EFFECT OF MULTIPHASE QUEUING SYSTEMS ON SERVICE QUALITY AT RADIANT GROUP OF HOSPITALS

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DECLARATION

I, the undersigned, declare that this is my original work and it has not been submitted to any other college, institution or university other than The University of Nairobi for academic credit.

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Approval

This project has been presented for examination with my approval as the appointed supervisor.

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DEDICATION

This project is dedicated to my parents; Justice (RTD) Benjamin Patrick Kubo & Mrs. Constance Sophia Kubo for your relentless support and prayers. Your nurture, counsel and passion to see my siblings and I realize our dreams is unmatched. We cannot thank you enough! Love you both!!

ABSTRACT

Keywords: Multiphase queuing systems, service quality, SERVQUAL, healthcare

Manufacturing and service organizations which directly interact with customers must confront a common phenomenon of queues or waiting lines. The basic characteristics of healthcare services means that queues cannot be avoided. Long waiting times are a source of dissatisfaction and anxiety amongst clients and staff, necessitating the employment of operational techniques like queuing system or waiting line analysis, in order to optimize scarce resources thereby providing efficient and effective services. Service quality, on the other hand, is the difference between customer expectation of service and the perceived service and is an essential strategy for success and survival in today's competitive environment. The demand for healthcare services in Kenya far outweighs the number of trained personnel capable of providing the services, creating bottlenecks in the service delivery system that result in queues. Moreover, previous studies focused only on single phase queuing systems and do not relate the concept of queuing systems to service quality. The study aims at providing data that will fill the gap created by establishing the effect of multiphase queuing systems on service quality, using the SERVQUAL model, in a private healthcare facility. A sample of 100 non-critical clients was selected using both systematic random sampling and cluster sampling. A log of their waiting times at each service delivery point was kept and at the final service delivery point, the respondents were requested to fill in a close-ended, self-administered questionnaire evaluating the different service quality dimensions. From the results, clients agreed that they perceived service quality despite the long turn-around time. The study recommends that the facility displays its service charter to sensitize clients of their expected turn-around time, that it addresses the bottlenecks and improves on client flow in order to reduce the queue length thereby improving client perception of service quality.

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ABBREVIATIONS

FIFO	First In First Out
LIFO	Last In First Out
NHIF	National Hospital Insurance Fund
RGH	Radiant Group of Hospitals
SDP	Service Delivery Point

CHAPTER ONE

INTRODUCTION

1.1   Background to the Study

Manufacturing and service organizations which directly interact with customers must confront the issue of queues. Waiting lines or queues have become a common phenomenon in our day to day life with customers having to wait in turn to receive services. The basic characteristics of healthcare services, just like financial services, supermarkets or barbershops means that waiting lines or queues cannot be avoided (Zeithaml, Parasuraman & Berry, 1985). Moreover, within these queues, there are nodes at which services are dispensed (Fomundam & Herrmann, 2007). When the demand at these nodes is greater than the capacity, bottlenecks result, which reduce optimal utilization of other service delivery points creating an idle capacity. The overall effect is an increase in client waiting time and a back log in service delivery resulting in queue formation, yet customers are not interested in waiting in queues.

Tough economic times have necessitated the employment of Operations Management techniques in optimization of scarce resources so as to provide efficient and effective services. Operations management increases product value through form, place, possession or time utility and the queuing theory is one such optimization technique. This technique provides insight by utilizing mathematical models and performance measures to assess and hopefully improve the flow of patients through a queuing system (Brahma, 2013). Moreover, the management of queues has recently received increased attention, owing to the fact that speed of service has been shown to provide a firm with competitive

advantage in the market place (Stalk, 1988). Long waiting times are a source of dissatisfaction and anxiety amongst clients and staff. It is the efficiency through speedy service (or the lack of it) that affects service quality and helps the firm to retain and attract (or lose) new customers.

1.1.1 Queuing Systems

A queue is a line or sequence of people or vehicles awaiting their turn to be attended or to proceed (Oxford Dictionary, 2014). A queuing system, also known as a processing time, entails the following characteristics: the arrival, the queue discipline, the service mechanism and the cost structure (Williams, 2003; Brahma, 2013). The queuing systems, therefore, entail the whole process of service delivery; the way the client arrives and enters the queue, the rule for formation of the queue, the service time and how the client is served. Queuing systems are associated with various operational characteristics which are: the average number of customers arriving, the expected number of units waiting in the system, the expected number in the queue, the expected time an arrival must wait in the queue, the probability of having no customers in the system and the expected time an arrival must wait in the system. These help in decision making for non-deterministic parameters, those whose prediction of occurrence is not with certainty.

There are two basic configurations of queuing systems: single channel system (only one server) and multichannel systems (there are several servers) and both are further classified into single- or multiple- phase systems (Render, Stair & Hanna, 2012). Most healthcare facilities fall under the multiple phase systems, regardless of whether they are

single channel or multiple channel. A problematic queuing system (long queues), leads to client perception of excessive, unfair or unexplained waiting time. This affects their overall perception of service quality.

The queuing theory, on the other hand, is the formal study of waiting in line and is an entire discipline in the field of operations management (Brahma, 2013). The queuing theory was developed by Erlang in 1904 to help in determining the capacity of the Danish telephone system (Brockmeyer, Halstrom & Jensen, 1948). Queuing models have played a key role in identifying appropriate staffing levels, number of beds in a hospital, resource allocation and in designing new services (Green, 2006). Furthermore, it has been used extensively by service industries in areas such as; staff schedules, working environment, productivity while in hospitals, it has been applied to assess a multitude of factors such as registration filling time, patient wait time and counselling time (Brahma, 2013). Waiting lines are associated with two primary costs, that is, waiting costs (social cost and cost of lost customers) and service costs (cost of idle facility and employee) (Kunwar & Kongere, 2003; Srindhar, 2001) and they are formed when the current demand for the service exceeds the current capacity to provide that service. They are associated with a waiting psychology with prepositions like idle time making waiting seem longer than occupied time and in-process waits making waiting seem shorter than pre-process waits. The adequacy of queuing systems of waiting lines has a strong effect on quality of service and productivity (Srindhar, 2001).

1.1.2 Service Quality

Quality is the totality of features and characteristics of a product or service that bear on its ability to meet stated or implied needs (Ellis & Norton, 1993). Service quality can be defined as the difference between customer expectation of service and the perceived service, whereby if expectations are greater than performance then perceived quality is less than satisfactory. This results in customer dissatisfaction (Parasuraman, Zeithalm & Berry, 1985; Lewis & Mitchell, 1990). Service quality is more a function of attitude than technology and is relativistic, intangible and has a tendency to deteriorate (Srindhar, 2001). For purposes of this paper, the operational definition of service quality will be the difference between customer expectation of service and the perceived service.

Service quality is important since its delivery is considered an essential strategy for success and survival in today's competitive environment (Parasuraman et al., 1985; Zeithalm et al., 1990). It is a customer oriented phenomenon which is defined, judged and deduced by the customer based on factors like his experience, service process, physical evidence, physical evidence, first impression and expertise (Srindhar, 2001). Using the SERVQUAL scale, service quality has 5 dimensions of measure, that is; tangibles, reliability, responsiveness, assurance and empathy (Parasuraman et al., 1985). According to Parasuraman et al. (2002, pp. 140), "SERVQUAL is a concise multi-item scale with good reliability and validity that retailers can use to better understand the service expectations and perceptions of customers, and as a result, improve service". SERVQUAL as a method of measuring service quality has however received both widespread support and criticism (Wisniewski, 2001). Apart from the SERVQUAL scale,

other scales of measure of service quality include the SERVPERF scale and the E-S-QUAL scale. The SERVPERF scale measures customers' perception of a service firm's performance (Cronin & Taylor, 1992). The E-S-QUAL scale, on the other hand, enables assessment of electronic service quality (Parasuraman, Zeithalm & Malhotra, 2005). These scales tend to revolve around the SERVQUAL scale hence the preference to the latter in its use.

