SUBCONTRACTOR SELECTION IN TELECOMMUNICATIONS INDUSTRY: A CASE STUDY OF NOKIA SIEMENS NETWORKS IN KENYA

BY:

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A MANAGEMENT RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION (MBA) SCHOOL OF BUSINESS

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DECLARATION

This research project is my original work and has not been presented for award of degree in any other university.

Signed ..... Date 08/11/2012

Dawo George Oscar Odongo

This research project has been submitted for examination with my approval as the University Supervisor.

Signature:..... Date:8/11/2012

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ACKNOWLEDGEMENTS

First, I want to acknowledge the support and guidance of my University supervisor Mr Michael Chirchir and all teachers who have added great value to my life through impartation of knowledge and skills.

I am also grateful to my friend John Tanui for always being available for consultation and giving suggestions, Joseph Akaka for his contribution. I thank my vicar, Ven. Canon Joel Awili for his encouragement, spiritual support and prayers.

A special appreciation goes to my employer Nokia Siemens Networks for supporting my MBA program and giving me a chance to offer my skills in enriching life through communication.

I am deeply grateful to my family, above all my wife Rose and children, Joy Esther and John Mark for their encouragement, support and patience, especially when I had to work at wee hours. A special appreciation goes to my parents and siblings for giving all they could to see that I get the best education and grow in the fear of God.

Finally, I thank Almighty God for His divine favour and grace and for the gift and joy of life.

DEDICATION

This research project report is dedicated to my beloved wife, Rose and children, Joy Esther and John Mark, the most special people in my life. Their love and moral support during my MBA program at the University of Nairobi enabled me to come this far.

ABSTRACT

The overall purpose of the study was to evaluate subcontractor selection in telecommunications industry with three specific objectives. The first specific objective of the study was to determine factors considered during the selection process in NSN Kenya. The second objective was to determine methods used in the selection of the subcontractor by NSN Kenya and finally, the third objective was to establish the challenges faced by NSN Kenya during the subcontractor selection process. Primary data was collected using structured questionnaires.

The results of the study showed that the factors considered during subcontractor selection are subcontractor's performance, its ability to deliver, the contractual terms and its reliability and delivery quality during the selection process. In the method used found out that there is no specific method used by NSN Kenya. This study recommended that the telecommunications industry adopts a specific method among the recommended ones for proper benchmarking. The study found out that NSN Kenya faced challenges in obtaining subcontractor internal knowledge, delivery assurance and knowledge on subcontractor responsiveness. It is recommended in this study that telecoms industry address these challenges. The methods used by NSN Kenya as found in the study were AHP and CBA. The limitation of this study is that it focused on one telecommunication vendor in Kenya with a population of fifty respondents. This study recommends a similar study to be done in other existing vendors within Kenya and other countries with a larger population.

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LIST OF ABBREVIATIONS:

AE:	Achieving Excellence
AHP:	Analytical Hierarchy Process
ANP:	Analytical Network Planning
BTS:	Base Transceiver Systems
CBA:	Cost Benefit Analysis
CCK:	Communications Commission of Kenya
CEM:	Customer Experience Management
CSDB:	Customer Subscriber Database
DEA:	Data Envelopment Analysis
ICT :	Information and Communication Technology
IT:	Information Technology
MSS:	Mobile Switching Center Server
NSN:	Nokia Siemens Networks
PPM:	Parts Per Million
RATER:	Reliability, Assurance, Tangibles, Empathy, Responsiveness
RFI:	Request for Information

RFP:	Request for Proposal
RfQ:	Request for Proposal
SPSS:	Statistical Packages for Social Sciences
ZTE:	Zhongxing Telecommunication Equipment Corporation (formerly)

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CHAPTER ONE: INTRODUCTION

1.1 Background of Study

The advantages for outsourcing in telecommunication mobile operators are immense and the end-users are making large investments to implement it. With the evolution of the complex networks, the number of vendors that supply the telecommunication mobile operators with equipment and services have increased. New forces have emerged in the market to supply the traditionally well positioned vendors (Dell'Oro Group, 2010). Telecommunication operators are companies which provide services to the end-user mobile subscribers such as voice and data calls. These companies contract vendors who provide them with equipment and services who are referred to as vendors. Once the vendors get contracted by the telecommunication operators, these vendors outsource some of the services and products to other suppliers who are referred to as subcontractors.

Given that mobile telecommunication vendors are part of the wide and complex world of ICT, vendor availability is key to enhancing outsourcing in telecommunications operators (Kini, 2007). Vendors have also partnered with the other firms to increase their chances of increased market share in the operator networks. A need has risen for vendors to enhance their strategy to present their products and services to the operators for open offer and competitive bids. In Kenya, telecommunication sector currently supports 28.6 million mobile subscribers through the operators (CCK, 2012). With such a large number of subscribers and given the challenges of managing large number of vendors, the

operators have classified the vendors into major and minor vendors (Dell'Oro, 2010). Vendors have also developed an internal model to partner with other suppliers in an effort to be classified under major vendors (Kumar and Roy, 2012).

In Kenya, the key vendors in the telecommunications mobile industry are Ericsson, Huawei, Nokia Siemens Networks, ZTE and Alcatel Lucent (Dell'Oro, 2010). Apart from providing supplies to the local operators with equipment and services, these vendors are also global suppliers. The telecommunications mobile operators supplied with equipment and services by the vendors are Safaricom, Airtel Kenya, Orange Telkom and Essar Telecomms (CCK, 2012). To gain competitive advantage, the vendors have developed different internal outsourcing models. The models differ from one vendor to another. An example of models include modeled functional block systems in field bus technology (Kaghazchi, *et al*, 2007).

1.1.1 Factors Considered in Subcontractor Selection

Interdependencies of factors identified in the Analytical Network Process (ANP) approach are categorized into determinants, dimensions and enablers (Jharkharia and Shankar, 2007). Determinants identified in the study are compatibility, cost, quality and reputation. These determinants are related to four dimensions, namely, Long-Term Relationship, Operational Performance, Financial Performance and Risk Management. In making the decisions, initial screening is first done followed by final selection based on ANP. Each dimension in this model is separately supported by some enablers. Long-Term Relationship dimension is supported by performance measurement, willingness to use logistics manpower, flexibility in billing and payment, quality of management and

information sharing. Operational Performance dimension is supported by IT (Information Technology) capability, size and quality of fixed assets, experience in similar products, delivery performance and employee satisfaction level. Financial Performance dimension is supported by market share, range of services provided, geographic spread and access to retailers. Enablers for Risk Management are surge capacity, clause for arbitration and escape, and flexibility in operations and delivery.

Seven factors are listed during vendor selection while using Analytical Hierarchy Process (AHP) by Srdjevic, *et al*, (2005). The factors are net price, delivery, quality, production facility, technical capability, management and organization and geographical location. Six top ranked factors were quality, delivery, performance history, warranties, claim process and price. AHP determines the preferences among a set of alternatives by employing pair-wise comparisons of the hierarchy elements at all levels, following the rule that, at given hierarchy level, elements are compared with respect to the elements in the higher level by using a scale.

Bello (2003), presents a comparative evaluation of supplier selection processes in different corporate environments using a multiple exploratory case study approach and the ISO 9000 standards. In this study, ten factors are considered namely, consistent superior product and service; ease of billing and payment; effective methods of communication; quick conflict resolution; financial stability; consistent cost-effective prices; little or no receiving issues; environmental friendly; technological advances and reliable delivery schedules. The supplier performance is measured by five AE criteria. These are quality PPM (Parts Per Million), delivery PPM, wavelength, technical and cost

management. The suppliers are then categorized according to their achievements into four categories: Partner, Key, Approved and Conditional.

Supplier selection factors are also done by multi-criteria decision making involving five criteria and seventeen sub-criteria (Liu, 2006). The factors considered are compliance with due time, compliance with quality, incoming failure rate, reliability, product quality, product line compliant rate, cost down ratio, price, offer lowest prices, transport costs, exchange rate, financial position, profitability, long-term relational, development, tight relationship, open communication and reputation.

Ability to participate in an e-auction and related information security have been identified as additional factors in vendor selection (Hartley *et al.*, 2006). The case study examines factors that may prevent a buying organization from initially deciding to adopt e-auction implementation. Lack of e-auction knowledge and information security is perceived to be less of a barrier to e-auction adoption by adopters compared to non-adopters of e-auctions. On the other hand, importance of supplier relationships and lack of supplier participation are considered as barrier to e-auction use.

1.1.2 Challenges of Subcontractor Selection

The services required are highly specialized which makes the targeted subcontractor to be either global or local. There is reluctance in outsourcing global service subcontractors due to complications in ramping up resources and equipment from abroad. Main challenges faced in global subcontractors are the lead time to provide the necessary equipment and services. To overcome this challenge, some global equipment vendors have established offices in Kenya. This reduces the lead time and therefore provide

competitive advantage over other vendors without similar establishment (Räisänen, 2003).To provide adequate and timely response to RfQs (Requests for Quotation) floated by the operators, vendors have to enter into agreement with their subcontractors in advance. The vendors sign exclusive supply contracts with the operators and are expected to fulfill the RfQ requirements. A procurement departments is formed to handle subcontractor selection. This increases the head-count and the overheads that companies are under pressure to reduce (Pollitt, 1998). The department must therefore be capable of adding value to the company.

Another challenge faced by the vendor is getting the correct subcontractor. This is because the actual proof of vendors' ability to the operator lies in the delivery of a similar project elsewhere. This requirement disqualifies vendors who do not have the required experience (Ojiako and Maguire, 2008). However, this does not mean that the vendors are not capable of delivering the service. Therefore, the challenge becomes the vast number of subcontractors and the ability to select the ones who provide the expected quality of goods and services. Internal outsourcing organization transformation has been adopted to improve this sector. Instead of the traditional manual systems, the use of information systems technology has been introduced to assist in the selection of vendors (Ballow, 1999).

1.1.3 Nokia Siemens Networks, Kenya

Nokia Siemens Networks (NSN) B.V. (*Besloten Vennootschap,* a type of a limited company) is a multinational data networking and telecommunications equipment vendor headquartered in Espoo, Finland and a joint venture between Nokia of Finland and

Siemens of Germany. It is the world's fourth-largest telecoms equipment manufacturer measured by 2011 revenues (after Ericsson, Huawei and Alcatel-Lucent) (Reuters, 2012). NSN has operations in around 150 countries worldwide [Nokia Siemens Networks Factsheet, 2007]. The company was created as the result of a joint venture between Siemens Communications division (minus its Enterprise business unit) and Nokia's Network Business Group. The formation of the company was publicly announced on 19 June 2006. Nokia Siemens Networks was officially launched at the 3GSM World Congress in Barcelona in February 2007. NSN then began full operations on 1 April 2007 (Nokia Press Release, 2007) and has its headquarters in Espoo, Greater Helsinki, Finland.

NSN has about 73,000 employees including the employees from its acquisition, Motorola Net. Most of those employees work in one of the six central hubs around the world, including: Espoo in Finland, Munich in Germany, Wrocław in Poland, Chennai and Bangalore in India, Guangdong in China and Lisbon in Portugal. Its major manufacturing sites are in Chennai in India, China, Oulu in Finland and in Berlin, Germany (Nokia Siemens Press Release, 2008). About a quarter of the world's population are connected everyday using NSN infrastructure (Nokia Siemens Company Profile, 2012). The customer base of NSN includes 1,400 customers in over 150 countries (including more than 600 operator customers). Combined 2010 revenues exceed € 12.7 billion, making the company one of the largest telecommunication equipment makers in the world (Reuters, 2012).

NSN has set up an operational base in Africa with headquarters in Nairobi. There are about 350 employees in three offices located in Nairobi. These office locations are

Nairobi Business Park, Ngong Road; The Citadel, Muthithi Road and Wilson Business Park, Wilson Airport. The operators supplied by NSN in Kenya are Safaricom Kenya Limited and Airtel Limited. The solutions supplied to the operators are BTS (Base Transceiver Systems), MSS (Mobile Switching Center Server), Microwave solution, CSDB (Customer Subscriber Database) and CEM (Customer Experience Management). In providing these solutions, NSN is contracted to provide an end-to end solution to the operator which consists of supply of the hardware (equipment) and provision of related services. To supply the hardware which is manufactured outside Kenya, NSN enters into a contract with the operator on the terms of supply within the Inco Terms 2010. Related services are provided by the local office are project management, installation and commissioning, testing and integration and after sales support. Supply of installation materials such as cables is also done locally.

