USING CUSTOMER SATISFACTION MEASUREMENTS TO BUILD A STRONGER BUSINESS CASE

by

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ABSTRACT

MONISHA MAMBALUM MAHENDRABU. Using Customer Satisfaction Measurements to Build a Stronger Business Case. (Under the direction of DR. JAKE SMITHWICK)

Customer satisfaction has been talked about for centuries. While the use of it in the industry as a performance measure tool to communicate value to the owners has come to light in the recent years, the use of customer satisfaction measurements in the industry with the constant change in the dynamics of the market will help contractors to survive and differentiate from the competition. Customer satisfaction tools help contractors to understand the needs of the customer, their demands, and their requirements. This directs them to build customer loyalty and retention. The contractors build a customer base which looks beyond price and sustain contractor profitability.

In the low-bid industry, where the selection of contractors is solely on financial indicators. The performance of the contractors does not meet the needs of the project and leads to low-client satisfaction and risks the project. There are other performance measures which can be considered by owners and change their selection criteria.

The purpose of this study is identified use performance measures as a tool to strengthen proposals and to increase work opportunities for the contractors. The researcher surveyed sheet metal contractors and computed satisfaction levels of these contractors.

The researcher also identified traits of high-performing contractors which would differentiate high-performing contractors to low-performing contractors. This research also communicates value to those owners who are ready to look beyond price and not be liable for non-performance of the project

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LIST OF ABBREVIATIONS

ACSI	American Customer Satisfaction Index
CSF	Critical Success Factors
CSI	Customer Satisfaction Index
FM	Facilities Management
GSI	Growth Strategies International
HVAC	Heating, Ventilation, and Air-Conditioning
KPI	Key Performance Indicators
MBNQA	Malcolm Baldridge National Quality Award
NHF	New Horizons Foundation
NPS	Net Promoter Score
OEE	Over Equipment Effectiveness
ROA	Return on Assets
ROI	Return on Investments
SCSB	Swedish Customer Satisfaction Barometer
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPC	Statistical Process Control
SPSS	Statistical Package for the Social Sciences
TQM	Total Quality Management
VOC	Voice of Customer

CHAPTER 1: INTRODUCTION

1.1 Overview

The low-bid approach which is a well-established procurement system used in the United States is also called as competitive bidding. This procurement system is usually used as it averts favoritism and corrupt deals between owner's representatives and contractors (Pesek et al. 2019).

The contractor selection is constrained by the traditional low-bid price procurement system which is the most popular and frequently used system. Within, this system all the contractors are considered equal in capability whereas the only difference being the financial indicators in terms of bonding capacity and insurability. This situation forces customers to depend on the quality of the design and the specification documents which ensure that contractors meet their performance expectations (Sullivan and Kashiwagi 2007).

In the low-bid system, it is seen that the contractors generally don't meet the client's expectations. This award system has led to a reduction in owners' satisfaction due to cost overruns, budget shortfalls, schedule delays, and adversarial relationship between owners and contractors. These issues can affect the contractor's and the company's image in terms of procuring future business prospects.

The purpose of this research is to support contractors to survive in competition with the changing dynamics of the market. With the increase in competition, contractors need to be equipped with leading-edge tools and build a vital customer base who look beyond

price (considering performance). This research provides insights from the customer's perspective of the factors which are most essential for the contractor's performance.

The contractor's performance is closely aligned to the contractor completely understanding the buying decisions of the customers, satisfying their customers, and ensuring customer retention. Customer satisfaction is a non-financial indicator which assesses a customer's overall expectations of the product or the service. This research pertains to the level of customer satisfaction on factors which are most essential to hiring HVAC (Heating, Ventilation, and Air-Conditioning) and sheet metal contractors.

1.2 Purpose of Research

The selection of contractors based on the bid price is prevalent in most construction projects. Contractors are key personnel who hold the primary responsibility to achieve and fulfill the project's goals. This selection of the contractor can have a major impact on the project's success (Olaniran 2015).

Even though low-bid procurement provides several benefits to owners, these benefits are short-termed such as monetary savings at the time of bidding and it makes the selection process simple. Despite these short-term benefits, low-bid procurement has many drawbacks such as a failure to consider contractor's ability to perform the task. The contractor's past performance, technical ability, and quality considerations are also excluded (Nguyen et al. 2018).

This research focuses on the need for contractors to survive in competition and compete in the prevalent low-bid industry with the use of performance measures such as customer satisfaction to identify their customer needs and to communicate value and competence of contractors to the owners.

Customer satisfaction measurements indicate the level of satisfaction of a customer with a product or a service. This research aims to track customers' perceptions and requirements. It also documents sheet metal contractors past performance.

The low-bid industry leads to low client satisfaction. This forces the owner to depend on the quality and the specifications provided in the bid document. The quality of the project is compromised as the contractor's experience in the industry is not considered and their ability to perform tasks is ignored as the contractors are selected based on price.

The owners do not completely understand to evaluate contractor's performance based on other factors such as risk management, customer satisfaction, planning and execution of the project which influences the quality of work. Because in the low-bid procurement system, stresses on the price. This affects effective project success, profit margins, and the quality of services which are offered by the contractor.

There are other performance measures to evaluate contractors' performance apart from prices such as past performance, the key person assigned to the job, project approaches, and quality management. The low-bid system does not effectively consider these other performance measures to communicate value and capability which in the long run will affect contractor and the industry in terms of their overall performance and development.

1.3 Research Scope and Objectives

The purpose of this research is to identify the capability of sheet metal and air conditioning contractors to collect and document performance satisfaction levels. Customer performance is assessed through a survey of quantitative (1-10) satisfaction ratings and analysis of qualitative comments.

The information could then be used by contractors to enhance communication of their skills and capabilities to the owner. The performance measures are a tool which allows the contractor to explain their value proposition in terms of cost and other factors. Customer performance measures can strengthen the contractor's value proposition with owners who are interested in evaluating factors besides just price alone. That is, if an owner is only interested in price (legally required or otherwise), customer performance measures would be of little value. They are most effective for buyers who are interested in the contractor's past performance, ability to minimize risk, recommendations for optimal project scoping, and of course, price.

This study is initiated and funded by the New Horizons Foundation (NHF) and conducted on behalf of Sheet Metal and Air Conditioning Contractors National Association (SMACNA). It is a pilot study conducted with 3 contractors and 89 of their customers. It was a national study conducted between the dates 23rd August 2018 and 12th February 2019. The eight performance factors were selected based on the previous study by NHF (Appendix A gives a list of factors which were considered) (NHF 2006).

This thesis presents a framework for the contractors to be evaluated in terms of performance, quality, and cost. The objectives of this research focus on identifying and implementing the best practices to assist the contractors in achieving the following:

- Identify customers' perception of purchasing decisions of HVAC contractors, and identify the factors they consider most important.
- Create a simplified flowchart which shows how contractors can use the information in communicating with their customers.

- Create performance reports which can be used to enhance the contractor's value proposition.

1.4 Research Hypotheses

Two primary hypotheses were developed based on the objectives of the study. The first hypothesis was developed to test the difference between dependent variables (eight customer satisfaction measures) and the independent variable (the participating contractors). The second hypothesis was developed to assess the common traits of positive customer opinions for high performing contractors.

HYPOTHESIS 1: The distribution of eight customer satisfaction measures will vary in terms of contractor performance.

HYPOTHESIS 2: There are certain factors that customers identify being traits of high performing contractors.

1.5 Research Summary

This research focused on the need to provide a clear explanation to the owner about how to select a contractor based on price and performance. The prevalent competition and procurement system forces owners to select contractors just on price, and this leads to a decrease in the quality and performance of the contractor.

This study suggests performance measurements such as customer performance measures help contractors differentiate their performance in competitive and cost-focused industry. The measures are most effectively used when communicating with owners who can see the values in considering factors outside of price alone.

To identify the level of satisfaction of the sheet metal contractors a survey was conducted to identify customers' perceptions and buying decisions. The customer satisfaction measures were used as variables to test the research objectives and to identify traits of high-performing contractors. This research can help sheet metal contractors to improve their performance. This research can also be applied to other contractors.

The need to use performance measurements in the low-bid industry is to communicate value and persuade owners to evaluate the contractor's capabilities and differentiate them from other contractors in terms of their technical abilities and experience. It also identifies the best practices and measures for contractors to survive in competition.

CHAPTER 2: LITERATURE REVIEW

2.1 Definition of Customer Satisfaction

Customer satisfaction is a metric, used alongside conventional tools, to indicate the performance of the contractor. Although the necessity of achieving customer satisfaction has been acknowledged, little attention has been paid to the process of establishing customer satisfaction and the factors involved in customer satisfaction (Junnonen et al. 2009). Two views of customer satisfaction are the transaction-specific view and the cumulative view. From a transaction-specific viewpoint, customer satisfaction is an evaluation of satisfaction after a specific purchase, whereas from a cumulative viewpoint, customer satisfaction is an overall evaluation of purchase and the overall experience, of including while purchasing and consuming of a good or service. In other words, the transaction-specific view focuses on a specific product or service, whereas the cumulative gauges view focuses on a firm's past, current and future performance (Anderson et al. 1994).

In the facility management (FM) sector, the driving forces of customer satisfaction include the order and outcome of Facility Management (FM) services, transparency of the process, and solutions provided by that employees provide to meet customer needs. Identifying and measuring customer needs and measuring them is an important field in the management of FM services (Coenen et al. 2013). Customer satisfaction is an intangible asset and is a critical element for a firm to use in measuring performance (Aksoy et al. 2008). According to Coenen et al. (2013), customer satisfaction is a consolidation of cognition and emotion. Therefore, it is necessary to understand all dimensions and relationships between cognitive and emotional/ behavioral elements.

The determinants of customer satisfaction are expectations, preexperience standards, product/service performance, and factors that affect perceptions. Identifying the specifics of these determinants will help in identifying the greatest customer needs (Barsky and Labagh 1992).

Hansemark and Albinsson (2004) defined *satisfaction* as a customer's attitude toward a service or a customer's emotional reaction to what the customer expected to receive versus what the customer actually received. Satisfaction can be measured at various stages of a product lifecycle, beginning when the product is purchased, then to the sales experience, the administration, and the interaction at the time of purchase, and finally to the ongoing service during possession of the product (Zairi 2000).

When examining satisfaction, it is important to define the term, recognize when a customer is satisfied, and understand the importance of satisfaction and how to enhance satisfaction. To define, recognize, and enhance satisfaction, eight factors should be considered: service, feeling, chemistry, relationship, confidence, dialogue, complaints and retention (Hansemark and Albinsson 2004).

2.2 Importance of Customer Satisfaction

Customer satisfaction is a statement of intent. Customer Satisfaction signals to an organization the need to create new concepts and management disciplines. When an organization creates new systems, procedures, and guidelines, the organization should consider the customer's needs. The customer's focus is a state of mind rather than a concept and indicates perceptions regarding optimal performance and how to achieve success (Zairi 2000).

A firm's performance is computed based on two types of measures: (1) accounting-based measures, such as return on investments (ROI) and return on assets (ROA), and (2) direct measures, such as sales, price, and cost. ROI and ROA are ratio measures, meaning the firm can compare the results with industrywide ROIs and ROAs. These ratios measure accounting profit, not economic profit, unlike capital measures. A good measure of firm's capital is its shareholder value which is a culmination of stock prices. The shareholder value is related to customer satisfaction (Anderson et al. 1994).

According to Aksoy et. al. (2008), customer satisfaction positively affects equity prices and valuation ratios: specifically, (1)Tobin's *q*, which is the ratio of a firm's market value to the replacement cost of its assets, and (2) the market-to-book ratio, which is the ratio of market value of total assets to the book value of total assets (Chen and Zhao 2006). Evidence shows that high levels of customer satisfaction can act as a buffer against stock-price fluctuations and reduce the impact on the firm's share value. Empirical evidence shows a positive correlation between customer satisfaction and good economic performance (Merrin et al. 2013).

Rank Xerox, founded in 1956, manufactured and marketed reprographics. The company achieved rapid growth and good market position, but this position was threatened by Japan companies, especially in the small, high-quality, low-priced sector. To combat this threat, the company conducted several benchmarking studies to discover the reasons for the success of Japanese companies. Xerox identified that it had weaknesses in terms of cost, quality, and innovation, indicating that the company needed to implement total quality management (TQM) in order to survive in amid the competition. The company developed a closed-loop escalation process, which is a root cause analysis technique to continuously

improve customer satisfaction (see Figure 1). The five steps of root cause analysis to identify possible causes, identify which cause contributes to the problem, develop a checklist of the root causes of the problem, develop solutions, and select and test solutions (Zairi 2000).