The quality of service can only be assessed during or after consumption (Audesh, Hasty & Gopala, 2005) and most services cannot be sampled or tried in advance. The perceived service quality is realized at the moment of truth, that is, when the service delivery personnel and customer come into contact for delivery and receipt of services thereby emphasizing the need for customer participation in service delivery process (Srindhar, 2001). Service quality on the other hand can be defined as the difference between customer expectation of service and the perceived service. The primary source of value creation for service quality is the performance by the service provider and it is often the small things which influence customer's overall perception of the same (Kumar, Kee & Charles, 2006). Studies on service quality in healthcare indicate that healthcare services are distinct in nature from other services offered. In healthcare, treatment combines intangible service supported by tangible goods (like a surgery) and tangible goods supported with intangible services (like pharmaceuticals) and patients incur expenses rather than acquire tangible assets (Berry & Bendapudi, 2007).

In service quality, the expected service, which is a critical component of the perceived service, is shaped by word of mouth communication, the client's personal needs and the client's past experience (Parasuraman et al., 1985). Perceived service quality is seen to be the result of the consumer's comparison of expected service with perceived service. There are various levels or gradations of service quality (Srindhar, 2001). Exceptional or surprise quality in service exceeds the clients expectation and leads to not only client satisfaction but delight. However, there is the basic minimum of the client's expectation is just met. Below this basic level are the levels of miserable, unconcerned or careless levels of service quality where expectation is far below the minimum. Above the basic level are the levels of anticipated, performance and competent quality.

1.1.3 Queuing Systems and Service Quality

In today's competitive world, one major factor influencing the success of any organization is its ability to increase customer satisfaction through the improvement of service quality. The service delivery process in any organization is essentially described by a queuing model. In any service organization, managers are concerned about the time customers are required to wait in order to receive a service, making the queue length and waiting time the two significant factors that play an important role in customer perception about service quality (Madadi, Roudsari, Wong & Galankashi, 2013). Many organizations thus pay special attention to service quality as the most significant core competence in order to ensure that they attract and retain customers so as to remain competitive.

Long queue length and waiting time have an effect on the behavior of the customer. Customers may resort to balking (leaving the queue due to its long length), reneging (customer leaves the queue due to impatience) or jockeying (moving from one queue to another in the hope of gaining faster service) when required to queue (Shah, Gor & Soni, 2007). This may result in loss of potential clients along the queue before they can access the service, creating a leaky cascade along the different queues. Optimal service configuration therefore becomes important to effectively and efficiently manage queues in order to have higher client retention rates, translating in maintained or higher sales margins. The queuing theory is responsible for managing client flow through the system, such that if the flow is good, completion of service delivery is done with minimal delay (Obamiro, 2010). The reverse is also true. It is therefore important to note that clients' evaluation of service quality is not only affected by the actual waiting time, but also the perceived waiting time, customers expectation and the attribution of the causes of the waiting (Obamiro, 2010).

1.1.4 Radiant Group of Hospitals

Radiant Group of Hospitals (RGH) is a medium volume, private hospital that was started in 1949 by a medical doctor by the name of Dr. Macharia, the owner of the property on which the main hospital stands to date. At the time of his death, however, the hospital management had been given up to a board of directors to run it. In 2010, the hospital changed management for the third time and in the same year; the hospital changed its name from Radent hospital to Radiant Group of Hospitals.

The top management team comprises of the board of directors and the chief executive officer, under whom is a team of managers including: Clinical Administrators, the Human Resource Manager/ Hospital Administrator, the Medical Manager and the Finance Manager. Below this team are departmental in-charges, under whom all other hospital staff fall under, including the administrative staff, support staff and different cadres of healthcare workers. The healthcare workers comprise a diverse team of consultants, doctors, nurses, laboratory and pharmaceutical personnel, nutritionists and physiotherapists. The hospital provides a nurse to patient ratio of 1:4.

The facility provides various services including: in patient services, comprising of the maternity, neonatal unit, male ward, pediatric, medical and surgical wards. It also offers out-patient services consisting of diagnostic and imaging services, specialized clinics, pharmacy, theatre services, dietary services, physiotherapy, dental clinic, counselling and ambulance services. Its main hospital is located in Pangani while its two satellite sites are located in Kiambu and Kasarani. Both the Pangani and Kiambu hospitals operate for twenty four hours while the Kasarani clinic operates for twelve hours in a day.

RGH allows access to services for both cash paying, NHIF covered clients. Moreover, private insurances including First Assurance, Pioneer Assurance, Britam, APA, Xplico, Kenindia, General Assurance, Jubilee Insurance and Equity bank allow their clients to access services from this hospital.

Radiant Hospital, while providing out-patient services, operates a multiphase queuing system in order to provide healthcare services to its clients. Continuum of care starts from the registration, to the triage onto the doctor's consultation. The client could be sent for auxiliary services, either to the laboratory or imaging for further investigative tests so as to give the clinician adequate evidence to support diagnosis. Once diagnosis has been made, he is sent to the pharmacy to have his prescription filled. The client completes his payment, collects his medicines then exits the clinic.

RGH seeks to meet the needs of its client by fostering a culture that ensures consistent delivery of the highest quality, patient-focussed healthcare. The facility prides of a staff compliment that is passionate, dedicated and competent, who strive to achieve correct diagnosis the first time. It also has modern equipment necessary in making a difference in patient care and clinical outcomes. The hospital's service charter describes length of turn-around time as 30 minutes.

1.2 Research Problem

In day to day life, queues are a common phenomenon. Waiting lines are formed when the demand for the service surpasses the capacity to provide that service. Concepts of queuing systems and service quality are important since they form a causal relationship while waiting line analysis allows decisions to be made for non-deterministic parameters, resulting in optimal resource allocation. Queuing system, however, is associated with costs and care must be taken to achieve an economic balance between the cost of service and the cost of waiting.

In Africa, there is a high demand for medical services, Kenya not being an exception. While the World Health Organization recommends a standard of doctor to patient ratio is 1:1000, statistical data shows that the ratio in Kenya is 14:100,000 (www.africapedia.com, accessed 11-10-14). This presents the gap with the demand for healthcare services far outweighing the number of trained personnel capable of offering the services. This translates to clients having to queue in order to obtain services of a doctor, with a potential of huge delays in emergency situation. This queuing depletes the number of productive man hours for substantive output of employees in firms, creating a need to address the gap in order to reduce client turn-around times.

A number of studied have been done on the concepts of queuing systems and service quality. On a study of queuing systems, Nosek and Wilson (2001) reviewed the use of queuing theory in pharmacy applications in order to improve customer satisfaction. They found that customer satisfaction is improved by predicting and reducing waiting times and adjusting staffing. Agnihothri and Taylor (1991) sought the optimal staffing at a hospital scheduling department which handles phone calls with varied intensity throughout the day. They found that by redistributing server capacity over time, customer complaints reduced immediately without staff addition. Moreover, Mardhia and Basri (2013) conducted an analysis of appointment system to reduce waiting time at a public hospital. They found that to improve efficiency and effectiveness of the out-patients department performance, there was need to establish an appointment system, take attention of patient flow and schedule capacity. The most common application of queueing theory in hospital operations is to reduce patient waiting times and maximize

staff effectiveness (Brahma, 2013). However, studies done have been limited to simple M/M/1 systems focusing on single phase rather than multiphase systems, yet most clinics operate using the multiphase system.