To provide the services to both operators, NSN selects a set of subcontractors to provide installation materials as well as provide installation services. It has an established regional office for procurement and logistics based in Nairobi Business Park that has about 50 staff. The procurement department is tasked with ensuring that the right subcontractor is selected for a given task. An RfQ (Request for Quotation) is advertised in the media and responses from the subcontractors are received and evaluated. The exact number of subcontractors is not known but about 50 subcontractors respond to every RfQ. Out of this number, only two or three are selected after considering several factors. It is the factors considered in the selection process by NSN that is the subject of this case study.

1.2 Statement of the Problem

The field of telecommunications is wide and requires a large number of subcontractors to satisfy products and services requirement. Due to high demand by operators to expand, the number of subcontractors has increased exponentially. Kini (2007) observed that this led vendors to adopt ways to select subcontractors who suit their needs. To establish their strength, the vendors developed their own products and services and also partnered with other third party suppliers to provide the required services.

A fast and efficient method is required in order to satisfy the fast-changing mobile industry with suitable products and services. An established pre-qualification process and effective management is required in order to obtain the required results. The requirement for a reliable subcontractor among the many that exist in the market has increased the need to analyze and research this topic. Also, one subcontractor can offer different services to different vendors depending on its capacity. When the outsourcing decision is made, the vendor aims to select a subcontractor who will provide solutions that are in line with its strategy.

One of the most important aspects of the modern business environment is the subcontractor selection process. In the last couple of decades there has been a phenomenal change in the structure of the manufacturing process. This, Bello (2003) notes that it was because not long ago companies used to manufacture parts of the supply chain themselves. However, now hardly any company manufactured the entire range of products used in the manufacturing of their final product. There are many different reasons for this new trend. Da Silva, *et al*, (2007) found out that the complexity of the

new business environment made it near impossible to engage in the manufacturing of different parts.

No study was known to the writer about subcontractor selection in the telecommunications industry in Kenya. However, previous studies by Moenga (2011), Onyango (2011) and Otila (2011) focused on small scale tea farming, cement and cosmetic industries respectively in Kenya. Therefore, this study aimed at answering the following questions within the telecommunications industry: What factors were considered in the selection of subcontractors by NSN Kenya? Did NSN Kenya have an established method for selecting subcontractors? Given the large number of subcontractors in the market, what challenges did NSN Kenya face in selecting the subcontractors?

1.3 Specific Research Objectives

To answer these questions, the study sought to evaluate subcontractor selection by telecommunications service provider specifically to:

i) Determine the factors that influences the selection of subcontractors in NSN, Kenya.

ii) Determine methods adopted by NSN Kenya to select subcontractors.

iii) Establish the challenges faced by NSN Kenya in subcontractor selection.

1.4 Value of the study

The results of the study would be of great importance to NSN Kenya to enable it to know the factors that determined its subcontractor selection and improve or maintain them. The results would be a valuable input to supply chain departments in the companies within the same industry during subcontractor selection process. The factors, methods and challenges found out in the findings would be used to optimize the selection process. Also supply chain departments for other industries would since subcontractor selection is not a preserve of telecommunications company. The study was also to contribute more knowledge to the already existing literature on in the field of subcontractor selection and thus help students and other researchers in their related studies.

2 LITERATURE REVIEW

2.1 Introduction

This study concerned three important concepts: methods, factors and challenges in subcontractor methods . First the literature on the subcontractor selection strategies was discussed then methods for subcontractor selection was analyzed. The literature on the concepts of the challenges faced during subcontractor selection were also discussed. Finally, a conceptual framework was developed.

Empirical research from the numerous studies illustrated different models had been developed to consider factors used in selecting subcontractors. Different factors were considered under different environments. AHP, ANP and CBA had been used to determine the factors that determined subcontractor selection. It had also been shown that in a project life cycle, procurement consumed a shorter time compared to other phases such as planning, design and construction. However, it was the key phase in which the cost of the project was determined. According to a report from Gartner (2004), 70% of enterprises was projected to outsource their operations using more than three sources for service delivery in key areas by 2005. As the number of sources required to fulfill enterprise demand increased, Gartner observed comparable effort in most enterprises push to create organizational structures, apply necessary management resources and implement processes to manage this environment. Gartner recommended that enterprises quantified the value lost due to poor multi-sourced management practices, identified where gaps existed in their own management, gained executive commitment to change, and developed a structure to manage relationships.

2.2 Subcontractor Selection Strategies

A review of existing literature was done to establish the selection strategies. The subcontractor network was not only a supplier network but also an infrastructure network. It extended to all parts of the organizations and thus acted an enabler of innovation and creativity. Rinehart (2006) found out that the new advances in lean manufacturing techniques had completely revolutionized the attitude towards manufacturing and relationships with subcontractors. Katz (1991) further contends that the organizations under these strategies used more than one subcontractor to increase the output from their business activities and to tackle complexities of the business environment. A case sudy by Da Silva, *et al* (2007) found out that the idea of subcontractor selection strategy supported the argument that in order to really follow organization vision, mission and strategies which stemmed from the two, an organization had to be totally independent to choose the solutions and subcontractors which best meet their environment.

Enck and Blacharski (1997) found out that the organization service provision was limited by the capabilities of its subcontractor. In a continuously evolving business environment, continuous improvement was required. The organization had to continue offering to its customer better products which fulfilled their diverse needs. The subcontractor selection process of an organization in this regard had the freedom of choice. The business environment with subcontracting was becoming increasingly diverse. A study by Chad and Money, 2010 found out that a vendor could often avoid substantial damage to

customer satisfaction by establishing a priori, formal backend partnerships with the subcontractors.

Katz (1991) observes that the flexibility of businesses in the modern environment was the key to innovation. In any open business environment, the business continued to evolve relentlessly. Organizations therefore continued to evolve their businesses as well. As most integral components were outsourced, the business sometimes limited itself due to slow growth or lack of innovations of its subcontractors. Therefore it was imperative that business did not allow lack of growth in subcontractors to block their innovation and flexibility. However, the increased emphasis on customization made it near impossible to rely totally on a single subcontractor all the time. The selection of subcontractors was therefore a continuous process to enable a vendor to keep abreast with innovation. Thus Katz (1991) concluded that a subcontractor selection strategy was required to enhance innovation and flexibility.

Kiini (2007) observed that selection of a subcontractor introduced risk in the entire business environment. In addition, in the case study by Kiini (2007) on subcontractor availability in ICT (Information and Communications Technology) industry he observed that the ICT companies outsourced subcontractor and had categorized them as dominant and back-up. The subcontractor availability was key to selection of subcontractors. In the competitive business environment the service quality was one of the most important elements of doing business. Pulakos (2009) in using the RATER model developed by Zeitham *et al* (1992), defined five factors which businesses would consider an important in assessing the service quality of their vendors:

Reliability basically checked the dependability and accuracy of the service. The accuracy here was the meeting of customer demand (which was the organizations as it was a business to business model). The service had to meet the contract made between the two parties. If the subcontractor did not follow the agreement exactly it would cause reliability concerns with the organization. The reliability concerns could be also timeliness of the service. Assurance dealt with the relationship with subcontractor as very integral in terms of service quality. If this relationship was not based on mutual trust and understanding, the end product suffered. The dealing of subcontractor's employees with the organization could set perceptions about assurance. This would basically measure perceptions and expectations of service. The subcontractor scored low with base relationship management with the organizations and other factors which had negative influence on its image.

Tangibles included machinery used or offered by subcontractor that were in top notch conditions. There would be no delays because of old or faulty machinery. Specifically for services, the quality of tangibles being used for solutions were required to be in good conditions. Empathy required a subcontractor to be caring towards the customer and develop a positive image of the service being provided. The customer was kept in touch constantly and be informed of any updates. Responsiveness required that subcontractor to be willing to help customers, provide prompt service and solve problems.

2.3 Subcontractor Selection Methods

This section outlines subcontractor selection processes that existed in established literature. Three subcontractor selection methods were found in the literature, that is,

AHP, ANP and CBA. It was also noted that there were firms which did not practice these methods precisely but used a combination of two or all of the process.

2.3.1 Analytical Hierarchy Process (AHP)

AHP has been used to select subcontractors in a number of companies. Kumar and Roy (2011) used this concept to analyze and rank the factors considered in subcontractor selection in transmission company . AHP based model, described in this work, studied the requirements of customers to select suitable vendors for ordering required components and materials for customers. The factors considered were percentage of rejected parts, delay time, unit cost and quality of service. The factors were then compared from a common scale and then synthesized to obtain the priorities. These priorities were then multiplied by weights to get the overall priority of each alternative vendor as shown in Appendix 3. Using quantitative analysis, quality was found to be more important than both service and delay time in that order. Delay time was found to be more important than unit cost as well as service and cost was more important than service. The subcontractor with the maximum weight was selected.

However, the AHP method had been improved to by adding DEA (Data Envelopment Analysis) using quantitative approach. Whereas AHP method compared two factors at a time, DEA continued to assess the productivity of an organization with multiple incomparable inputs and outputs. DEA was a linear programming based technique for measuring the relative efficiency of organizational units. It produced a single score for each unit which makes comparison easy. DEA accommodated multiple inputs and multiple outputs. In contrast to regression methods, DEA focused on individual

observations and optimized the performance measure of each unit. A priori knowledge of weights or prices for inputs and outputs was not required in DEA; however, managerial judgment could be accommodated when desired (Sevkli, *et al*, 2006).

2.3.2 Analytical Network Process (ANP)

The limitation of AHP method was the assumption that there is interdependency among the factors. ANP considered interdependencies among the factors and allowed a more systematic analysis (Jharkhariaa and Shankar, 2007) as shown in Appendix 4. ANP method was more generalized without making assumptions. The factors considered were both subjective and objective. There was initial screening of the subcontractors before ANP was applied. Eight-point plan of selection of subcontractor was outlined: The points in the plan were (i) define or specify the service, (ii) understand the volume bought, (iii) simplify and standardize, (iv) market survey, (v) request for information, (vi) request for proposal, (vii) negotiations, and (viii) contracting. The methodology started with developing a team of competitive managers (this was important for initial screening and making the final judgement). Secondly, service and distribution of objectives was defined. Thirdly, distribution and functional specifications were developed. Fourthly, potential subcontractors were identified. Development and evaluation of RFI (Request For Information) which lead to RFP (Request for Proposal) development. The responses for RFP were evaluated, sites visited and inspected and finally, selection was done and the scope agreed.

2.3.3 Cost Benefit Analysis (CBA)

CBA selection method considered the effort and cost incurred by a company in preparation, floating a bid and the entire bidding process (Ng and Skitmore, 2001). To reduce the costs associated with bidding, vendors adopted prequalification method based on financial, technical, managerial and resources capabilities. The emphasis in this method was the need to ensure that subcontractor pre-qualification process was efficient in its costs of operation. It was expected that the benefits gained from improved prequalification decisions exceeded the costs involved. CBA was a decision criterion that provided maximum amount of benefit or satisfaction, after considering the costs. Different alternatives were weighed based on costs and benefits and the one with the highest net benefit was one selected. However, a conflict would arise when there was a difference in the scale of operation. Ng and Sktmore (2011) found out that decision makers prequalified subcontractors based on decision criteria that had significant benefits to the decision process but with minimal costs to those involved. Cost–benefit analysis, therefore, assisted decision makers in establishing a set of cost-effective decision criteria for subcontractor prequalification.

2.4 Theoretical Framework

The review of literature indicated that there was a relationship between the factors and subcontractor selection. A mobile operator floated a bid to the vendors. Upon receiving the tender documents, NSN as a vendor, in turn prepared bid documents with the relevant services to the subcontractors. In general, there was relationship between NSN and subcontractors in order to float the tender to them. A classification of subcontractors was

required in order to group the subcontractors by their functions. The grouping of subcontractors could be in terms of services offered and materials.

The essence of the whole procurement process was to select a suitable subcontractor. The selection was done by evaluating the suitability of the subcontractors based on a number of factors. In this conceptual framework, the factors are the presumed cause for subcontractor selection. Therefore, factors considered in subcontractor selection are the independent variables. These factors could be affected by the subcontractor having contracts with similar companies and the subcontracting company ownership and the conflict of interest, which in this framework are the intervening variables. Factors considered during the selection process leads to subcontractor selection. Therefore, ultimate aim of the selection process is subcontractor selection which is the dependable variable. The relationship between these variables are shown in Fig. 1.

