degree of fit between the conceptual and operational definitions of the construct of the research and the instrument of measure should be usable for the specific intended purpose. This research is not dealing with an external objective truth but the internal truth of the perceptions of dentists and technicians. There was need to ensure that the participants' authentic perceptions were obtained by making them feel secure and safe during the interviews. This was done by reassuring them that there would be no

risks involved and their perceptions were valued regardless of who they were. Polkinghorne (2005) believes that respondents need to feel safe in order to open-up and disclose their deep personal feelings and experience. The fear of power imbalance typical of researcher-researched interview relationships (Cohen, Manion and Morrison 2007) did not arise with this research as the researcher was interviewing experienced, qualified dentists and technicians; however care was taken to ensure confidentiality and other approaches which increase trustworthiness in interview data. Confidentially was achieved through ensuring that respondents could not be identified when presenting results in the final dissertation. The interviews were all conducted in privacy at the convenience of the respondents to ensure confidentially and put them at ease so that they spoke their true feelings. All the respondents were coded as discussed in the previous section. Data collected would be retained in the department for five years thereafter discarded.

Kvale (2007) says research interviews involve moral activities that affect the methodology as well as the data obtained. Hence there is the need to ensure that ethical matters are discussed. The discussion now turns to ethical consideration made in this study.

3.8 Ethical considerations

Ethics refers to “the study of right and wrong action” (Collins and O’Brien, 2003:128). In this research we are concerned with consequential ethical systems. Thus actions are judged against the consequences that result from the actions of the researcher that could impact on the future well being of those involved in the research process (Collins and O’Brien, 2003).

Practically, for purposes of this research, ethical considerations involved a means through which the research respondents were informed about the research process and had it explained to them. This involved

informing respondents as to the nature of the research and addressing any concerns that arose as a result of their consent.

Participation was voluntary. Letters[19] of introduction were distributed via email and the post, and the follow up to their responses was done telephonically. Individual visits were carried out in order to conduct onsite interviews. Details of how the sample was selected are discussed in the section of sampling to generate data above.

Letters of introduction were distributed to the dentists[20] and technicians[21] in order to give them background information about the research project. In order to obtain their permission, the respondents were asked to sign letters of consent[22] at the interview. No respondent withdrew from the study. The respondents, both dentist and technicians were selected from the Medical Council of Zambia (MCZ) register. Therefore, their permission to conduct the study was obtained. To this end, a letter seeking the required permission[23] to interview their members was written to the Council. Ethical clearance[24] was obtained from the research ethics committee of the Faculty of Health Sciences. The committee required that permission to conduct the study in Zambia be sought from the MCZ. The necessary permission was obtained from the Registration officer Mr. Bwemya Bwalya for MCZ on the 8th of July, 2009. A copy of the letter is attached.[25]

Every research project is bound to experience problems especially when dealing with people. This discussion now turns to limitations of this study that were observed.

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[19] [19] See Appendix 1 and 2 for letters of information and consent to dentists and technicians respectively.
[20] Appendix 1 Introductory letter to the dentists.
[21] Appendix 2 Introductory letter to the technicians.
[22] Appendix 3 Consent letter to be signed by all respondents.
[23] Appendix 6 Permission to conduct research letter to the Medical Council of Zambia.
[24] Appendix 9 Ethics clearance certificate obtained from the research ethics committee
[25] *Appendix 7* Letter of Permission from MCZ.

3.9 Limitation of the study

Miles and Huberman (1994) outline a number of drawbacks associated with qualitative research that include researcher bias which may affect the research design and data collection as: lack of equal credibility of all participants, building trust with the respondents in order to attain absolute and truthful self-representation in short term studies, biased analysis of the observations, the presence of the researcher may alter any group studied hence distort the data to some degree and failure of study groups to be representative of the bigger population. These disadvantages were considered and views of participants were collected and interpreted in an ethical manner.

Lack of prior accurate information by Zambia Dental Association (ZDA) and MCZ concerning the practising professionals, especially of the dental technicians in the cities targeted for this study made locating the necessary persons quite difficult. This study revealed that Zambia had even fewer dental technicians than originally expected given the information supplied by the ZDA and the MCZ. For example Kitwe had three registered technicians but there is only one currently practising, as one had retired and the other was studying outside the country. Therefore, the study was limited to capturing the views of only the available technicians.

There were a few instances where appointments had to be re-scheduled. Some appointments had to be rescheduled several times (seven to ten times). Hence the interviewing process had budgetary implications. Henning (2004) recommends that respondents need to be reassured that their privacy, sensitivity and confidentiality will be guaranteed, throughout the inquiry and the research procedures. Prior to each interview the researcher had briefings with respondents to encourage them to speak the truth and view the exercise as beneficial to them as well, as the findings might help provide some clarity about the

challenges they might be facing in their career therefore their authentic perceptions had to be captured. The limitations noted can affect the validity of this study; however, Cohen, Manion and Morrison (2005) believe that every piece of work is prone to threats which affect validity and reliability.

Nevertheless, the threats faced in this study were controlled and the research was conducted with minimal interruptions. The participants responded with honesty. Hence, it can be concluded that their true feelings were captured.

3.10 Conclusion

Research paradigms have been discussed and this study has been positioned in an interpretive paradigm. This chapter explained that the medium of semi-structured interviews was used to generate the data. Initially twenty interviews were targeted however the actual interviews conducted numbered nineteen. The design of the study addressed the method of sampling to generate data, data analysis, examined trustworthiness of the data and the ethical consideration of the study. The researcher can thus conclude that the study was conducted in an ethical manner and the data collected is trustworthy. The limitations to the design were also noted.

The discussion now turns to a presentation of the results.

Chapter: Four Analysis and Discussion of the Results

4.1 Introduction

Views of all the respondents who participated in this study will be presented in this chapter. Analysis of the views of dentists and technicians resulted in the identification of themes and subthemes. *Figure 1* below depicts these themes and subthemes. The themes and subthemes are discussed in detail in order to answer the three key research questions which were:

1. What are the perceptions of dentists and dental technicians currently practising in Zambia, of the quality of dental technical services?

2. Does the quality offered by technicians meet dentist's and dental technicians' expectations of dental technical services?

3. What are the perceptions of dentists and dental technicians of the national objectives of the Ministry of Health in respect of dental technical services?

The literature reviewed in this study, as well as having discussions with this researcher's supervisors, led to the identification of themes as identified in *Figure 1*. Tuckett (2005:75) states that reviewing the literature beforehand can improve your data analysis by sensitizing you to the more understated features of the data. The literature search also helped the researcher apply flexibility in the analysis in order to answer the research questions (Patton, 1990). Thus the differences and similarities between the reviewed literature in this study and the data collected were considered in order to derive the themes. Relevant quotations from the data have been used where necessary in order to clarify and sustain the findings. Thus, perceptions of the respondents on the quality of dental technical services in Zambia and how they are governed were analysed.

The respondents were given identification codes (ZD[26] and ZT[27]) to ensure anonymity.

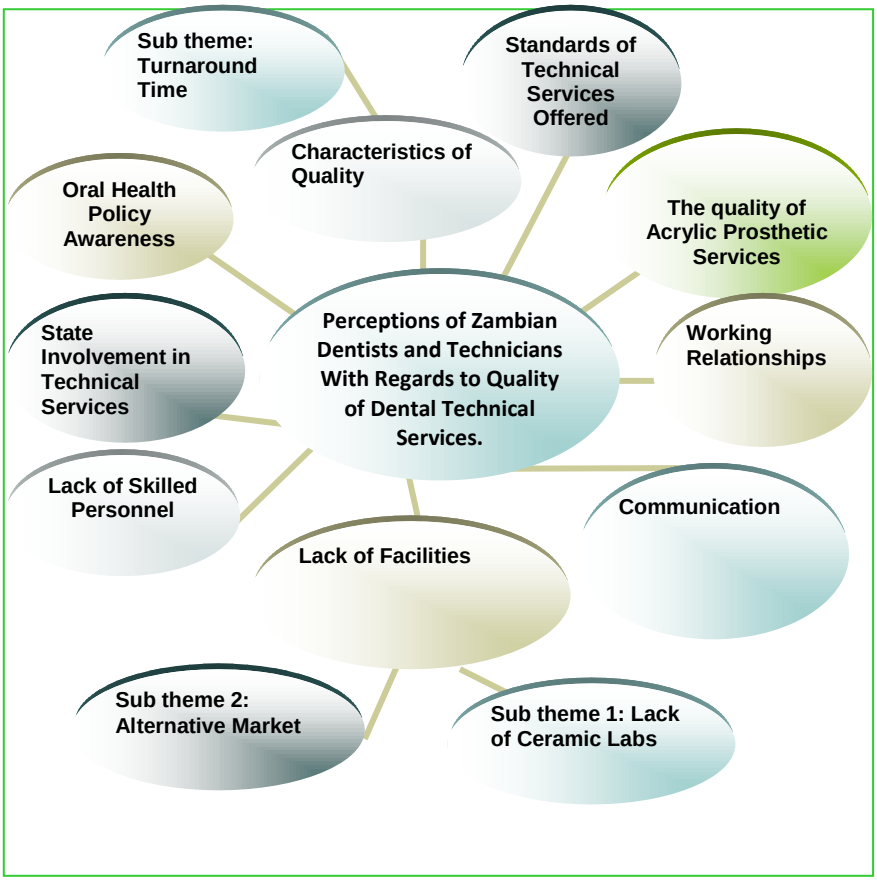

Figure 1. **Themes that emerged from the data collected from dentists and dental technicians**

4.2 Characteristics of quality

4.2.1 Dentists' perceptions

In order to understand the perceptions of the dentists and technicians with regard to quality of the technical services provided in Zambia, there was need to find out their views on what they perceive as characteristics of quality technical services. The data revealed that most dentists held views consistent as those reported by Naert, Van Der Donck and Beckers (2005). They identified the characteristics of quality to be fit,

[26] ZD for Zambian dentist followed by number

[27] ZT for Zambian technician followed by a number

aesthetics, strength of the prosthesis and function as fundamental to quality service.

> *Of course the fit, the most important thing is the fit, you see, either a denture or a crown and bridge, it should fit passively*[28]*, it should fit properly... and also the strength and other things [are important].*
>
> *[ZD 9]*

Another view expressed was that if the prosthesis adapted well to the oral cavity then this would ensure that the patient would be happy and therefore, a quality prosthesis would be assured.

> *It's a good fit, the patient is comfortable* and [if] *the shade is matching as per the impression's requirement*[29]*.* *[ZD 10]*

Dentists also felt that the variety of services obtainable from technicians reflects the quality of the services offered by technicians.

> *To be able to provide you know - dental services actually and I mean more and any type of services, you know.* *[ZD 2]*

In dental practise overall customer satisfaction enhances loyalty to the client (Caruana & Fenech, 2005). Roelen, Koopmans and Groothoff (2008:434) believe that "there is no gold standard" when it comes to evaluating job satisfaction however they define job satisfaction as "the positive emotional reactions and attitudes individuals have towards their job". In this study it was established that dentists also perceived good quality work, as work done perfectly, first time, by the technician.

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[28] An appliance that is passive *in situ* is one that is clinically perfect.
[29] Meaning, as stated on the laboratory prescription as sent by the dentist.

Well basically [when] you don't have to repeat any work which is sent [for placement] by the work group [technicians]. *[ZD 10]*

The discussion now turns to consider the views of the service providers (technicians) as to what they regard as quality dental technical services.

4.2.2 Technicians' perceptions

The technicians expressed similar views to the dentists in how they understood quality. The technicians interviewed in this study pointed out that the patient's as well the dentist's satisfaction are important factors in identifying quality technical service.

Mm, a well-constructed denture, a denture which is accepted by the patient and not only accepted as in the appearance – of course the appearance is one of those things that can make even the patient accept it – but it's something that the patient should be able to use without any problems or with very little problems, if at all they are problems, so if all those criteria or points are met then you call that product to be a quality product, because one, the person who made it would have also taken into consideration that the denture is nicely fitting, two, aesthetically it is pleasing, and the patient is not complaining when using that product.

[ZT 1]

A second technician argued that characteristics of quality dental technical appliances were determined by the ability of the products to conform to universal standards as taught in dental technology education.

So basically the characteristics are first of all those that match what is taught and those that can be moderated by someone else and be accepted or graded as a good appliance.... *[ZT 2]*

Another technician stated that they regarded patient and dentist satisfaction as a measure of good quality besides previously stated characteristics such as fit, aesthetics and function.

> *Is the patient, the client in this case and if the client is happy, then I'm happy that I've done the best I can. Then the dentist, of course, must be satisfied that the technician has made the right [appliance] be it functional in the sense that, first and foremost, it must look good aesthetically, the person must be happy that he looks well; secondly, it must perform the masticatory functions as it were.* *[ZT 8]*

The type of materials used was also viewed as a contributing factor to the quality of dental technical services. It was argued that the quality of materials used to construct appliances was very important as it affected aspects of quality such as, fit, aesthetics and function.