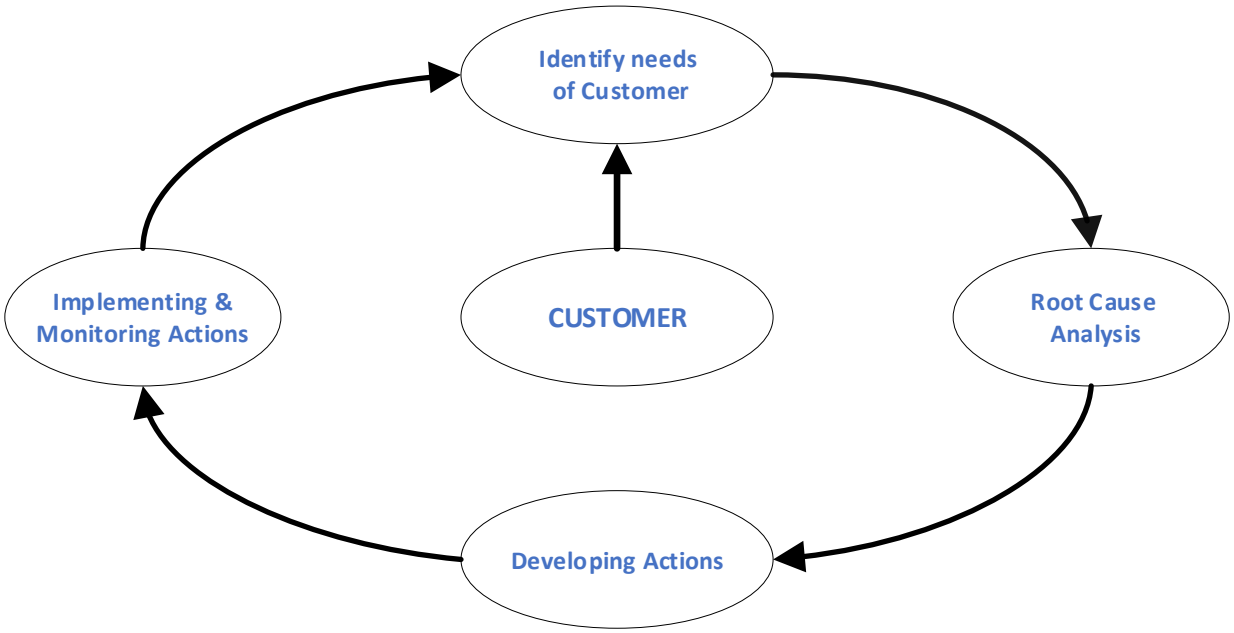


Figure 1:Description to continuously improve Customer Satisfaction (Adapted from Zairi 2000)

According to Hokanson (1995), with the increase in market complexity, competition, and budget limitations, firms are now investing in studies not only to develop strategies and tactics but also to quantify the benefits of TQM with respect to customer satisfaction. There are various aspects of customer satisfaction, and it is impossible to improve one aspect without affecting others.

Customer satisfaction has an impact on purchase intentions, customer retention, share of wallet (i.e., the volume of business conducted with a client for 12 months; Keiningham et al. 2003), receptiveness to cross-selling efforts, the number of complaints,

and word of mouth about the company (Aksoy et al. 2008). Word of mouth can be positive or negative; positive word of mouth includes descriptions of pleasant, experiences, recommendations to others, and conspicuous display of products, whereas negative word of mouth includes product criticism, descriptions of unpleasant experiences, rumors, and complaints (Anderson 1998).

Bursk's (1996) and Jackson (1985) found that customer relationships are an indicator of a firm's performance. The research also suggests that customer satisfaction tends to result in increased repeat business, usage levels, reservation prices, market prices, productivity, cross-buying (i.e., which is defined as customer behavior of buying additional products or services from the same firm; Shah et al. 2012),cost competitiveness, long-term growth, and price elasticity, as well as reduced customer complaints, transaction costs, and employee turnover. These factors affect stock prices and company valuation. Customer satisfaction also reduces cost related to warranties, complaints, defective goods, and field service costs (Fornell et al. 2006).

Satisfaction leads to loyalty, which can be improved by understanding the features which that customers want and decreasing the gap between expected service and received service (Bowen and Chen 2001). Assessing customer loyalty goes beyond the physical and tangible features to include benefits such as reliability, the consciousness of making good choices in terms of purchasing a product or a service, and appreciation from colleagues and friends (Clarke 2001).

Companies are satisfied with the objective of developing long-term relationships with customers. Long-term relationships are of paramount importance necessity for all firms, (Coldwell (2001), Growth Strategies International (GSI) performed a statistical

analysis which showed that completely satisfied customers contributed 2.6 times more revenue to an organization than a dissatisfied customer (Singh 2006).

When evaluating customer loyalty, an organization must consider the micro and the macro level. The micro level focuses on individuals, whereas the macro focuses on the overall market (Clarke 2001). Evaluating the micro and macro levels will help an organization increase customer loyalty by focusing on major customers, prioritizing efforts to increase customer satisfaction with every interaction, by being aware of customer needs before the competition, and by creating perceptions of value (Singh 2006).

However, evaluating and increasing customer satisfaction will not ensure that a firm survives amid competition. Not all satisfied customers may be loyal, but all loyal customers are satisfied. Customer retention is what leads to sustained profitability Zineldin (2000), defined *retention* as a customer's ongoing a commitment to a company's service or product. *Retention* can also be defined as "customers' liking, identification, commitment, trust, willingness to recommend, and repurchase retention, emotional-cognitive retention constructs, and behavioral intentions" (Hansemark and Albinsson 2004, p. 42).

Retaining existing customers costs less than obtaining new ones. All companies must make sure that customer retention is their priority. First, they must focus on satisfying and retaining their customers. Complaint management is an important part of customer satisfaction (Hansemark and Albinsson 2004). Research indicates that the level of satisfaction is related to on the number of customer complaints. Firms should review the complaints to better understand what customers issues with. Other factors affecting

customer satisfaction include product innovations, staff service, convenience, and business profile.

When hiring employees, companies must examine whether candidates can to handle customer service operations. Once hired, customer service representatives must undergo training. Customer satisfaction must be made a priority throughout the organization (Olstein et al. 2000). To be a customer-focused, a company needs to establish clear goals and strategies. The key drivers of customer satisfaction include identifying the needs of customers; learning about market the competition; understanding the changing dynamics of the market; identifying opportunities; and important, understanding what is required, how to create a customer focus, and how to measure satisfaction.

2.3 Tools to Gauge Customer Satisfaction

2.3.1 Net Promoter Score (NPS)

NPS is a tool that is used to measure customer satisfaction. This tool is the most reliable indicator of a company's growth (Keiningham et al. 2007). Reichheld, who introduced the concept of NPS in 2003, asserted that it is the one metric that can indicate customer satisfaction and loyalty (Grisaffe 2007). According to Reichheld (2003), NPS is the difference between the percentage of promoters and detractors of a company.

Firms with high NPS have a major share of industry growth. To calculate the NPS, a company usually starts by creating a survey with the following question: "Would you recommend this product or service to a friend or colleague?". The company sends out the survey and then calculates the percentage of customer responses. These responses are categorized into three groups: promoters (rating of 9 and 10), passively (ratings of 7 and 8), and detractors (ratings of 0-6). The NPS is calculated and then compared with scores

from different regions, branches, services, and segments. Finally, the company devises ways to improve its score (Reichheld 2003).

Word of mouth plays a significant role in NPS because a satisfied customer will engage in positive word of mouth, whereas an unsatisfied customer will engage in negative word of mouth (Reichheld 2006.). Grisaffe (2007) reported that word of mouth is not a measure of loyalty but an outcome of loyalty. When someone refers a product or service, to others, the person is loyal. Word -of -mouth is also an indirect metric of growth.

2.3.2 Customer Satisfaction Index (CSI)

American Customer Satisfaction Index (ACSI) is a market-based performance measure used at various levels: individual firm, industry, economic sector, and national economy. The ACSI represents and covers more than 200 firms in over 40 industries in seven major consumer sectors of the economy (Fornell et al. 1996).

Fornell et. al (1996) explained that the ACSI computes customer satisfaction at the firm level and then weighs the results against the industry, sector, and national indices. For an individual firm, the ACSI identifies the firm's customers and provides and an evaluation of the overall expected and actual purchase and consumption experience. The ACSI was introduced in 1994, whereas the Swedish Customer Satisfaction Barometer (SCSB) developed national satisfaction indexes in 1989. These indexes provide a single measure of customer expectations, specifically, perceived value. SCSB was redefined in terms of ACSI. The ACSI provides an independent means of assessing the quality of what customers consume, what companies produce, and the quality of services and goods the customer experiences (Fornell et al. 1996).

The NPS and the ACSI are both metrics that are used to predict profit, sales, and share price changes. The ACSI, measures customer satisfaction based on overall satisfaction, the degree to which expectations have been met, and the actual performance, whereas the NPS uses word of mouth information to indicate the areas in which performance needs to improve (East et al. 2011).

According to the findings of East et. al. (2011), neither tool measures negative sentiments which may come from ex-customers and those who have never been customers. Because the tools do not account for negative sentiments, the tools can be good predictors of sales but may not be accurate in which would affect predicting company's performance or growth rate.

2.4 Total Quality Management

Total quality management (TQM) is a "holistic management philosophy that strives for continuous improvement in all functions of an organization and can be achieved if the total quality concept is employed from accession of resources to customer service after the sale." TQM is applied as a single tool to analyze the relationship between TQM and a company's performance (Kaynak 2003, p.406).). TQM focuses on continuous improvement through deep knowledge of core systems.

Use of TQM has increased considerably over the years. The general understanding is that TQM is a way of managing all the operations in an organization, leading to of overall efficiency (Porter and Parker 1993). According to Pearson (2000), the focus of this tool is on "helping companies pursue gradual, unending improvement through a participatory management style that stresses teamwork, deep knowledge of the core systems on which

enterprises rely to produce its product and services, and the use of statistical methods to measure performance" (p.52).

TQM tends to improve market share, profitability, customer satisfaction, and employee relations (Griffin and Hauser 1993). The critical factors that influence the TQM implementation process are good leadership, a well-defined organizational structure, defined strategy, effective communication, training and education, employee involvement, management of the process, implementation of quality technologies (e.g., statistical process control), quality costing, and benchmarking (Porter and Parker 1993).

Saraph et. al. (1989) identified eight critical factors, based on the results of a questionnaire and factor analysis. These factors are leadership and the quality policy, the role of the quality department, training, product design, supplier quality management, process management, quality data and recording, and employee relations.

The Malcolm Baldridge National Quality Award (MBNQA) has also identified a list of critical factors: leadership, information and analysis, strategic quality planning, human resource development and management, process quality management, quality and operational results, and customer satisfaction (Porter and Parker 1993). The MBNQA award acknowledges US companies that excel in quality management practices. These practices are directed toward business outcomes, are nonprescriptive, and include learning cycles and alignment (Yasamis et al. 2002). Table 1 compares the three sets of factors necessary for TQM implementation.

Table 1:Comparison of the Critical Factors for TQM (adapted from Porter and Parker 1993)

Porter and Parker	**Saraph et al.**	**Malcolm Bridge Award**
Management behavior	Role of top management and policies regarding quality	Leadership
TQM strategy	Role of top management and policies regarding quality	Strategic plans for quality
Organizational structure	Part of the quality department	×
Communication	×	×
Training	Training	Human resources and management
Involvement of employees	Maintaining employee relations	×
Management of processes and systems	Management of processes/ operating procedures	Management of process quality
The process of quality management	×	×
Quality technologies	Quality data and reporting	Information and analysis
×	Design of product/ service	×
×	Quality management of supplier	×
×	×	Quality and operational results
×	×	Customer satisfaction and focus

Porter and Parker (1993), identified eight elements that are needed to successfully implement TQM (see Fig 2). These eight factors were identified through a series of surveys conducted with companies that understood TQM.

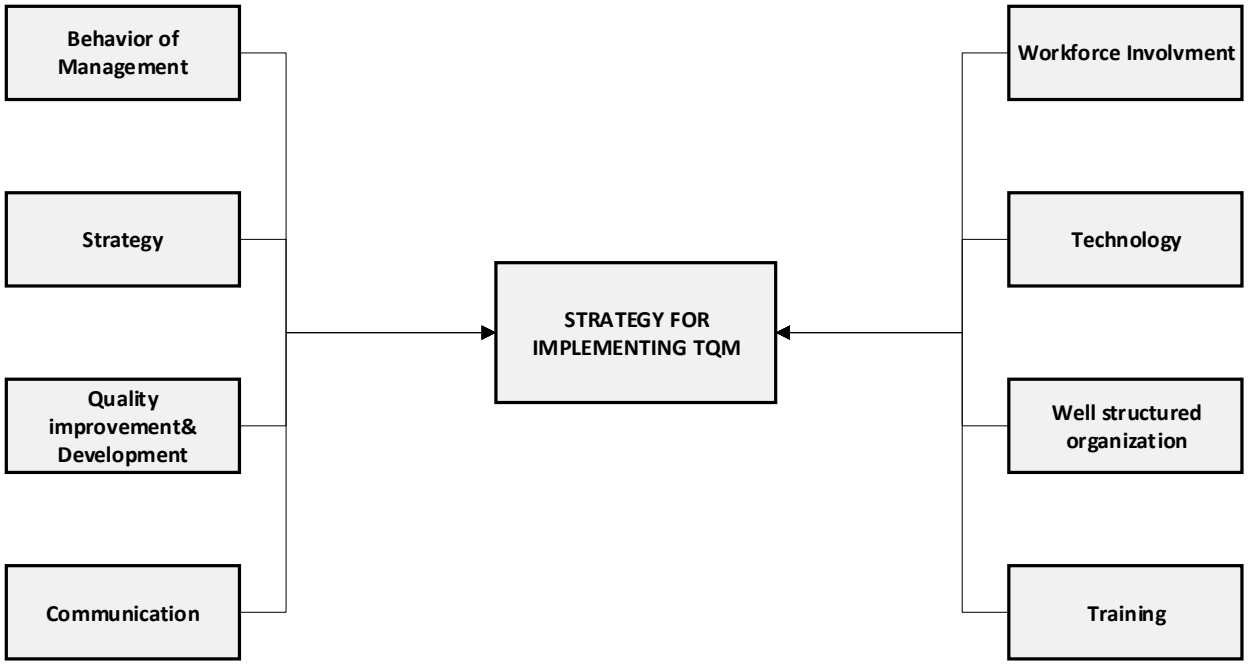


Figure 2: Summary of the critical factors for TQM implementations (As adapted from Porter and Parker 1993)

TQM is built upon three principles which should be incorporated in organizations shown in (see Figure 3). The first principle is customer focus, which involves meeting customer needs. The second principle is continuous improvement, which incrementally increases performance because of innovation and changes in organizational processes. The third principle is teamwork which involves combining the efforts of all the organization's employees, customers, and suppliers. Most TQM practices lead to performance improvement. Implementing the principles of TQM requires a radical change in the design of the organization (Victor et al. 2000).