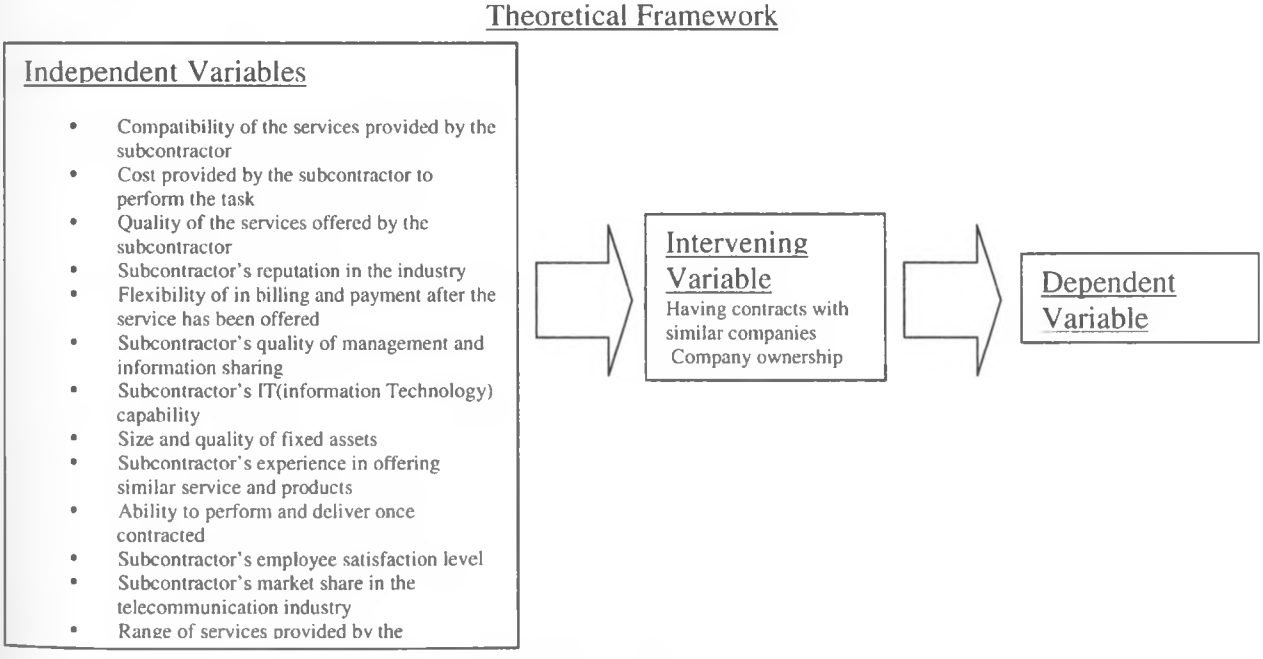


Fig. 1. Theoretical Framework of Subcontractor Selection (Source: Own Compilation)

RESEARCH METHODOLOGY

3.1 Introduction

This section briefly discusses the research design, data collection, and data analysis and presentation techniques. It sets out research design in the first section, data collection method in the second section and finally data analysis and presentation in the last section.

3.2 Research Design

A case study design was adopted for this research so as to effectively realise the objectives of the study. The study concerned one organisation namely Nokia Siemens Networks. This study applied the exploratory research design to find out the factors methods and challenges considered in subcontractor selection in a telecommunication vendor (NSN, Kenya). The studies by Wanjau et al (2012) also used case study designs and their findings confirmed that the specific research objectives were adequately met.

3.3 Population

In this study, the population included all the persons involved in logistics within NSN Kenya. They were cost and progress managers, technical implementation managers, account managers, logistics engineers, field engineers, and procurement managers. A total of 50 persons formed the population of the study. Due to the relatively small size of the population, a census was carried out.

3.4 Data Collection

Research data was collected through a structured questionnaire. The questionnaire was divided into four parts. Part A consisted of general information, Part B sought

information on the possible factors under study, Part C sought to identify the method used by NSN Kenya in subcontractor selection and Part D found out the challenges faced during subcontractor selection. A five point Likert scale was used in Part B, Part C and Part D to help managers rate each of the variables on their role in subcontractor selection process from a high of (5) to a least of (1). The questionnaires were dispatched using the "drop and pick" method because this ensured a high response rate. No assistance was provided as all the respondents answered the questionnaire.

3.5 Data Analysis

The quantitative data collected was analysed using descriptive statistics. Factor analysis was used to determine the factors while correlation analysis will establish the relationship between the factors.

4 DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

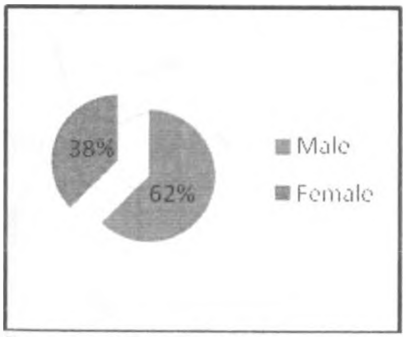
In this chapter data pertaining to the factors, methods and challenges considered in subcontractor selection in telecommunication industry is analyzed and interpreted. Each specific objective was analyzed separately.

Of the 50 questionnaires distributed for this research, 48 useable questionnaires were returned giving a response rate of 96 percent, which was considered satisfactory for subsequent analysis.

4.1.1 Gender

The respondents were asked to indicate their gender. From the research findings, it was established that 62 percent were male while 38 percent were female as shown in chart 4.1.1. This shows that most respondents were male.

Chart 4.1.1 Gender

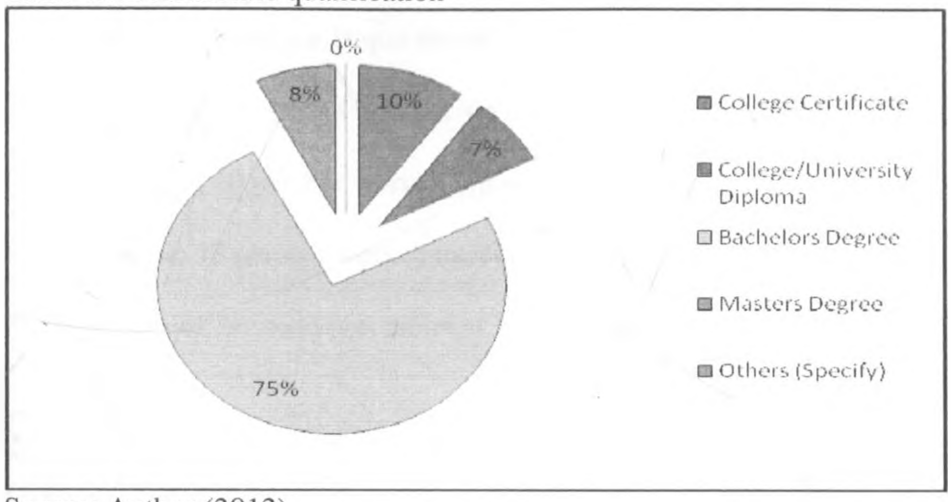


Source: Author (2012)

4.1.2 Academic Qualification

The respondents were asked to indicate their academic qualification. From the study, it was established that 10 percent of the respondents had college certificate, 7 percent had college/university diploma, 75 percent had bachelor's degree while 8 percent had masters degree. This implied that most employees had obtained Bachelor's degree.

Chart 4.1.2 Academic qualification

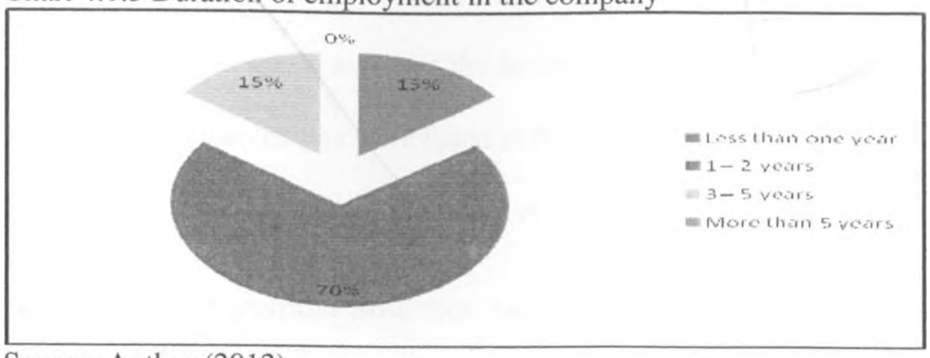


Source: Author (2012)

4.1.3 Duration of employment in the company

The researcher wanted to establish the duration respondents had worked in the company. From the research findings, it was established that 15 percent had worked between 3-5 years, 70.0 percent had worked between 1-2 years while 15 percent had worked between less than one year as shown in chart 4.1.6 below. This implied that most employees had relatively less experience in the telecommunication industry

Chart 4.1.3 Duration of employment in the company

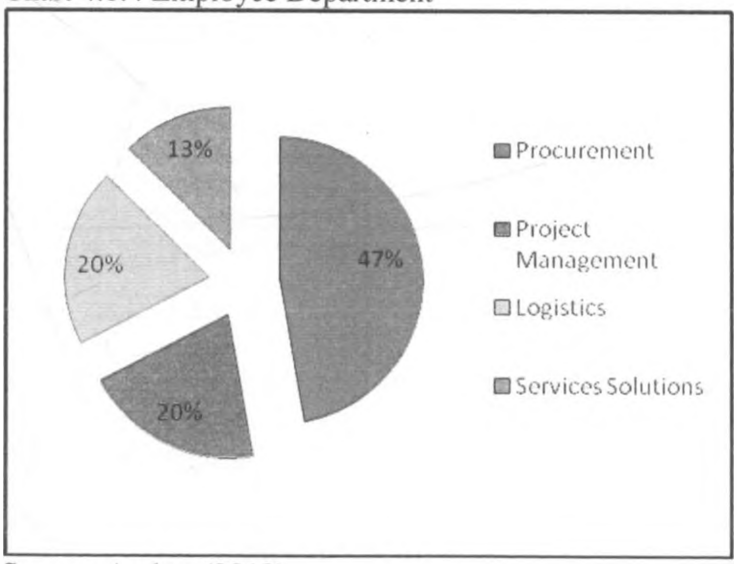


Source: Author (2012)

4.1.4 Employee Department

The respondent were asked the specific department they worked for. 47 percent worked in Procurement, 20 percent worked in project management, 20 percent worked in logistics while 13 percent worked in service solutions. This indicates that a good number of employees understood procurement.

Chart 4.1.4 Employee Department



Source: Author (2012)

4.2 Factors influencing the selection of subcontractors in NSN Kenya

The first objective was to ascertain the factors influencing subcontractor selection in NSN Kenya. Twenty two factors were listed in the questionnaire with ordinal scale from Very Important (1) , Neutral or Not Important at All (5).

4.2.1 Descriptive Statistics Data

The descriptive statistics data is contained in Table 4.2.1

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Compatibility of the services and products provided by the subcontractor	2.23	1.276	48
Cost provided by the subcontractor to perform the task	2.94	0.697	48
Quality of the services offered by the subcontractor	1.50	0.505	48
Subcontractor's reputation in the industry	2.31	0.468	48
Flexibility of in billing and payment after the service has been offered	1.98	0.601	48
Subcontractor's quality of management and information sharing	3.73	0.736	48
Subcontractor's IT(information Technology) capability	3.48	0.772	48
Size and and quality of fixed assets	3.27	0.917	48
Subcontractor's experience in offering similar service and products	2.52	1.010	48
Ability to perform and deliver once contracted	2.88	0.981	48
Subcontractor's employee satisfaction level	4.10	0.627	48
Subcontractor's market share in the telecommunication industry	2.94	0.633	48
Range of services provided by the subcontractor	4.10	0.627	48
Subcontractor's geographical presence	2.71	0.849	48
Flexibility in operations and delivery	1.67	0.476	48
Subcontractor's claim process	3.90	0.627	48
Subcontractor's ability to expand (surge capacity)	3.77	0.951	48
Subcontractor's clause on penalty, arbitration and escape	3.17	1.098	48
Effective methods of communication	3.46	0.898	48
Subcontracor is environmental friendy	3.19	0.915	48
Ability to participate in an e-aucton	3.71	0.988	48
Subcontractor's level of information security	3.52	1.091	48

Table 4.2.1 Descriptive statistics data for Selection Factors (Source: Author ,2012)

From table 4.2.1, the factors with highest mean score were Subcontractor's employee satisfaction level and Range of services provided by the subcontractor with a mean of 4.10 (Less important). The factor with lowest mean score was Quality of the services offered by the subcontractor with a mean of 1.50 (Very important).