> *First it would be the type of material that would be used to make those appliances, and then the way they will fit and the way the patient will appreciate them. Appearance and comfort are very important.*
>
> *[ZT 6]*

Technicians challenged the dentists' view that with quality services work should be done right the first time. The technicians argued that they would do the job correctly the first time if the dentists sent them quality work and their quality often reflected the quality being sent to them.

> *...They [dentists] expect you to do a very good job where you only have very bad preparation[30]. It doesn't work out like that. It doesn't work out like that. A good – a good crown or a bridge can*

[30] This is a procedure in which tooth material is removed to create biomechanical means by which the teeth can receive and retain fixed restorations for crown and bridge materials. Preparations are sometimes colloquially referred to as *preps*.

only be constructed on a good preparation, and that will give us even a very good fit. Because when you're fitting and the preparation is bad, everything comes out bad.

[ZT 1]

Turnaround time was another aspect of quality dental technical services identified in the data collected. The discussion now looks at the data regarding turnaround time as perceived by the respondents.

4.2.3 Turnaround time

Olmstead et al. (2007:943) say that in community health, turnaround time is defined as "the interval between the previous patient's departure from the operation room and the next patient's arrival in the OR[31]". Therefore, this author concludes that turnaround time in relation to dental technical services may be defined as the period of time between the time a service is requested by the dentists and the time that the completed service is delivered to them.

In service delivery, turnaround time is an important aspect that plays a major role in customer satisfaction. Winkelman (1999) advises that before a dental laboratory is chosen, the turnaround time is one of the most important credentials by which an individual laboratory should be evaluated to ascertain the quality of the services they provide. Olmstead et al. (2007:944) point out that in working as a team, each team member needs to understand their role in order to enhance "team member consistency" that contributes positively towards efficient turnaround time. In Gopalakrishna and Munaleneni's (1993) study it was established that dental patients consider waiting time as one of the most important factors that constitute service satisfaction even more than the dentist's ability to relieve pain. In this study 40 percent (four out of ten) of the dentists felt that service delivery was an important aspect of quality service.

[31] OR stands for operation room.

The main good quality for dental technical services is the efficiency of [producing] the work. *[ZD 7]*

Prompt services are the most important, because many times the patients don't have time to wait. *[ZD 6]*

Another dentist had this to say about turnaround time.

I think a quality dental technical services would have to do with, first of all, a good product that is good denture work, or whether it is bridge work that is delivered to you in good time. *[ZD 3]*

However, some of the dentists felt that the completion times of prosthetic services currently being offered to them were unpredictable. This is so despite the high laboratory charges they paid for the service.

Unpredictable actually. A work that is simple sometimes, a simple crown porcelain it may take you even [many] weeks to get it, despite the fact that we're paying a lot of money for each unit actually.

[ZD 1]

Some of the dentists perceived the insufficient number of technicians as a factor affecting the turnaround time of technical services in Zambia. They felt that the few available technicians in Zambia could not cope with the volumes of prosthetic work being generated. Therefore, they tended to cut corners which ultimately affected the quality of work.

Like I said, the problem which is there is that the ones that can do good work are limited, there are very few, and that creates an overload for them and therefore you also need to like – either you compromise on quality and get the work quickly or you take your

time and explain to your patient that this is going to take three days and not one day.

[ZD 3]

4.2.4 Conclusion of characteristics of quality

It may be concluded that both dentists and technicians were aware of what constitutes quality for dental restorations. Their views were consistent with the conceptual framework views expressed in the literature (Negrutiu, et al. 2009; Koke et al., 2004; Coelho et al. 2004 and Panyayong et al. 2002). However, in addition to fit, aesthetics, strength and function, dentists identified turnaround time as an important feature of quality service.

This study identified a shortage of dental technicians in Zambia. This was negatively affecting service quality as the number of technicians currently present cannot cope with volumes of work being expected of technicians.

A further concern affecting quality raised by dentists was their satisfaction with the prostheses constructed by technicians for placement. They argued that they expected the technician to do their job right the first time. Technicians argued that they would do the job correctly first time if the dentists sent them quality work, and their quality often reflected the quality being sent to them.

Finally, technicians argued that the characteristics of quality are determined by quality of materials used in the construction of prostheses. Unfortunately, obtaining quality materials in Zambia is difficult owing to high import costs and unreliable service delivery. A more complete discussion on materials follows later in this chapter.

4.3 Standards of technical services offered

4.3.1 Dentists' perceptions

The majority of the dentists (see *Figure 2* below) raised concerns that the standard of dental technical services in Zambia was poor. They stated that this was caused by a number of factors such as technician competence and a lack of equipment and materials. Technicians or employers of technicians were in a position to "develop meaningful work environment for increased job satisfaction, great motivation, increased productivity and decreased employee turnover" (Roelen, Koopmans & Groothoff, 2008:437). It is therefore believed that if technicians were happy in their jobs that they would produce better quality work.

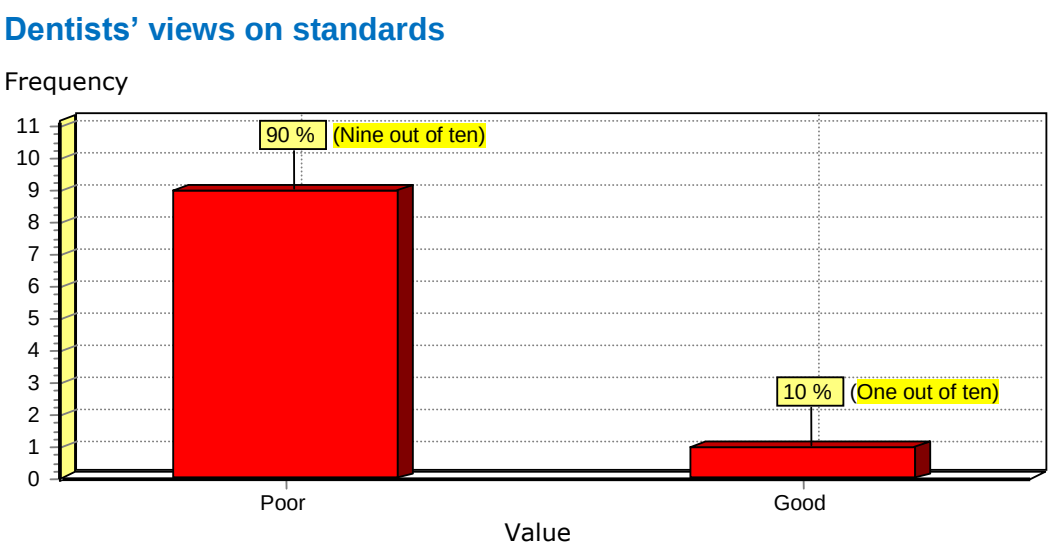

Figure 2 **Illustration of the dentists' views on the standards of technical services offered.**

The dentists' views are recorded below:

> *The quality is so low you know that there is no quality when it comes to dental technicians it's terrible, equipment and materials are very scarce, and quite a number of things.* *[ZD 2]*

> *It's very, very poor actually, that's why most of the dentists they prefer – I mean most of the restoration work like a bridge and*

some other works and metal work we prefer to send to Zimbabwe, because of the poor quality...in terms of the skill of the technologists, in terms of the lack of facilities which is not up to standard actually, below the standard, so that's why we don't have the proper skill. *[ZD 1]*

Generally speaking I'd say they are below par. Below par - what I mean is they're not really the worst that you can find but I think there's a lot of room for improvement, and when you look at the work that is done, it really needs a bit of attention, [laboratories] are either ill-equipped or they are ill-stocked in terms of materials. *[ZD 3]*

Other concerns raised with regard to the quality of technical services were that the type of equipment and materials one uses were a determining factor of the quality:

You also take a lot of things into consideration. One, I'd say what equipment are you having …so that one is very important of course, because for you to be able to achieve a good quality denture, you also need proper equipment, then you also look at the type of materials you are using. *[ZD 4]*

The research revealed that there existed a notion of support that those supplying technical services in Zambia were doing their best given the environment that they operated in. However, this view was tempered by acknowledging that the standard of service needed improvement.

- Yeah, given the environment, the demand on the market, one would say yes, our technicians are trying their best to give us those services that we are demanding ... they need practice I think, the technologists ...– I believe we can do more. *[ZD 8]*

4.3.2 Technicians' perceptions

As service providers, the technicians were expected to be able to evaluate their own products and services. Service providers needed to individually assess themselves in order to enhance "professional development and improved performance" (Huey-Ming, 2004:491). The technicians, honestly, also raised similar concerns to those of the dentists, namely that the services they were supplying were not of required standards. *Figure 3* below diagrammatically illustrates technicians' opinions on the standards of the quality of the services they offered.

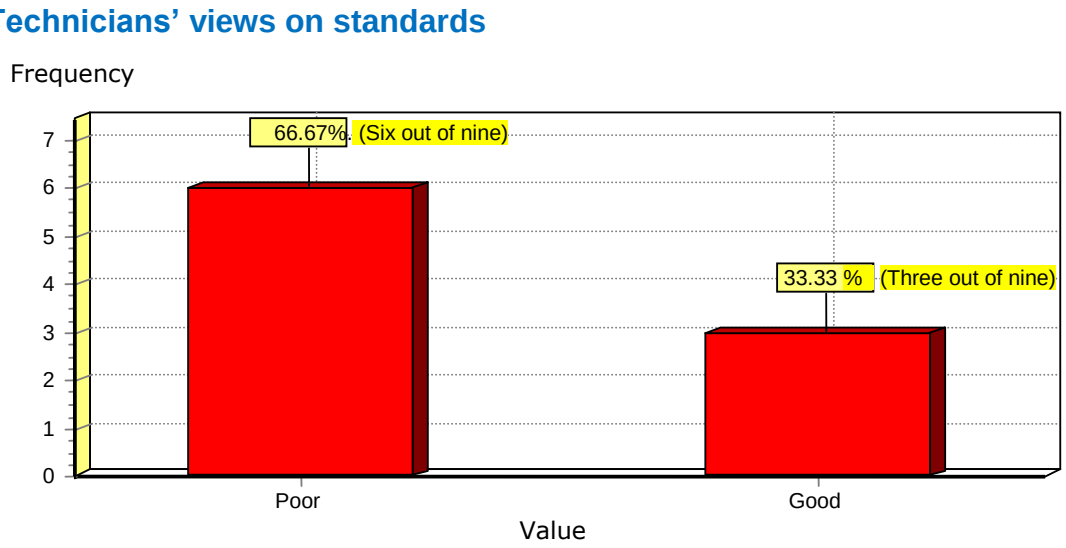

Figure 3 **Illustration of the technicians' views on the standards of technical services offered.**

It was surprising to determine that technicians believed that the standard of their work was poor. Notwithstanding their opinions they offered the following explanation as to why they believed that their standards were low. They believed that standards were affected by a scarcity of materials. The study has revealed that there is only one dental laboratory supplier in Zambia that sells quality materials.

> *Yes, and here we have, there's a monopoly, only one person, only one is a supplier you know …and if the supplier doesn't*

have, then we have nothing. *[ZT 4]*

However, high import costs prevent the supplier from maintaining adequate stocks to meet the demand. Therefore, service providers end up using cheaper poor quality materials. The first question one may ask was whether this concern was cited as an excuse to cover-up inadequacies in service delivery or not. However, a telephone follow up on 15 February, 2010 with respondent *ZT 2*[32] revealed that some materials lacked the ideal properties that are required for attaining quality restorations. *ZT 2* cited common dental materials such as plaster of Paris, alginate and porcelain as mostly affected by the compromise in standard. For example, plaster of Paris that was readily available in Zambia was locally produced but it lacked specific and necessary components to make it suitable for dental purposes. Dental procedures require plaster of Paris to set slowly. However, Zambian plaster of Paris had an extremely fast setting time which can be likened to the "speed of light or driving at a speed of 5000km/h" (*ZT 2, 2010 pers. comm. 14 February*). In addition, set models etched or were partially dissolvable in water[33] like ordinary clay. Thus, models could easily break or, perhaps more importantly, distort the oral tissue details which the appliance must replicate. Hence the appliances would not fit. The local porcelain had insufficient translucence and thus the finished crowns had a chalklike appearance. Consequently, shade matching was almost impossible to achieve. Pink wax was mostly used as an alternative to alginate impression material which affects the fit due to the unstable properties of wax. Special trays were hardly ever produced because special tray materials were rarely stocked by the suppliers (*ZT 2, 2010 pers. comm. 14 February*). The study identified that these problems mainly affected state owned dental laboratories as the private laboratories were able to

[32] ZD and ZT have been used in the running text as the use of he or she prepositions could compromise anonymity of the respondents.
[33] Technical procedures require models to be soaked in water. Hence, if they etch or dissolve, then the appliance produced on the model will be severely compromised.

independently order and purchase materials and equipment from abroad, unlike state owned laboratories that could only purchase equipment and materials through government laid down procedures and from approved suppliers.