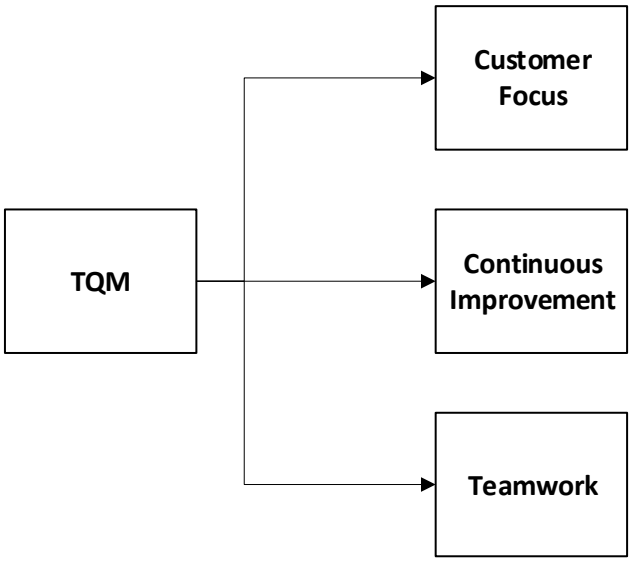


Figure 3:TQM principles incorporated in organizations (adapted from Victor et. al 2000)

TQM principles focus on retaining current customers and acquiring future customers by creating quality in terms of cost and customer driven measures. Quality is a measure of TQM, and customer satisfaction is a goal of the TQM process (Victor et al. 2000).

Customer input, known as the voice of the customer, provides important insights regarding customer needs and development of new products and services. Therefore, customer input is used to make s to form strategic and operational decisions. Obtaining the voice of the customer is a technique for developing products that match a detailed set of customer needs, which can be organized hierarchically and prioritized in terms of importance and the needs of customers. The four aspects of voice of customer are customer needs, hierarchical structure, priorities, and customers' perceptions of performance (Griffin and Hauser 1993).

TQM is revolutionizing the construction industry, leading to reforms in management styles, organizational culture style and behaviors, and statistical methods to measure performance. Top managers no longer command and control; instead, they coach and direct middle and lower managers to deliver excellent goods and services, to test new approaches, and to implement the ones that are effective (Pearson 2000).

TQM can only be implemented effectively when appropriate management behaviors have been adopted (Porter and Parker 1993). Ensuring that management behaviors are appropriate helps companies survive amid the in competition, give better service to customers, enhance shareholder value, and improve the overall quality and safety of services and facilities (Tang et. al 2005). Successfully implementing TQM in an organization requires that performance is continually measured, and that the workforce understands the importance of using performance measures to identify issues and solutions, evaluate alternatives and achieve well-defined quality-related goals.

2.5 Project Performance Indicators

Performance is a measure of the work completed; the performance of every person involved must be evaluated, in every phase of a project. Industries use, the performance indicators of cost, time, defects, and customers' satisfaction with products or services, whereas company indicators include safety, profitability, and productivity. Performance indicators are used to obtain measurable evidence that the attempted work has achieved the desired goal "Performance measures are numerical or quantitative indicators" and are systematically used to assess inputs and outputs to achieve continuous improvements. This is the distinction between performance indicators, measures, and measurements (Takim and Akintoye 2002).

Performance indicators indicate the performance level of single and multiple aspects of services. The indicators can be used in financial reports and can monitor the progress of employees' work, customer satisfaction, and overall equipment effectiveness (OEE). It is essential to identify these indicators because they can provide insight regarding resource allocation, benchmarking, personnel performance, problem areas, and maintenance, and overall business objectives (Parida and Kumar 2006).

Key performance indicators (KPIs) are performance indicators that are used to help senior managers make crucial strategic decisions. KPIs are used to identify improvements or problems. After KPI's are identified, changes can they are implemented, and the results can be analyzed. KPI's are grouped into four categories: financial, physical, functional, and survey-based (Dixit et al. 2010).

Another way to measure performance is through benchmarking. Benchmarking involves systematically comparing the performance of companies or divisions and then identifying areas for improvement. There are two types of benchmarking: internal and external. Internal benchmarking involves comparing departments or units within a company, whereas external benchmarking involves comparing different companies. External benchmarking is divided into two types: competitive and generic. Competitive involves comparing a company with a specific competitor for a product or service, whereas generic involves comparing a company's business functions with those of other companies not necessarily in the same industry (Takim and Akintoye 2002).

Benchmarking is important because remaining competitive depends not only on the product or service but also on the processes; and people involved. Before the benchmarking process is implemented, company must identify various financial and nonfinancial

measures that influence performance. These measures called critical success factors (CSFs). CSFs are the fundamentals that are needed to achieve company goals. It is important to identify these factors in every category and subcategory. Nonfinancial critical success factors include product or service quality, customer satisfaction, and business processes. The CSFs must be integrated with the strategies and performance measurements for a company to achieve its goals, prosper, and remain competitive (Mbugua et al. 1999).

2.6 Performance Measurement in HVAC Sector

Humans spend 80% of their time indoors; hence high-quality indoor air is important (Au-Yong et al. 2014). Indoor air quality and other factors produce environmental conditions that play an important role in the satisfaction of z building's occupants in terms of comfort. Thermal comfort is the expectation of indoor quality or climate to what exists which is synonymously associated with occupant satisfaction (De Dear and Brager 2002). Carbon dioxide concentrations, indoor air contaminants, volatile organic compounds, formaldehyde, and microbiological contaminants are responsible for building-related health symptoms which can affect occupant satisfaction. Adequate ventilation should be a major focus of building design or remodel efforts. Studies show that symptoms of asthma and sick-building syndrome are commonly reported (Daisy et. al 2003).

Discomfort can result from unpleasant odors, lack of air movement, insufficient lighting, and loud noise (Sexton 1986). The use of performance measurements in the HVAC industry is aimed at achieving occupant satisfaction mitigating sick- building syndrome and achieving good health. Customers' need in the HVAC service sector should

be monitored regularly, with the aim of helping contractors achieve maximum customer satisfaction and improve overall performance.

The New Horizons Foundation (NHF) funded a study on HVAC and sheet metal customers' requirements, with the aim of improving competitiveness. The change in the dynamics of this industry has forced companies to fully understand the key factors contributing to contractor's high performance. HVAC contractors must know their customers' buying decisions, foster customer confidence, and build customer trust and loyalty. The contractors in this industry must be equipped with leading-edge tools to remain competitive and to assemble a strong customer base that looks beyond price. As identified in the NHF study, the areas that HVAC contractors must first address are scheduling, quality of work, price, and, most importantly, customer service (NHF 2006).

2.7 Need for Performance Measures

The performance measurement literature can be categorized into two phases: one starting in the 1880s and the other starting in the 1980s. The first phase stressed on financial measures, such as profit, ROI, and productivity. The second phase began as a result of changes in the market. US companies began to lose market share to overseas companies because overseas companies were able to sell higher quality products at low costs. To regain a competitive edge, US companies shifted their priority priorities from lowcost to high-quality products, flexibility, short time leads, and dependable delivery (Ghalayani and Noble 1996).

Traditional performance measures were insufficient in terms of enabling for companies to remain competitive. These measures were criticized because they lacked strategic focus; did not provide data on quality, responsiveness, and flexibility; and did not

provide information on what customers need and how the competition performs. In the 1990s, British Rail's Network Southeast used performance indicators to increase its income by 28%, reduced controllable assets by 30%, improved service delivery, and customer improve customer satisfaction from the worst to the best on record (Neely 1999).

Relationship marketing is an integral part of the business in this complex market. *Relationship marketing* It is defined as "attracting, maintaining, and enhancing customer relationships." It is necessary for companies to maintain long-term relationships with stakeholders such as customers, suppliers, and employees., and competitors. Companies must establish relationship portfolios that identify and revenues of relationships and contributions to profits (Hunt 1997).

In 1991, Eccles wrote a paper for the *Harvard Business Review* titled, "The Performance Measurement Manifesto". In this article, he stated that for seven main reasons, said every company needed to redesign how it measures performance. These reasons are changes in the nature of work, increased in competition, improvement initiatives, national and international awards, changes in organizational roles, changes in external demands, and the power of information technology. Performance measures are needed today because they are used to test business strategies. There is also a positive correlation between showing business performance and customer satisfaction. Performance measures must be adopted appropriately based on the company's strategies which are based on company's strengths and weaknesses (Neely 1999).

In the low-bid procurement system, which is the predominant procurement system, predominantly used, a contractor is selected based on price. Research shows that this

procurement system is correlated with poor performance and poor quality. The poor performance has led to dissatisfaction among owners (Parmar et al. 2005).

Construction project outcomes can be measured in terms of cost, time, and quality. The owner's selection of a contractor based on price affects value criteria (Holt 1998). Also, in a global review of project management conducted by PricewaterhouseCoopers (2009), 2.5% of projects are defined as successful when assessed in terms of four critical dimensions: scope, cost, schedule, and business benefits.

Research shows that the low-bid procurement system has the following performance results:

- On-budget rate: 33%
- On-schedule rate: 42%
- Client satisfaction: 53%

To overcome the issues resulting from low-bid procurement and to help contractors survive in a low-bid industry, it is necessary for owners to consider bidders' performance when selecting a contractor. Doing so minimizes risks for owners and increases contractors' accountability. The use of performance measurements in this low-bid industry will boost the contractors' ability to obtain work and will enable high-performing contractors to identify and address risks (Sullivan and Kashiwagi 2006). Performance measures are a tool that contractors can use to strengthen their position in the market despite changing trends of the market.

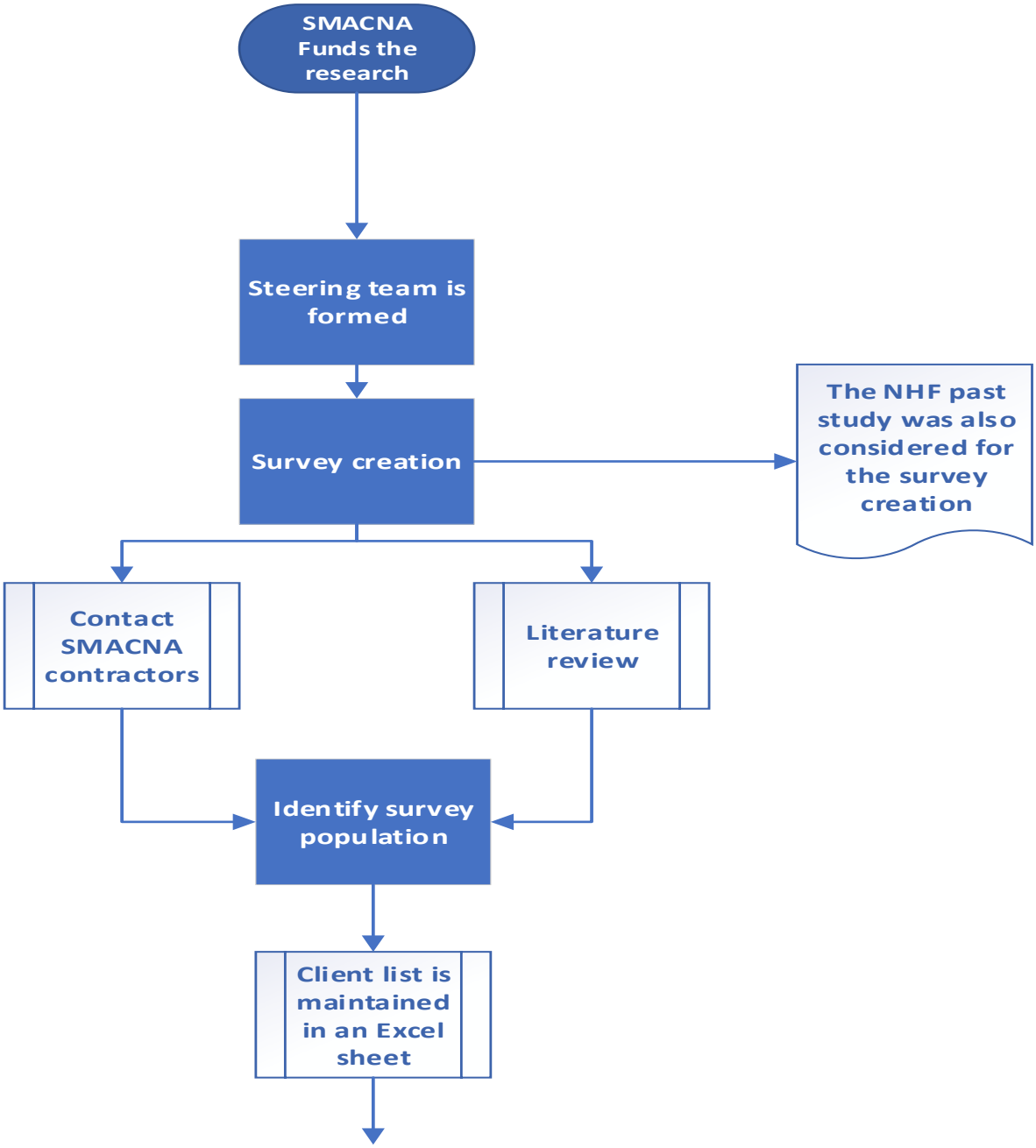
CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This research follows the methodology depicted in Figure 4. The research began with an analysis of the literature to understand the best practices for improving customer satisfaction and how to use customer satisfaction as a tool to increase work opportunities. Previous studies provided a framework for the current study to build on. The reviewed literature focused on the need for customer satisfaction, the best practices for achieving customer satisfaction and the inadequacies of traditional performance measures.

The database created based on the literature was used to prepare a survey for SMACNA contractors regarding their level of satisfaction with three companies. Based on literature, the researcher identified the customer satisfaction measures to assess the contractors' past performance. The survey, data were was managed using Microsoft Excel. Additionally, SPSS was used to conduct various statistical tests to identify characteristics of contractors' past performance.

Analyzing the survey results helped to identify the satisfaction with eight measures of contractor performance and to determine the critical factors that are traits of high-performing contractors.