4.2.2 Correlation Matrix

Since one of the goals of factor analysis is to obtain 'factors' that help explain these correlations, the variables must be related to each other for the factor model to be

appropriate. If the correlations between variables are small, it is unlikely that they share common factors. Table 4.2.2 of correlation matrix shows that seventy three coefficients are greater than 0.3 in absolute values (highlighted in the table), satisfying the requirement of factor analysis. This means that the analysis can proceed.

Correlation Matrix

		Compa	Cost	qulaity	Reputa	Bill Fle	MgtQu	IT	Size	Experi	Ability	Satisfa	Mrksh	ServRa	GeoPr	OpDel	Claims	ExpCa	PenAr	ComM	Enviro	E-Auc	ItSec
Correlation	Compat	1.000	0.136	0.578	-0.122	0.145	-0.204	0.318	-0.254	-0.161	-0.079	0.076	0.124	-0.270	-0.408	0.163	-0.182	0.360	-0.058	0.185	-0.001	-0.182	0.493
	Cost	0.136	1.000	0.393	0.452	0.149	-0.324	-0.418	-0.339	-0.043	-0.012	0.210	0.232	0.064	0.256	0.064	0.472	-0.054	0.014	-0.327	-0.382	0.158	0.016
	qulaity	0.578	0.393	1.000	-0.045	0.315	-0.257	0.136	-0.253	-0.271	-0.086	0.168	0.100	-0.101	-0.149	0.265	0.034	0.155	-0.192	0.188	-0.023	0.000	0.328
	Reputation	-0.122	0.452	-0.045	1.000	0.250	0.189	-0.541	-0.449	0.368	0.226	0.611	0.498	-0.113	0.501	-0.286	0.620	-0.075	-0.145	-0.601	0.009	0.339	-0.075
	Bill Flexi	0.145	0.149	0.315	0.250	1.000	-0.109	0.068	-0.105	-0.297	0.104	0.514	0.556	-0.051	0.321	0.495	0.333	0.029	-0.446	0.294	0.549	0.563	0.147
	MgtQuality	-0.204	-0.324	-0.257	0.189	-0.109	1.000	0.046	-0.173	0.480	0.630	0.201	0.054	-0.260	0.075	-0.627	0.076	-0.091	-0.390	-0.194	0.330	-0.140	-0.033
	IT	0.318	-0.418	0.136	-0.541	0.068	0.046	1.000	0.204	-0.190	-0.088	-0.369	-0.417	0.071	-0.367	0.154	-0.422	0.066	-0.347	0.659	0.171	-0.259	0.076
	Size	-0.254	-0.339	-0.253	-0.449	-0.105	-0.173	0.204	1.000	-0.500	-0.222	-0.605	-0.557	0.616	-0.088	0.016	-0.246	-0.464	-0.025	0.337	0.014	0.019	-0.442
	Experience	-0.161	-0.043	-0.271	0.368	-0.297	0.480	-0.190	-0.500	1.000	0.217	0.215	0.119	-0.188	-0.018	-0.560	0.054	-0.095	0.112	-0.433	-0.154	-0.271	-0.135
	Ability	-0.079	-0.012	-0.086	0.226	0.104	0.630	-0.088	-0.222	0.217	1.000	0.264	0.193	-0.082	0.160	-0.364	0.324	-0.123	-0.553	-0.344	0.216	-0.016	0.042
	Satisfaction	0.076	0.210	0.168	0.611	0.514	0.201	-0.369	-0.605	0.215	0.264	1.000	0.821	-0.569	0.338	0.119	0.461	0.255	-0.057	-0.313	0.448	0.325	0.292
	Mrkshare	0.124	0.232	0.100	0.498	0.556	0.054	-0.417	-0.557	0.119	0.193	0.821	1.000	-0.466	0.322	0.282	0.412	0.365	0.015	-0.248	0.499	0.447	0.325
	ServRang	-0.270	0.064	-0.101	-0.113	-0.051	-0.260	0.071	0.616	-0.188	-0.082	-0.569	-0.466	1.000	-0.062	-0.095	0.082	-0.637	-0.088	0.065	-0.369	-0.019	-0.547
	GeoPres	-0.408	0.256	-0.149	0.501	0.321	0.075	-0.367	-0.088	-0.018	0.160	0.338	0.322	-0.062	1.000	0.123	0.541	-0.032	-0.243	-0.211	0.236	0.581	-0.108
	OpDel	0.163	0.064	0.265	-0.286	0.495	-0.627	0.154	0.016	-0.560	-0.364	0.119	0.282	-0.095	0.123	1.000	-0.119	0.438	0.108	0.514	0.342	0.422	0.300
	Claims	-0.182	0.472	0.034	0.620	0.333	0.076	-0.422	-0.246	0.054	0.324	0.461	0.412	0.082	0.541	-0.119	1.000	-0.255	-0.221	-0.405	-0.039	0.156	-0.168
	ExpCap	0.360	-0.054	0.155	-0.075	0.029	-0.091	0.066	-0.464	-0.095	-0.123	0.255	0.365	-0.637	-0.032	0.438	-0.255	1.000	0.241	0.200	0.320	0.222	0.794
	PenArbi	-0.058	0.014	-0.192	-0.145	-0.446	-0.390	-0.347	-0.025	0.112	-0.553	-0.057	0.015	-0.088	-0.243	0.108	-0.221	0.241	1.000	-0.122	-0.328	-0.190	0.015
	ComMeth	0.185	-0.327	0.188	-0.601	0.294	-0.194	0.659	0.337	-0.433	-0.344	-0.313	-0.248	0.065	-0.211	0.514	-0.405	0.200	-0.122	1.000	0.385	0.058	0.099
	Environ	-0.001	-0.382	-0.023	0.009	0.549	0.330	0.171	0.014	-0.154	0.216	0.448	0.499	-0.369	0.236	0.342	-0.039	0.320	-0.328	0.385	1.000	0.485	0.262
	E-Auction	-0.182	0.158	0.000	0.339	0.563	-0.140	-0.259	0.019	-0.271	-0.016	0.325	0.447	-0.019	0.581	0.422	0.156	0.222	-0.190	0.058	0.485	1.000	0.203
	ItSec	0.493	0.016	0.328	-0.075	0.147	-0.033	0.076	-0.442	-0.135	0.042	0.292	0.325	-0.547	-0.108	0.300	-0.168	0.794	0.015	0.099	0.262	0.203	1.000

Table 4.2.2 Correlation Matrix for Selection Factors (Source: Author ,2012)

4.2.3 Significance Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA) and Bartlett's Test of Sphericity was used to perform the significance test. The results are shown in Table 4.2.3

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.608
Bartlett's Test of Sphericity	Approx. Chi-Square	856.044
	Degrees of Freedom	231
	P-value	0.000

Table 4.2.3 KMO and Bartlett's Test for Selection Factors (Own Source, 2012)

From Table 4.2.2, the overall MSA for the set of variables included in the analysis was 0.608, which exceeds the minimum requirement of 0.50 for overall MSA. The twenty two variables remaining in the analysis satisfied the criteria for appropriateness of factor analysis. In addition, factor analysis requires that the probability associated with Bartlett's Test of Sphericity should be less than the level of significance. From the data, the probability associated with the Bartlett test (p-value) is less than 0.001 in this test, which satisfied this requirement that there was a correlation between the variables. The next step was to determine the number of factors to be included in the factor solution.

4.2.4 Evaluating Communalities

Communalities represent the proportion of the variance in the original variables that is accounted for by the factor solution. The factor solution should explain at least half of each original variable's variance, so the communality value for each variable should be 0.50 or higher. The communalities for the data are provided in Table 4.2.4. All the communalities were higher than 0.5 and there was no further iteration.

Communalities

	Initial	Extraction
Compatibility of the services and products provided by the subcontractor	1.000	0.752
Cost provided by the subcontractor to perform the task	1.000	0.778
Quality of the services offered by the subcontractor	1.000	0.748
Subcontractor's reputation in the industry	1.000	0.775
Flexibility of in billing and payment after the service has been offered	1.000	0.818
Subcontractor's quality of management and information sharing	1.000	0.877
Subcontractor's IT(information Technology) capability	1.000	0.751
Size and and quality of fixed assets	1.000	0.809
Subcontractor's experience in offering similar service and products	1.000	0.654
Ability to perform and deliver once contracted	1.000	0.667
Subcontractor's employee satisfaction level	1.000	0.807
Subcontractor's market share in the telecommunication industry	1.000	0.803
Range of services provided by the subcontractor	1.000	0.764
Subcontractor's geographical presence	1.000	0.656
Flexibility in operations and delivery	1.000	0.837
Subcontractor's claim process	1.000	0.707
Subcontractor's ability to expand (surge capacity)	1.000	0.815
Subcontractor's clause on penalty, arbitration and escape	1.000	0.845
Effective methods of communication	1.000	0.775
Subcontracor is environmental friendy	1.000	0.882
Ability to participate in an e-aucton	1.000	0.724
Subcontractor's level of information security	1.000	0.693

Table 4.2.4 Communalities for Selection Factors (Source: Author ,2012)

4.2.5 Total Variance Explained

The variable loadings on the components are contained in Table 4.2.5. Successive components explain progressively smaller proportions of the total sample variance, and are all uncorrelated with each other. Total variance explained by each factor is listed in the column labeled eignevalue under total, % of variance and cumulative %. Eigenvalues are roots of determinant equations and are fundamental to much of multivariate analysis. They are used as measures of the variance explained by factors. A factor less than 1.00 was not used because it accounted for less than the variation explained by a single variable Factors considered accounted for 76.989% which is a relatively large portion of the variation in the variables.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	Variance	%	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.202	23.643	23.643	5.202	23.643	23.643	4.370	19.863	19.863
2	4.210	19.134	42.778	4.210	19.134	42.778	3.743	17.015	36.878
3	2.930	13.317	56.095	2.930	13.317	56.095	3.572	16.238	53.117
4	2.655	12.070	68.165	2.655	12.070	68.165	2.876	13.071	66.188
5	1.941	8.825	76.989	1.941	8.825	76.989	2.376	10.801	76.989
6	0.932	4.236	81.225						
7	0.730	3.320	84.545						
8	0.607	2.761	87.305						
9	0.500	2.272	89.577						
10	0.453	2.061	91.639						
11	0.334	1.520	93.158						
12	0.299	1.357	94.515						
13	0.261	1.185	95.700						
14	0.202	0.916	96.616						
15	0.159	0.722	97.337						
16	0.150	0.680	98.017						
17	0.125	0.569	98.587						
18	0.107	0.485	99.072						
19	0.072	0.328	99.400						
20	0.061	0.276	99.676						
21	0.045	0.204	99.881						
22	0.026	0.119	100.000						

Table 4.2.5 Total Variance Explained for Selection Factors (Source: Author ,2012)

4.2.6 Variable Loadings on Components

Rotation matrix shown in Table 4.2.6 was obtained after 7 iterations. Component 1 included seven variables, namely, Subcontractor's reputation in the industry, Subcontractor's IT(information Technology) capability, Subcontractor's employee satisfaction level, Subcontractor's market share in the telecommunication industry, Subcontractor's geographical presence, Subcontractor's claim process and Subcontractor's claim process. These factors indicate that NSN considers internal and external performance of subcontractors. Component 2 included six variables, namely, Flexibility of in billing and payment after the service has been offered, Subcontractor's experience in offering similar service and products, Subcontractor's employee satisfaction level, Subcontractor's market share in the telecommunication industry, Range of services provided by the subcontractor and Subcontractor's level of information security. These factors can be grouped as subcontractor's ability to deliver the services

and products. Component 3 included six variables, namely, Flexibility of in billing and payment after the service has been offered, Subcontractor's experience in offering similar service and products, Subcontractor's geographical presence, Flexibility in operations and delivery, Subcontracor is environmental friendy and Ability to participate in an e-aucton. These factors can be grouped as contractual and legal issues. Component 4 included three variables, namely, Subcontractor's quality of management and information sharing, Ability to perform and deliver once contracted and Flexibility in operations and delivery. These factors can be grouped as reliability and quality issues. Component 5 included three variables, namely, Compatibility of the services and products provided by the subcontractor, Cost provided by the subcontractor to perform the task and Quality of the services offered by the subcontractor. These factors can be considered to be other factors.