Service quality, on the other hand, looks at the difference between expectation and perception of service. Owing to a highly competitive market environment, service quality is considered essential for success and survival today. Little research has been done with regard to the healthcare industry and service quality using SERVQUAL model. One such study proposes ideas for competitiveness through employee training to reduce service times and institute genuine urgency in dealing with customers (Butt & Cyril de Run, 2010). They found that SERVQUAL measures global and individual service quality dimensions, allowing for analysis of service delivery processes and enabling resource allocation for maximum benefit. In the study, generalizability of findings was questioned due to skewing of respondents' ages were skewed towards younger generations. Moreover, previous studies have not related the concepts of queuing systems and service quality and any relational studies of queuing systems concept have been made using other quality models like the six sigma approach (Dinesh, Singh and Remya, 2013).

It is in this light that Radiant Group of Hospitals will be used for the research and the study seeks to fill the knowledge gap by answering the question: What is the effect of multiphase queuing systems and service quality?

1.3   Research Objectives

The objective of the study is to explore the effect of multiphase queuing systems on service quality in outpatient medical clinics. The specific objectives are:

    i.   To determine the operational characteristics of the queue at Radiant Hospital

   ii.   To determine the relationship between multiphase queuing system and service quality at Radiant Hospital

1.4   Value of the Study

Administrators of the hospital will benefit from the study which will provide them with scientific evidence or data for resource allocation. This would enable them to make crucial decisions in order to optimize resources and meet client demand. Furthermore, the identification of SDPs with greater demand than capacity to deliver services will be identified and strategy created to increase capacity and improve service quality.

Another set of beneficiaries to the study will be the clients of the said facilities. The establishment of the effect of multiphase queuing systems on service quality will serve as a driver to quality improvement systems thereby increasing their satisfaction. Moreover, employees of the facilities will benefit from the study as this will advance their cause for employment of more personnel or restructuring of operations to increase efficiency. It will also create an increased sense of job satisfaction, reduce workload to recommended levels and enable staff understand customer behavior as influenced by multiphase queuing systems.

Finally, the study will benefit scholars by providing a basis for conducting further research. This will be through identification of further knowledge gaps that the study will not have addressed.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, both conceptual literature and past studies related to queuing systems and service quality will be discussed, with a focus of their relation to the healthcare sector. The chapter will be divided into various sub sections, which are: concept of queuing systems, concept of service quality, empirical studies, summary of the literature review and conceptual framework.

2.2 Queuing Systems

The concept of queuing systems has its backbone on the queuing theory. This helps us understand how clients are affected by queues. A queue is a waiting line which occurs when demand exceeds capacity of the delivery system. In healthcare systems, queuing systems affects the client flow through the various service delivery points in the continuum of care. If client flow is good, patient queuing is minimized while if it is bad, losses in businesses and queuing delays are resultant (Mehandiratta, 2011).

Queuing systems comprises of four major parts. These are: arrival pattern, queue discipline, service facility and the service mechanism. The arrival pattern is a description of the input process, how a client arrives and enters the system for service. The arrival can be in a singular manner, in batches or totally randomly and where arrival rate exceeds processing rate, a queue is resultant (Brahma, 2013). The queue discipline refers to the criteria of selecting the next person to be served, the most common being by use of the

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arrival order that is FIFO. The service facility refers to its characteristics including its design while the service mechanism describes how the client will be served. This describes the number of servers and the duration of service times. The common service facility structures are: single-channel, single phase; single-channel, multiphase; multi-channel, single phase and multi-channel, multiphase (Obamiro, 2010). The client then exits from the system and two possible scenarios may be the customer returning to source population and becoming a candidate for service again or re-service (Davis, Aquillano & Chase, 2003). The source population of clients can either be finite or infinite.

Queuing models operate using various assumptions: a steady state, known service time, service times being independent of each other, known service rate, greater service rate than arrival rate, service time being described by a negative exponential probability distribution and an average of all variables rather than real numbers is used. It is these assumptions that form the limitations of queuing systems and at best the queuing models are used in conjunction with other decision analysis methods like simulation and regression (Mehandiratta, 2011).

2.2.1 Multiphase Queuing Systems

Services require a single activity or a series of activities and are identified by the term phase (Maina, 2013). In a single-phase system, the service is completed at once, for example at a bank or a grocery store. On the other hand, in a multiphase system, the service is completed in a series of steps such as at a fast food restaurant or at an out-patient clinic. This multiphase system can be represented in the figures below:

Fig. 2.1 Single-Channel, Multiphase System

Queue

Arrivals → ○○○ → [Type 1 Service Facility] → ○ → [Type 2 Service Facility] → EXIT

Fig. 2.2 Multi-channel, Multiphase System

Queue

Arrivals → ○○○ → [Type 1 Service Facility 1] → [Type 2 Service facility 1] → EXIT

[Type 1 Service facility 2] → [Type 2 Service facility 2] →
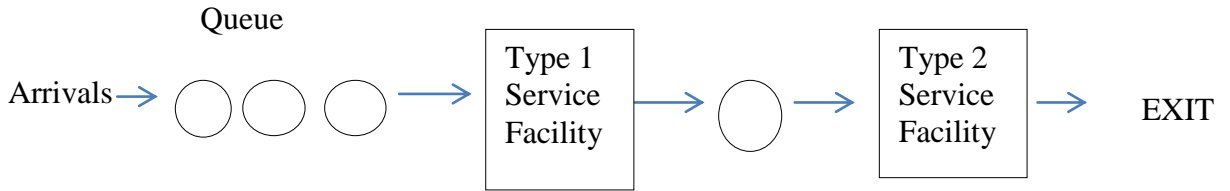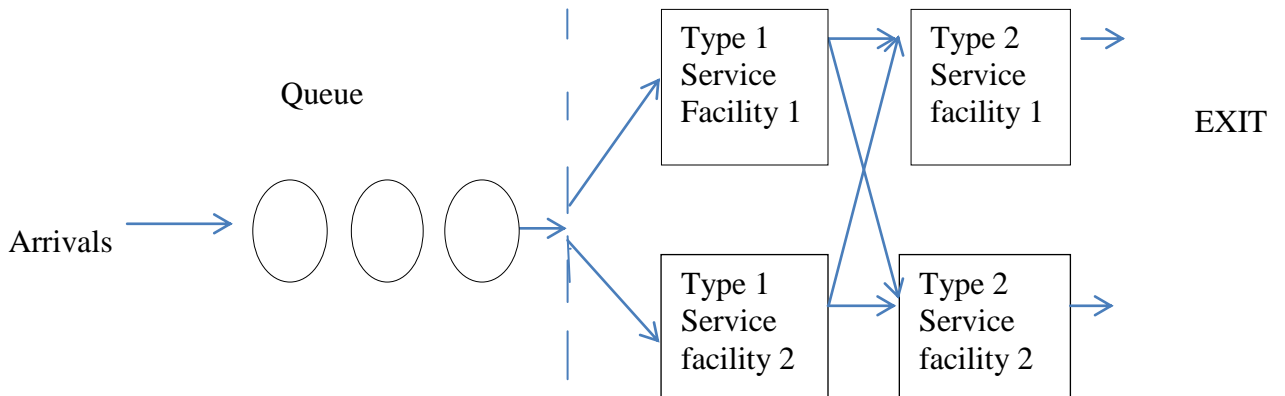
2.2.2 Queuing Operational Characteristics

A simple queuing model will be adopted for each SDP with the following operating characteristics: λ (Average number of customers arriving), L (expected number of units being serviced or waiting in the system), Lq (expected number in the queue), Wq (expected time an arrival must wait in the queue), W (expected time an arrival spends in the system both in queue and in service). The arrival pattern is random and follows a Poisson distribution.