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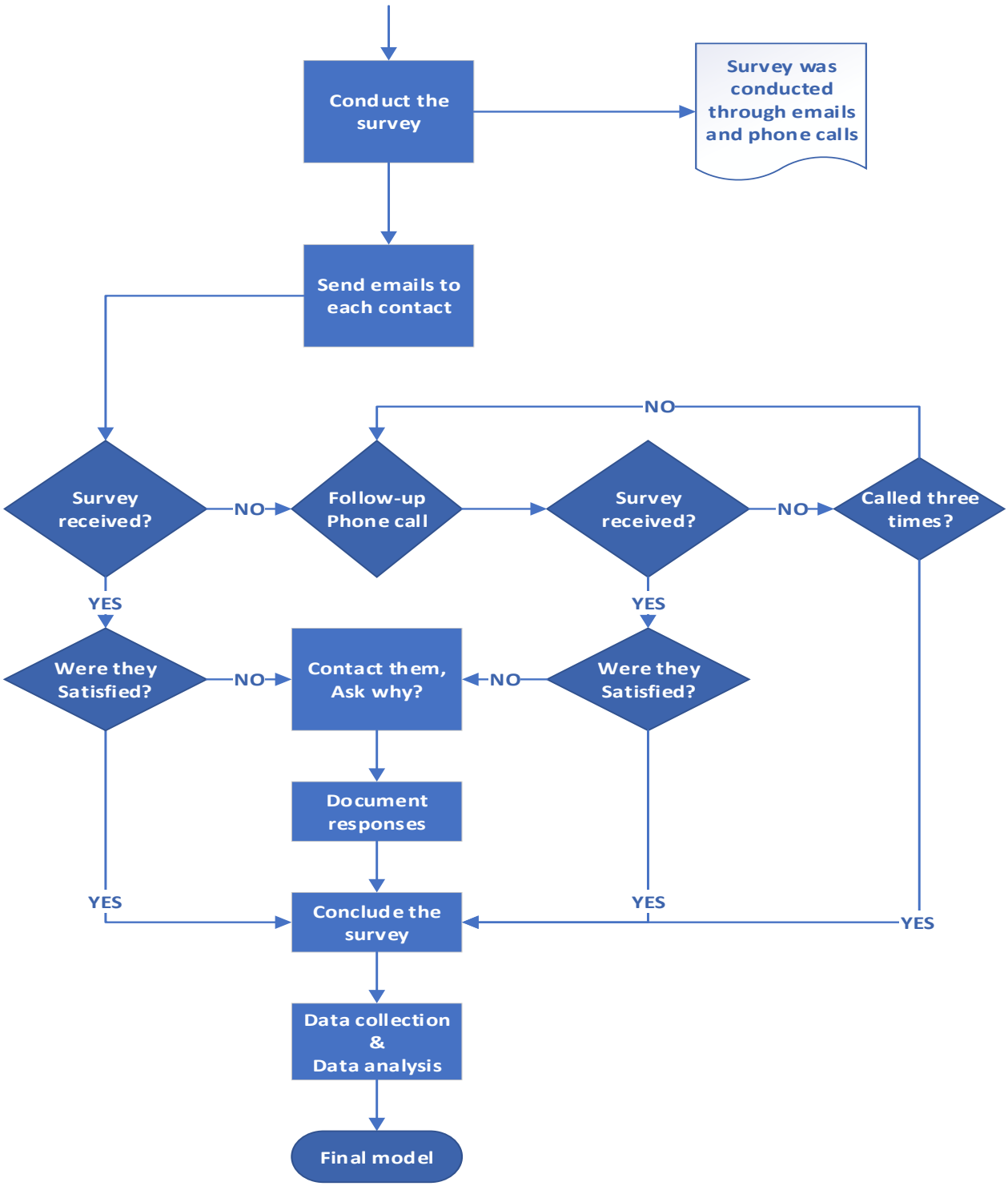


Figure 4: Steps in research methodology

3.2 Formation of Steering Team

The steering team for this research consisted of researchers from the University of North Carolina at Charlotte and from Kansas University, as well as SMACNA contractors. These individuals were involved in the entire process of creating and conducting the survey.

3.3 Survey Creation

3.3.1 Developing Survey Questions

Figure 5 shows the components of the survey. The survey collected information on the contractors' demographics, the scope of work, eight customer satisfaction measures, and the contractor's professional experience.

The eight customer satisfaction measures were selected from 50 possible indicators; the measures most relevant to the customers were identified by the NHF steering team. The survey questions were adapted from NHF research conducted in 2006. In finalizing the questions, input from the SMACNA steering team was also considered.

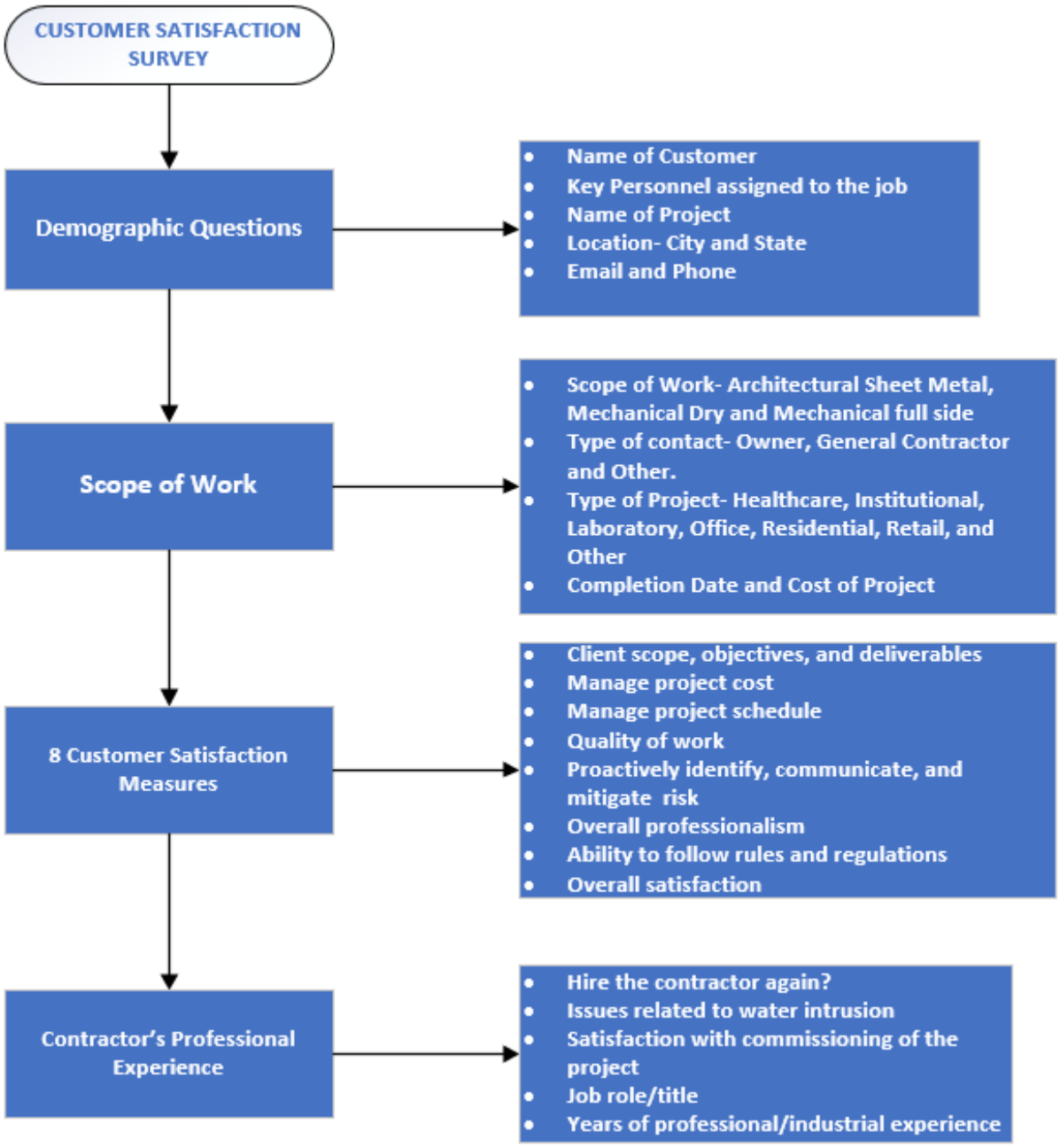


Figure 5:Flow of content in the Customer Satisfaction Survey

3.3.2 Survey Population

The survey population consisted of HVAC and sheet metal contractors. Contractors were contacted through email (see Fig 6) to obtain a list of their clients/customers (end users, subcontractors, general contractors, and other) who would be able to answer questions about the contractors' job performance.

Dear Participant,

Please see the attached Excel file and fill out the request information as best you can. There is an "Instructions" tab and a "Job List" tab.
Once we receive your job list, we will begin contacting your customers and collecting the survey satisfaction. Please see the attached survey which shows the questions we will be asking.

Please let me know if you have any questions or concerns.

Thank you!

Figure 6: Email sent to contractors

No	Project Name	Key Personnel From YOUR Company Working on Job	Company	City	State	Type of Project	Scope
0	*Example Project*	*Clyde Smith, Dale Ortiz, Claire Robinson*	*ABC School District*	*Anywhere*	*NC*	*Institutional*	*Mech*
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

Figure 7: Excel file with job list

An Excel file was attached to the email, and the contractors were asked to provide information regarding recent jobs (see Fig 7. The process of identifying the survey population took place over a period of five months. Three contractors participated in the study.

3.3.2.1 Definition of Terms

- Project name: Name of the project
- Key personnel: Key personnel who worked on the project
- Company: Name of the company
- City, State: Location of the project
- Type of project:
    a) Institutional: Projects that involve facilities used for education, recreation, and public works
    b) Healthcare: Projects that involve hospitals, doctor's offices, and other specialized care facilities.
    c) Laboratory: Projects that facilities such as laboratories, research facilities, forensic centers, and crime labs.
    d) Office: Projects that involve business facilities.
    e) Residential: Projects that involve single and multifamily housing.
    f) Retail: Projects that involve facilities where goods or services are exchanged such as restaurants, stores, and banks.
- Other: Projects that involve other types of facilities.
- Scope of work:

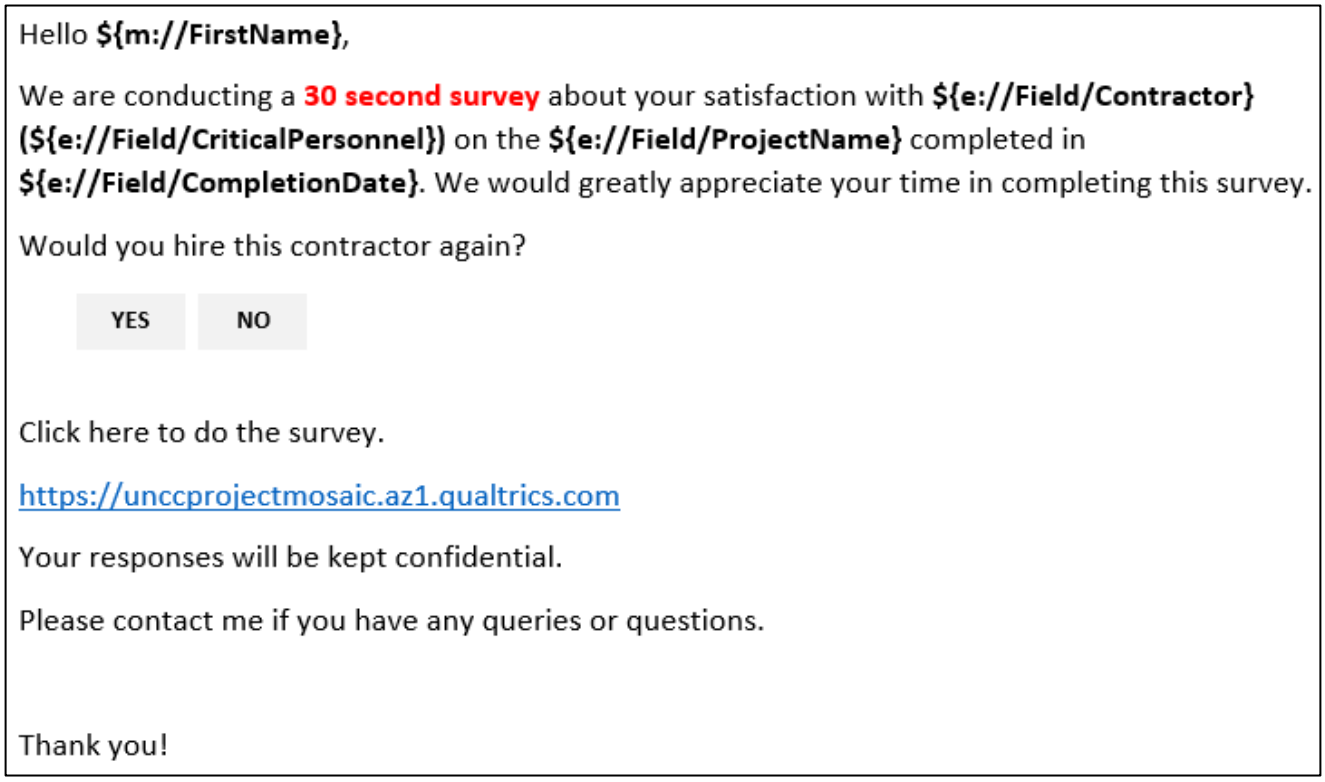
a) Architectural sheet metal: Involves the contractor installing panels and siding on a building to preserve it.
b) Mechanical dry side only: Involves the contractor, is a subcontractor to a wet side mechanical contractor, fabricating and/or installing the duct systems and providing the grilles, registers, diffusers, and exhaust fans (dry side) but not carry air handlers, VAV boxes, and piping (wet side).
c) Mechanical full side: Involves the contractor having direct contact with the owner or general contractor and being responsible for the wet and the dry (air) side.