Rotated Component Matrix(a)

	Component				
	1	2	3	4	5
Compatibility of the services and products provided by the subcontractor	-0.212	0.374	-0.109	-0.029	0.745
Cost provided by the subcontractor to perform the task	0.679	-0.102	0.009	-0.235	0.501
Quality of the services offered by the subcontractor	0.010	0.127	0.108	-0.056	0.847
Subcontractor's reputation in the industry	0.835	0.097	0.112	0.231	-0.042
Flexibility of in billing and payment after the service has been offered	0.132	0.072	0.819	0.169	0.309
Subcontractor's quality of management and information sharing	-0.010	0.166	-0.167	0.845	-0.327
Subcontractor's IT(information Technology) capability	-0.782	-0.067	0.040	0.226	0.286
Size and and quality of fixed assets	-0.459	-0.693	0.169	-0.167	-0.246
Subcontractor's experience in offering similar service and products	0.321	0.240	-0.525	0.359	-0.299
Ability to perform and deliver once contracted	0.202	0.035	0.013	0.791	0.000
Subcontractor's employee satisfaction level	0.551	0.574	0.342	0.238	0.036
Subcontractor's market share in the telecommunication industry	0.508	0.584	0.445	0.074	0.009
Range of services provided by the subcontractor	-0.040	-0.864	0.003	-0.122	0.025
Subcontractor's geographical presence	0.524	-0.080	0.541	0.088	-0.272
Flexibility in operations and delivery	-0.217	0.212	0.649	-0.532	0.203
Subcontractor's claim process	0.743	-0.179	0.240	0.228	0.116
Subcontractor's ability to expand (surge capacity)	-0.173	0.837	0.133	-0.251	0.064
Subcontractor's clause on penalty, arbitration and escape	0.074	0.237	-0.382	-0.739	-0.304
Effective methods of communication	-0.754	-0.032	0.400	-0.133	0.166
Subcontracor is environmental friendy	-0.250	0.399	0.702	0.349	-0.213
Ability to participate in an e-aucton	0.243	0.101	0.784	-0.120	-0.159
Subcontractor's level of information security	-0.138	0.751	0.115	-0.067	0.303

Extraction Method: Principal Component Analysis.

a. Rotation converged in 7 iterations.

Table 4.2.6 Rotated Component matrix for Selection Factors (Source: Author ,2012)

4.3 Methods Used by NSN Kenya for Subcontractor Selection

The second objective sought to find out the methods NSN Kenya uses to select subcontractors. Nineteen factors were listed in the questionnaire with ordinal scale from Strongly Disagree (1) , Not sure or Strongly Agree (5). The enquiry about the method was done by way of asking questions related to a particular method.

4.3.1 Descriptive Statistics Data

The results obtained for description are in Table 4.3.1

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Do you study the requirements the Customer (Telecomm Operator) before you select subcontractors?	3.98	0.785	48
Do you list down the factors for subcontractor selection?	3.88	0.672	48
Do you compare the factors on a common scale to get the priorities?	4.50	0.744	48
Are these factors weighted to get the priority of each subcontractor?	4 44	0.769	48
Do you get the overall priority by mulitplying priorities by weights?	3.98	0.699	48
Do you select the subcontractor with the maximum weight?	4.15	0.583	48
Apart from comparison, do you select a subcontractor based on other multiple incomparable inputs and outputs?	3.92	0.710	48
Is managerial judgment used to select subcontractors?	2.63	0.815	48
Do you perform initial screening of subcontractor before selection process by a team of managers?	3.94	0.755	48
Do you define the services scope and distribution of objectives?	3.38	0.890	48
Do you develop distribution and functional specifications?	2.60	0.869	48
Do you identify potential subcontractors?	3.67	0.883	48
Do you sent out RFI (Request for Information) to subcontractors?	4.31	0.903	48
Based on the evaluation of RFI response, do you send out the RFP (Request for proposal)?	4.21	0.798	48
During RFP evaluation, do you visit and inspect sites before selection is done?	2.98	0.863	48
Is the scope agreed after selection?	1.94	0.665	48
In subcontractor selection process, do take into consideration the effort and costs incurred by the company during the bidding process?	1.98	0.729	48
Do you perform pre-quallfication of the subcontractors?	3.48	0.684	48
Do you consider different alternatives in terms of cost and benefit to the company?	3.40	0.765	48

Table 4.3.1 Descriptive Statistic Data on Selection Methods (Source: Author ,2012)

In Table 4.3.1, the question with highest mean score was 'Do you compare the factors on a common scale to get the priorities?' with a mean of 4.50 (Strongly Agree). The question with lowest mean score was 'In subcontractor selection process, do take into consideration the effort and costs incurred by the company during the bidding process?' with a mean of 1.98 (Strongly Disagree).

4.3.2 Correlation Matrix

Table 4.3.2 of correlation matrix shows that thirteen coefficients are greater than 0.3 in absolute values (highlighted in the table). This is less than half the number and is unlikely that they share the factors. At least ten coefficients are required to have values greater than 0.3. The questions are now replaced by the three methods under investigation, namely, AHP, ANP and CBA.

Correlation Matrix

		AHP-1	AHP-2	AHP-3	AHP-4	AHP-5	AHP-6	AHP-7	AHP-8	ANP-1	ANP-2	ANP-3	ANP-4	ANP-5	ANP-6	ANP-7	ANP-8	CBA-1	CBA-2	CBA-3
Correlation	AHP-1	1.000	0.116	-0.018	0.051	0.542	0.193	0.188	0.087	-0.038	-0.141	-0.355	-0.256	-0.051	-0.163	0.282	-0.003	-0.075	-0.060	-0.305
	AHP-2	0.116	1.000	0.000	-0.057	-0.006	0.210	0.334	0.282	0.152	0.044	0.059	0.143	-0.039	0.129	0.252	0.220	0.081	0.179	-0.109
	AHP-3	-0.018	0.000	1.000	-0.093	-0.061	0.025	-0.040	0.351	-0.095	-0.129	0.016	0.291	0.111	-0.179	0.182	0.021	-0.020	-0.021	0.355
	AHP-4	0.051	-0.057	-0.093	1.000	0.017	0.044	-0.166	0.165	0.098	-0.120	0.137	0.125	0.258	0.126	-0.242	-0.029	0.130	0.078	-0.084
	AHP-5	0.542	-0.006	-0.061	0.017	1.000	0.425	-0.046	0.061	0.078	-0.056	-0.329	-0.184	-0.192	-0.259	0.211	0.043	-0.043	-0.023	-0.223
	AHP-6	0.193	0.210	0.025	0.044	0.425	1.000	0.133	-0.017	0.263	-0.108	-0.052	0.179	0.033	0.116	0.133	0.134	-0.143	0.195	-0.132
	AHP-7	0.188	0.334	-0.040	-0.166	-0.046	0.133	1.000	-0.129	0.308	-0.118	0.049	0.226	-0.158	-0.044	0.240	0.124	0.079	-0.179	-0.016
	AHP-8	0.087	0.282	0.351	0.165	0.061	-0.017	-0.129	1.000	-0.315	-0.037	-0.064	0.089	0.307	0.057	0.231	-0.162	-0.049	0.176	-0.200
	ANP-1	-0.038	0.152	-0.095	-0.098	0.078	0.263	0.308	-0.315	1.000	-0.028	0.383	0.191	-0.158	-0.119	0.161	0.500	0.191	0.018	-0.104
	ANP-2	-0.141	0.044	-0.129	-0.120	-0.056	-0.108	-0.118	-0.037	-0.028	1.000	-0.024	-0.081	-0.228	-0.052	-0.156	0.148	-0.086	-0.092	0.027
	ANP-3	-0.355	0.059	0.016	0.137	-0.329	-0.052	0.049	-0.064	0.383	-0.024	1.000	0.240	0.025	0.214	-0.040	0.398	0.020	0.040	0.081
	ANP-4	-0.256	0.143	0.291	0.125	-0.184	0.179	0.226	0.089	0.191	-0.081	0.240	1.000	0.053	0.191	0.130	0.109	0.121	-0.012	0.074
	ANP-5	-0.051	-0.039	0.111	0.258	-0.192	0.033	-0.158	0.307	-0.158	-0.228	0.025	0.053	1.000	0.114	-0.046	-0.038	-0.055	0.407	-0.091
	ANP-6	-0.163	0.129	-0.179	0.126	-0.259	0.116	-0.044	0.057	-0.119	-0.052	0.214	0.191	0.114	1.000	-0.148	-0.055	0.117	0.320	-0.103
	ANP-7	0.282	0.252	0.182	-0.242	0.211	0.133	0.240	0.231	0.161	-0.156	-0.040	0.130	-0.046	-0.148	1.000	-0.002	-0.136	0.053	-0.439
	ANP-8	-0.003	0.220	0.021	-0.029	0.043	0.134	0.124	-0.162	0.500	0.148	0.398	0.109	-0.038	-0.055	-0.002	1.000	0.041	0.067	0.008
	CBA-1	-0.075	0.081	-0.020	0.130	-0.043	-0.143	0.079	-0.049	0.191	-0.086	0.020	0.121	-0.055	0.117	-0.136	0.041	1.000	0.063	-0.061
	CBA-2	-0.060	0.179	-0.021	0.078	-0.023	0.195	-0.179	0.176	0.018	-0.092	0.040	-0.012	0.407	0.320	0.053	0.067	0.063	1.000	-0.370
	CBA-3	-0.305	-0.109	0.355	-0.084	-0.223	-0.132	-0.016	-0.200	-0.104	0.027	0.081	0.074	-0.091	-0.103	-0.439	0.008	-0.061	-0.370	1.000

Table 4.3.2 Correlation Matrix on Selection Methods (Source: Author ,2012)

4.3.3 Significance Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity was used to perform the significance test. The results are shown in Table 4.3.3

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.471
Bartlett's Test of Sphericity	Approx. Chi-Square	230.053
	Degree of Freedom	171
	P-value	0.002

Table 4.3.3 KMO and Bartlett's Test on Selection Methods (Source: Author ,2012)

From Table 4.3.3, the overall MSA (Measure of Sampling) for the set of variables included in the analysis was 0.47. From the data, the probability associated with the Bartlett test (p-value) is 0.002 in this test, indicting that there is a correlation between the variables. The next step was to determine the number of factors to be included in the factor solution.

4.3.4 Evaluating Communalities

The communalities for the data are provided in Table 4.2.4. All the communalities were higher than 0.5 and there was no further iteration. Therefore, the factor analysis was completed.

Communalities

	Initial	Extraction
Do you study the requirements the Customer (Telecomm Operator) before you select subcontractors?	1.000	0.669
Do you list down the factors for subcontractor selection?	1.000	0.688
Do you compare the factors on a common scale to get the priorities?	1.000	0.784
Are these factors weighted to get the priority of each subcontractor?	1.000	0.678
Do you get the overall priority by mulitplying priorities by weights?	1.000	0.791
Do you select the subcontractor with the maximum weight?	1.000	0.849
Apart from comparison, do you select a subcontractor based on other multiple incomparable inputs and outputs?	1.000	0.665
Is managerial judgment used to select subcontractors?	1.000	0.793
Do you perform initial screening of subcontractor before selection process by a team of managers?	1.000	0.789
Do you define the services scope and distribution of objectives?	1.000	0.770
Do you develop distribution and functional specifications?	1.000	0.648
Do you identify potential subcontractors?	1.000	0.615
Do you sent out RFI (Request for Information) to subcontractors?	1.000	0.621
Based on the evaluation of RFI response, do you send out the RFP (Request for proposal)?	1.000	0.726
During RFP evaluation, do you visit and inspect sites before selection is done?	1.000	0.777
Is the scope agreed after selection?	1.000	0.739
In subcontractor selection process, do take into consideration the effort and costs incurred by the company during the bidding process?	1.000	0.678
Do you perform pre-qualification of the subcontractors?	1.000	0.660
Do you consider different alternatives in terms of cost and benefit to the company?	1.000	0.788

Extraction Method: Principal Component Analysis.

Table 4.3.4 Communalities of Selection Methods (Source: Author ,2012)

4.3.5 Total Variance Explained

The variable loadings on the components are contained in Table 4.3.5. From Table 4.3.5 factors considered accounted for 72.254% which is a relatively large portion of the variation in the variables. From the Scree Plot in Fig. 4.3.5, there is no distinct break between the slope of large factors.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.579	13.573	13.573	2.579	13.573	13.573
2	2.423	12.754	26.327	2.423	12.754	26.327
3	2.256	11.875	38.202	2.256	11.875	38.202
4	1.729	9.098	47.301	1.729	9.098	47.301
5	1.321	6.955	54.255	1.321	6.955	54.255
6	1.254	6.601	60.856	1.254	6.601	60.856
7	1.094	5.758	66.615	1.094	5.758	66.615
8	1.071	5.639	72.254	1.071	5.639	72.254
9	0.924	4.864	77.118			
10	0.889	4.677	81.795			
11	0.704	3.704	85.499			
12	0.568	2.987	88.486			
13	0.438	2.305	90.791			
14	0.411	2.162	92.953			
15	0.356	1.874	94.827			
16	0.298	1.568	96.395			
17	0.290	1.525	97.920			
18	0.252	1.324	99.244			
19	0.144	0.756	100.000			

Extraction Method: Principal Component Analysis.