Notwithstanding that their views could be seen negatively, technicians stated, honestly, that technical services in Zambia were not of standard. They had the following views to share.

> *The quality of dental technical services in Zambia are not very good.*
>
> *[ZT 4]*

> *As a technician, I think they are not up to the required standards due lack of suitable required materials for the services [ZT 3]*

> *Technical services. Ah, you know the technical services like in our country; the way we work, they are not up to standard. [ZT 7]*

The majority of technical services offered in Zambia were limited to acrylic restorations. This was due to reasons expounded above. Even though technicians specialised in acrylic prostheses, technicians remained concerned with the quality offered.

> *Um, in my opinion still remains much to be desired. Not so much developed as one would like to, considering the years of dental technology, has been you know, in existence in Zambia. [ZT 8]*

Similarly the second technician felt that technical services were under developed in Zambia and therefore could be rated as poor.

> *As of now I can see that it is not up to standard that is including even the work that we do here. It's not up to standard in that, um, if we talk about dentures alone, I think it is up to standard, but*

dental technology or technical services, it's not only the dentures, so that being the case therefore it's not up to standard because there are other things that are left out. *[ZT 1]*

Not all technicians (33.33%) agreed that technical services were poor. However, these opinions reflected a minority opinion.

Mmm, the quality is quite good – very good actually. *[ZT 9]*

Dental technical services in Zambia – the quality is quite good. *[ZT 6]*

They supported their belief by comparing their work with prostheses produced in other countries.

… we have seen a lot of jobs from different parts of the world, this patient will come, you know this was done in this country, but when you look at it, and compared to what you're doing, I think some of them you can see that, we are more advanced than them, and apart from that – even the patients themselves – a patient whose job was done somewhere else comes, you do this job, the patient might come after one month, saying I didn't know that you're doing this in Zambia. You see, I couldn't have paid so much, I could not have done this, so that actually encourages us and you know, we feel very good. *[ZT 9]*

4.3.3 Conclusion of the standard of services

In conclusion the majority of the respondents raised concerns that the standard of dental technical services being offered in Zambia were not up to standard. They argued that this was due to limitations such as scarcity of equipment and materials as well as the inability of service providers to offer fully-fledged services. In addition, they also questioned the standards of dental technology education. This will be reported on later in this chapter. It can be concluded that Zambia is faced with a

critical shortage of basic dental equipment and quality materials which ultimately affects the standards of technical services.

Acrylic work, as identified above, was the most common procedure performed in Zambia. This procedure requires simple equipment as compared to crown and bridge and chrome procedures. Having learnt from the previous section of this discussion that the quality of technical services can also be assessed by the type of services available, it was vital to evaluate the quality of such a procedure, so the discussion turns to the data regarding views on acrylic prosthetic services.

4.4 The quality of acrylic prosthetic services.

4.4.1. Dentists' perceptions

Acrylic is a widely used denture material as "no other material has been found that matches the appearance of oral tissues with such great fidelity as acrylic resin" (Wong et al. 1999:300). Acrylic is used in the manufacture or removal of dentures. In addition, it is a relatively cheap material and is thus widely used for the restoration of missing dentition. Acrylic prostheses are considered the most basic of services offered by dental technicians and are widely offered due to their affordability. Furthermore, only simple inexpensive equipment is required for the construction of dentures which makes it a popular service for technicians to offer.

Views on the quality of acrylic services offered in Zambia were equally divided between those who felt that the quality offered was good and those who offered no comment about the quality of the acrylic services.

Dentists' views on acrylic prosthetic services

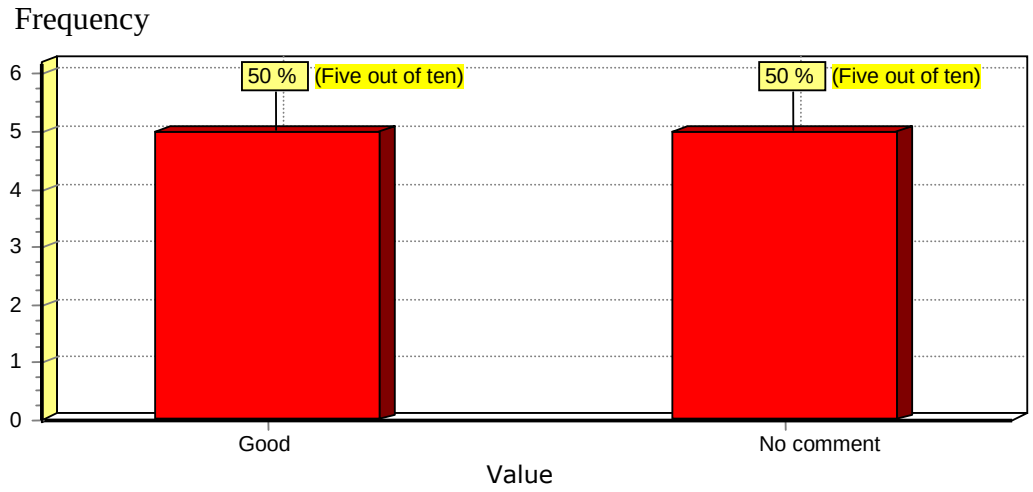

Figure 4 **Illustration of dentists views on quality of acrylic prosthetic services**

Those with positive opinions reported as follows:

> *Denture work actually, okay.* *[ZD 1]*

> *Well, as I said before, you know, simple acrylic jobs its okay.* *[ZD 2]*

> *Ja, at the moment the acrylic work is not bad in a sense, that most of major the hospitals, the state hospitals they offer these services.* *[ZD 9]*

Whilst 50 percent (five out of ten) were happy with standards of acrylic services as explained above, the other 50 percent did not comment on the quality of acrylic prosthetic services. The silence of these dentists could be an indication that they were satisfied with the services or that they were so unhappy that they could not comment. However, the dentists generally felt that the quality of technical services was poor.

Having understood the dentist's position in respect of the standard of acrylic prosthetic services, it is now important to find out how technicians evaluate the quality of this basic service. It is for this reason that the

analysis now turns to the technicians' views on the quality of acrylic prosthetic services.

4.4.2 Technicians' perceptions

Technicians' views on the standard of acrylic prosthetic services are presented in *figure 5* below:

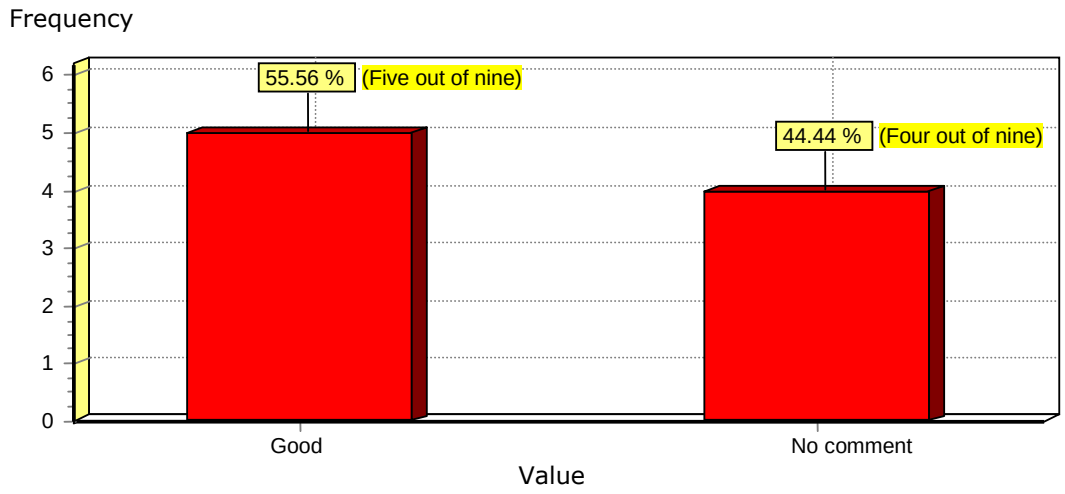

***Figure 5* Illustration of technicians' views on quality of acrylic prosthetic service**

As indicated in *Figure 5* most of the technicians felt that their acrylic prosthetic services were acceptable although it was not a unanimous view as can be seen in *figure 5*.

> *Sometimes I look at pieces of work that come from Zimbabwe, from South Africa and from Botswana, and I look at my own work that I do, in that sense I do really compare myself, but that is basically on the plastics, you know, appliances only and I can say that my work is just as good as the work that I've seen from other countries...* *[ZT 8]*

> *Oh like, ja on quality I don't have any problem - especially I have, I mean proper material to use and everything. Like dentures, we make good dentures.* *[ZT 7]*

One technician categorically pointed out that with acrylic prosthetic services, there is both good and poor quality work being produced. *ZT 1* argued that generally the quality is poor but there are some technicians who are able to provide good quality work. This is what this technician had to say:

> *...even with very little or, ja minimal instruments available, some people are able to do a quality denture, so I can say that there is, although generally there is that poor quality around, but still there is very quality dentures being produced, because for dentures really there is not much problem as per se.*
>
> *[ZT 1]*

It was explained that the general poor quality could be attributed to the type of training being currently offered. This was attributed to the factors such as lecturers tending to cut corners on important procedures which therefore results in the graduating students being poorly taught.

> *… And you can see that some of the stages are no longer being followed. For instance, articulating nowadays when you go to that school, people are no longer doing those, they are not following those small, small procedures which are very, very important in the construction of a denture, so you find at the end of the day you're going to have a poor quality of the end products. [ZT 1]*

4.4.3 Conclusion of acrylic prosthetic services

It can be concluded that both dentists and technicians were divided as to the quality of acrylic prosthetic services being produced. The data has revealed that some technicians felt that since acrylic work is a basic service, one would expect it to be uniformly of good quality. However, they argued that there is a range of poor acrylic prosthetic services being produced, which can be attributed to a number of factors such as compromised lecturing standards in the training school, competence of

the technicians, scarcity of materials and equipment. They have further argued that standard procedures in dental technology are not being taught by the lecturers thereby inculcating bad practises in the students.

4.5 Working relationships

4.5.1 Dentists' views

An efficient working relationship based on mutual respect between dentists and technicians is very important and the benefits cannot be over emphasized as has been established in the review of the literature. The dentists in this study felt that their working relationship with the technicians was not very good as their technicians had 'know it all attitudes' and they did not follow instructions given. Perhaps more significantly, dentists believed that technicians were lacking in professionalism. Professionalism in health care service delivery may be defined as "medical morality" (Masella, 2007:207). Masella (2007:207) believes that professionalism in service delivery entails "integrity, honesty, civic-mindedness, courage, self-sacrifice, ability to communicate clearly, thorough and clear work documentation and commitment to quality".

Because here the attitude of technicians, they know it all, you know.

[ZD 2]

In most cases instructions are not followed. There is a lot of unprofessionalism with some of our technicians in Zambia.

[ZD 4]

Some felt that technicians were overwhelmed with work and that is why they were not able to interact with the dentists and verify instructions.

Maybe sometimes I feel, you know, that he's overworked -Well, maybe that's why he [the technician] cannot come to the dentist himself. *[ZD 1]*

Some dentists however felt that sometimes the technicians were not to blame for poor quality jobs but the blame should rather be attributed to the dentists. For example, some dentists take bad impressions. This, they felt, was unprofessional.

He [the dentist] says he [the technician] hasn't done a good job and then they blame the dentist – [I mean] the technician, which is not right the problem is the dentist he hasn't taken a good impression, it's unprofessional. *[ZD 9]*

However, there are dentists who felt they had good working relationships with their technicians and they, together, solved many work related problems.

[Working relationship are] very good. No problems at all. Once in a while we'll have a disagreement about how, you know, something is supposed to be made or, but It's mutual. We sit down and, for example, there was one time I wanted a reverse twin block he didn't know how to do it. I printed out everything, showed him what I was looking for he had no problems. Uh, there was one time he showed me something new, so it's a very mutual and a very good relationship.

[ZD 6]

Well I have had no problems with the technicians in terms of relationships. Except where you need to like demand that the quality of the work be changed to something better than what they've given you, but generally speaking there hasn't been much of any problems with them. *[ZD 3]*

On the other hand technicians had their opinions with regard to working relationships with their dentists. The discussion now turns to understanding technicians views.

4.5.2 Technicians' views

The review of the literature has shown that technicians experience problems with the quality of the work delivered to them by dentists. They felt that dentists do not listen to their opinion (Gregory, 1995). In this study similar concerns were raised.

> *The problem that I have with these is the preparation of the, the preps[34]. Their preps normally, they are not all up-to-date. Maybe out of these three, only this Dr ...[35], at least he tries to do the correct job. Otherwise the rest mmm mmm, there's a very big problem, and sometimes you may explain but preps do come out like, you know. I think they don't just understand the point. They miss out on the point.* *[ZT 1]*

Some of the technicians raised concerns about dentists not paying them on time for the services rendered. Delaying payment results in poor relationships as technicians cannot function if they do not get paid on time. If the dentist does not pay then the technician delays doing the work until he gets paid which ultimately results in the patient suffering. One of the technicians had this to say in support of this view.