- First and last name: Name of the customer
- Phone and email: Phone and email of the customer
- Type of contact/Customer type:
    a) General contractor: Is responsible for providing all the material, labor, equipment, and services required for construction.
    b) End users: Uses the building or other item that is the focus of the project.
    c) Sub to a sub-contractor: Carries out for a contractor on portion of work in a large project.
    d) Other
- Completion date and final cost: Date of completion and the final cost of the project

3.3.3 Conducting the Survey

Qualtrics was used to email the survey to the listed clients/customers. The email contained details of the survey and provided a link to the survey (see Fig 8). Phone calls

were made to customers/clients that did not complete the survey. Additionally, respondents who reported low satisfaction ratings or warranty issues were contacted to again additional information.


Hello **${m://FirstName}**,

We are conducting a **30 second survey** about your satisfaction with **${e://Field/Contractor}** **(${e://Field/CriticalPersonnel})** on the **${e://Field/ProjectName}** completed in **${e://Field/CompletionDate}**. We would greatly appreciate your time in completing this survey.

Would you hire this contractor again?

YES NO

Click here to do the survey.

https://unccprojectmosaic.az1.qualtrics.com

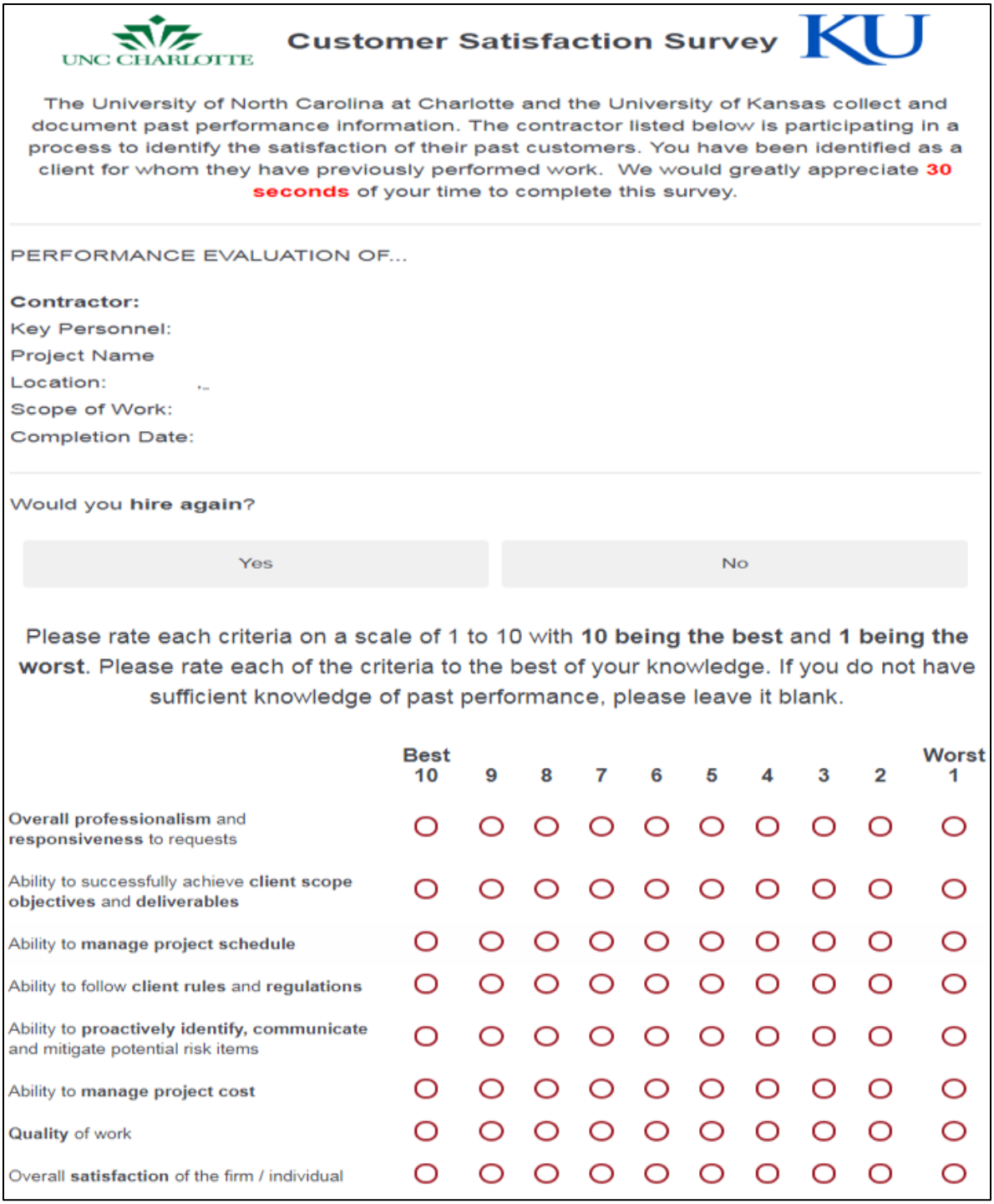
Your responses will be kept confidential.

Please contact me if you have any queries or questions.

Thank you!

Figure 8: Email sent to customers

The surveys, (see Fig 9) was housed on Qualtrics's website, and the survey data were recorded in Qualtrics's system. The survey collection concluded on February 12, 2019.



UNC CHARLOTTE

Customer Satisfaction Survey

KU

The University of North Carolina at Charlotte and the University of Kansas collect and document past performance information. The contractor listed below is participating in a process to identify the satisfaction of their past customers. You have been identified as a client for whom they have previously performed work. We would greatly appreciate **30 seconds** of your time to complete this survey.

PERFORMANCE EVALUATION OF...

Contractor:
Key Personnel:
Project Name
Location:
Scope of Work:
Completion Date:

Would you **hire again**?

Yes | No

Please rate each criteria on a scale of 1 to 10 with **10 being the best** and **1 being the worst**. Please rate each of the criteria to the best of your knowledge. If you do not have sufficient knowledge of past performance, please leave it blank.

	Best 10	9	8	7	6	5	4	3	2	Worst 1
Overall professionalism and **responsiveness** to requests	○	○	○	○	○	○	○	○	○	○
Ability to successfully achieve **client scope objectives** and **deliverables**	○	○	○	○	○	○	○	○	○	○
Ability to **manage project schedule**	○	○	○	○	○	○	○	○	○	○
Ability to follow **client rules** and **regulations**	○	○	○	○	○	○	○	○	○	○
Ability to **proactively identify, communicate** and mitigate potential risk items	○	○	○	○	○	○	○	○	○	○
Ability to **manage project cost**	○	○	○	○	○	○	○	○	○	○
Quality of work	○	○	○	○	○	○	○	○	○	○
Overall **satisfaction** of the firm / individual	○	○	○	○	○	○	○	○	○	○

Figure 9:Customer Satisfaction Survey

3.3.4 Data Collection and Analysis

The survey data were analyzed through using descriptive and inferential statistical tests. The data were categorized as quantitative or qualitative data and were analyzed using Excel and SPSS. The analyses were performed to achieve the research objectives.

3.3.5 Final Model

A flowchart was developed to depict the contractors' past performance and how the contractors use performance reports to communicate with their customers .

CHAPTER 4: DATA ANALYSIS

4.1 Overview

The survey responses were analyzed using SPSS version 25. The responses were summarized, and then the dataset was exported to an Excel spreadsheet. Of the 89 customers who were invited to complete the survey, 39 responded, for a response rate of 44%. Figure 10 shows the overall response rate and Figure 11 shows the response rate for each of the three companies that were asked to identify customers/clients to participate in the study. Descriptive and inferential statistical tests were performed. Table 2 shows descriptive statistics regarding the responses to the eight customer satisfaction measures addressed in the survey. The results show that even though the means for overall professionalism and the adherence to rules and regulation is the highest among the customer satisfaction measures, the sample sizes for these two criteria are comparatively small. These sample sizes are smaller than most of the other criteria because the researcher asked the first few criteria then the last criterion because it was challenging to obtain responses from general contractors (customers). The data set consists of qualitative and quantitative data. While taking the survey, respondents added comments for a few questions, and this textual data was included in the analysis.

Figure 10:The response rate for the Customer Satisfaction Survey

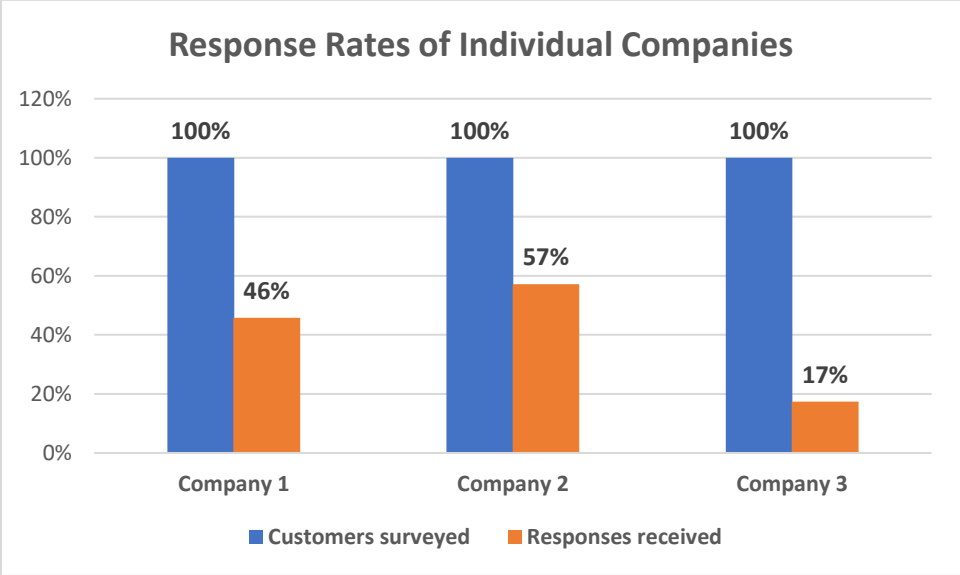


Figure 11:The response rate of the survey by company

Table 2: Descriptive Statistics regarding Eight Customer Satisfaction Measures for SMACNA contractors

Criteria	Sample size		Mean	Standard deviation	Min	Max
	Valid	Missing				
Client scope and objectives	35	4	9.1	1.4	5	10
Manage project cost	38	1	8.7	1.7	3	10
Manage project schedule	29	10	8.3	2.1	1	10
Quality of work	35	4	9.0	1.2	5	10
Identify and communicate risk	17	22	8.4	2.3	2	10
Overall professionalism	21	18	9.2	1.0	7	10
To follow rules and regulations	10	29	9.2	1.0	8	10
Overall satisfaction	32	7	8.8	1.6	3	10

4.2 Data Description

Figure 12 shows the variables that were examined in this study. The independent variable was the contractors who were surveyed. The dependent variables were the eight satisfaction measures which are ordinal variables. These variables were used to test the hypotheses.

The dataset also consisted of qualitative responses to open-ended questions about the respondent's overall experience. Table 3 lists of these questions.

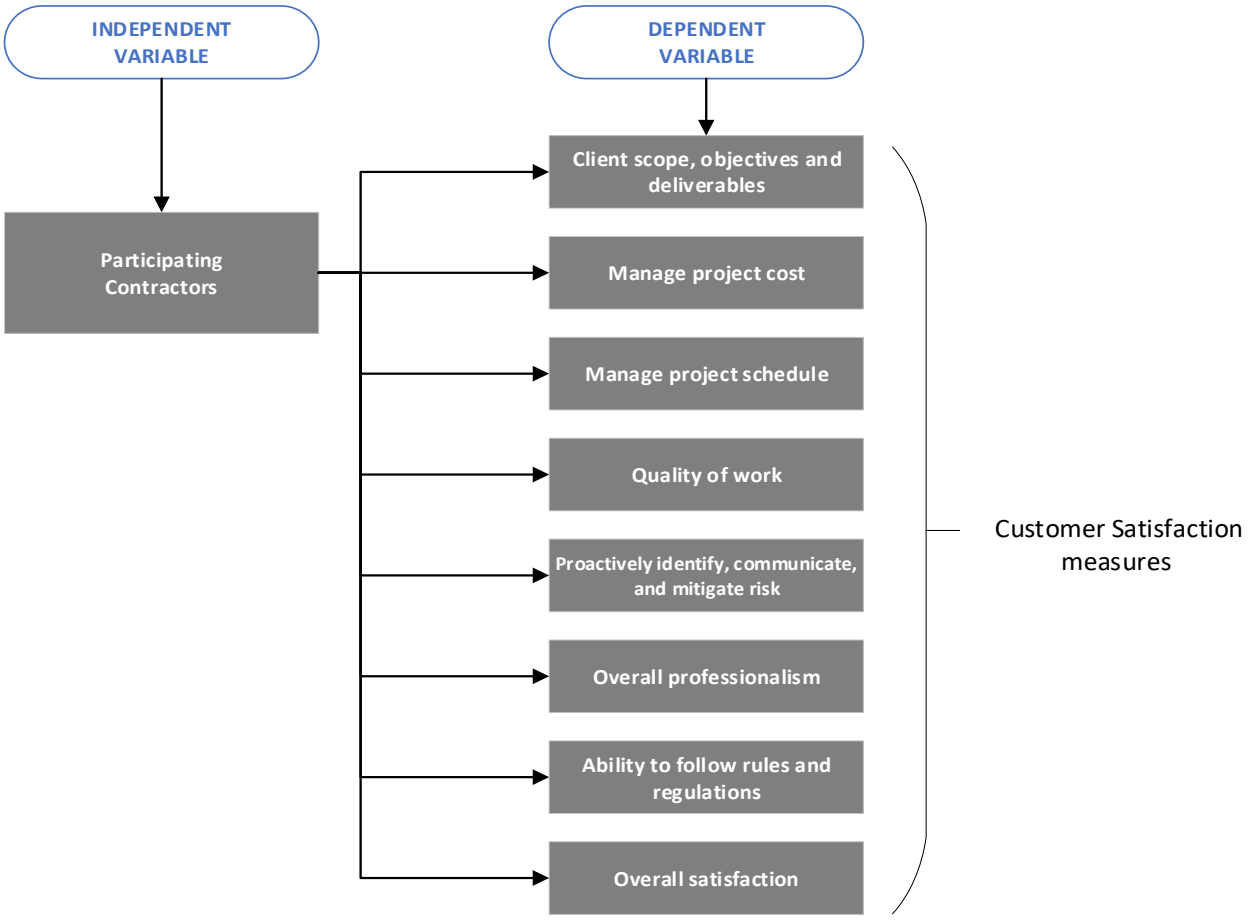


Figure 12: Variables examined in this study

Table 3:Open-Ended Survey Questions

Questions
What is the reason for you to hire/not hire them again?
What were the issues regarding water intrusion?
What were the issues regarding commissioning/close out stage of the project?
Do you have any comments/recommendations?