Table 4.3.5 Total Variance Explained of Selection Methods (Source: Author ,2012)

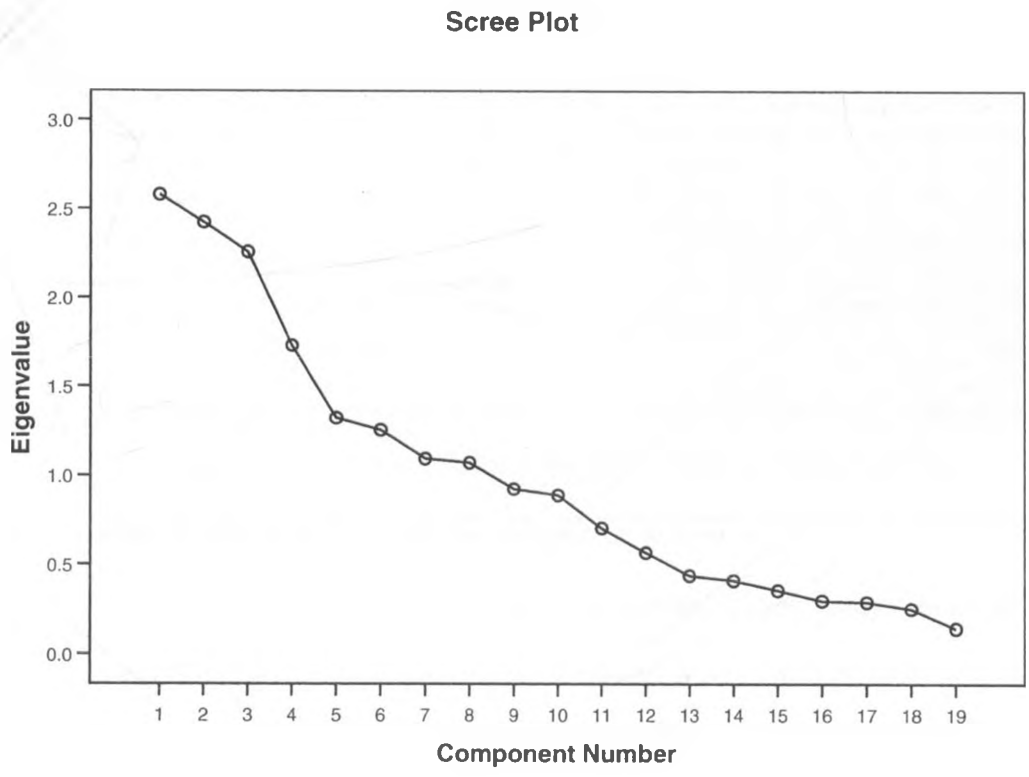


Fig 4.3.5 Scree Plot for Selection Methods (Source: Author ,2012)

4.3.6 Variable Loadings on Components

Component matrix shown in Table 4.2.6 was obtained after 8 extractions. Rotation failed to converge in 25 iterations. (Convergence equal to 0.005).Component 1 included three variables which are two variables in AHP method and one in CBA method. This finding indicates that the most preferred method is the AHP. Component 2 included four variables, which are all in ANP method . ANP method comes second as a preferred method. Component 3 has one variable in AHP whereas component 6 and 8 have the same variable in CBA method. The results shows in the overall that NSN Kenya prefers the using AHP to select subcontractors.

Component Matrix(a)

	Component								
	1	2	3	4	5	6	7	8	Method
Do you study the requirements the Customer (Telecomm Operator) before you select subcontractors?	0.700	-0.328	-0.107	-0.046	0.145	-0.131	-0.004	0.142	AHP-1
Do you list down the factors for subcontractor selection?	0.396	0.374	0.214	0.130	-0.384	-0.009	0.334	0.264	AHP-2
Do you compare the factors on a common scale to get the priorities?	-0.039	0.009	0.161	0.815	0.231	0.172	-0.023	0.097	AHP-3
Are these factors weighted to get the priority of each subcontractor?	-0.122	-0.049	0.421	-0.240	0.487	-0.192	0.060	0.384	AHP-4
Do you get the overall priority by mulitplying priorities by weights?	0.676	-0.287	-0.199	-0.136	0.380	0.100	0.152	0.129	AHP-5
Do you select the subcontractor with the maximum weight?	0.528	0.205	0.136	-0.080	0.385	0.138	0.494	-0.304	AHP-6
Apart from comparison, do you select a subcontractor based on other multiple incomparable inputs and outputs?	0.353	0.442	-0.221	0.216	-0.192	-0.445	0.064	-0.107	AHP-7
Is managerial judgment used to select subcontractors?	0.177	-0.252	0.594	0.403	-0.158	0.146	0.040	0.368	AHP-8
Do you perform Initial screening of subcontractor before selection process by a team of managers?	0.278	0.730	-0.237	-0.161	0.185	0.068	-0.240	-0.009	ANP-1
Do you define the services scope and distribution of objectives?	-0.172	0.007	-0.284	-0.166	-0.385	0.480	0.332	0.378	ANP-2
Do you develop distribution and functional specifications?	-0.281	0.675	0.139	-0.047	0.076	0.193	-0.219	0.002	ANP-3
Do you identify potential subcontractors?	-0.049	0.525	0.271	0.401	0.122	-0.201	0.214	-0.031	ANP-4
Do you sent out RFI (Request for Information) to subcontractors?	-0.100	-0.112	0.684	0.024	0.198	0.129	-0.241	-0.126	ANP-5
Based on the evaluation of RFI response, do you send out the RFP (Request for proposal)?	-0.192	0.212	0.505	-0.308	-0.213	-0.208	0.400	-0.215	ANP-6
During RFP evaluation, do you visit and inspect sites before selection is done?	0.654	0.075	0.088	0.344	-0.304	0.038	-0.325	-0.138	ANP-7
Is the scope agreed after selection?	0.136	0.629	-0.126	-0.126	0.177	0.438	-0.093	0.248	ANP-8
In subcontractor selection process, do take into consideration the effort and costs incurred by the company during the bidding process?	-0.077	0.241	0.081	-0.169	0.037	-0.548	-0.137	0.509	CBA-1
Do you perform pre-qualification of the subcontractors?	0.146	0.071	0.667	-0.317	-0.095	0.237	-0.059	-0.144	CBA-2
Do you consider different alternatives in terms of cost and benefit to the company?	-0.562	0.059	-0.331	0.425	0.295	0.019	0.299	-0.039	CBA-3

Extraction Method: Principal Component Analysis.

Table 4.3.6 Component matrix for Selection Methods (Source: Author ,2012)

4.4 Challenges Faced by NSN in Subcontractor Selection

The second objective sought to find out the method NSN Kenya uses to select subcontractors. Fourteen factors were listed in the questionnaire with ordinal scale from Strongly Disagree (1) , Not sure (3) or Strongly Agree (5). The enquiry about the method was done by way of listing down the probable challenges that could be faced while

selecting the subcontractors. None of the respondents added challenges to the questionnaire list.

4.4.1 Descriptive Statistics data

The Descriptive Statistics data obtained are shown in Table 4.4.1

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Determining the capability of the subcontractor to perform the task	4.16	0.825	49
Having a large number of subcontractor base to select from	4.35	0.805	49
Ability of the selected subcontractor to affect company's relationship with the customer	4.08	0.672	49
Determining the flexibility of the subcontractor to adopt to changes made by the customer	3.78	0.468	49
Determination of the risk exposed by selecting the subcontractor	3.96	0.644	49
Ascertaining the ability of the subcontractor to grow in innovation	4.61	0.606	49
Determination of the availability of the subcontractor when required	3.94	0.626	49
The ease to classify the subcontractor as dorminant or back-up	2.22	0.896	49
Ascertaining the quality of service to be offered by the subcontractor	4.12	0.526	49
Determination of dependability and accuracy of the service offered by the subcontractor	4.53	0.710	49
Ascertaining the level of mutual trust between subcontractor and the company (Giving an assurance to the company)	3.51	0.681	49
Knowlegde of the state of the machinery or tools used to offer the service, how updated and suitable they are for the task.	2.67	0.718	49
Knowledge of the subcontractor attitude towards the customer	3.90	0.621	49
Knowledge of the degree of responsiveness of the subcontractor	3.76	0.693	49

Table 4.4.1 Descriptive Statistics for Selection Challenges (Source: Author ,2012)

In Table 4.4.1, the challenge with highest mean score was 'Ascertaining the ability of the subcontractor to grow in innovation' with a mean of 4.61 (Strongly Agree). The challenge with lowest mean score was 'The ease to classify the subcontractor as dorminant or back-up' with a mean of 2.22 (Strongly Disagree).

4.4.2 Correlation Matrix

Table 4.4.2 of correlation matrix shows that three coefficients are greater than 0.3 in absolute values (highlighted in the table). This is less than half the number and is unlikely that the factors are correlated. At least ten coefficients are required to have values greater than 0.3.

		Determining the	Having a large	Ability of the select	Determining the	Determination of	Ascertaining the	Determination of	The ease to	Ascertaining the	Determination of	Ascertaining the	Knowlegde of the	Knowledge of the	Knowledge of the
Correlation	Determining the capability of	1.000	-0.212	0.051	0.097	0.052	0.212	-0.142	0.006	-0.095	0.062	0.108	-0.084	0.237	0.217
	Having a large number of	-0.212	1.000	-0.169	-0.065	0.028	-0.103	0.043	0.092	-0.053	0.181	-0.254	-0.052	-0.178	0.043
	Ability of the selected	0.051	-0.169	1.000	-0.073	-0.088	0.028	-0.285	0.142	-0.147	0.344	-0.047	0.143	0.120	0.223
	Determining the flexibility of	0.097	-0.065	-0.073	1.000	-0.031	-0.240	-0.048	0.073	0.029	-0.010	-0.287	0.273	-0.080	0.020
	Determination of the risk	0.052	0.028	-0.088	-0.031	1.000	-0.041	-0.006	-0.200	-0.354	-0.134	-0.189	0.061	-0.063	0.070
	Ascertaining the ability of the	0.212	-0.103	0.028	-0.240	-0.041	1.000	0.211	-0.067	0.021	0.101	0.338	-0.105	0.059	-0.032
	Determination of the	-0.142	0.043	-0.285	-0.048	-0.006	0.211	1.000	0.025	-0.167	-0.066	0.173	0.094	-0.070	-0.035
	The ease to classify the	0.006	0.092	0.142	0.073	-0.200	-0.067	0.025	1.000	-0.060	-0.027	-0.123	0.116	-0.033	0.157
	Ascertaining the quality of	-0.095	-0.053	-0.147	0.029	-0.354	0.021	-0.167	-0.060	1.000	0.157	0.055	-0.168	-0.025	-0.030
	Determination of dependability	0.062	0.181	0.344	-0.010	-0.134	0.101	-0.066	-0.027	0.157	1.000	0.032	0.102	-0.064	-0.027
	Ascertaining the level of mutual trust	0.108	-0.254	-0.047	-0.287	-0.189	0.338	0.173	-0.123	0.055	0.032	1.000	-0.078	0.126	0.005
	Knowlegde of the state of the machinery or	-0.084	-0.052	0.143	0.273	0.061	-0.105	0.094	0.116	-0.168	0.102	-0.078	1.000	0.064	0.254
	Knowledge of the	0.237	-0.178	0.120	-0.080	-0.063	0.059	-0.070	-0.033	-0.025	-0.064	0.126	0.064	1.000	0.280
	Knowledge of the degree of	0.217	0.043	0.223	0.020	0.070	-0.032	-0.035	0.157	-0.030	-0.027	0.005	0.254	0.280	1.000

Table 4.4.2 Correlation Matrix for Selection Challenges (Source: Author ,2012)

4.4.3 Significance Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity was used to perform the significance test. The results are shown in Table 4.3.3

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.383
Bartlett's Test of Sphericity	Approx. Chi-Square	91.056
	Degree of Freedom	91
	P-value	0.479

Table 4.4.3 KMO and Bartlett's Test for Selection Challenges (Source: Author ,2012)

From Table 4.3.2, the overall MSA (Measure of Sampling) for the set of variables included in the analysis was 0.383. The data, the probability associated with the Bartlett

test (p-value) is 0.472 in this test. This analysis method may not be suitable for analysing the data.