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It therefore follows that:

$L = \lambda\, W$

$1/\lambda$ = expected inter arrival time

$1/\mu$ = expected service time

Utilization factor p (fraction of time the server is busy) is given by $p = \lambda / s\mu$ where $s\mu$ is the fraction of service capacity being utilized on average by arriving customers λ

2.2.3 Service System

The characteristics of the service system are: the number of waiting lines, the number of servers, their arrangement, the arrival and service patterns and the service priority rules (Maina, 2013). In healthcare clinics, the service is delivered in a series of steps which are sequential.

On arrival, clients queue at the registration desk. Once registered, the client's hospital file is retrieved and the client waits to be called into the triage room. Here, the client's vital signs (including the temperature, height and weight) are monitored and recorded on the continuation form. The client then joins another queue awaiting consultation from the clinician or doctor. Once called into the doctor's room, the client explains his signs and symptoms. Depending on the clarity of his explanation, the doctor could require further investigations to be carried out in order to come up with a diagnosis (thereby sending the client to the laboratory or x-ray) or he could make a diagnosis and send the client to the pharmacy for medication. The client again joins another queue in order to access the auxiliary service required. The final SDP is normally the pharmacy where the client's

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prescription is filled. Once this is done, the client then exits from the system. However if he is dissatisfied, the client could opt to rejoin the system and seek re-service.

At the various SDPs, there could be a mix of single servers (at the triage) and multiple servers (at the registration and consultation points). The queue discipline normally follows the FIFO system; however, this is interrupted when emergency cases are brought into the clinic. As the client is being attended to at the various SDPs, the queue discipline could include reneging (customer leaves queue due to impatience) or balking (customer leaves queue due to lack of time or waiting space).

2.2.4 Psychology of Waiting

The proposition that customers intensely and universally dislike queuing is based in the idea that people typically experience emotional discomfort while waiting in line (Schmitt, Dube & Leclerc, 1992; Schopler & Stockdale, 1977). In particular, they are said to lose control over their immediate situation as they cannot move around freely and might be forced into close physical propinquity with non-favored individuals (Baron & Rodin, 1978).

Waiting lines where the client does not have to be present and those of goods are easier to handle than those where clients are personally present. This is because unoccupied time feels longer for clients than occupied time. This is well taken care of in set ups where there are distractors like television sets, magazines or mirrors at waiting areas so as to reduce the feel of the client being idle. Moreover, pre-process waits seem to be much

longer than in-process waits. This can again be taken care of by establishing a triage with very short turn-around times between registration and triage to establish the feel of being in-process. Moreover, anxiety and uncertain waits make the customer feel that waiting time is subjectively longer. Explanations for long waits play a great part in relieving the tension created through such uncertainties. Finally, unfair waits feel longer than equitable waits. This calls the queue discipline to be adhered to and any priority treatment should be explained to other clients on the waiting line.

It has been found that customers are unwilling to queue and their loyalty to organizations is pegged on the way they are treated when they access service from the said organizations (Obamiro, 2010). Understanding inefficiencies within any organization is important in making policy decisions and optimizing available resources.

2.3 Summary of the Literature Review

Waiting lines or queues are formed when demand exceeds capacity to deliver a service and the basic components of the system are: the input process, arrival pattern, the queue discipline, the service mechanism and its output. The queue discipline at the clinic is FIFO, with priority service being given for emergency cases only. There are also operating characteristics of the queues: the average number of customers arriving, the expected number of units waiting in the system, the expected number in the queue, the expected time an arrival must wait in the queue, the probability of having no customers in the system and the expected time an arrival must wait in the system. Moreover, the

service mechanism is characterized by the sequential delivery of service along the different SDPs.

Service quality can be defined as the difference between customer expectation of service and the perceived service. There are various levels of service quality, depending on the level which client expectation has been met or unmet; exceptional, performance, anticipated, competent, basic, miserable, unconcerned or careless levels of service quality. The quality of service can only be assessed during or after consumption with an inability to sample most services in advance. Perceived service quality is realized at the moment of truth when the service delivery personnel and customer come into contact for delivery and receipt of services. This emphasizes the need for customer participation in service delivery process. The relationship between waiting lines and service quality is influenced by the queue length and the time taken for clients to access services, which also affects their loyalty to the organization. This study therefore seeks to answer the question as to the effect of multiphase queuing systems and service quality at Radiant Group of Hospitals.

2.4 Conceptual Framework

A conceptual framework is a theoretical structure of assumptions, principle and rules that holds together the ideas comprising a broad concept (businessdictionary.com, accessed 26-7-14). The independent variable in the study is queuing systems, whose variables stem from its queuing characteristics: the average arrival rate, the average number of units in the system, the average number in the queue, probability that the service facility is idle, the average time a unit spends in the queue and the average time a unit spends in the

system. The dependent variable is service quality and its variables are: tangibles, reliability, responsiveness, assurance and empathy. This can be represented schematically as follows:

Fig 2.3 Queuing systems and service quality conceptual framework

Independent variable

Queuing systems operating characteristics
λ= Average arrival rate
L= Average number of units in the system
Lq= Average number in the queue
Wq= Average time a unit spends in the queue
W= Average time a unit spends in the system (both in queue and in service)

Dependent variable

Dimensions of service quality
Tangibles
Reliability
Responsiveness
Assurance
Empathy

Source: Author (2014)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research design, population, sample design, procedures for data collection and the data analysis methods that were used.

3.2 Research Design

The study adopted a descriptive research design of a cross sectional type since it gives insight to the effect of queuing systems to service quality. Descriptive research entails collecting data that describes the events and then organizes, tabulates, depicts and describes the data collected (Glass & Hopkins, 1984). A cross sectional design was adopted which, according to Cooper and Schindler (2003), is carried out at once and represents a snapshot of one point in time. Quantitative research techniques were used to establish the cumulative effect of multiphase queuing systems on service quality in public university clinics.

3.3 Population

The study population was determined to be all the non-critical patients at the Radiant Group of Hospitals. This comprised of a diverse group of people from the various environs that surround the hospital and its two satellite sites in Kiambu and Kasarani. The population was spread across these three facilities.

3.4 Sample design

Due to the size and spread of the population, a sample was determined. The sample frame comprised of: corporate clients and cash paying clients and their dependents. The sample design took into account that respondents only visit the facility on a need basis and sought to evaluate respondents seeking healthcare services over three days. The sample was gotten from the main hospital located in Pangani due to a higher number of patients who visit this facility.

The study was carried out over three days in which observation was made. The sample size was determined using the rule of thumb, where if n=30 the sample is considered to follow a normal distribution. The main hospital serves and average of 70 clients per day. Hence, a sample size of 80 consenting respondents was observed over three days. Both systematic random sampling and cluster sampling was employed where participants were selected after every 5th client and in clusters of fives.

3.5 Data collection

Primary data was used in this study. This was collected using both observation and questionnaire method. At each SDP, there was an observation of service times and the time taken logged into a time log sheet by the researcher. The time in and the time out from one SDP to another were logged on the research tool. At the final SDP, pharmacy, the respondent was handed a self- administered, structured, close ended questionnaire and requested to fill it.