4.3 Analysis of Quantitative Data

The quantitative data were subjected to descriptive and inferential statistical tests. The descriptive tests were performed using Excel, and the statistical tests were performed using SPSS. Table 4 contains a summary of the descriptive analysis of the respondents' satisfaction with the past performance of the three companies examined in this study.

Table 4:Statistical summary of the Performance of Three Companies

Descriptive Analysis

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Client Scope	Company 1	8	8.88	1.885	.666	7.30	10.45	5	10
	Company 2	23	9.22	1.347	.281	8.63	9.80	5	10
	Company 3	4	8.75	1.258	.629	6.75	10.75	7	10
	Total	35	9.09	1.442	.244	8.59	9.58	5	10
Project Cost	Company 1	11	8.45	2.162	.652	7.00	9.91	3	10
	Company 2	23	9.04	1.492	.311	8.40	9.69	4	10
	Company 3	4	7.25	.500	.250	6.45	8.05	7	8
	Total	38	8.68	1.710	.277	8.12	9.25	3	10
Project Schedule	Company 1	7	7.43	3.409	1.288	4.28	10.58	1	10
	Company 2	18	8.72	1.565	.369	7.94	9.50	5	10
	Company 3	4	7.75	1.500	.750	5.36	10.14	7	10
	Total	29	8.28	2.136	.397	7.46	9.09	1	10
Quality	Company 1	11	9.09	1.300	.392	8.22	9.96	6	10
	Company 2	20	9.00	1.257	.281	8.41	9.59	5	10
	Company 3	4	9.00	1.155	.577	7.16	10.84	8	10
	Total	35	9.03	1.224	.207	8.61	9.45	5	10
Mitigate Risk	Company 1	5	8.20	3.493	1.562	3.86	12.54	2	10
	Company 2	8	8.63	1.847	.653	7.08	10.17	5	10
	Company 3	4	8.00	1.826	.913	5.09	10.91	6	10
	Total	17	8.35	2.290	.555	7.18	9.53	2	10
	Company 1	9	9.22	1.202	.401	8.30	10.15	7	10

Overall Professionalism	Company 2	8	9.19	1.067	.377	8.30	10.08	7	10
	Company 3	4	9.00	.816	.408	7.70	10.30	8	10
	Total	21	9.17	1.041	.227	8.69	9.64	7	10
Rules & Regulations	Company 1	4	9.50	1.000	.500	7.91	11.09	8	10
	Company 2	2	9.00	1.414	1.000	-3.71	21.71	8	10
	Company 3	4	9.00	1.155	.577	7.16	10.84	8	10
	Total	10	9.20	1.033	.327	8.46	9.94	8	10
Overall Satisfaction	Company 1	7	8.14	2.545	.962	5.79	10.50	3	10
	Company 2	21	9.00	1.265	.276	8.42	9.58	5	10
	Company 3	4	8.50	1.291	.645	6.45	10.55	7	10
	Total	32	8.75	1.606	.284	8.17	9.33	3	10

4.3.1 Statistical Tests Performed Using SPSS

A one-way ANOVA was performed using SPSS to determine whether there is a statistically significant difference between the means of eight customer satisfaction measures in terms of contractor performance. Table 5 shows the ANOVA results. Prior to conducting one-way ANOVA, homogeneity tests are to be conducted between the variables to assess the homogeneity within the groups. Table 6 shows the distribution of the customer satisfaction ratings received by the customers.

Table 5:ANOVA results for the Three Companies in relation to the Satisfaction Measures

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Client Scope & Objectives	Between Groups	1.205	2	.602	.277	.760
	Within Groups	69.538	32	2.173		
	Total	70.743	34			
Project Cost	Between Groups	11.777	2	5.888	2.137	.133
	Within Groups	96.434	35	2.755		
	Total	108.211	37			
Project Schedule	Between Groups	9.718	2	4.859	1.070	.358
	Within Groups	118.075	26	4.541		
	Total	127.793	28			

Quality	Between Groups	.062	2	.031	.020	.981
	Within Groups	50.909	32	1.591		
	Total	50.971	34			
Mitigate Risk	Between Groups	1.207	2	.604	.102	.903
	Within Groups	82.675	14	5.905		
	Total	83.882	16			
Overall Professionalism	Between Groups	.142	2	.071	.060	.942
	Within Groups	21.524	18	1.196		
	Total	21.667	20			
Rules & Regulations	Between Groups	.600	2	.300	.233	.798
	Within Groups	9.000	7	1.286		
	Total	9.600	9			
Overall Satisfaction	Between Groups	4.143	2	2.071	.792	.463
	Within Groups	75.857	29	2.616		
	Total	80.000	31			

Table 6:Frequency of customer satisfaction rating

Frequency of rating	Criteria							
	Client scope and objectives	Ability to manage project cost	Ability to manage project schedule	Quality of work	Ability to identify risk	Overall professionalism	Ability to follow rules and regulations	Overall satisfaction
1	0	0	1	0	0	0	0	0
2	0	0	0	0	1	0	0	0
3	0	1	0	0	0	0	0	1
4	0	1	0	0	0	0	0	0
5	2	0	3	1	1	0	0	1
6	1	1	0	1	1	0	0	0
7	2	5	4	1	2	2	0	3
8	2	5	4	6	1	3	4	5
9	8	8	6	10	3	5	0	9
10	20	17	11	16	8	11	6	13

4.3.2 Statistical Tests Performed Using Excel

Figure 13 shows the respondents' years of experience in the profession/industry; this information was collected to ensure the collected data were reliable (Au-Yong et al. 2014). Figure 14 shows the type of respondents (end customer, owner, subcontractor, general contractor, and others). Figure 15 contains data regarding whether the respondents would hire the contractors again. Of the 39 responses to this item, 77% indicated the respondent would hire the contractor again.

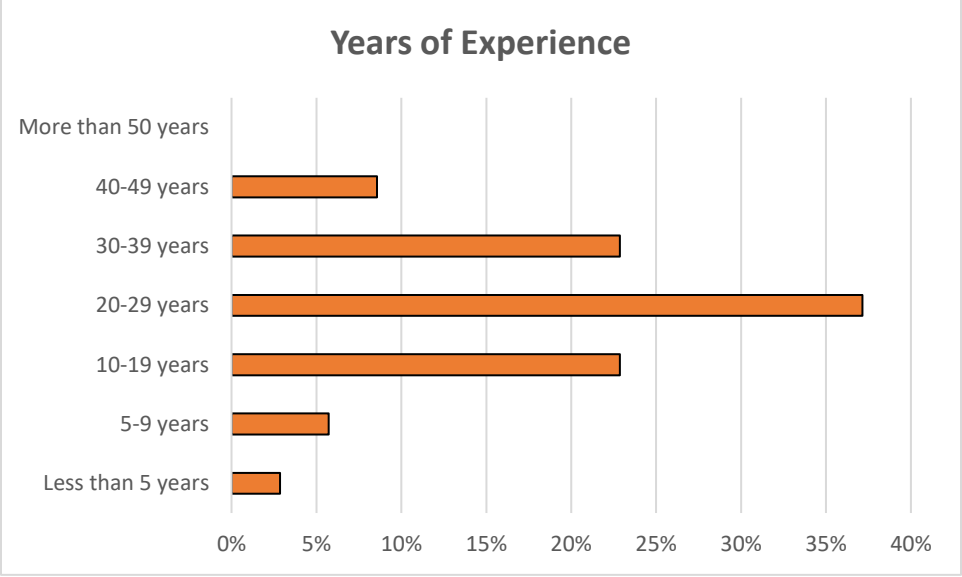


Figure 13:Respondents' years of professional/industry experience

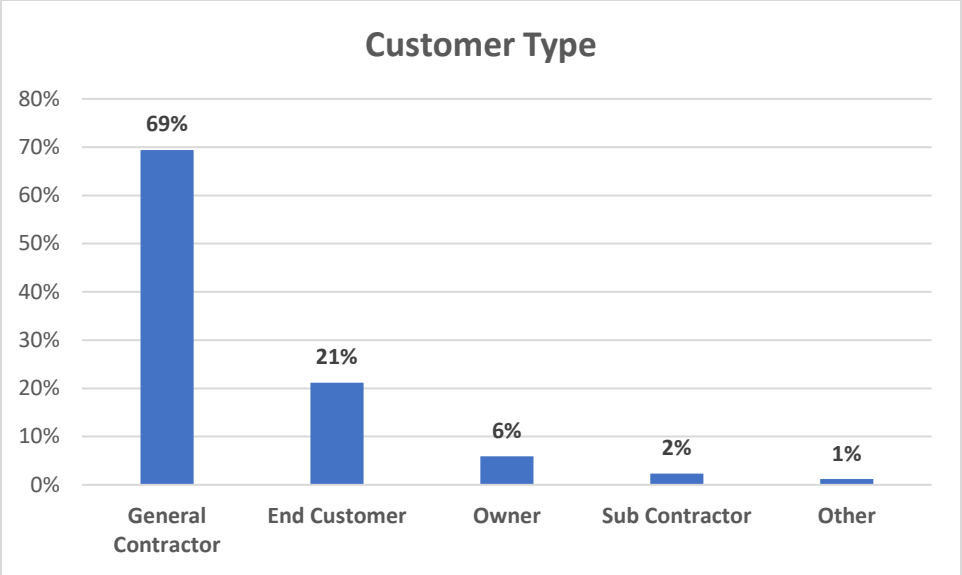


Figure 14:Types of respondents

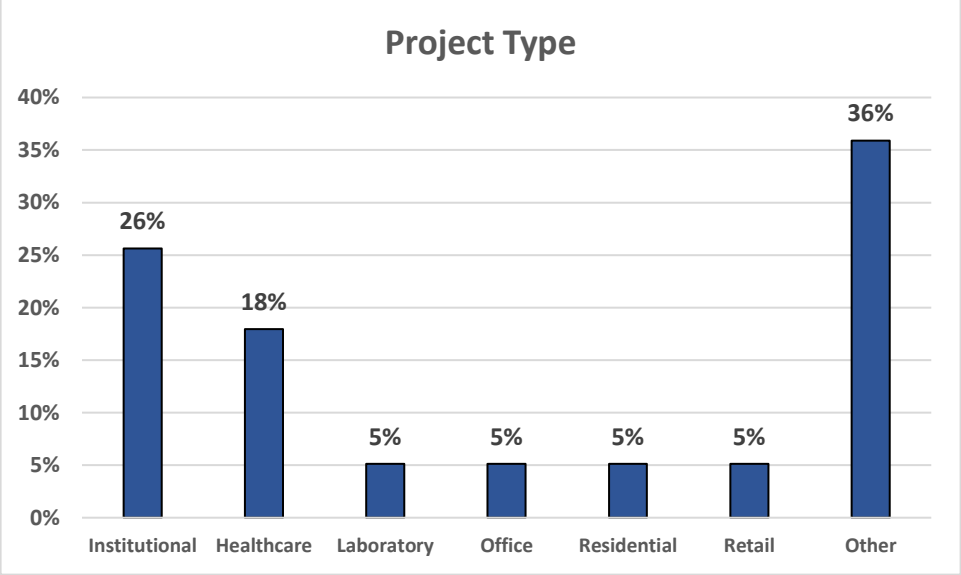


Figure 15:Types of projects the contractors worked on for the respondents

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The client list which was obtained and maintained in Excel sheets to be surveyed were summarized based on type of project which is illustrated in Figure 16.

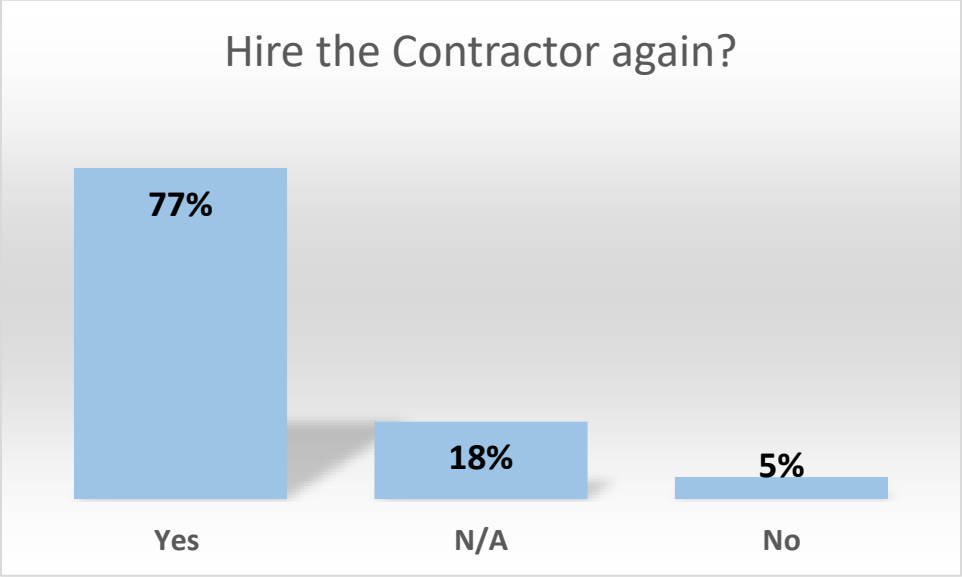


Figure 16: Responses regarding whether the respondent would hire the contractor again.