> *Uh, not really, they're delaying me a lot. They don't want to pay for the services. There are very few who are direct payers, others are bad payers, so they delay me, but I also fix them in the sense that sometimes they lie, they would lie that the work that has been sent has not been paid for, but when I keep it without attending to*

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[34] "Tooth Preparation is the process of re-shaping a tooth in order to restore it". Preparations are sometimes colloquially referred to as *preps (Restorative dentistry...crown and bridge preparations, 2010)*.

[35] Name removed for ethical reasons

it and then the patient starts shouting at them, that's when they disclose ah, no this patient has already paid they want to claim back their money, then I know, so in that respect I would do the work and send them and then pin them on the fact that It's already been paid for, therefore they are supposed to pay me, but there are others that we have a relationship such that at the end of the month, I send them the bills. They are very faithful and they pay, but some of them, mmm..... [ZT 2]

On the other hand, some technicians expressed satisfaction with payments from the dentists although they felt they were under paid as compared to what the technicians abroad were being paid.

They pay me well and they pay me on time but I don't think that they pay as much as they do pay the other technicians from outside [abroad].

[ZT 8]

Another concern raised with the working relationship was lack of cooperation between technicians and dentists especially in cases where both the technicians[36] and dentists see patients. The technicians felt that the dentists tended to send the patients to the technician without proper examination so that the technicians were the ones that ended up noticing problems that required clinical attention such as the need for extractions.

The way it has been, it's like if I have seen the need like for extractions, I am the one who refers to the dentist they won't even. [ZT 4]

Some technicians felt that their working relationships with the dentists were not good due to dentists acting in a manner to suggest that their

[36] Unlike South Africa it is not illegal for technicians to see and treat patients in Zambia.

qualifications were superior to those of the technicians. One technician described the dentists as operating as more superior oral health team members to them and they had the following to say.

> *I would say that they [dentists] are not all that okay, because most of time they want to show that they are more superior, you know. Oh just because they give you orders Just because of their papers mainly, so you see, they always want to be above.*
>
> *[ZT 3]*

4.5.3 Conclusion - Working relationships

It can be concluded that the relationships between technicians and dentists were not perfect and that problems existed. The dentists raised concerns that the technicians were lacking in professionalism. Whilst some of the dentists felt that the blame should also be put on the dentist for clinical faults. The technicians, contrarily, complained that lack of cooperation from the dentists and power imbalance issues affected their performance. Another concern raised by the technicians was that some dentists did not settle their laboratory bills in time thereby affecting their operations. However, the study has revealed that although the dentists and technicians have working relationship problems they are able to find common ground in prosthetic production.

4.6 Communication

4.6 1 Dentists' perception

Communication has been identified as one the most important factors that contribute to a good working relationship between the dentists and dental technicians (McArdle, 2002 and Howe, 2004). Communication was found to be consistently problematic in the literature reviewed by several authors (Hatzikyriakos et al., 2006; Afsharzand, Rashedi & Petropoulos, 2006; Farah et al., 1991 and Morgenthal, 1977). Similarly dentists in this study have raised the concern of lack of good communication between themselves and the technicians.

What the expectation the dentist wants from him, or at least there's an active communication actually – there's supposed to be proper communication with the dentist and the technologist, and how we can find out that. The technologist has to be first patient, listen to what the dentist wants, you know, because the dentist he's the one who knows what the patient wants and he wants his client to be happy, so maybe the technologist, if he had proper communication with the dentist, or he has to be quite aware of what, you know, open minded- Good communication is very important. *[ZD 1]*

You do your preparations, you do your preparations of everything, okay, then you send it, when it comes – I won't mention names – but there has been instances that when you prepare something then you send to the technician locally- You know what you want for the success of the restoration okay-They get there, they make their own adjustments again, it's a problem when it gets to you... because it can't fit on the original preparation Communication is very important. *[ZD 5]*

4.6.2 Technicians' perception

Some of the technicians in this study also felt that communication was lacking. As a result they end up working on cases without the dentist's involvement. One technician who was in support of this view had this to say.

Because we're supposed to do things like bites[37], we're supposed to do together, but we don't do that and so I'm just working alone. *[ZT 4]*

[37] Bite taking is a colloquial term referring to that procedure in dentistry which establishes jaw relationships.

On the other hand some technicians felt that they had good communication with their dentists. The first technician explained that they were able to communicate and send back faulty jobs to their dentists without any problems as there was mutual understanding between them.

> *[When] we send back the work...they [dentists] understand, because we explain to them like this impression is not good... there is mutual understanding.* *[ZT 3]*

The second technician agreed with Perry and Orfanidis (2004:126) who state that "when the dentists and technicians work together benefits accrue". The technicians felt that they had a good working relationship with their dentists because they consulted each other.

> *The working relationship is quite good because we work hand-in-hand. They [dentists] bring a case and consult me and I consult them. So we agree on what should be done on that particular case.* *[ZT 6]*

Another technician also felt that the good working relationship they previously had with their dentists had helped them maintain high standards of work as they used to hold constructive meetings. This technician said the dentists would offer constructive criticism on which they improved.

> *And normally what you know – what used to happen see, when we were in ...[38], we used to have meetings where we technologists we used to face the dentists … and then they give you whatever constructive ideas they think or whatever problem they're facing, whatever complaints they have, and then we improve on them.* *[ZT 5]*

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[38] Name withheld for reasons of maintaining anonymity.

4.6.3 Conclusion - Communication

This study established that communication problems existed between dentists and technicians with dentists believing that communication was more compromised than do the technicians. Dentists raised concerns that technicians altered prescriptions without informing them. A minority of the technicians felt that if the dentists involved them in clinical procedures, communicating directly to them, they would not operate without specific instructions that potentially were in conflict with the dentists' wishes. However, the majority of the technicians felt that they had good communication with their dentists as there was mutual understanding between them and this should contribute positively to their standard of work.

During the interviews concerns about lack of equipment and materials were consistently raised. Therefore, the study now turns to data discussion regarding the perceived lack of facilities.

4.7 Lack of facilities

4.7.1 Dentists' perception

Respondents raised serious concerns about lack of basic facilities such as equipment and materials. The dentists felt that the technicians were frustrated by a lack of these facilities. Consequently, procedures took longer than usual to complete. This especially applied to those in government owned institutions who, as a result, were forced to compromise on the quality of work.

> *Uh, no, the care is there, but looking at it, if you look at government institutions, looking at the procedures or even to improve to say if I want this work to be done, it takes longer- then in the end people [technicians] usually become frustrated, so at the end of the day what happens is people [technicians] will just be doing the work for the sake of doing it.*
>
> *[ZD 4]*

The second dentists had this to say in support of the view that equipment problems affected the technicians' output of work.

> *They're hard-working but, like I said, their limitations are based on equipment and material. Sometimes you get the feeling that they don't want to do the work, but it's because they're overwhelmed with what they have. You know many times they're overwhelmed. They may want to get something to you within a week but inevitably ends up longer.*
>
> *[ZD 6]*

The dentists raised concerns about infrastructure. They felt lack of proper infrastructure such as modern well constructed and equipped laboratories was an impediment to the technicians' work. Infrastructure identified in this study refers to equipment, materials, laboratory structures and laboratory systems such as casting and ceramic procedures. *ZD 7* strongly argued that the Government must intervene to supply modern infrastructure.

> *They follow instructions and they're really good technicians. They do follow instructions but due to lack of infrastructure, there could be a failure of work... So it's not the technicians who lack, it's the infrastructure and the training which they don't get [jobs completed] on time. If that was given... they need a lot of support in terms of equipment, materials, along with the training there should be internal support of equipment and materials. And all the new methods of manufacturing [advancements in chrome and ceramic work]...they [the government] need to put up a new system. They [technicians] can, yeah, they can bring out good work if everything was supported [equipment, materials and infrastructure]...* *[ZD 7]*

There was also a general concern that there was lack of skilled people in

the country who could repair equipment. Therefore, there were instances when the technician's machinery broke down and the dentists had to wait for extended periods to get their work done.

> *He's limited by what he has available to him. You know machines, um, the machines, the material, sometimes an equipment will break down. For example, the other time his porcelain oven broke down. He was not able to get it back for almost a month and a half. It had to be sent out for repairs so for a month and a half it was down so you know you're delaying the patients by that much time. Because, you know, they don't have anyone locally available to fix it [equipment], they have to send it abroad. To send it abroad, you need that much money.*
>
> *[ZD 6]*

4.7.2 Technicians' perceptions

The technicians concurred with the opinions of dentists and felt that lack of equipment and scarcity of the right dental materials to use affected their quality of work. As already alluded to earlier in this chapter, the scarcity of dental materials and equipment mostly affected the technicians who worked in state owned dental laboratories. Respondent *ZT 4* pointed out the lack of proper equipment and materials as the data in this study earlier revealed that Zambia had only one reliable supplier of proper dental equipment and materials. Therefore, technicians were forced to buy cheaper products that were manufactured locally, and which were of questionable quality.

> *Lack of proper equipment, two, scarcity of materials – we don't have enough and just the right things to use - the right materials.*
>
> *[ZT 4]*

Another concern expressed with regard to equipment was that much equipment available to them was outdated and broken. Nevertheless, dentists expected technicians to deliver quality work. Technicians

questioned how they could be held accountable for lack of delivery if they did not have the necessary tools for delivery.

> *Very, very basic equipment. Probably, we are, I would say that we're about ten years behind [the rest of the world]. [ZT 8]*

The second technician felt that as in their laboratory, most state owned dental laboratories in the country were poorly equipped.

> *Yes, because of the – because of limitations like as I have mentioned, like the equipment, proper equipment – the equipment is old and most of the laboratories, just like here, it's like poorly equipped laboratory, you know.*
>
> *[ZT 4]*

Another technician emphasized that their casting machine had been out of order since they joined the institution ten years ago.

> *Problem with machinery and this machinery mainly is about, um, for like porcelain crown, you're talking about the casting machine which has been down since I joined this institution, and that you're talking about 10 years ago.*
>
> *[ZT 1]*

Respondent *ZT 4* further emphasized that they improvised for some dental materials such as pumice[39] in order for them to be able to carry out their normal duties and this ultimately affected the end products.

> *Like in the case of polishing we use Ajax[40], brushes for polishing we don't have.Um, material like for separating medium we use Vaseline, so many things, so it's quite hectic. The flasks are finished, we have faults mmm, dentures come out with faults and*

[39] A dental material used for polishing teeth, both natural and artificial.
[40] Ajax is a household scouring power.

then, since we don't have – most of the things we're improvising, the quality like – the quality of the appliances are not very good.

[ZT 4]

The study has revealed that Zambia had only one reliable supplier of genuine dental materials as respondent ZT 4 confirmed below.

Yes, and here we have, there's a monopoly, only one person, only one is a supplier you know …and if the supplier they don't have then we have nothing.

[ZT 4]

The supplier often runs out of materials and it takes them time to import materials into the country. Moreover, the import costs are high. This has lead to other dealers entering the market selling cheap goods of questionable quality.

4.7.3 Lack of ceramic laboratories

4.7.3.1 Dentists' views

A majority of the dentists expressed concern for a lack of dental ceramic laboratories in Zambia. Brosky et al. (2003:913) feel that "professional competence is the health care provider's ability to provide adequate dental care". Respondents to this study expressed dissatisfaction with the number of ceramic laboratories available in Zambia.

Okay there are one or two people [technicians] who do here, for fixed porcelain, metal, all metal work... *[ZD 1]*

... There are actually very few [ceramic labs] that are available,

[ZD 3]

One dentist confirmed that only one ceramist is based in the Copperbelt.[41] This dentist had this to say.

> *There are hardly any services [ceramic labs]. There is only one technician who is based in Luanshya[42] working for the mines there. For the copperbelt I know only him.* *[ZD 10]*

4.7.3.2 Technicians' Views

Ceramic work is a vital aspect of dental services therefore its unavailability deprives the community of a vital service. Some of the technicians interviewed confirmed the concern raised by dentists that there are very few ceramic laboratories in Zambia.

> *crown and bridge, yes, except that there are very few people doing it, if not one or two people in the country* *[Z*T 2]

This technician further explained that he could provide ceramic prostheses if he had the right equipment for the construction of ceramic prostheses.

> *[The lack of appropriate equipment] incapacitates you that you cannot do the metal part which is part of the porcelain work, so as a result you cannot do the porcelain work...* *[ZT 1]*

Given the status of dental ceramic services in Zambia it is not surprising that many dentists are seeking specialist services outside of the country. Thus the discussion now turns to the effect of alternative market of dental prostheses on service delivery.