The questionnaire was divided into two sections, one section capturing the clients' demographic data and the second capturing the clients' responses on service quality as measured using the five service quality dimensions defined by the SERVQUAL model. Demographic data of interest included the gender, age of the client, level of education and frequency of interaction or visits to the facility. In the second section, client responses on service quality were captured by use of a Likert scale. Dimensions of service quality like responsiveness, reliability and assurance were captured in this section using a total of 22 questions adapted from the SERVQUAL model.

3.6 Data Analysis

The operating characteristics were determined by observation and logging the timings on the time log sheet and by calculation. Formulae to be used for these characteristics are:

λ= Average arrival rate

L= Average number of units in the system = λ W== Lq+λ/μ

Lq= Average number in the queue = λ^2/μ (μ-λ)

Wq= Average time a unit spends in the queue = Lq/λ

W= Average time a unit spends in the system (both in queue and in service) = Wq=1/μ

1/λ = expected inter arrival time

The perception of the clients of service quality was determined by analyzing their responses of the various dimensions of the same on the 5 point Likert scale and determining their means. The overall mean of service quality was then determined from the dimensional means.

The relationship between multiphase queuing systems and service quality was then determined by relating the average time spent in accessing healthcare services at the facility to the average score of the five dimensions of service quality.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

The chapter presented the statistical data and analyzed using SPSS 17.0 software, results and discussion of the research. Data was summarized using statistical averages and presented in the form of tables. Out of the 80 respondents requested to be part of the research, only 54 respondents consented to the same, representing a response rate of 67.5% which was considered as being satisfactory for analysis.

4.2 Client Profiling

The respondents were asked several questions to determine their demographic data. The results were summarized in the table 4.1 below:

Table 4.1: Gender Representation

		Frequency	Percentage
Valid	Female	20	52.6
	Male	18	47.4
	Total	38	100.0

Source: Research data (2014)

Majority of the respondents (52.6%) were female while 47.4% of the respondents were male. 16 respondents (29.6%) out of a total of 54 respondents did not answer the question on gender. The results indicated that the majority of the clients who sought services from the facility were women.

Secondly, respondents were asked to state their age bracket. The findings were summarized in table 4.2 below:

Table 4.2: Age Bracket

		Frequency	Percentage
Valid	Below 20 years	1	2.5
	21-40 years	28	70.0
	41-60 years	10	25.0
	61 years and above	1	2.5
	Total	40	100.0

Source: Research data (2014)

Majority of the respondents (70.0%) were in the 21-40 years age bracket, followed by the 41-60 years age bracket (25.0%). Respondents above 61 years and those below 20 years age brackets constituted 2.5% each of the total population captured for the study. Out of a total of 54 respondents, 14 respondents (25.9%) did not respond to the particular question.

From the findings, majority of the respondents (95%) were of the age brackets between 21-60 years. These age brackets represent respondents who form the working class and for whom long waiting times and queues adversely impacts their productivity due to the aspect of opportunity cost.

Kunwar & Kongere (2003) associate waiting lines with two primary costs: waiting costs (which is the social cost and cost of lost customers) and service costs (the cost of idle

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facility and employees). Long queues in the facility would increase waiting costs for the facility's clientele hence requiring attention and proper management of the same.

Thirdly, respondents were asked to indicate their frequency of interaction with the facility. The research findings were summarized in the table 4.3 below:

Table 4.3 Frequency of Interaction with the facility

		Frequency	Percentage
Valid	Monthly	12	30.0
	Occasionally	28	70.0
	Total	40	100.0

Source: Research data (2014)

Majority of the respondents (70.0%) visited the facility occasionally while 30.0% of the respondents visited the facility monthly. Out of a total of 54 respondents, 14 respondents (25.9%) did not respond to the question.

From the data, it is clear that the facility's services are sought for on need basis, that is, when one is unwell. Moreover, although the occasional visits from clients were more as compared to the monthly visits, clients having monthly appointments contributed to 30% of the queue. This represents a significant proportion of the waiting line requiring an appropriate strategy to ensure that the queue is well managed in order to maintain a turn-around time of 30 minutes as per the facility's service charter.

Fourthly, respondents were asked to indicate their highest level of education. This was summarized in table 4.4 below:

Table 4.4 Highest Level of Education

		Frequency	**Percentage**
Valid	High School	20	51.3
	Diploma Level	14	35.9
	Bachelor's Degree	3	7.7
	Master's Degree	2	5.1
	Total	39	100.0

Source: Research data (2014)

Majority of the respondents (51.3%) had their highest level of education as high school level. 35.9% of respondents had Diploma level of education as their highest level of education. 7.7% of respondents had a Bachelor's degree while 5.1% of respondents had a Master's degree as their highest level of education. 15 respondents (27.8%) out of a total of 54 respondents did not respond to the question on education level.

The findings indicate that majority of the respondents (87.2%) had either high school or diploma level of education. This validated the research findings as the respondents were deemed capable of understanding the questions asked.

Fifthly, respondents were asked their mode of payment. The research data was summarized in table 4.5 below:

Table 4.5 Mode of Payment

		Frequency	Percentage
Valid	Cash	7	17.1
	Credit (Insurance)	11	26.8
	NHIF	23	56.1
	Total	41	100.0

Source: Research data (2014)

Majority of the respondents (56.1%) were covered under the government's National Hospital Insurance Fund (NHIF) scheme. 26.8% of respondents were covered by private insurance companies while only 17.1% of respondents were cash payers. 13 respondents (24.1%) out of a total of 54 respondents did not respond to the question on mode of payment.

From the data, it is clear that the bulk of the clients (82.9%) seeking services at the facility constituted those covered under both the NHIF scheme and private insurance companies, who may have had a limited choice of facilities they could access healthcare services at due to their insurance policy restrictions, resulting in them forming the bulk of the queue. The cash paying clients, on the other hand, had the freedom of choice of facilities to access services from and formed a very small proportion (17.1%) of clients seeking services at the facility.

Lastly, respondents were asked to indicate the length of time they had interacted with the facility. The research findings are shown in the table 4.6 below:

Table 4.6 Length of interaction with the facility

		Frequency	Percentage
Valid	Less than 1 year	25	61.0
	1-5 years	16	39.0
	Total	41	100.0

Source: Research data (2014)

Majority of respondents (61.0%) had interacted with the facility for less than 1 year while the rest of the respondents (39.0%) had interacted with the facility between 1-5 years. Out of a total of 54 respondents, 13 respondents (24.1%) did not respond to the particular question.

There were more new clients (61.0%) compared to older clients (39.0%). The possible reason for the reduced retention of the older clients could be attributed to the queue length.

Obamiro (2010) argues that customers are unwilling to queue and their loyalty to organization is pegged on the way they are treated when accessing services from said organizations. Moreover, Stalk (1988) argues that queue management requires increased attention since the speed of service has been shown to provide a firm with competitive advantage in the market place. The facility thus needs to focus more on queue management in order to increase its client retention rates.

4.3 Operational Characteristics

An observation of the time taken from one service delivery point to the next was made and a record kept on the time log sheet. The total time and average time taken for each service and waiting was determined and these were represented in table 4.7 below:

Table 4.7: Total Time and Average Time Taken for Service and Wait

SDP	Registration	Wait	Triage	Wait	Consult 1	Wait	Lab
Total Time (min)	310	552	147	739	294	14	79
Average Time (min)	5.85	11.27	3.00	15.40	6.39	1.00	6.58
SDP	Wait	Other	Wait	Consult 2	Wait	Pharmacy	Total
Total Time (min)	98	48	388	64	57	204	2988
Average Time (min)	23.00	12.00	25.87	4.27	1.54	5.51	56.38

Source: Research data (2014)

It was noted that the average service times at registration, triage, first consultation and the laboratory were 5.85 minutes, 3 minutes, 6.39 minutes and 1 minute respectively. Average waiting times between registration and triage was 11.27 minutes, between triage and the first consultation was 15.4 minutes and between the first consultation and laboratory was 1 minute.