4.3.3 Hypothesis for Contractor's Performance

HYPOTHESIS 1:

Null Hypothesis H_0: The distribution of eight customer satisfaction measures varies in terms of contractor performance.

Alternate Hypothesis H_1: The distribution of eight customer satisfaction measures does not vary terms of contractor performance.

4.3.4 Conclusion

HYPOTHESIS 1: We failed to reject the null hypothesis because there is no statistically significant difference between the means of the eight customers satisfaction measures in terms of contractor performance.

4.4 Analysis of Qualitative Data

The qualitative data set comprises 40 comments that respondents made when completing the survey. The comments regarded issues about water intrusion, commissioning projects, and the overall performance of the contractors. The comments provided insight into the contractors' past-performance and identified areas for improvement.

These results combined with analysis of literature review and the NHF past study guided the researcher to identify the critical factors or common traits to evaluate contractor performance. The factors are leadership, training of employees, quality, employee involvement, technology, communication, customer satisfaction, management behavior, goal-oriented, cost, and schedule.

The comments were maintained and were combined in one Excel file. Only the comments which depicted the strengths, or the positive traits of the contractor's performance were considered while grouping these open-ended comments.

The open-ended comments which were received for four questions were considered and grouped into critical factors as shown in Table 7. Figure 17 shows the critical factors required for contractor's performance. The researcher first segregates the comments into

strengths and weaknesses relevant to contractor's performance. Some of the comments accentuated both strength and weakness, such comments were broken down and grouped accordingly. For example, comments such as "best quality contractor", "meet the deadlines", and "they are the most preferred and are the best contractors" were grouped under quality, schedule, and performance accordingly. The critical factors were identified from the comments by identifying key words. The comments which were grouped under strengths were again divided into ten critical factors by identifying key words from these comments such as schedule, quality, proactive, and others. These critical factors are important to ensure project success as they act as key project factors. The factors identified are cost, time, quality, safety, customer satisfaction, and organizational and stakeholder benefits (Lindhard and Larsen 2016). These factors will help customers to measure the performance of the contractor in terms of the critical factors identified and distinguish other high-performing contractors based on these critical factors. Table 8 is a comparison of the critical factors as identified by the researcher with the literature review and the NHF past studies.

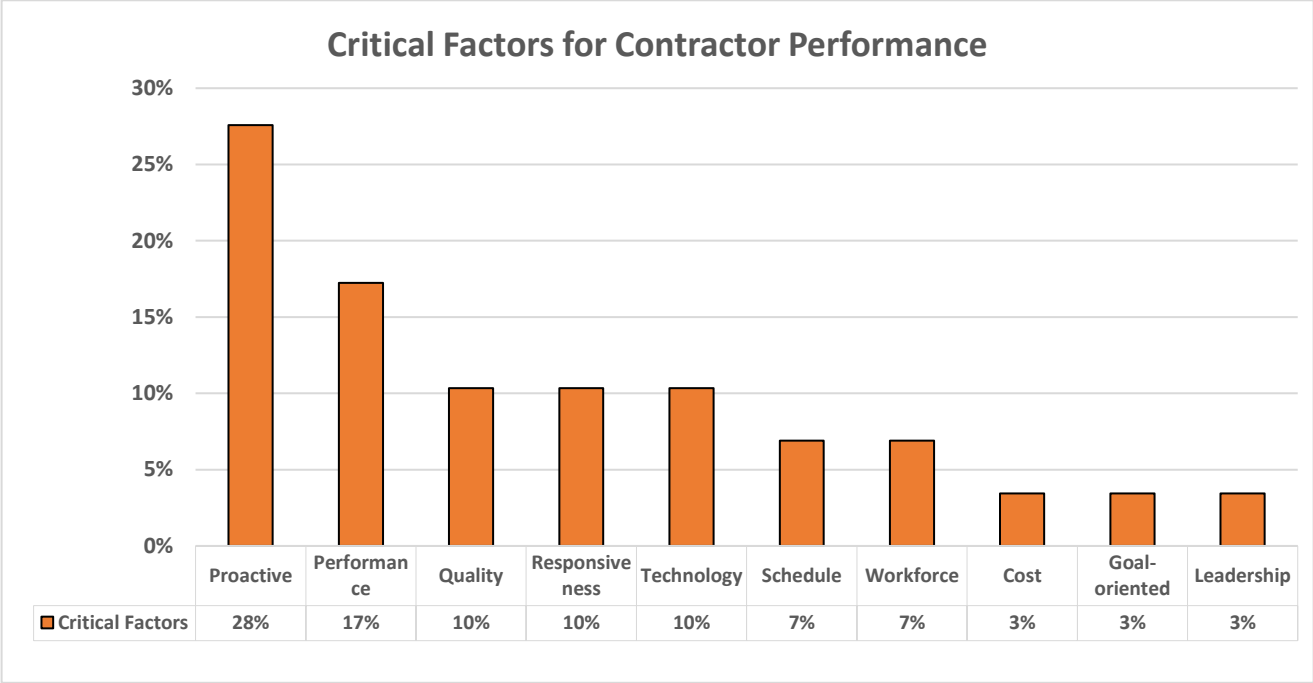


Figure 17:Common traits identified for contractor's performance

Table 7:Definition of Critical Factors

Factor	Definition of the factors
Proactive	Responding to a situation or a problem instantly
Performance	Accomplishing action or service with perfection keeping in mind all the requirements
Quality	Performing work which conform with customers' needs and requirements
Responsiveness	Reacting quickly to any issues or problems identified
Technology	Equipped with the latest technology
Schedule	Ability to deliver the project or services on time
Workforce	Efficient team working on the project
Cost	Performing work within the budget
Goal-oriented	Well defined goals
Leadership	Necessary management behavior is enforced

Table 8:A Comparison of the Critical factors for Contractor Performance

Criteria	Literature Review	NHF research findings	
		2006	2018 (this study)
Leadership	✓		✓
Training of Employees	✓		
Quality	✓	✓	✓
Employee Involvement	✓		✓
Technology	✓		✓
Communication	✓	✓	
Customer Satisfaction	✓		
Management Behavior	✓		
Goal-oriented			✓
Cost	✓	✓	✓
Schedule	✓	✓	✓

The comments which were grouped under weaknesses helped to identify the major issues with the past performance of the contractors. The issues are water intrusion, chiller issues, temperature issues, equipment failures, tube leaks, control issues on the rooftop, and plumbing issues. These issues affected the satisfaction of the customers and the rating of the contractor's past performance.

4.4.1 Conclusion

From the analysis of the qualitative data, the researcher identified critical factors which are detected as traits of high performing contractors. The factors which are traits of high-performing contractors are proactive, performance, quality, responsiveness, technology, schedule, workforce, cost, goal-oriented, and leadership.

CHAPTER 5: RESULTS

This section covers the results of this thesis with a focus on the customer's overall level of satisfaction. The critical traits of high performing contractors as identified by customers are also discussed in this section. The need for contractors to use customer satisfaction as an asset to increase work opportunities is also addressed.

5.1 Results of Quantitative Data

Analysis of the data shows that there is no statistical significance between the means of the customer satisfaction measures in terms of contractor performance. The first research objective results are presented in this section. The contractor performance in terms of customer satisfaction measurements varies but does not significantly show a major difference in the means of the responses. Figures 18-25 represents the means for the customer satisfaction measurements for the contractors who participated in the survey.

The highest level of variance was seen in response to the customer satisfaction measure, "Ability to Manage Project Cost (Figure 19). While Contractor 1 and Contractor 2 had only a 0.5 difference in means, Contractor 3 had a score of 1.45 lower than others. While the analysis of variance showed no overall statistical difference, it is evident that there is potentially a performance concern to Contractor 3's ability to manage overall project cost.

Similarly, it is observed that Contractor 2 has higher overall customer satisfaction ratings in response to the question, "Ability to Manage Project Schedule". Contractor 2's overall rating is 8.7 out of 10, whereas Contractor 1 and Contractor 3 have scores of 7.4 and 7.8 respectively. Again, while there is no statistical difference, it appears that

Contractor 2 may be excelling in the area of schedule management of projects such as healthcare, institutional, industrial, and retail.

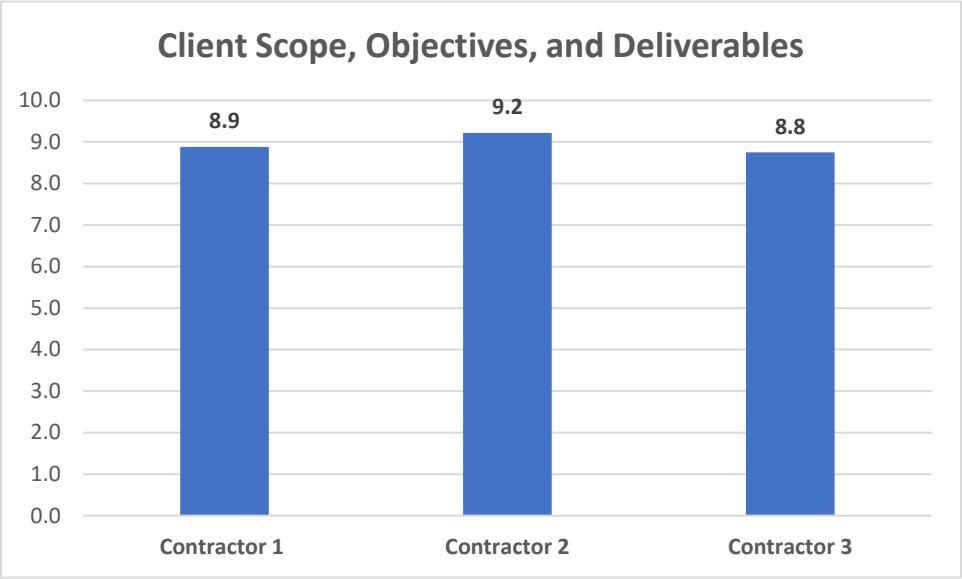


Figure 18:Distribution of contractors' ability to achieve client scope, objective, and deliverables