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[41] Kitwe and Ndola are found in the Copperbelt province of Zambia.
[42] Luanshya is a town in the copperbelt province of Zambia.

4.7.4 Alternative market

Some of the dentists who expressed the concern that they are forced to send their work especially crown and bridge work abroad[43] had the following to say:

> *So we send all our work abroad to Zimbabwe, [to] .....[44] and we have no complaints about their work. The quality is very good actually.*
>
> *[ZD 9]*

> *I do everything, I send the impressions to Harare, you know.*
>
> *[ZD 2]*

> *Otherwise, we send our materials to India. Currently, we're using a lab in India, um and otherwise we send Zimbabwe. So that's the two places we use*.
>
> [ZD 6]

Volumes being outsourced were large. Given that outsourced work was paid for in foreign exchange the outsourcing was an economic drain on Zambia.

> *...in week time I have almost 201 (sic) patients, uh, porcelain fixed,*
> *porcelain...* *[ZD 1]*

The use of the alternative market by the dentists had another general economic concern that because shipment costs were high the patients were being overcharged for the services rendered. High cost of services in dentistry can cause patients to review whether they can live without the prosthesis. This is so as dentistry is said to be a "discretionary service" and patients become selective in choosing only the services that

[43] Zimbabwe, South Africa and India were countries identified.
[44] Name withheld

are absolutely necessary (Brennan & Spencer, 2006:75). The views of the dentists interviewed were consistent with Brennan and Spencer's (2006) view on the cost of services. These dentists had this to say.

> *....but sometimes we don't have a choice because we send the work to South Africa or Zimbabwe or some other place, there's a lot of fees or charges being involved and it would be difficult for the patient to cover it, so sometimes we just even carry out the poor quality [of delivery in Zambia] just to cover up the expenses.*
>
> *[ZD 1]*

> *Everything, everything. I mean, you know, and then we're charging the patient for the courier service and everything else, which raises the cost of medicine. If it's locally made, you can always deduct all of those charges of courier services and everything.* *[ZD 6]*

One technician challenged this view as they felt that the dentists who sent their work abroad did so as a means of exploiting the patients with the pretext that they had to recover courier charges. They felt that if the dentists were genuinely concerned about the status of technical services in Zambia one would expect them to invest in the profession so that they cut down on production costs.

> *Ja, so in short I would say why [they send work abroad] – they want to make money out of the poor patients and – but with me, what I tell them is that the areas where you are sending this work, have invested – it's the dentists that have invested in that field, so that they [technicians] can deliver the services within the door-step so basically I would say that's the more reason why they wanted that work.* *[ZT 2]*

Another concern raised in connection with outsourcing was that the turnaround time was affected by courier services as the work took up to

two weeks in transit.

> *The lab in India gives us a one week turnover, within one week, whether it's a one unit crown or it's a six unit bridge, they will give it to us back in a one week turnaround. Five working days, that's what they take, but we end up having to call a patient after 28 days, because we spend close to two weeks in courier services, so you know if it was local – and even if it's going to Zimbabwe, the same thing. If we send it to Zimbabwe we end up spending two weeks just in courier.* *[ZD 6]*

4.7.5 Conclusion - Lack of facilities

It can be concluded that there was a general lack of both equipment and materials that ultimately affected the quality of technical services. Generally both dentists and technicians shared this perception. There was a serious shortage of dental ceramic laboratories in Zambia hence the dentists were not adequately served. The shortage of ceramic dental laboratories has resulted in majority of the dentists being forced to utilize alternative markets. This had an ultimate economic effect on the patients as they ended up being overcharged due to high shipment fees incurred by the dentists. The study also identified a degree of mistrust existing between technicians and dentists. Some technicians felt that dentists outsourced as a deliberate move to exploit the patients. Turnaround times are affected by courier services as outsourced work takes up to two weeks in transit. Some state employed technicians who were trained to offer ceramic services were hampered in supplying services because of broken down equipment not being replaced by the state.

In addition, it has been argued that Zambia had a critical shortage of quality dental materials. This has resulted in the rise of dealers who manufacture and sell materials of questionable quality. Moreover, technicians were being forced to buy these materials of questionable quality as the only genuine supplier could not meet the needs of the dental industry.

4.8 Lack of skilled personnel

4.8.1 Dentists' perceptions

Some of the dentists interviewed clearly indicated that they felt that there was lack of skilled technicians in the industry. There was only one dental technology training school in Zambia, the Zambian Dental Training School. This institution only trained a total of five to eight students every three years (Mtolo, 2009 pers. comm. 5th February). Therefore, a shortage of technicians results.

> *I mean the skilled people are not enough even to employ them or whatever.*
>
> *[ZD 1]*

> *We don't have enough dental technicians.* *[ZD 6]*

The dentists expressed a general concern that even those few technicians that were trained were not sufficiently trained and, therefore, they were unable to execute their duties competently. These dentists felt that in addition to not being sufficiently trained they lacked sufficient exposure to the critical practical aspect of dental technical services.

> *I think the problem that they have is, um, I think training. I think training and exposure* *[ZD 5]*

> *I feel they need to be trained in the right – in – I mean they need training.*
>
> *[ZD 7]*

Dentists also felt that some courses, for example ceramics, were only taught theoretically. Thus competence, in these courses could be questioned.

Also offer more courses. I'm not sure if, over here in the dental school, they teach porcelain baking and everything. Nothing. You see learning it just in theory is fine, but you have to have practical experience on it. I know when I was in dental school, we had to have – we made our own dentures, so there should be that practical knowledge. Theoretical knowledge is fine but practical is more important. *[ZD 6]*

Dentists questioned the quality of training being delivered in the ZDS. The dentists interviewed expressed concern that the lecturers were using outdated methods from as far back as twenty years ago.

So say if you take a technician who was trained maybe let say, 10 or 15 years ago, I feel maybe they were more exposed and even the teaching was much in what, detail, as compared to what, the product is coming out of late because why am I saying this – its because you discover that people who are teaching, mm, they are still using the same notes of twenty years ago. They are not upgrading their notes.

[ZD 4]

It was forcefully argued that there was a lack of skilled lecturing staff in the training school.

So maybe it comes within structure, which comes within staffing or maybe in terms of teaching and training, there's nobody [skilled staff] there [at the training school].... *[ZD 1]*

A minority of dentists felt that the training of Zambian technicians was hampered due to the lack of proper materials and equipment being available to the training school as was noted with the commercial sector. They believe that the training school had the skill and knowledge to efficiently train technicians but they were being forced to purchase

materials of questionable quality and therefore practical work was affected.

> *Well in terms of practice, they are limited but in terms of skill and knowledge I think they have acquired enough to do even more than what they are doing today.* *[ZD 8]*

The analysis now turns to the technicians' views with regards lack of skilled personnel.

4.8.2 Technicians' perceptions

The technicians agreed with the views of dentists. They believed that the training of technicians in the country was poor. They felt that the training available only caters for basic courses such as removable prostheses.

> *.....because I know that the dental technologist in Zambia is only trained to do the prosthetic type of dental technology, and that is all, and that prosthetics involves only making removable dentures, that does not include the chrome cobalt aspect, the metal dentures that are supposed to be made.* *[ZT 8]*

Respondent *ZT 2* emphasized that the Zambian technicians' quality of service delivery was limited due to lack of sufficient knowledge and skill.

> *Limitations in the sense that there is limited knowledge and skill, especially skill.* *[ZT 2]*

The technicians also agree with the dentists' view that there were teaching concerns at the ZDS. They felt that there was a lot of compromise in the way the training was offered. The practical aspect of

the training was especially compromised as procedures such as articulation[45] and special trays[46] were omitted due to lack of materials. This makes one question how dental technical practical lessons could be conducted without practical demonstrations and practice on a basic critical stage of denture construction such as articulation. *ZT 1* confirmed that there was compromise in the way the training was conducted and had the following to say:

> *Education now is very compromised, because if you go to school right now, you find that most steps, or stages of learning, they're not being followed. There is too much short cuts that are being done. … And you can see that some of the stages are no longer being followed. For instance, articulating nowadays when you go to that school, people are no longer doing those, they are not following those small, small procedures [such as articulation and special trays] which are very, very important in the construction of a denture.*
>
> *[ZT 1]*

The technicians in state owned laboratories have the desire to go back to school to improve on their skills and knowledge. However, government did not offer them support. Thus they are left feeling frustrated. As shown in the data the technical training was lacking in terms of the practical aspect therefore some technicians had the aspiration to go back to school and better themselves. One technician had the following to say.

> *Like I've worked for ten years now I desire to go to school, but I've never had an opportunity to go to school, so it's really frustrating you know.*
>
> *[ZT 4]*

---

[45] Articulation is the procedure that involves mounting of upper and lower models to maintain the bite of the patient by simulating the condyles.
[46] Special tray is a custom made dental impression tray to enhance accuracy of the impression.

The second technician also emphasized that if state employed technicians were provided with further training they could produce quality dental technical services.

> *... I would talk of training [further education]...that we need to be provided with so that we can produce quality work.* *[ZT 7]*

Another technician from the private sector recommended that there was need for more state employed technicians to undergo further training in order to improve the standard of service delivery in the country. This technician had the following to say:

> *…So basically more technologists need to be exposed to training, then they will understand because one person alone who is highly trained and starts preaching to them, they will think that you are boasting but not until they face training, then they will understand and say okay, this is what that fellow was talking about. Training is important.* *[ZT 2]*

4.8.3 Conclusion - Lack of skilled personnel

In conclusion, both dentist and technicians felt that there was a general lack of skills and sufficient knowledge for the technicians to operate competently. Technician training in Zambia is outdated. The training being offered has not progressed with development in dentistry. The training was mainly theoretical. However, Dental Technology is a practical profession. In addition, the theoretical content of the training offered was outdated. Hence, the technicians graduating lacked the skills and knowledge in order to make technicians skilled practitioners. Furthermore the training was compromised due to the short supply of vital dental materials. The result was that very few skilled technicians were graduating from the training institution as the training school's intake of students happened only every three years with a very small intake. Therefore, a critical shortfall was naturally created.

The data analysis now turns to views of the dentists on state involvement in technical services.

4.9 State involvement in dental technical services

4.9.1 Dentists' views

Dentists unanimously expressed concern that little attention by Government policymakers was being afforded to dental technical services whilst attention was paid rather than to clinical dental services that was concerned with communicable diseases.

> *Maybe technical services are more or less not their priority. As such they tend to emphasise on other aspects of health services delivery where usually there's a life threatening concept in the health sector starting at the moment, so we are ready to spend more on malaria or treating of malaria, prevention of malaria, than or correcting deformity in the mouth.* *[ZD 8]*

Other dentists felt that government did not do enough for oral health care in general. Otherwise there would have been a support system in place to enhance technical services.

> *The government doesn't give much care about oral health as such.* *[ZD 6]*

It was also important to find out the technicians views with regard to governing of technical services thus this analysis turns to the data regarding technicians' views on the state involvement in dental technical services.

4.9.2 Technicians' views

A majority of the technicians interviewed also felt that government paid more attention to clinical oral health services compared to technical services. Some of the technicians felt that dental technology lagged

behind in Zambia due to the fact that most managerial positions that concern OHP are occupied by dentists. Therefore, there was rather more support granted to clinical services than to technical service delivery.

> *Yes, and somehow I feel the dentist we had, it's like she didn't really didn't see my importance, you know, because even in the examination, in the buying of materials, you find preference you know is given – priority is given to the clinic and not to the lab. Very frustrating. Maybe it's because people don't die from lack of teeth.* *[ZT 4]*

Other technicians felt that historically the dental technical course was more advanced compared to clinical dental therapy training, however the latter had been up graded whilst the former continued to lag behind.

> *Historically, when I started training at the UTH[47]; dental technology was the only diploma course in dentistry. At that time we were getting medical Government Diplomas and City and Guilds of London...We could have gone as far as a degree [by now]. Now...dental therapist where it was a certificate course and the minimum was form 3. Dental technology has always been form 5, form 5 O-levels ... but when you look at this now, what has been improved is the therapists. On equal terms they have upgraded their training from 2 years to 3 years and then the Diploma University of Zambia, but when you look at the technical services, it has always remained the same.* *[ZT 2]*

One technician raised concern that most dental technicians have resorted to changing their career due to lack of support from government.

[47] Stands for University Teaching Hospital of Zambia and it used to offer dental technical training.

Because what's happening now is like people are changing now from the dental technology into other line of business because they see that there is no future in the technical, now, especially dentists – I mean dental technology.

[ZT 4]

The technicians also raised a concern that administrative appointments to oral health public office positions such as Chief Dental Officer, were only made to dentists. The technicians felt that appointing technicians to such positions would help in alleviating some of these problems faced in service delivery.

...Because normally that position [chief dental officer] is taken by a dentist – and these dentists they are like more – more inclined to dental surgery than dental technology. I would rather that probably a similar position is created specifically for dental technology so that he or she spearheads on most of these dental technology services, you know what I mean, so that we have very, a very good representation to specifically enhance this, because this part of dental technology – dental services, has really lagged behind.