4.4.4 Evaluating Communalities

The communalities for the data are provided in Table 4.4.4. All the communalities were higher than 0.5, therefore, there was no further iteration.

Communalities

	Initial	Extraction
Determining the capability of the subcontractor to perform the task	1.000	0.453
Having a large number of subcontractor base to select from	1.000	0.638
Ability of the selected subcontractor to affect company's relationship with the customer	1.000	0.693
Determining the flexibility of the subcontractor to adopt to changes made by the customer	1.000	0.731
Determination of the risk exposed by selecting the subcontractor	1.000	0.743
Ascertaining the ability of the subcontractor to grow in innovation	1.000	0.566
Determination of the availability of the subcontractor when required	1.000	0.756
The ease to classify the subcontractor as dorminant or back-up	1.000	0.569
Ascertaining the quality of service to be offered by the subcontractor	1.000	0.655
Determination of dependability and accuracy of the service offered by the subcontractor	1.000	0.762
Ascertaining the level of mutual trust between subcontractor and the company (Giving an assurance to the company)	1.000	0.626
Knowlegde of the state of the machinery or tools used to offer the service, how updated and suitable they are for the task.	1.000	0.700
Knowledge of the subcontractor attitude towards the customer	1.000	0.518
Knowledge of the degree of responsiveness of the subcontractor	1.000	0.592

Extraction Method: Principal Component Analysis.

Table 4.4.4 Communalities for Selection Challenges (Source: Author ,2012)

4.4.5 Total Variance Explained

The variable loadings on the components are contained in Table 4.4.5. From Table 4.4.5 factors considered accounted for 64.295% which is a relatively large portion of the variation in the variables. From the Scree Plot in Fig. 4.3.5, there is no distinct break between the slope of large factors.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.913	13.661	13.661	1.913	13.661	13.661	1.689	12.068	12.068
2	1.849	13.210	26.871	1.849	13.210	26.871	1.646	11.755	23.822
3	1.567	11.190	38.061	1.567	11.190	38.061	1.498	10.701	34.523
4	1.325	9.466	47.527	1.325	9.466	47.527	1.472	10.517	45.040
5	1.258	8.984	56.511	1.258	8.984	56.511	1.360	9.716	54.756
6	1.090	7.784	64.295	1.090	7.784	64.295	1.335	9.539	64.295
7	0.995	7.104	71.399						
8	0.959	6.851	78.250						
9	0.708	5.056	83.305						
10	0.625	4.465	87.770						
11	0.543	3.881	91.651						
12	0.513	3.666	95.317						
13	0.419	2.995	98.312						
14	0.236	1.688	100.000						

Extraction Method: Principal Component Analysis.

Table 4.4.5 Total Variance Explained for Selection Challenges (Source: Author , 2012)

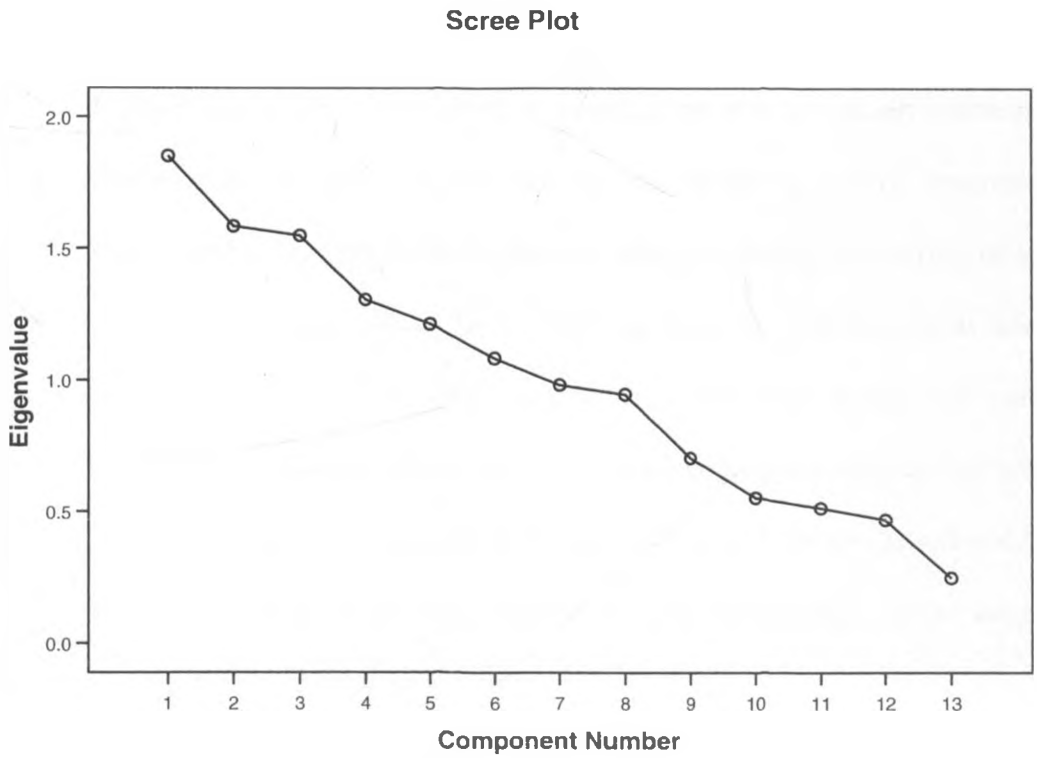


Fig 4.4.5 Scree Plot for Selection Challenges (Source: Author ,2012)

4.4.6 Variable Loadings on Components

Rotation Component matrix shown in Table 4.2.6 was obtained after 9 extractions. Component 1 included four variables Determining the capability of the subcontractor to perform the task, Having a large number of subcontractor base to select from , Knowledge of the subcontractor attitude towards the customer and Knowledge of the degree of responsiveness of the subcontractor. These challenges can be grouped as ascertaining internal subcontractor information. Component 2 included three variables, which are Ascertaining the ability of the subcontractor to grow in innovation, Determination of the availability of the subcontractor when required and Ascertaining the level of mutual trust between subcontractor and the company (Giving an assurance to the company). These challenges can be grouped as getting assurance that subcontractor will deliver if awarded the contract. Component 3 has two variables, namely, Determination of the risk exposed by selecting the subcontractor and Ascertaining the quality of service to be offered by the subcontractor. These challenges can be summarized as knowing subcontractor's relationship with NSN ' customer. Component 4 has two variables namely Ability of the selected subcontractor to affect company's relationship with the customer and Determination of dependability and accuracy of the service offered by the subcontractor. Component 5 has one variable namely, Knowledge of the degree of responsiveness of the subcontractor while component 6 has two variables which are Determining the flexibility of the subcontractor to adopt to changes made by the customer and Knowlegde of the state of the machinery or tools used to offer the service, how updated and suitable they are for the task. These are challenges that can be

summarized as ascertaining subcontractor's responsiveness and its flexibility in operations and delivery.

Rotated Component Matrix(a)

	Component					
	1	2	3	4	5	6
Determining the capability of the subcontractor to perform the task	0.659	0.051	0.091	0.089	-0.011	-0.015
Having a large number of subcontractor base to select from	-0.638	-0.188	0.134	0.080	0.284	-0.300
Ability of the selected subcontractor to affect company's relationship with the customer	0.236	-0.087	0.072	0.763	0.208	0.015
Determining the flexibility of the subcontractor to adopt to changes made by the customer	0.052	-0.357	-0.124	-0.098	-0.087	0.754
Determination of the risk exposed by selecting the subcontractor	0.046	-0.175	0.802	-0.089	-0.238	-0.046
Ascertaining the ability of the subcontractor to grow in innovation	0.143	0.691	0.019	0.158	-0.106	-0.179
Determination of the availability of the subcontractor when required	-0.349	0.655	0.165	-0.323	0.126	0.240
The ease to classify the subcontractor as dorminant or back-up	-0.149	-0.065	-0.169	0.004	0.710	0.099
Ascertaining the quality of service to be offered by the subcontractor	0.002	-0.091	-0.786	0.001	-0.142	-0.088
Determination of dependability and accuracy of the service offered by the subcontractor	-0.190	0.110	-0.149	0.824	-0.097	0.057
Ascertaining the level of mutual trust between subcontractor and the company (Giving an assurance to the company)	0.257	0.708	-0.189	-0.018	-0.077	-0.131
Knowlegde of the state of the machinery or tools used to offer the service, how updated and suitable they are for the task.	-0.018	0.062	0.215	0.196	0.279	0.730
Knowledge of the subcontractor attitude towards the customer	0.624	0.065	-0.006	-0.048	0.331	-0.110
Knowledge of the degree of responsiveness of the subcontractor	0.362	-0.053	0.170	0.099	0.646	0.045

Extraction Method: Principal Component Analysis.

a. Rotation converged in 9 iterations.

Table 4.4.6 Rotated Component matrix for Selection Challenges (Source: Author ,2012)

5 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The overall purpose of the study was to evaluate subcontractor selection in telecommunications industry with three specific objectives. The study found out that main factors NSN considered can be ranked as subcontractor internal and external performance, subcontractor's delivery ability, contractual and legal issues, and reliability and quality issues . The methods used by NSN Kenya was AHP. The challenges NSN faced were ascertaining internal subcontractor information, getting assurance that subcontractor will deliver the contract, knowing subcontractor's relationship to NSN's customer and ascertaining subcontractor's responsiveness and its flexibility of operations and delivery.

5.2 Conclusion

5.2.1 Factors that Influence Selection of Subcontractors in NSN, Kenya

It is apparent from the study that majority of the respondents were male (62%) and a majority also had a basic university degree (75%). Most of the employees had worked for 1- 2 years and many of the respondents worked in the procurement department.

The factors could be grouped into four which had closely related factors and ranked in. In terms of ranks, the first group to be considered by NSN Kenya is subcontractor internal and external performance. These factors are Subcontractor's reputation in the industry, Subcontractor's IT (information Technology) capability, Subcontractor's employee

satisfaction level, Subcontractor's market share in the telecommunication industry, Subcontractor's geographical presence, Subcontractor's claim process and Subcontractor's claim process

The second group of factors can be concluded as subcontractor's delivery ability. The factors in the second group are Flexibility of in billing and payment after the service has been offered, Subcontractor's experience in offering similar service and products, Subcontractor's employee satisfaction level, Subcontractor's market share in the telecommunication industry, Range of services provided by the subcontractor and Subcontractor's level of information security.

The third group of factors summarizes contractual and legal issues. The factors are Flexibility of in billing and payment after the service has been offered, Subcontractor's experience in offering similar service and products, Subcontractor's geographical presence, Flexibility in operations and delivery, Subcontracor is environmental friendy and Ability to participate in an e-aucton.

The fourth consideration can be summarized as reliability and quality issues, namely, Subcontractor's quality of management and information sharing, Ability to perform and deliver once contracted and Flexibility in operations and delivery. Finally, the fifth consideration could be summarized as others. The factors included Compatibility of the services and products provided by the subcontractor, Cost provided by the subcontractor to perform the task and Quality of the services offered by the subcontractor. Srdjevic, *et al*, (2005) found that the seven factors considered in subcontractor selection, namely, net price, delivery, quality, production facility, technical capability, management and

organization and geographical location. Three of these factors have been observed during this study.

According to the study, none of the methods found in literature is used by NSN Kenya. NSN Kenya adopts partially all the methods, namely AHP, ANP and CBA. In term of rank, NSN Kenya mostly considers AHP, followed by ANP and finally CBA. Quite a large number of employees have relatively little experience and this could explain why there is no fixed method. Jharkharia and Shankar, (2007) confirms that it takes time to develop a specific method. Furthermore, NSN being a global company, it would adopt combination of methods depending on the global procurement requirements.

The challenges found in the study can be categorized and ranked in four challenges, namely, ascertaining internal subcontractor information such as attitude and response, getting assurance that subcontractor will be up to the task if awarded the contract, knowing subcontractor's relationship to NSN's customer and ascertaining subcontractor's responsiveness and its flexibility of operations and delivery.

5.2 Recommendations

The study recommends that telecommunication industry considers subcontractor's performance, its ability to deliver, the contractual terms and its reliability and delivery quality during the selection process. In the method used, this study recommends the industry adopting a specific method between the one recommended for proper benchmarking. This study further recommends that during selection of subcontractors, the telecommunication industry addresses methods to obtain subcontractor internal knowledge, delivery assurance and knowledge on subcontractor responsiveness.