Furthermore, the average service times for other diagnostic tests, the second consultation and pharmacy were 12 minutes, 4.27 minutes and 5.51 minutes respectively. The average waiting times before a client accessed other diagnostic services was 23 minutes, before

the second consultation was 25.87 minutes and before they access the pharmacy services was 1.54 minutes.

Of importance to note is that the inter arrival rate did not hold for this particular set of clients. This is because there was a tendency for most clients to arrive in clusters rather than one after the other. Moreover, the data indicates that there were three major points of bottlenecks in the service delivery system. These are at the point of clients waiting for other diagnostic services (23 minutes) and at the points of clients waiting to consult the doctor for both the second time (25.87 minutes) and for the first time (15.4 minutes).

Operational characteristics were then determined by both observation and calculation and these were represented in the table 4.8 below:

Table 4.8: Queuing Operational Characteristics

	Arrival rate	Total time	Wait time	Service Time
sum	310	2988	1842	1146
average (minutes)	5.85 (λ)	56.38 (W)	34.14 (Wq)	21.24
	Av. number in system		Av. number in queue	
Formulae	L= λ W	μ=1/Wq	Lq= L-λ/μ	
Value (units)	329	0.029	127	

Source: Research data (2014)

From the findings, it is clear that the average arrival rate at the facility (λ) was 5.85 minutes while the average time a unit spends in the system (both in queue and in service) (W) was 56.38 minutes. The average time a unit spends in the queue (Wq) was

determined as 34.14 minutes. Moreover, the average total service time was determined as 21.24 minutes. The average number of units in the system (L) was found to be 329 units while the average number in the queue (Lq) was determined as 127 units.

The data indicates that the average total time the client spent waiting to receive the services (34.14 minutes) was far greater than the average total time taken to receive all services (21.24 minutes). This indicates that the client flow within the facility is not as smooth as it should be, representing one of the gaps needing to be addressed.

Mehandiratta (2011) argues that if client flow is good, client queuing is minimized while if it is bad, losses of business and queuing delays are resultant. Moreover, Mardhia & Basri (2013) recommend taking attention of patient flow to improve efficiency and effectiveness of out-patients department performance.

4.4 Service Quality

In this sub section, an analysis of the client perception of the five dimensions of service quality: tangibles, reliability, responsiveness, assurance and empathy as will be discussed. Descriptive statistics were used to analyze the findings.

4.4.1 Clients perception to Tangibles

Respondents were requested to rate the extent to which they perceived the tangibles of the facility as being ideal. The analysis was done on a 5 point Likert scale where 1=

Strongly Disagree, 2=Disagree, 3= Not sure, 4= Agree, 5= Strongly Agree. Findings were summarized in the table 4.9 below:

Table 4.9: Clients perception of the facility's Tangibles

Attributes of tangibles	N	Mean	Std. Deviation
Staff are professionally dressed and appear neat	39	4.77	.49
Information signs and communication material are visually appealing and easy to understand	40	4.73	.60
Hospital equipment is up to date	40	4.60	.59
Physical facilities are visually appealing	40	4.45	.60
GRAND MEAN	**39**	**4.64**	**.57**

 Source: Research data (2014)

From the data, clients were found to tend towards strongly agreeing that the staff dressing was professional and neat (M=4.77, SD=.49), that the information signs and communication material were visually appealing (M=4.73, SD=.60) and that the hospital equipment was up to date (M=4.60, SD=.59). However, clients just agreed that the physical facilities were visually appealing (M=4.45, SD=.60).

Tangibility, according to Edvardsson (1998), refers to the physical environment in the service organization. The findings indicate that the facility needs to make on its physical facilities more visually appealing. This will enable it increase it client volumes to the facility.

4.4.2 Clients perception to Reliability

Respondents were requested to rate the extent to which they perceived the facility staff as being reliable. The analysis was done on a 5 point Likert scale where 1= Strongly Disagree, 2=Disagree, 3= Not sure, 4= Agree, 5= Strongly Agree. Research data was summarized in the table 4.10 below:

Table 4.10: Clients perception of the facility staff Reliability

Attributes of reliability	N	Mean	Std. Deviation
Staff show sincere effort to solve customer problems	40	4.53	.88
Promises to customers are fulfilled in the agreed time frame	39	4.10	.91
Services are provided without mistakes	39	4.03	1.04
GRAND MEAN	**39**	**4.22**	**.94**

 Source: Research data (2014)

Clients were found to merely agree that the staff showed sincere effort to solve customer problems (M=4.53, SD=.88). However, the clients though they agreed, they tended towards not being sure that the staff fulfilled promises to customers on time (M=4.10, SD=.91) and that services were provided without mistakes (M=4.03, SD=1.04).

Wong & Sohal (2003) argue that reliability is the service provider's ability to implement promised services accurately and dependably. From the clients responses, they tended towards not being sure that the staff is reliable which could have a significant effect and could possibly be the reason behind the facility not retaining its old clients.

4.4.3 Clients perception on Responsiveness

Respondents were requested to rate the extent to which they perceived the facility staff as being responsive. The analysis was done on a 5 point Likert scale where 1= Strongly Disagree, 2=Disagree, 3= Not sure, 4= Agree, 5= Strongly Agree. Findings were summarized in the table 4.11 below:

Table 4.11: Clients perception of facility staff Responsiveness

Attributes of responsiveness	N	Mean	Std. Deviation
Staff are willing to help	39	4.67	.66
Staff are prompt in attending to customer requests	39	4.56	.75
Staff are willing to provide solutions	38	4.53	.80
Staff provide customers with necessary information to make decisions	39	4.41	1.12
Staff are willing to handle customer complaints	38	4.03	1.00
GRAND MEAN	**38**	**4.44**	**.87**

 Source: Research data (2014)

From the data, clients tended to strongly agree that staff were willing to help (M=4.67, SD=.66), that they were prompt in attending to customer requests (M= 4.56, SD=.75) and that they were willing to provide solutions (M=4.53, SD=.80). Moreover, clients agreed that staff provided necessary information to make decisions (M=4.41, SD=1.12). However, clients tended towards not being sure about the staff willingness to handle complaints (M=4.03, SD=1.00).

Johnston (2006) defines responsiveness as the willingness to provide a service accurately and quickly. The clients overall response tends to agree that they perceived the staff as

being willing to provide accurate and quick service. This could be seen reflected in the short service times used to actually provide service to the clients.

4.4.4 Clients perception to Assurance

Respondents were then requested to rate the extent to which they perceived the facility staff as being assuring. The analysis was done on a 5 point Likert scale where 1= Strongly Disagree, 2=Disagree, 3= Not sure, 4= Agree, 5= Strongly Agree. Findings were summarized in the table 4.12 below:

Table 4.12: Clients perception of facility staff Assurance

Attributes of assurance	N	Mean	Std. Deviation
Staff are courteous and respectful	39	4.77	.47
Staff are honest	39	4.64	.58
Staff are competent and able to answer questions	39	4.64	.58
Safety and security of customers is assured when dealing with staff	39	4.49	.72
Staff behavior raises confidence	39	4.38	.82
GRAND MEAN	**39**	**4.58**	**.63**

 Source: Research data (2014)

From the findings, clients tended to strongly agree that staff were courteous and respectful (M=4.77, SD=.47), that they were honest (M=4.64, SD=.58) and that they were competent and able to answer questions (M=4.64, SD=.58). However, clients just agreed that they felt safe and secure while dealing with staff (M=4.49, SD=.72) and that staff behavior raised confidence (M=4.38, SD=.82).