[ZT 1]

4.9.3 Conclusion - State involvement in dental technical services

Even though people do not die from the lack of teeth, Brennan, Spencer and Roberts-Thomson (2008) believe that the patient's masticatory ability has an influence on the "quality of their general health" (2008:228). In this study conducted in Zambia both dentists and technicians collectively felt that government did not do enough for oral health care and gave more support to the clinical aspect rather than the technical aspect of dentistry in Zambia. It can be concluded that dental technology training had, over the years, declined. However, clinical dental education had advanced. The study has identified that

appointments to oral health administrative positions are not fairly made between dentists and technicians as the technicians complained that appointments are only made to dentists.

4.10 Oral health policy awareness

4.10.1 Dentists' perceptions

The data analysis given in this section will help answer what are the perceptions of dentists and dental technicians of the national objectives of the Ministry of Health in respect of dental technical services. The dentists interviewed unanimously expressed ignorance of the OHP and its objectives. Ninety percent (nine out of ten) of dentists interviewed were not aware as to whether an OHP existed or not. See *figure 6* below.

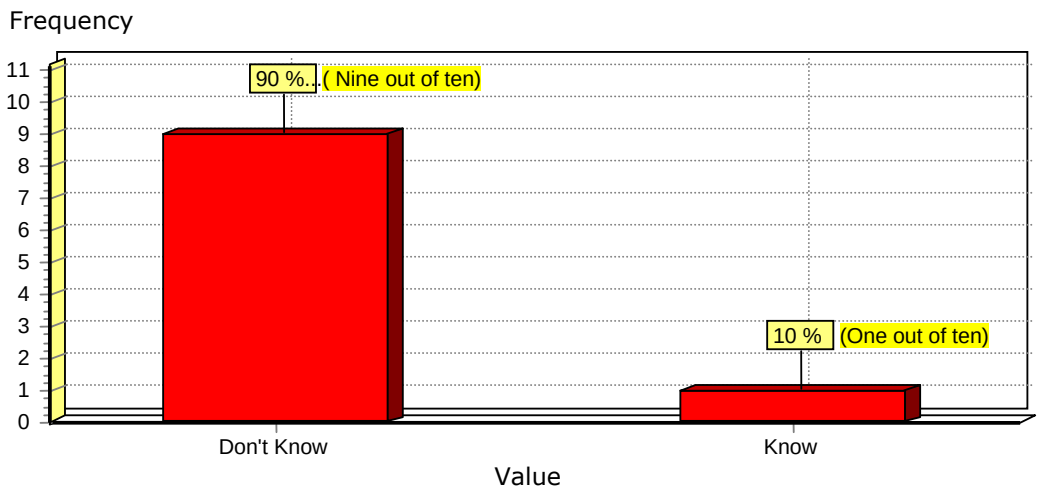

Figure 6 Analysis of the dentists' views on the OHP

ZD 7 had the following to say:

> *I don't know what- oral polices or health policies with regard to the dental technical services.* *[ZD 7]*

One dentist however seemed to be aware of the OHP as he was able to confirm that there is a draft policy submitted to the MoH. This dentist happened to have sat on the committee that drafted the policy that was currently being approved by parliament. However, the dentist indicated that at present technical services in Zambia were being governed without a specific policy.

> *And the – that policy, when it was drafted, has been submitted to the Minister of Health. As to whether it has been forwarded to the other relevant authorities, I am not aware, so we are still working in an environment where there is no specific policy as to how we should be able to deliver technical services.* *[ZD 8]*

4.10.2 Technicians' perceptions

The technicians also unanimously expressed ignorance of the OHP. More than 70 percent (seven out of nine) of the interviewed technicians said they were not aware as to whether an OHP existed. Refer to *figure7* below.

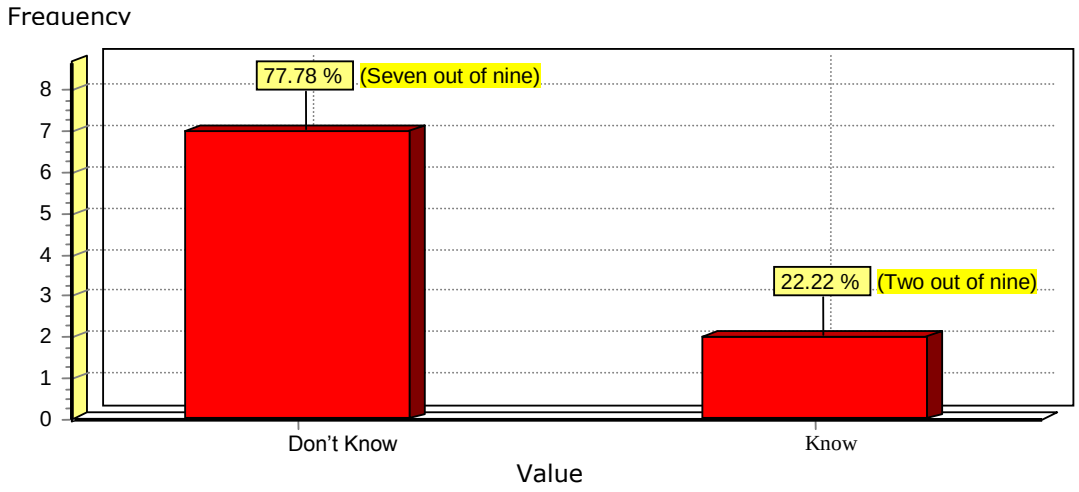

Figure 7 Analysis of the technicians' views on OHP.

The number of technicians who were aware of the draft policy was

higher than that for the dentists because in this study more of the technicians who happened to have been part of the draft policy committee[48] were randomly selected for interviews. The technicians who were unaware of the policy had the following to say.

> *To tell you the truth I have never read those policies, and I would like to read if there is any policy.* *[ZT 7]*

One of the technicians who seemed to be aware of the OHP felt that the lack in service delivery in state owned laboratories could be attributed to lack of a direct policy for dental technical services.

> *There is no – what I know is this – the policy that was formulated and developed on oral health services, and I was party to that formulation, I participated right from the start up to the end – there's no specific policy that targets dental technology, its just an inclusive – um, dental technology is included as, as a small section per sé, much of it is in the clinical services,...So there is no direct policy on dental technology.*
>
> *[ZT 2]*

4.10.3 Conclusion - Oral health policy awareness

It can be concluded that the majority of the dentists and technicians were not aware of the OHP and its objectives with regard to technical services in Zambia. This could be attributed to government's lack of serious commitment to the development of oral health service in the country. And some respondents felt that oral health was not a priority as attention by government was rather given to life threatening diseases. The lack of a direct policy governing dental technical services could also be the causative factor for dealers who manufacture and sell dental materials of questionable quality. As established in chapter two of this dissertation

[48] Zambia has a limited number of technicians (12 technicians were identified as potential respondents for this study) therefore when random selecting amongst those respondents who sat on the adhoc draft committee the technicians happened to be more than the dentists.

Zambia has never had a policy implemented on oral health however a draft policy does exist which is undergoing approval by parliament.

Therefore, it can be concluded that, currently there are no policy control measures in place with regards to regulating the oral health industry including the manufacturing and supply of the materials.

4.11 Conclusion

This chapter has looked at the views of both the dentists and technicians with regard to the quality of technical services in Zambia. Similarities and differences in the data collected were considered which resulted in nine main themes. The data was analysed in consideration of findings from similar studies. The analysis has demonstrated matters of vital importance to help the reader have more understanding of the study. References to the existing literature and the respondents' views were made where applicable.

Vital information has emerged from the study that is useful for the `development of service delivery as it will be discussed in the next chapter.

Chapter Five: Conclusions and Recommendations

5.1 Introductory Remarks

This study looked at perceptions of the Zambian dentists and technicians with regard to dental technical services. The study investigated the participants' perception of the quality of dental technical services and governing of the services. The national objectives with regard to current Zambian OHP were reviewed. Individual semi structured interviews were conducted to collect relevant data. Nineteen dentists and technicians in three main cities of Zambia were interviewed.

The aim of this study was to investigate the views of the Zambian dentists and technicians in respect of the quality of technical services practised in Zambia. The study examined the accessibility and adequacy of the services provided as well as studying the structures governing dental technical services.

In order to understand what constituted good practice, business and working relationships between dentists and technicians in studies done in the United States of America and Greece were reviewed. No evidence of studies on the said subject matter undertaken in Africa was established. Understanding of what constitutes quality dental technical services was established through the discussion on the notion of quality as it related to service delivery. In order to have an overview of how dental technical services were governed in Zambia, the Zambian Ministry of Health draft OHP of 2006 was reviewed. This draft policy was reviewed as, prior to the draft policy, no OHP in respect of oral health existed.

The data obtained in the study revealed numerous areas of concern in the manner in which the technical services are practiced in Zambia. Therefore, this chapter ends with recommendations which, if acted upon,

will contribute towards the improvement of service delivery of dental technical services in Zambia.

5.2 Concluding remarks on findings

From this study it may be concluded that both dentists and technicians were aware of what is acceptable quality for dental restorations when compared with the industry norms as identified in the conceptual framework of this study. This was discussed in chapter two of this dissertation. The dentists in this study identified fit, aesthetics, strength, function and turnaround time as important features of quality dental technical service. The study concludes that the respondents know what is required of them in terms of quality dental technical service delivery and thus one expects quality services in Zambia. The study revealed a further concern, raised by the dentists, that communication channels between themselves and their technicians could be improved and that if they were, this would result in prostheses being manufactured correctly at the first attempt. Technicians challenged this notion as they felt that their ability to do the job correctly first time was directly dependant on the quality of work that dentists supplied them with. Thus, it is concluded that communication between the dentist and technicians is in need of improvement. The study revealed that differences of opinion exist on the quality of communication between dentists and technicians, technicians believing that their quality of service would improve if dentists took greater care in communicating their needs to them. If better communication was achieved the two parties would be able to accommodate each other and work unison in order to enhance quality service delivery.

A critical shortage of dental technicians in Zambia was identified in this study. McGarry and Jacobson (2004) believe that lack of enough qualified dental technicians critically affects the quality and accessibility of dental technical services. This study has established that the shortage negatively affects the quality of technical services because the number

of technicians currently practising cannot cope with the volume of work being generated. This conclusion is consistent with McGarry and Jacobson's (2004:220) finding that a "reduction of quality skilled and knowledgeable dental technicians jeopardizes" dental technical service delivery. Therefore, it is concluded that the low number of qualified and skilled technicians in Zambia is affecting the quality of service delivery.

The study has revealed that Zambian dentists and technicians who were interviewed unanimously felt that the quality of dental technical services in the state health system was poor due the low priority afforded to the oral health sector. A state employed technician working in the health sector confirmed in the following statement that the services were perceived to be better in privately owned laboratories.

The private [sector] is slightly better. *[ZT[49]]*

Respondents raised serious concerns about critical shortages of basic dental equipment and materials as factors affecting service delivery. The concern about poor quality restorations is critical as they have long term effects on patients such frictional keratosis as identified by Durndar and IIhan Kal (2007) in chapter two of this dissertation. Therefore, it can be concluded that the Zambian dental patients who are supplied with poor appliances may be at risk of contracting such conditions. Hence, it is concluded that remedial measures must be put in place to combat such practices.

Respondents felt that, in addition, the country had insufficient suppliers of dental equipment and materials. This sentiment was emphasized by this study revealing that there was only one dental laboratory supplier in the country.

[49] Identification withheld in the interests of anonymity.

State owned laboratories were found to be worst affected by the lack of adequate materials and equipment compared to privately owned laboratories. This conclusion was reached as state owned laboratories may only buy dental equipment and materials from suppliers who are approved and registered by government through its tender procedures. This study concludes that if the supply of consumables was improved and the infrastructure upgraded with attention paid to aging and broken equipment in state owned laboratories the quality of service delivery would be improved.

The concern about lack of equipment and materials is serious as it affects the quality of services as this study has established that technicians in state owned laboratories sit idle when they run out of dental materials.

> *I just sit.* *[ZT 3]*

However, technicians reported that they got paid their salaries in full at the end of the month because they were not to blame for the shortages. During the interview process *ZT 3* was asked if he was paid normally, despite the fact that he sat idle for most of his time. He replied "*Exactly*". The concern about lack of equipment and materials is crucial as it creates a gap in service delivery because the limited number of technicians available, as revealed by the data in this study, are unable to operate to the fullest extent of their potential. Therefore, this study concludes that if the Zambian government intervenes and improves the availability of equipment and materials, the quality of service delivery will subsequently be improved.