5.3 Limitations of the Study

In the vast field of telecommunications industry, this study covered one vendor. Currently there are five vendors in Kenya. Apart from operating in Kenya, the vendors also operate globally. The sample population of fifty respondents was also a limitation as was the time period for this study.

5.4 Suggestions for Future Research

This study was done on one telecommunications vendor in Kenya only. It is suggested that similar study should be replicated in other telecommunication vendors in Kenya and in other countries. A more focused study on a specific vendor can be carried out to reveal more details and also a similar study can be done in other sectors of the economy.

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APPENDICES

APPENDIX 1: RESEARCH QUESTIONNAIRE

Introduction

This questionnaire is designed to gather information on factors considered during selection of subcontractors in NSN, Kenya. Your response will be accorded strict confidentiality. Kindly respond to the questions honestly by ticking the most appropriate response.

Part A : General Information

1. Gender:

☐ Male ☐ Female

2. Highest academic qualification

☐ College Certificate ☐ College/University Diploma

☐ Bachelors Degree ☐ Masters Degree

☐ Others (Specify).....

3. For how long have you worked in this company?

☐ Less than one year ☐ 1 – 2 years

☐ 3 – 5 years ☐ More than 5 years

4. Please indicate the department you work for:

☐ Procurement ☐ Project Management

☐ Logistics ☐ Services Solutions

Part B : Factors For Selecting Subcontractors

Objective One: Determine the factors that influence the selection of subcontractors in NSN Kenya.

To what extend do you agree with the following statements concerning factors that determine selection of subcontractors in NSN, Kenya.

Use the scale of :

1. Very important
2. Important
3. Neutral
4. Less Important
5. Not important at all

	List of Factors	1	2	3	4	5
1	Compatibility of the services and products provided by the subcontractor					
2	Cost provided by the subcontractor to perform the task					
3	Quality of the services offered by the subcontractor					
4	Subcontractor's reputation in the industry					
5	Flexibility of in billing and payment after the service has been offered					
6	Subcontractor's quality of management and information sharing					
7	Subcontractor's IT(information Technology) capability					
8	Size and and quality of fixed assets					
9	Subcontractor's experience in offering similar service and products					
10	Ability to perform and deliver once contracted					
11	Subcontractor's employee satisfaction level					
12	Subcontractor's market share in the telecommunication industry					
13	Range of services provided by the subcontractor					
14	Subcontractor's geographical presence					
15	Flexibility in operations and delivery					
16	Subcontractor's claim process					

17	Subcontractor's ability to expand (surge capacity)					
18	Subcontractor's clause on penalty, arbitration and escape					
19	Effective methods of communication					
20	Subcontracor is environmental friendy					
21	Ability to participate in an e-aucton					
22	Subcontractor's level of information security					
23	Any other factor....					

Part C : Methods used for subcontractor selection

Objective Two: Determine the methods adopted by NSN Kenya to select subcontractors.

Several methods exist to select subcontractors. Kindly answer the set of questions below which are based on the methods used to select the subcontractors.

Use the scale of :

1. Strongly Disagree
2. Disagree
3. Not Sure
4. Agree
5. Strongly Agree

	Methods	1	2	3	4	5
1	Do you study the requirements the Customer (Telecomm Operator) before you select subcontractors?					
2	Do you list down the factors for subcontractor selection?					
3	Do you compare the factors on a common scale to get the priorities?					
4	Are these factors weighted to get the priority of each subcontractor?					
5	Do you get the overall priority by mulitplying priorities by weights?					
6	Do you select the subcontractor with the maximum weight?					
7	Apart from comparison, do you select a subcontractor based on other multiple					

	incomparable inputs and outputs?					
8	Is managerial judgment used to select subcontractors?					
9	Do you perform initial screening of subcontractor before selection process by a team of managers?					
10	Do you define the services scope and distribution of objectives?					
11	Do you develop distribution and functional specifications?					
12	Do you identify potential subcontractors?					
13	Do you sent out RFI (Request for Information) to subcontractors?					
14	Based on the evaluation of RFI response, do you send out the RFP (Request for proposal)?					
15	During RFP evaluation, do you visit and inspect sites before selection is done?					
16	Is the scope agreed after selection?					
17	In subcontractor selection process, do take into consideration the effort and costs incurred by the company during the bidding process?					
18	Do you perform pre-qualification of the subcontractors?					
19	Do you consider different alternatives in terms of cost and benefit to the company?					
20	Any other method (s) not mentioned above					

Part D : Challenges Faced by NSN in Subcontractor Selection

Objective Three: To establish the challenges faced by NSN Kenya in subcontractor selection.

There are several challenges that exist during selection of the vendors. In this section, kindly indicate the challenges most applicable to NSN in subcontractor selection.

Use the scale of :

1. Strongly disagree
2. Disagree
3. Not Sure

4. Agree
5. Strongly Agree

	List of Challenges	1	2	3	4	5
1	Determining the capability of the subcontractor to perform the task					
2	Having a large number of subcontractor base to select from					
3	Ability of the selected subcontractor to affect company's relationship with the customer					
4	Determining the flexibility of the subcontractor to adopt to changes made by the customer					
5	Determination of the risk exposed by selecting the subcontractor					
6	Ascertaining the ability of the subcontractor to grow in innovation					
7	Determination of the availability of the subcontractor when required					
8	The ease to classify the subcontractor as dorminant or back-up					
9	Ascertaining the quality of service to be offered by the subcontractor					
10	Determination of dependability and accuracy of the service offered by the subcontractor					
11	Ascertaining the level of mutual trust between subcontractor and the company (Giving an assurance to the company)					
12	Knowlegde of the state of the machinery or tools used to offer the service, how updated and suitable they are for the task.					
13	Knowledge of the subcontractor attitude towards the customer					
14	Knowledge of the degree of responsiveness of the subcontractor					
15	Any other challenge(s).....					

APPENDIX 2: INTRODUCTION LETTER

To

NSN Kenya Employee

Re: Introduction of George Dawo (D61/P/8628/2005)

I write to formally introduce myself on the subject of the research data for my MBA research proposal (Subcontractor Selection in Telecommunications Industry: A Case Study Of Nokia Siemens Networks in Kenya). I am a final year MBA (Operations Management) student at the University of Nairobi writing my thesis on the above topic.

I write this letter to formally request audience with my respondents (cost and progress managers, technical implementation managers, account managers, logistics engineers, field engineers, and procurement managers) to facilitate collection of data in the subject.

Thank you for your kind consideration.

Yours sincerely,

George O Dawo

APPENDIX 3: AHP SELECTION METHOD

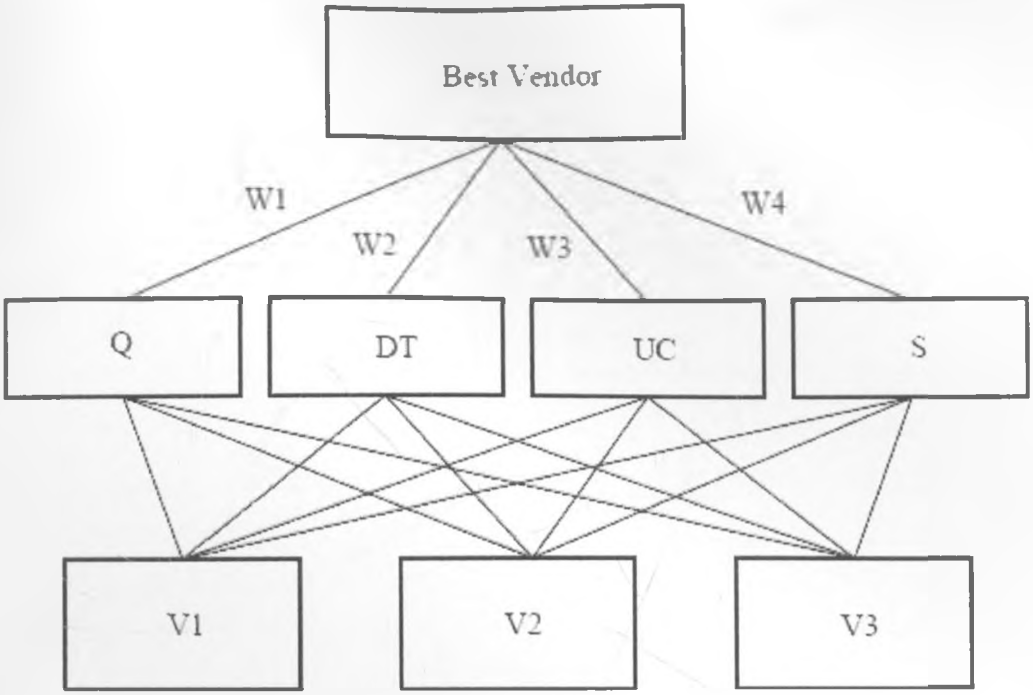

Fig. 2 A AHP for vendor selection (Source: Kumar and Roy (2011))

Factors considered are quality (Q), delay times (DT), unit cost (UC) and services(S) of vendors, V1, V2 and V3.

APPENDIX 4: ANP SELECTION METHOD

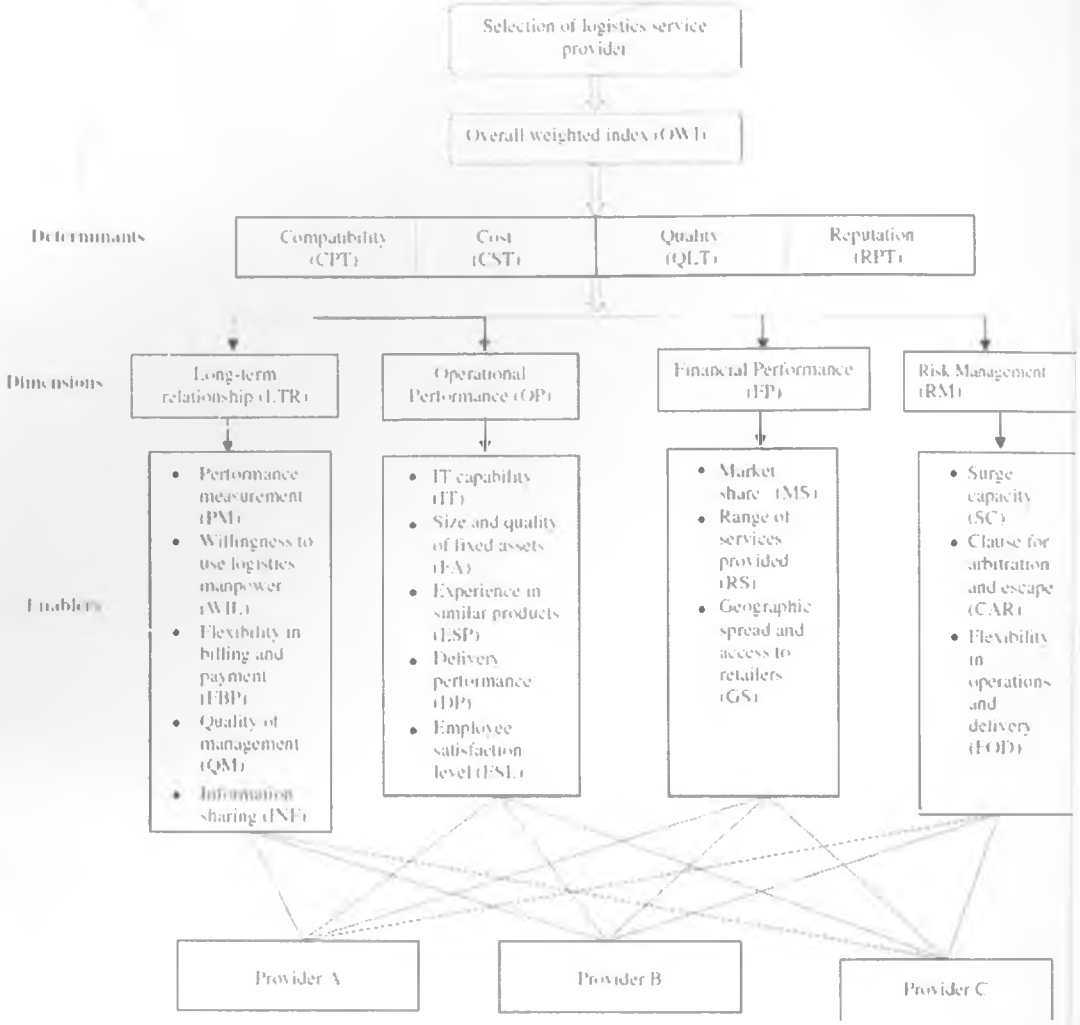

Fig. 3 ANP vendor selection (Source: Jharkharia and Shankar, (2007))