According to Juwaheer & Ross (2003), assurance is defined as the credibility, competence and security assumed in delivering services. From their responses, the clients agreed that they perceived assurance from the staff they interacted with.

4.4.5 Clients perception to Empathy

Respondents were finally requested to rate the extent to which they perceived the facility staff as being empathic. The analysis was done on a 5 point Likert scale where 1= Strongly Disagree, 2=Disagree, 3= Not sure, 4= Agree, 5= Strongly Agree. Findings were then summarized in the table 4.13 below:

Table 4.13: Clients perception of facility staff Empathy

Attributes of empathy	N	Mean	Std. Deviation
Staff give priority to what is best for customers in communication and service	39	4.44	.85
Staff give customers individualized attention	39	4.44	.94
Staff provide timely and clear communication	39	4.41	.85
Staff understand customers particular needs	39	4.23	1.14
Staff apologize when mistakes occur	38	3.89	1.03
GRAND MEAN	**38**	**4.28**	**.96**

 Source: Research data (2014)

From the data, clients agreed that staff gave priority to what is best for customers in communication and service (M=4.44, SD=.85), that they gave customers individualized attention (M=4.44, SD=.94) and that they provided timely and clear communication (M=4.41, SD=.85). Moreover, clients tended not to be sure that staff understood the

customers particular needs (M=4.23, SD=1.14) and that they apologized when mistakes occurred (M=3.89, SD=1.03).

Juwaheer & Ross (2003) relate empathy to caring, attention and understanding customer needs while providing services. Data indicates that clients were not sure that the staff understood their particular needs and this is reflected by the low retention rates of old clients as majority of clients sampled were new to the facility.

4.4.6 Clients overall perception of Service Quality

Table 4.14 below represents the clients overall perception as concerns service quality in descending order. The analysis was done on a 5 point Likert scale where 1= Strongly Disagree, 2=Disagree, 3= Not sure, 4= Agree, 5= Strongly Agree:

Table 4.14: Clients perception of Service Quality

Dimensions of Service Quality	Mean	Std. Deviation
Tangibles	4.64	.57
Assurance	4.58	.63
Responsiveness	4.44	.87
Empathy	4.28	.96
Reliability	4.22	.94
GRAND MEAN	**4.43**	**.79**

 Source: Research data (2014)

From the research data, clients tended to strongly agree that the dimension of tangibles (M=4.64, SD=.57) and that of assurance (M=4.58, SD=.63) were perceived at the facility. However, clients just agreed that they perceived the dimension of responsiveness

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(M=4.44, SD=.87) while they tended not to be sure as to whether they perceived the dimension of empathy (M=4.28, SD=.96) and that reliability (M=4.22, SD=.94).

Lewis & Mitchell (1990) define service quality as the extent to which a service meets customer's needs and expectations. From the foregoing and the overall mean score of client perception of service quality (M=4.43, SD=.79) at Radiant Group of Hospitals, it is clear that the clients agreed that they did perceive service quality at the facility.

4.5 Effect of Multiphase Queuing System on Service Quality

From the foregoing data that has been discussed, it was found that the average time it takes for clients to go through the whole multiphase queuing system (turn-around time) is 56.38 minutes. The clients took a total average time of 21.24 minutes for service and a total average time of 34.14 minutes waiting.

This turn-around time of 56.38 minutes is only four minutes shy of doubling the facility's target of 30 minutes as indicated on its service charter. However, clients agreed that they perceived service quality (M=4.43, SD=.79) at the facility despite this long turn-around time.

Despite Srindhar (2001) arguing that the adequacy of queuing systems of waiting lines has a strong effect on quality of service and productivity, this is not supported by the findings in this research. The contrary findings can be attributed to the clients not being aware of the hospital's service charter, making them have no grounds to demand for

faster service and to make comparisons. Furthermore, majority of the respondents were new and this may have skewed the clients' perception of service quality in favor of the facility despite the long turn-around time. The clients also experienced in-process waiting, which feels generally shorter than pre-process waits and which the research findings can also be attributed to.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the aim of the research, its summary, recommendations and draws a conclusion based on the research findings. Limitations of the research and suggested areas of further research are also covered in this chapter.

5.2 Summary

The current study was based on descriptive research of cross sectional type. The population of the study was 80 non critical, consenting clients. However, only 54 respondents consented, representing a response rate of 67.5%. The study sought to determine the relationship between multiphase queuing systems and service quality at Radiant Group of Hospitals and to establish the facility's queuing characteristics.

From the client profiling, it was clear that the facility served a majority of clients from the working group age bracket and who had an insurance cover whether public or private insurance. There were fewer cash paying clients compared to insured clients, more new clients compared to regular clients and the facility served more occasional clients compared to clients requiring monthly visits. This trend strengthens the need for the facility to reduce its total turn-around time in order to increase its client volumes, retention and diversity.

The operating characteristics indicated that client turn-around time far surpassed what was stated on the service charter (30 minutes), almost by double (56.38 minutes). Moreover, the waiting time to receive services was also far greater (34.14 minutes) than the actual time the client took to receive the service (21.24 minutes). The research data further indicates that the facility had three major bottlenecks areas; while waiting for other diagnostic services and also while waiting to consult the doctor at both the first and second consultations.

Finally, the research data determined that despite the long turn-around times experienced; clients generally agreed that they perceived service quality. This, despite literature supporting quite the opposite, meant that client perception of service quality was not affected by the multiphase queue and the turn-around time, which were attributed to clients having no knowledge of the hospital's service charter and also to majority of the respondents being new to the facility. Also, clients experiencing in-process waiting which generally seems shorter than pre-process waits was another factor that the findings were attributed to.

5.3 Conclusion

In conclusion, it is clear that queues have an effect on client retention and on increasing client base of an organization. The study indicates that queues at the facility are as a result of poor client flow and bottlenecks caused to higher demand than supply of the service. From its operating characteristics, the facility was performing excellently with regards to the actual average time it took for clients to receive actual services. However,

the facility was performing dismally with regards to the average waiting times that clients were subjected to before they received the services.

On the other hand, with regards to service quality, the facility was performing generally well on many aspects of the various service quality dimensions. However, there were aspects of empathy that clients tended not to be sure they perceived while at the facility. Radiant Group of Hospitals should address the areas that they were not doing well in so as to reduce the facility's turn-around times and both attract and retain more clients.

5.4 Recommendations

From the research data gathered, recommendation is made for Radiant Group of Hospitals to display its service charter. By so doing, the hospital will empower clients thereby ensuring that they are served within the stipulated time. This will help increase efficiency and effectiveness at the facility. Secondly, the facility should invest in more diagnostic machines and increase its doctors. This will go a long way in reducing the waiting time at the bottleneck areas of the facility resulting in a reduced turn-around time for clients.

Furthermore, recommendation is made for the facility to better manage its client flow. This could be done by deploying client-relations personnel responsible for ensuring that clients do not queue for longer than is necessary especially before the second consultation. The facility is also encouraged to train hospital staff on customer care, on handling patient complaints and also to develop a clear policy on the handling of

customer complaints. This will ensure that complaints are handled efficiently and effectively and reduce delays.