A concern raised during this study was that the country lacks trained professionals who are capable of repairing dental equipment. As a result all repair work had to be outsourced outside of Zambia. This ultimately affected the operating costs of dental laboratories. State owned dental laboratories were affected differently, they were subject to state

procurement regulations. The effect of these cumbersome regulations was that repairs on broken equipment happened slowly, if at all. This study revealed that some vital equipment had been broken for up to ten years. One would assume that such equipment would be considered nonexistent as one could not see it ever being repaired. The study revealed that most of the state owned dental laboratories were under equipped with obsolete equipment. This could be related to lack of clear policies governing the services. Thus it is concluded that the government of Zambia needs to address initiatives to get broken equipment repaired.
The respondents expressed de facto concerns about dental technical services being limited only to acrylic prosthetic services. As discussed in chapter four generally in dentistry acrylic prostheses is a basic service that is inexpensive. Only 50 (five out of ten) percent of the dentists and 55 (five out of nine) percent of technicians felt acrylic prosthetic services were of good quality. Therefore, it can be concluded that in this study even with such a basic service as prosthetic restorations the quality of service requires improvement. Some respondents remained mute about the quality of acrylic services, without venturing an opinion. By remaining silent it can be concluded that they indeed did not hold acrylic prosthetic services in high esteem.

This study has identified that there were not enough skilled technicians, particularly dental ceramic service providers in Zambia. The respondents unanimously expressed concern that there were only two dental ceramists in the country. McGarry and Jacobson (2004:220) believe that lack of “educationally trained dental technicians creates a clinical and economic burden on both dentists and patients”. The study has established that the lack of ceramic services in Zambia forced many dentists to outsource outside the country, for example, Zimbabwe, South Africa and India. Thus this study concludes that this was an economic drain for Zambia as revenue was lost in foreign exchange. Although the dentists expressed dissatisfaction with the local services, the high volume of work forced them to send work to local laboratories in the quest of cutting down on the running costs. Brennan and Spencer

(2006:77) believe that in order to avoid high costs of services, patients opt to go for cheaper procedures such as tooth extraction contrary to the "practitioner's wishes to restore and maintain the patient's teeth". Respondent *ZD 1* clearly supported this view as follows:

> *...But still I do send to him [local technician] because he's the only one, at least compared to sending to South Africa, I mean to other places the charges are quite high, because they charge in dollars, plus I have to pay DHL and other courier services. That makes it quite difficult on my part and even the patient's part to pay all these expenses, so we don't* [outsource in an attempt to reduce costs] *[ZD 1]*

The cost of dental services has also been named in the literature as one of the "determinants of patient satisfaction" as dental patients tend to "become cost conscious" with time (Gopalakrishina & Munnaleneni, 1993:17). The dentists in this study argued that the patients paid more for outsourced services due to shipment costs involved. This sentiment was challenged by technicians who believed that the dentists perhaps sent their work abroad as a deliberate means to increase their revenue as the patients paid exorbitant prices for outsourced work. Respondent *ZT 2* challenged this sentiment as follows:

> *Ja, so in short I would say why [they send work abroad] – they want to make money out of the poor patients [ZT 2]*

Outsourcing dental technical services also has negative implications, such as poor quality of services delivery. Outsourcing limits personal communication between dentists and dental technicians. Efficient service delivery is seen to be a consequence of dentists and technicians "discussing patients' needs and the design of restorations" (McGarry & Jacobson, 2004:223).

This study therefore concludes that Zambian dental patients:

- have a limited choice in terms of treatment plans due to high costs of services.
- are subjected to a service that is potentially overcharging
- do not receive adequate ceramic services due to the dearth of ceramic technicians in the country and the prohibitive cost of ceramic prostheses caused by the necessity of outsourcing this service outside Zambia, and are thus receiving prostheses of compromised quality especially when alternative treatments are sourced to cut patient costs.

The study revealed that working relationship problems exist between the dentists and their dental technicians in Zambia. The dentists felt that the technicians were lacking in professionalism. In dental care delivery professionalism is an important factor that should be developed right from the time when dental personnel are undergoing training (Masella, 2007). The perceived lack of professionalism among the Zambian technicians could be attributed to the lack of a direct policy to govern the training of technicians, and technical services delivery. Some of the dentists felt that to ensure professional service was received the blame should also be attributed to their colleagues who expected quality work but delivered poor clinical prosthetic preparatory work to their technicians, expecting the technician to produce quality work on a poor foundation.

Technicians, however, held opposing opinions. They felt that dentists were unprofessional as they had an attitude of superiority as they believed that they were better qualified than the technicians. The study established that this notion affected the technicians' performance as it created a power imbalance. This concern confirms Shaffer's (2008) view that the oral health team should be a place where all members are equally valued in order for successful service delivery to be attained. The technicians also raised strong views that their operations are were

affected by those dentists who did not settle their laboratory bills regularly.

Another factor affecting poor working relations was the fact that the two parties do not communicate well with each other. The dentists believed that they were more affected than the technicians as they felt that technicians altered prescriptions without informing them which ultimately affected the fit of the restorations. On the other hand the technicians felt that if the dentists did not involve them in clinical procedures with direct communication to them, they were forced to arrive at decisions that could contradict the dentists' wishes. This view is in agreement with Browne (2005) and Bellows (2006) who both emphasize that technicians deserve to be consulted during dental clinical procedures, amongst other clinical benefits, to enhance team spirit. In this study it was identified that the dentist's failure to involve technicians in decision making had negative effects and leaves technicians feeling frustrated.

> *One thing I've seen – I've found it difficult because the dentist is the one who's supposed to do the mouth preparation and send the patients to the lab, but I see a lot of, you know, irregularities. I'm the one who does, you know [see the patient first], and point out the tooth to be removed; this root should come out, things like that. Because we're not doing things together. Very frustrating.*
>
> *[ZT 4]*

However, besides the working relationship concerns noted above the study established that, nevertheless, there existed reasonable working relations between the dentists and their technicians which is a positive contributing factor to the standard of work being produced in Zambia under difficult circumstances.

The study established that the training of dental technicians was one of the major contributing factors to the poor quality of technical services in Zambia. The respondents unanimously expressed concern that

education in the dental training school was lagging behind world standards. Cox et al. (2008:33) feel that self assessment in tertiary education is a critical process that enables “grading and supplying valuable feedback to a student”. It has, therefore, been concluded that the current training curriculum requires revision. Clark, Radford and Fenlon (2004:574) believe that in dental curriculum transition processes “the one proviso is that the teachers must be behind whatever is taught”. A curriculum should “not only be about outlining” the scope of a programme but also proving measures of “assessing its practicality” (Mqadi, 2009:84). McGarry and Jacobson (2004:224) believe that a dental technical training curriculum “should be based on scientific evidence and be consistent with information that is taught in dental education”. Therefore, the state of affairs at the Zambian dental training school in terms of technical training as identified in this study poses serious concerns that call for intervention. Dental technical training is practically oriented, however, this study has established that the Zambian training was heavily weighted in theoretical content as well as being outdated. In addition, critical parts of the practical training were not taught, for example, articulation and special tray procedures. This results in training that is compromised:

McGarry and Jacobson (2004:221) believe that “exposure to the different phases of laboratory procedures is critical in dental technical training”. Thus, one cannot expect to be a competent technician unless one has been taught modern up to date pedagogy and all production stages in order to produce a quality product (Bass, 2010 pers. comm. 24 March).

The study also established that continuing professional development for technicians does not exist in Zambia. Qualified technicians are not informed of any new technical developments in their professional field. Furthermore, the Zambia Dental Technicians’ Association (ZDTA) is inactive. Hence there is no professional interaction whereby colleagues can learn from each other and share matters of common interest.

We don't even have any scientific conferences to discuss the latest achievements in dentistry where technology is concerned, and so on. The Dental Technicians' Association does not exist at all, so there is no forum where – in Zambia – where these two [technicians & dentists] can, you know, can come together and compare their work and see how they can improve together, the services that they provide. So it's very difficult. *[ZT 8]*

It is therefore concluded that there is a lack of continuing education support for qualified technicians and that technicians are frustrated by this.

Zambian dentists and technicians interviewed in this study complained that government involvement in dental technical service delivery was lacking as more support was given to clinical dentistry than to the technical aspect of dentistry. The technicians in this study expressed a concern that oral health administrative appointments were not equally extended to technicians, which they feel contributes to poor service delivery as their interests were not adequately represented. McGarry and Jacobson (2004:225) argue that "there is need for the dental profession to help create a coherent vision of the role of the dental technician in the delivery of care to patients". The decline of dental technology training over the years could be attributed to the lack of government understanding of the benefits that can accrue from technical service delivery. As Trotman, Haden and Hendricson (2007:714) state, in dental schools there is a need to "cultivate an attractive and intellectually stimulating academy" conducive for dental technical academics.

This study concluded that the majority of the respondents were unaware of the proposed Zambia National OHP or its objectives for dental technical services. This can be attributed to the fact that Zambia had no existing policy on oral health services as established in chapter two in the review of the OHP, despite a draft policy having been drawn up in

2006. However, this study established that the draft policy was currently being used to govern the services. In addition, the study established that there were very few respondents who were aware of this fact. Thus, the efficacy of this draft policy is questioned as the industry was being governed against a policy that very few were aware of. Theoretically, the new policy should address the concerns raised in this study. The fact that the problems continued to exist, calls into question the validity of the proposed draft policy. It can also be noted in this study that four years is a long time for a policy to be in draft form and thus the desire of Government to pass the draft into law is questioned. Many of the concerns raised with regard to dental technical service delivery in this study could be directly attributed to the lack of policies governing the services, as it would be correct to assume that the draft policy was only being used as a guideline in those areas where it suits authorities to do so.

5.3 Recommendations arising out of the study

The study has revealed important information that has indicated that dental technical services in Zambia need a complete overhaul if they are to develop and elevate the standards of service delivery. Therefore, the following recommendations are made.

- There is need to revise government budget allocations for dental technical services in order to boost the purchase of quality and advanced equipment such as porcelain furnaces and casting machines in all major referral health centres of Zambia.

- A centralized, regulated and efficient procurement system for dental equipment and materials should be developed in order to ensure control measures are formulated and adhered to, to maintain a steady supply of dental equipment and materials.

- The dental technology curriculum of the dental training school should be reviewed. This review could develop avenues for liaising with other international training institutes in order to foster an understanding of dental technological education as practised in other countries. The liaison could coordinate workshops and in-service hands on courses as further training for qualified technicians.

- More technicians need to be trained. A training policy with clear objectives needs to be established.

- Government needs to review its partnership training policy with international service providers.

- Staff development should be improved at the Dental Training School by offering support to the staff through further training and allowing them to attend international conferences.

- It is recommended that a system should be developed that will encourage open debates between dentists and technicians to review service delivery and resolve their conflicts in order to enhance services delivery.

- Infrastructure should be modernised.

- A policy should be developed to train personnel in the maintenance and repair of dental technical equipment to avoid interruption in service delivery in order to promote consistent quality service delivery.

- The school should attempt to activate an alumni and convocation committee to encourage further education amongst its graduates and, thus, encourage them to meet and share ideas and learn about new developments in the dental field.

- Administrative appointments for oral health staff should be equally extended to dental technicians in order to create space for dental technicians to contribute to policy formulation and decision making.

- The government should formulate a dental gazette that will be used to regulate dental technical products and their sources.

- The Zambia Dental Technicians' Association should be established with an object of regulating the industry in Zambia.

5.4 Areas for Future Study

- There is a need to undertake a study that will examine effects of unprofessional practices in dental technical service delivery in Zambia.

- A further study should be conducted to investigate patient satisfaction with regard to dental technical services.

- There is a need to undertake a study that will investigate the patients' and the general public's views on the effects of high costs of services as the views in this study are based on the respondents' professional assessment.

- A further study should be undertaken to investigate the possible effects of the exodus of skilled technicians on the quality of dental technical service delivery in Zambia.

5.5 Closing Statement

This study concludes that Zambian dental technical services are not of a sufficient standard for various reasons as outlined in the data. The

dentists are not adequately catered for in terms of technical services, for example, there are very few ceramic laboratories in the country. Hence the dentists have, in many instances, resorted to outsourcing abroad in search of quality and efficiency. This has a negative impact on the Zambian economy as revenue is lost through foreign exchange as a result of the high volume of work being outsourced. Outsourced work also affects patients negatively as they are subjected to high service charges incurred abroad. Strong views have been expressed by respondents concerning working relationship problems such as unprofessional practices, lack of team spirit and communication problems; however dentists and technicians were able to find common ground in service delivery with the majority of the technicians interviewed feeling that there was mutual understanding between the dentists and themselves. This view was not widely held by dentists.

Zambia has a critical shortfall of dental technicians and it is believed that dental technological training has declined over the years. This could be due to lack of government involvement in technical service delivery. Therefore, the few available technicians were overwhelmed with the high volume of work being generated by the dentists. This ultimately affected the quality of service delivery. The Zambian dentists and technicians were unaware as to whether an OHP existed or not. This reflects very negatively on the dental industry.

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Appendix 1

LETTER TO ZAMBIAN DENTISTS REQUESTING YOUR PARTICIPATION IN A RESEARCH STUDY

Kindly read this whole page first before deciding whether you are willing to participate in this study.

My name is Martha Mukena and I am currently registered for a master's degree at the Durban University of Technology in South Africa. I am doing research with practising Zambian dentists and technicians to investigate Zambian dental technical services. The title of my research is: ***"Perceptions of Zambian dentists and dental technologists in respect of dental technical services."***

This research will provide information on the following which will provide Government, dentists and dental technicians with information to refine dental technical services in Zambia:

1. Whether dentists are adequately served by the dental technical services.
2. The study will help identify relationship problems that exist between the dentists and technicians.
3. This study will help ascertain the utilization of dentists of the dental technical services.
4. This study will also help evaluate the perceptions of dentists regarding the output and quality of work produced by the dental technicians.
5. The standing of the private sector in the Zambian oral health services.

I am requesting that you allow me to interview you as part of the research. I will need to interview you once for approximately twenty to forty (20-40) minutes. Interviews will be recorded and recordings will be used for data transcription. There will be no risks involved as participants will remain anonymous at all times. Although there are no direct benefits, your participation will be highly valued. Data collected will be used exclusively for the purpose of this study and will not be translated to any other person for any reason including research in which I am not an active participant. If you choose to withdraw from the research at anytime, you will be free to do so. In an event that you decide to withdraw, data that may have been gathered through your participation will then be discarded.

If you agree to participate in this study I will contact you to establish the date and time convenient to you to set up the interview. I will only interview a small random sample of dentists and you might be contacted

by me to set up an interview or you may not hear from me any further. Whether you are selected or not, I appreciate the time you have spent reading this letter and indicating your willingness to be interviewed.

If you are willing to be interviewed and to participate in my study, please complete the details below and then fax it to my number below.

My supervisors during the course of this study are Mr. G.Bass and Prof. N. Gwele, should you require further information concerning this study, you are welcome to contact them at the Durban University of Technology on the following numbers:

- Mr. G.Bass 031 373 2033, and
- Prof. N. Gwele 031 373 2703.

Please complete the details below and fax them to the fax number indicated below or you may hand it to me directly.

Many thanks
Martha Mukena

Declaration of willingness to participate:
I am willing to be part of Ms Martha Mukena‘s research into the Dental technical services in Zambia. I understand that participants were selected by the researcher on random sample basis.

Name: _____

Signature: _____

Date: _____

Witness:_____

Please note that if you contacted to do the interview you will be asked to sign the attached letter at the interview.

Researcher: Miss Martha M. Mukena

Department of Dental Sciences
Mansfield Road Gate 8
Ritson Campus
Durban University of Technology
P.O.BOX 1334 Tell: **0955 431630** Fax **0026 0211 431630**
Durban**,** 4000 Cell: **0734116576**

Appendix 2

LETTER TO ZAMBIAN DENTAL TECHNICIANS REQUESTING YOUR PARTICIPATION IN A RESEARCH STUDY

May I interview you for my research?

Kindly read this whole page first before deciding whether you are willing to participate in this study.

My name is Martha Mukena and I am currently registered for master's degree at the Durban University of Technology in South Africa. I am doing research with practising Zambian dentists and technicians to investigate Zambia dental technical services. The title of my research is: **"*Perceptions of Zambian dentists and dental technicians in respect of dental technical services."***
This research will provide information on the following which will provide Government, dentists and dental technicians with information to refine dental technical services in Zambia:

1. Whether dentists are adequately served by the dental technical services.
2. The study will help identify relationship problems that exist between the dentists and technicians.
3. This study will help ascertain the utilization of dentists of the dental services.
4. This study will also help evaluate the perceptions of dentists regarding the output and quality of work produced by the dental technicians.
5. The standing of the private sector in the Zambian oral health services.

I am request that you allow me to interview you as part of the research. I will need to interview you once for approximately twenty to forty (20-40) minutes. Interviews will be recorded and recordings will be used for data transcription. There will be no risks involved as participants will remain anonymous at all times. Although there are no direct benefits, your participation will be highly valued. Data collected will be used exclusively for the purpose of this study and will not be translated to any other person for any reason including research in which I am not an active participant. If you choose to withdraw from the research at anytime, you will be free to do so. In an event that you decide to withdraw, data that may have been gathered through your participation will then be discarded.

If you agree to participate in this study I will contact you to establish the date and time convenient to you to set up the interview. I will only interview a small random sample of dentists and you might be contacted by me to set up an interview or you may not hear from me any further. Whether you are selected or not, I appreciate the time you have reading this letter and indicating your willingness to be interview.

If you are willing to be interviewed and to participate in my study, please complete the details below and then fax it to my number below.

My supervisors during the course of this study are Mr. G. Bass and Prof. N. Gwele, should you require further information concerning this study, you are welcome to contact them at the Durban University of Technology on the following number, Mr. G.Bass 031 373 2033 and Prof. N. Gwele 031 373 2703.

Please complete the details below and fax them to the fax number indicated below or you may hand it to me directly.

Many thanks,

Martha Mukena.

Declaration of willingness to participate:

I am willing to be part of Ms Martha Mukena's research into the Dental technical services in Zambia. I understand that participants were selected by the researcher on random sample basis.
Name: _____

Signature: _____

Date: _____

Witness:_____

Please note that if you contacted to do the interview you will be asked to sign the attached letter at the interview.

Researcher:

Miss Martha M. Mukena

Department of Dental Sciences
Mansfield Road Gate 8,
Ritson Campus
Durban University of Technology,
P.O.BOX 1334, Tell: **0955 431630** Fax **0026 0211 431630** Durban, 4000. Cell: **0734116576**

Appendix 3

CONSENT TO PARTICIPATE IN THE RESEARCH STUDY

1. I am registered with the Medical council of Zambia.
2. I agree to participate in Miss Mukena's research concerning the dental services in Zambia.
3. I understand that Miss Mukena will interview me and record my views
4. I accept that the results of the research will be used towards masters of dental technology degree through the Durban University of technology.
5. I understand that I will remain anonymous throughout the report unless I wish to be named.
6. I understand that on conclusion of the research the data collected will be retained for five years and there after it will be destroyed.
7. I understand that I am entitled to withdraw from the research at anytime and that my contribution to the research will be discarded.

Name: _____

Signature: _____

Date:_____

Researcher:
Miss Martha M. Mukena
Department of Dental Sciences
Mansfield Road Gate 8
Ritson Campus
Durban University of Technology
P.O.BOX 1334
Durban
4000

Tell: 0955 431630 Fax : 0026 0211 431630
Cell: 0734116576

Appendix 4

INTERVIEW SCHEDULE

QUESTIONS TO THE DENTISTS.

1. What do you regard as good quality for dental technical services? [Probe: what issues of quality are important in regards dental technical services? What do you think are the characteristics of good quality for dental technical services?]
2. What do you think of dental technical services being offered in Zambia? [Probe: Have you had good service? How do you know the products are of good standard?]
3. Where do you send your work? [Probe, whether locally or abroad].
4. What would say about your technician/s?[Probe are their services good, are you happy]
5. How would describe your working relationship with your technician/s?[Probe do they follow instructions].
6. What do you think of Government policies on oral health with regard to dental technical services? [Probe what issues and characteristics of the policies do you think are suitable for dental technological services?]

Appendix 5

INTERVIEW SCHEDULE

QUESTION TO THE TECHNICIANS

1. What do you think about the quality of dental technological services in Zambia? [Probe: what issues of quality are important in regards dental technical services? What do you think are the characteristics of good quality dental technical services?]
2. What do you regard as quality for dental technical services?
3. Why? [Probe: Do you think you offer good service? How do you know the products are of good standard?]
4. Do you have any quality that you can compare your services with?
5. Do you think Zambian technical services are competitive?
6. How many dentists send you work?
7. What would say about your dentist/dentists?
8. How would you describe your working relationship with your dentist/dentists?
9. What do you know about the government's policies in respect of dental technological services? Elaborate.
10. What do you think of Government policies on oral health services with regard to dental technical services? [Probe what issues and characteristics of the policies do you think are suitable for dental technological services?]

Appendix 6

Department of Dental Sciences
Durban University of Technology
P.O.BOX 1334
Durban 4000

16 April, 2009

The Registrar
Medical Council of Zambia
P.O.BOX 32554
Thornpark
Lusaka
Zambia.

I am currently studying in South Africa at Durban University of Technology where I am registered for Masters Degree in Dental Technology.

I will be submitting my research proposal to Post-graduate Degrees Committee. The title of research study is ***"Perceptions of Zambian dentists and dental technicians in respect of dental technical services." A copy of the proposal is attached herewith.***

In terms of the rules at the Durban University of Technology, I am required to seek your permission before conducting this study in Zambia.

It is my hope that all is in order and will be grateful if the necessary permission will be granted.

Yours faithfully,

Martha Mukena.

Appendix 7

MEDICAL COUNCIL OF ZAMBIA

Dental Training School Premises, Wamulwa Road, Thornpark

P. O. Box 32554
10101 Lusaka
Zambia
Website: medicalcouncilofzambia.org.zm

Tel.: (260-1) 236241
Fax: (260-1) 239317
E-Mail: mcz@zamtel.zm

Your Reference

In reply please quote MCZ/101/2

8th July, 2009

Ms. Martha Mukena
Department of Dental Services
Durban University of Technologist
P.O. Box 1334
Durban 4000

Dear Madam,

RE: ASSESSMENT OF PRACTITIONER'S FOR THEIR KNOWLEDGE AND SKILLS.

The above subject matter refers.

The Medical Council of Zambia would like to inform you that permission is hereby granted that "***perceptions of Zambian Dentists and Dental Technologists in respect of dental technical services***" be done in accordance with your proposal. However, the Council advises that the outcome of the research be availed to the Council and the Zambia Dental Association of Zambia.

Yours faithfully
MEDICAL COUNCIL OF ZAMBIA

B. B. Bwalya
Registration Officer
For/Registrar

c.c. The President Zambia Dental Association of Zambia

Communications to be addressed to the Registrar

Appendix 8

Small Table of Random Digits

46 85 05 23 26	34 67 75 83 00	74 91 06 43 45
69 24 89 34 60	45 30 50 75 21	61 31 83 18 55
14 01 33 17 92	59 74 76 72 77	76 50 33 45 13
56 30 38 73 15	16 52 06 96 76	11 65 49 98 93
81 30 44 85 85	68 65 22 73 76	92 85 25 58 66
70 28 42 43 26	79 37 59 52 20	01 15 96 32 67
90 41 59 36 14	33 52 12 66 65	55 82 34 76 41
39 90 40 21 15	59 58 94 90 67	66 82 14 15 75
88 15 20 00 80	20 55 49 14 09	96 27 74 82 57
45 13 46 35 45	59 40 47 20 59	43 94 75 16 80
70 01 41 50 21	41 29 06 73 12	71 85 71 59 57
37 23 93 32 95	05 87 00 11 19	92 78 42 63 40
18 63 73 75 09	82 44 49 90 05	04 92 17 37 01
05 32 78 21 62	20 24 78 17 59	45 19 72 53 32
95 09 66 79 46	48 46 08 55 58	15 19 11 87 82
43 25 38 41 45	60 83 32 59 83	01 29 14 13 49
80 85 40 92 79	43 52 90 63 18	38 38 47 47 61
08 08 87 70 74	88 72 25 67 36	66 16 44 94 31
80 89 07 80 02	94 81 33 19 00	54 15 58 34 36
93 12 81 84 64	74 45 79 05 61	72 84 81 18 34
82 47 42 55 93	48 54 53 52 47	18 61 91 36 74
53 34 24 42 76	75 12 21 17 24	74 62 77 37 07
82 64 12 28 20	92 90 41 31 41	32 39 21 97 63
13 57 41 72 00	69 90 26 37 42	78 46 42 25 01
29 59 38 86 27	94 97 21 15 98	62 09 53 67 87
86 88 75 50 87	19 15 20 00 23	12 30 28 07 83
44 98 91 68 22	36 02 40 08 67	76 37 84 16 05
93 39 94 55 47	94 45 87 42 84	05 04 14 98 07
52 16 29 02 86	54 15 83 42 43	46 97 83 54 82
04 73 72 10 31	75 05 19 30 29	47 66 56 43 82

Rand Corporation, 1955 cited in Polit and Hungler, 1999:179.

Appendix 9

DURBAN UNIVERSITY of TECHNOLOGY

Faculty of Health Sciences

ETHICS CLEARANCE CERTIFICATE

Student Name	Ms M M Mukena	Student No	20619543
Ethics Reference Number	FHSEC 024/09	Date of FRC Approval	03 June 2009
Research Title:	Perceptions of Zambian dentists and dental technicians in respect of dental technical services.		

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	✓		

04/05/2009
DATE

04/05/2009
DATE

04/05/2009
DATE

03/06/2009
DATE

LEARANCE CERTIFICATE1/08-2007 Faculty Approved Document