Finally, the facility is encouraged to work on its physical facilities in order to make them more visually appealing. This will serve to attract more clients and boost confidence thereby also playing a role in retaining clients.

5.5 Limitations

The rigorous approval processes required for data collection in the healthcare sector was a major limitation. Several potential, high volume facilities were approached. However, these required rigorous approvals before data could be collected in those facilities. This challenge limited the research to being a case study.

Time was another limiting factor to the study. Due to the foregoing, a lot of time was spent seeking approvals resulting in a short time span left for actual data collection when the approval was finally granted. This limited time dictated the methodology of data collection, favoring the use of close ended self-administered questionnaires as opposed to data mining or interviews. Moreover, due to time constraints, data was only collected from the main hospital of Radiant Group of Hospitals despite the facility having satellite clinics.

The design of data collection, using observation, was another limiting factor since not all clients followed the conventional process, depending on their condition and the service

they were seeking for at the facility. This limited the researcher to only clients who followed the more conventional process of seeking services. Moreover, observing time spent and logging them down as a researcher rather than requesting the different healthcare workers to do the same was a rigorous process necessitating doing observation in clusters rather than in a continuous method.

The sample size of the study was limited to 80 due to the rigorous process of observation and administering the questionnaire. This, in comparison to the total population that seeks healthcare services is a small sample, affecting the generalizability of the research findings.

5.6 Suggestions for Future Research

The research was designed to study the relationship between multiphase queuing systems and service quality. The study was however undertaken in one sector, the healthcare sector. There exists the opportunity of conducting the research on other sectors for example the hospitality industry.

The respondents for this study were clustered mostly amongst high school and diploma level graduates and did not get views from the more elite group of society. Moreover, the facility the research was conducted in is considered as a medium volume private facility. There, then, remains the potential to explore the responses of the more elite group of society in order to determine if their responses would be similar and also that of conducting the research in high volume healthcare facilities.

Finally, the research was based in Nairobi, where is a large concentration of healthcare facilities. Opportunity therefore also exists to conduct the study in regions of Kenya where healthcare services are highly constrained. This would create a contrasting scenario to the study thereby enhancing the body of knowledge.

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APPENDICES

APPENDIX I: LETTER OF INTRODUCTION

UNIVERSITY OF NAIROBI
SCHOOL OF BUSINESS
MBA PROGRAMME

Telephone: 020-2059162 Telegrams: "Varsity", Nairobi Telex:　　22095 Varsity	P.O. Box 30197 Nairobi, Kenya

DATE....2/9/14..........

TO WHOM IT MAY CONCERN

The bearer of this letter ....Kubo - Maina Agnes Kuvuna..............

Registration No......D61/60918/2013.....................................

is a bona fide continuing student in the Master of Business Administration (MBA) degree program in this University.

He/she is required to submit as part of his/her coursework assessment a research project report on a management problem. We would like the students to do their projects on real problems affecting firms in Kenya. We would, therefore, appreciate your assistance to enable him/her collect data in your organization.

The results of the report will be used solely for academic purposes and a copy of the same will be availed to the interviewed organizations on request.

Thank you.

PATRICK NYABUTO
MBA ADMINISTRATOR
SCHOOL OF BUSINESS

APPENDIX II: QUESTIONNAIRE

EFFECT OF MULTIPHASE QUEUING SYSTEMS ON SERVICE QUALITY AT RADIANT GROUP OF HOSPITALS

Dear respondent

This questionnaire is designed to collect information on the effect of multiphase queuing systems on service quality at Radiant Group of Hospitals.

It is divided into two major sections; a service time log that will be filled in by the researcher through observation and a questionnaire that will be filled in by the respondent at the pharmacy before exiting the facility.

The information obtained will only be used for academic purpose and shall be treated in confidence.

Your participation in facilitating the study is highly appreciated.

PART I: Service Time Log

Kindly allow the time taken at each service delivery point to be observed and recorded by the researcher.

	Service Delivery Point	**Time in**	**Time Out**
1	Registration		
2	Triage		
3	Consultation		
4	Laboratory		
5	Pharmacy		
6	Any other (please specify)		

PART II: Demographic Data: (Please tick where appropriate)

Gender   Male ( )   Female ( )

Age of client

                              Below 20   ( )

                              20 – 40   ( )

                              41 – 60   ( )

                              61 & above   ( )

How often do you interact with this facility?

                              Daily   ( )
                              Weekly   ( )
                              Monthly   ( )
                              Occasionally   ( )

Highest level of education

                              High school   ( )
                              Diploma level   ( )
                              Bachelor Degree   ( )

                              Master's Degree   ( )

                              PhD Degree   ( )

Mode of Payment

                              Cash   ( )
                              Credit (insurance)   ( )
                              NHIF   ( )

How long have you interacted with this facility?

                              Less than 1 year   ( )
                              1-5 years   ( )
                              Above 5 years   ( )

PART III: Customer Perception of Service Quality

Please tick appropriately in the spaces provided to signify the extent to which you: 1-Strongly Disagree, 2-Disagree, 3-Not Sure, 4-Agree, 5-Strongly Agree with the following statements:

Focus on Tangibles

Statement related to physical facilities, equipment and appearance of personnel	1	2	3	4	5
1. Hospital equipment is up to date	( )	( )	( )	( )	( )
2. Physical facilities are visually appealing	( )	( )	( )	( )	( )
3. Information signs and communication material are visually appealing and easy to understand	( )	( )	( )	( )	( )
4. Staff are professionally dressed and appear neat	( )	( )	( )	( )	( )

Focus on Reliability

Statement related to ability to perform the promised service dependably and accurately	1	2	3	4	5
1. Promises to customers are fulfilled in the agreed time frame	( )	( )	( )	( )	( )
2. Services are provided without mistakes	( )	( )	( )	( )	( )
3. Staff show sincere effort to solve customer problems	( )	( )	( )	( )	( )

Focus on Responsiveness

Statement related to willingness to help customers and provide prompt service	1	2	3	4	5
1. Staff are prompt in attending to customer requests	( )	( )	( )	( )	( )
2. Staff are willing to help	( )	( )	( )	( )	( )
3. Staff provide customers with necessary information to make decisions	( )	( )	( )	( )	( )

		1	2	3	4	5
4.	Staff are willing to handle customer complaints	( )	( )	( )	( )	( )
5.	Staff are willing to provide solutions	( )	( )	( )	( )	( )

Focus on Assurance

Statement related to (including competence, courtesy, credibility and security) knowledge and courtesy of employees and their ability to inspire trust and confidence		1	2	3	4	5
1.	Staff behavior raises confidence	( )	( )	( )	( )	( )
2.	Staff are competent and able to answer questions	( )	( )	( )	( )	( )
3.	Staff are courteous and respectful	( )	( )	( )	( )	( )
4.	Staff are honest	( )	( )	( )	( )	( )
5.	Safety and security of customers is assured when dealing with staff	( )	( )	( )	( )	( )

Focus on Empathy

Statement related to (including access, communication, understanding the customer) caring and individualized attention that the firm provides to its customer		1	2	3	4	5
1.	Staff understand customers particular needs	( )	( )	( )	( )	( )
2.	Staff give customers individualized attention	( )	( )	( )	( )	( )
3.	Staff provide timely and clear communication	( )	( )	( )	( )	( )
4.	Staff give priority to what is best for customers in communication and service	( )	( )	( )	( )	( )
5.	Staff apologize when mistakes occur	( )	( )	( )	( )	( )

Thank you for your participation.