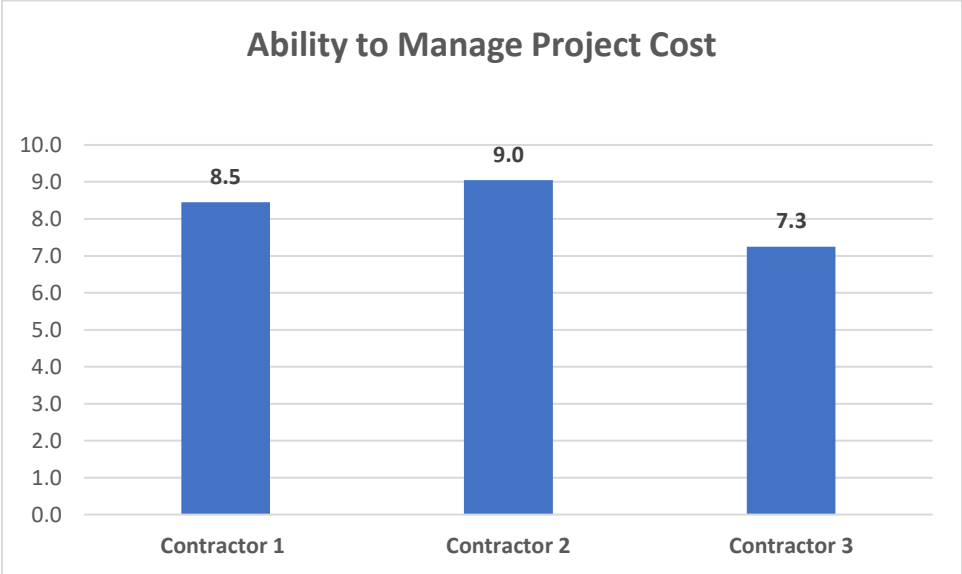


Figure 19:Distribution of contractors' ability to manage project cost

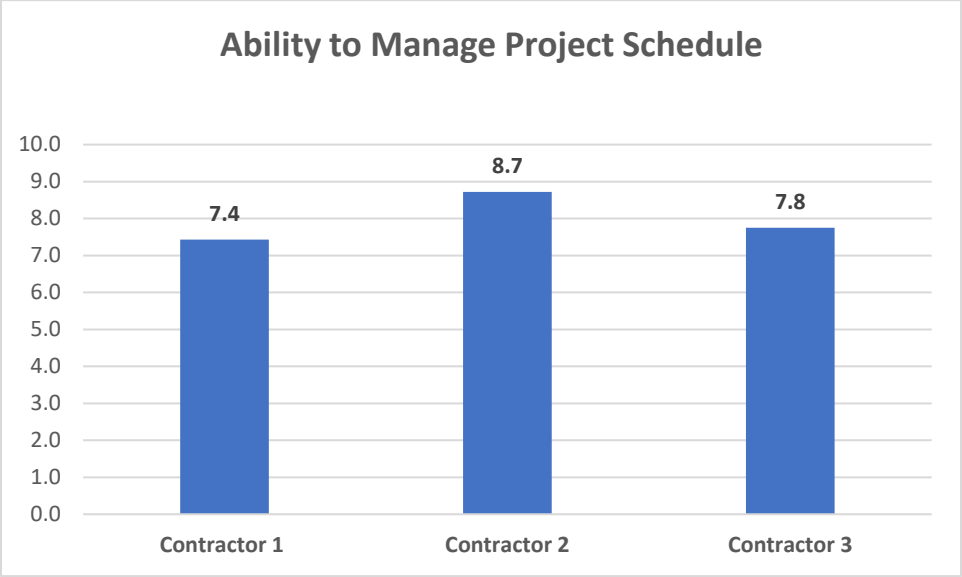


Figure 20:Distribution of contractors' ability to manage project schedule

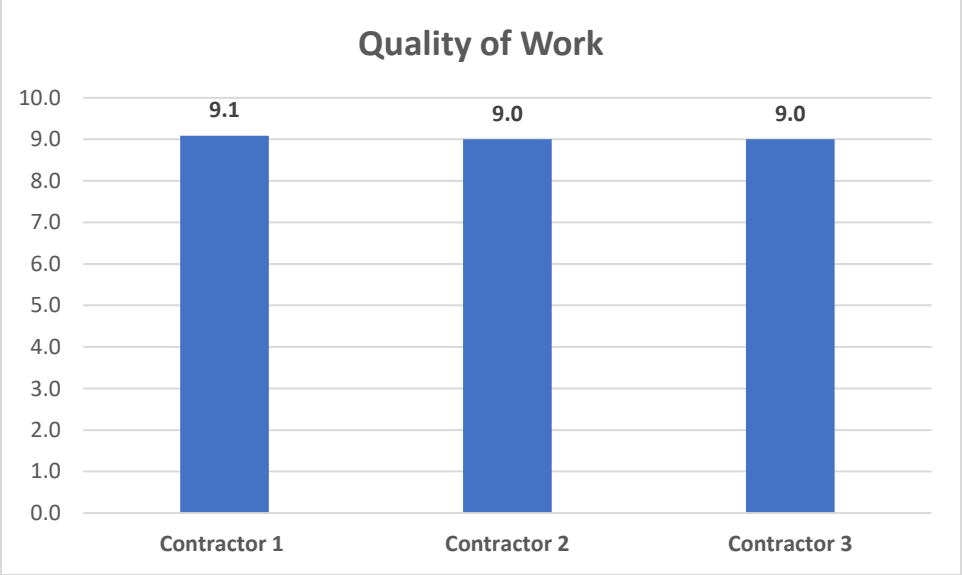


Figure 21:Distribution of achieving the required quality of work

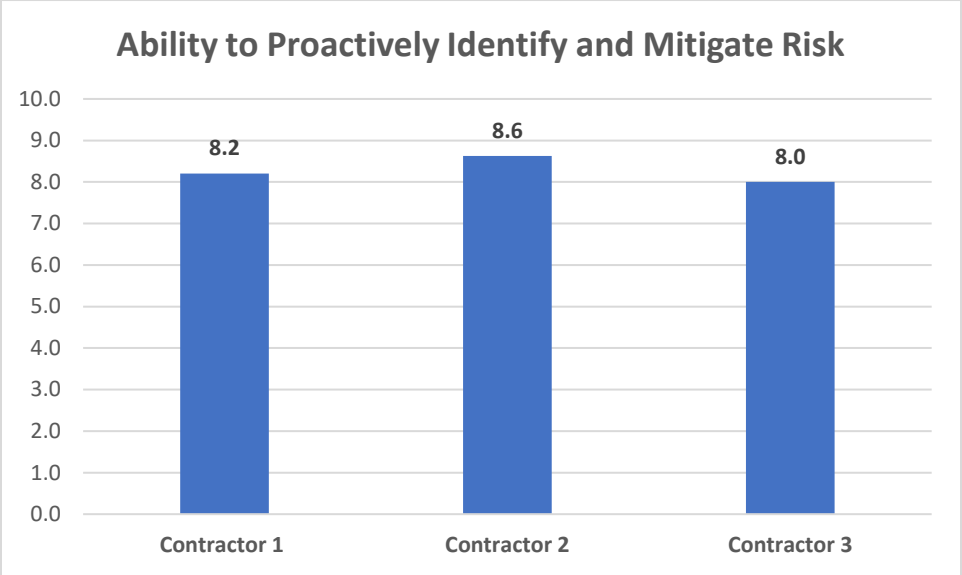


Figure 22:Distribution of contractors' ability to identify and mitigate risk

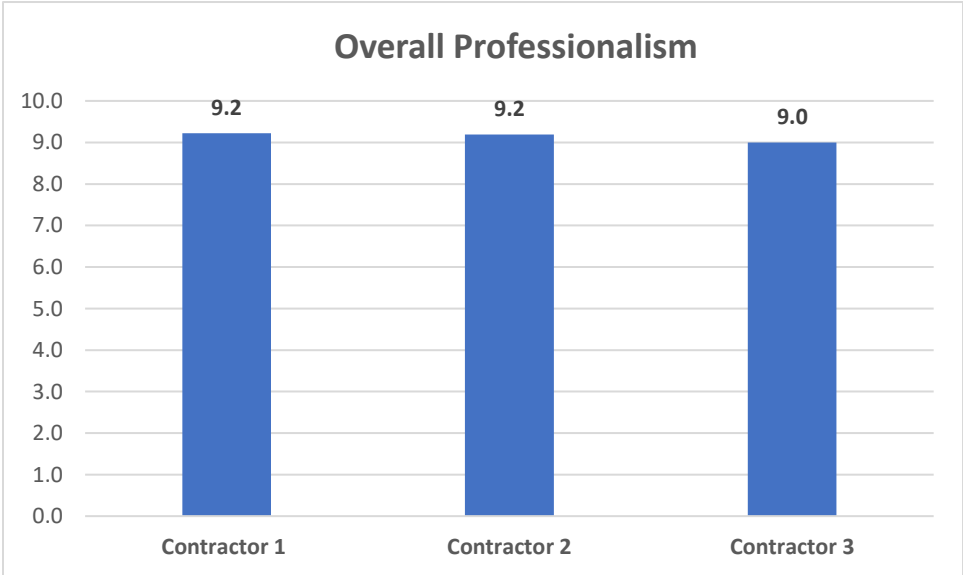


Figure 23:Distribution of contractors' ability to achieve overall professionalism

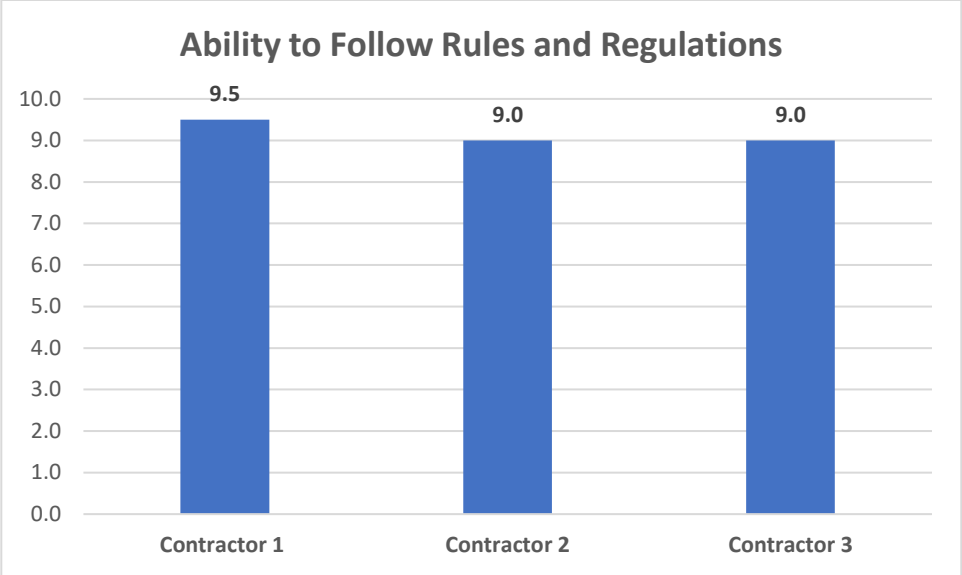


Figure 24:Distribution of contractors' ability to follow rules and regulations

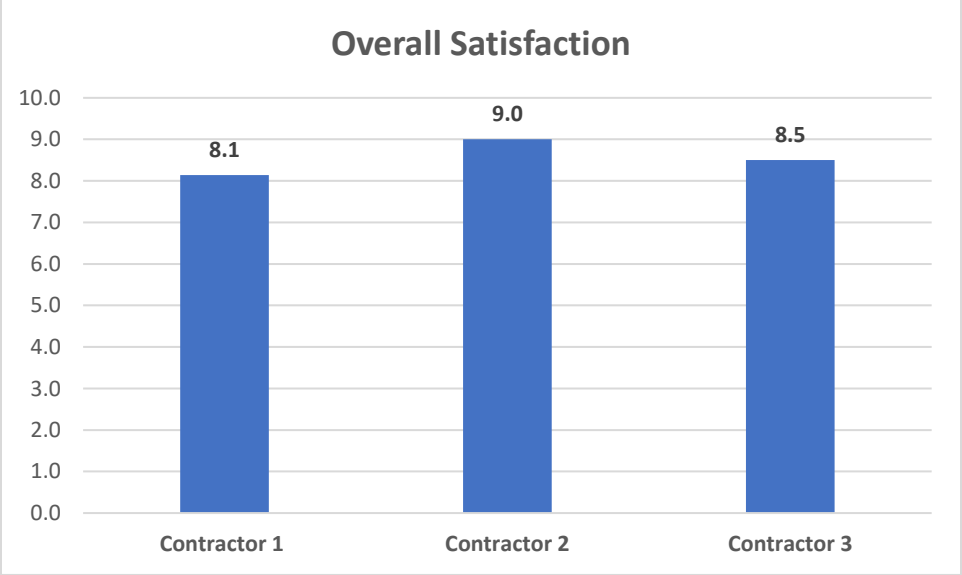


Figure 25:Distribution of customers' overall satisfaction with the contractor's performance

5.2 Results of Qualitative Data

The analysis of the open-ended comments received from the customers surveyed helped to identify certain critical factors which are necessary for contractor performance. The second research objective results are presented in this section. The factors identified are proactive, performance, quality, responsiveness, technology, schedule, workforce, cost, goal-oriented, and leadership which are traits of high-performing contractors as identified by the customers.

Moreover, the analysis of NHF (2006), literature review, and the present study helped to identify certain common factors which are traits for contractor performance. Quality is found to be the most important trait identified by the researcher for any high-performing contractor. Contractors should always be aware of customer needs and requirements to achieve maximum quality in delivering the product or the services effectively and efficiently.

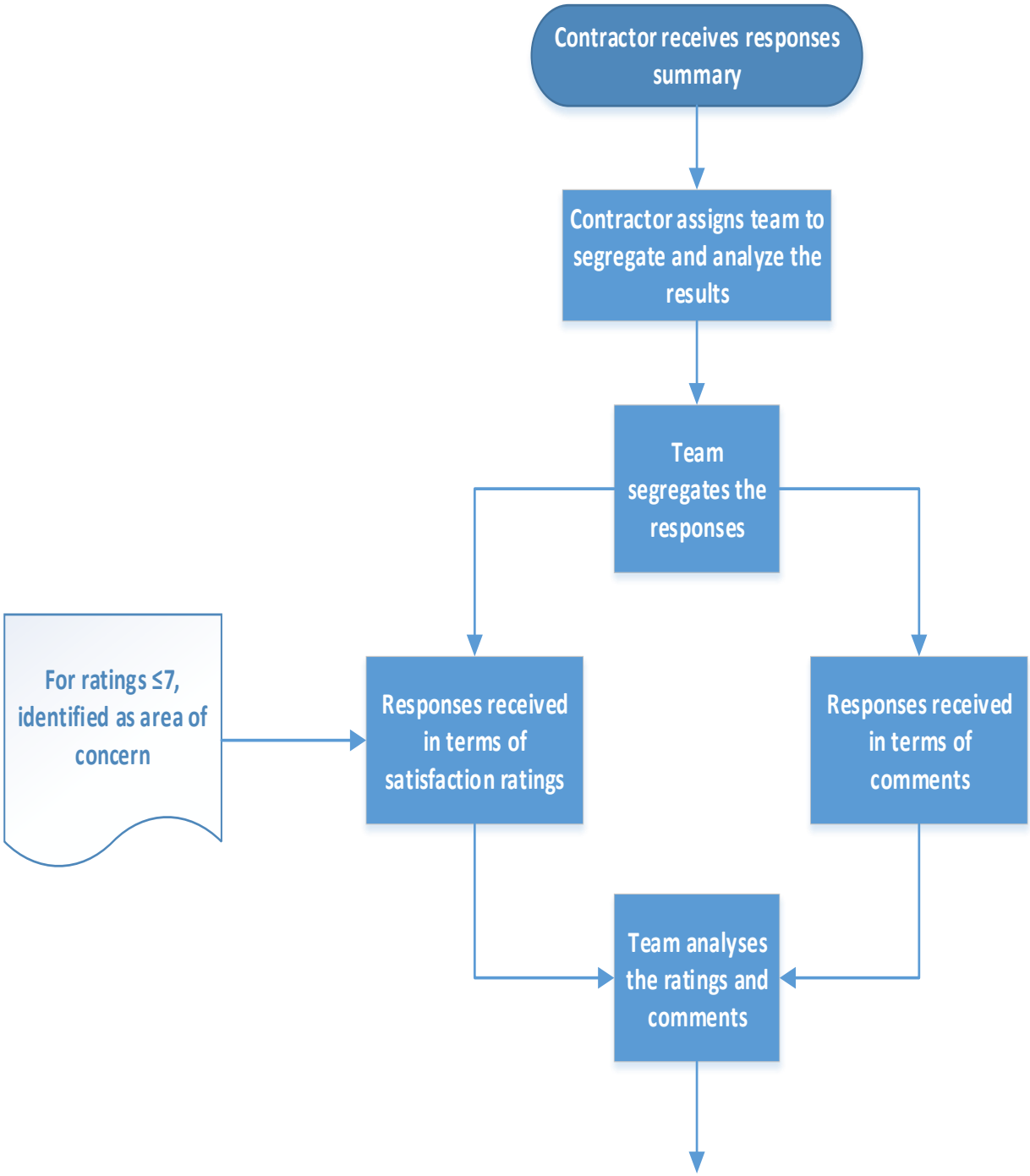
The feedback received also helped to identify issues with the HVAC equipment such as:

- Water intrusion
- Chiller issues
- Temperature issues
- Equipment failures
- Tube leaks
- Control issues on the rooftop
- Plumbing issues

These issues which were identified by the researcher from the survey's open-ended comments will help the contractor to improve their performance. It is summarized that the

contractor can increase the level of customer satisfaction by specifically addressing these areas with their customers.

5.3 Results of Contractor's Use of Customer Satisfaction as a Tool



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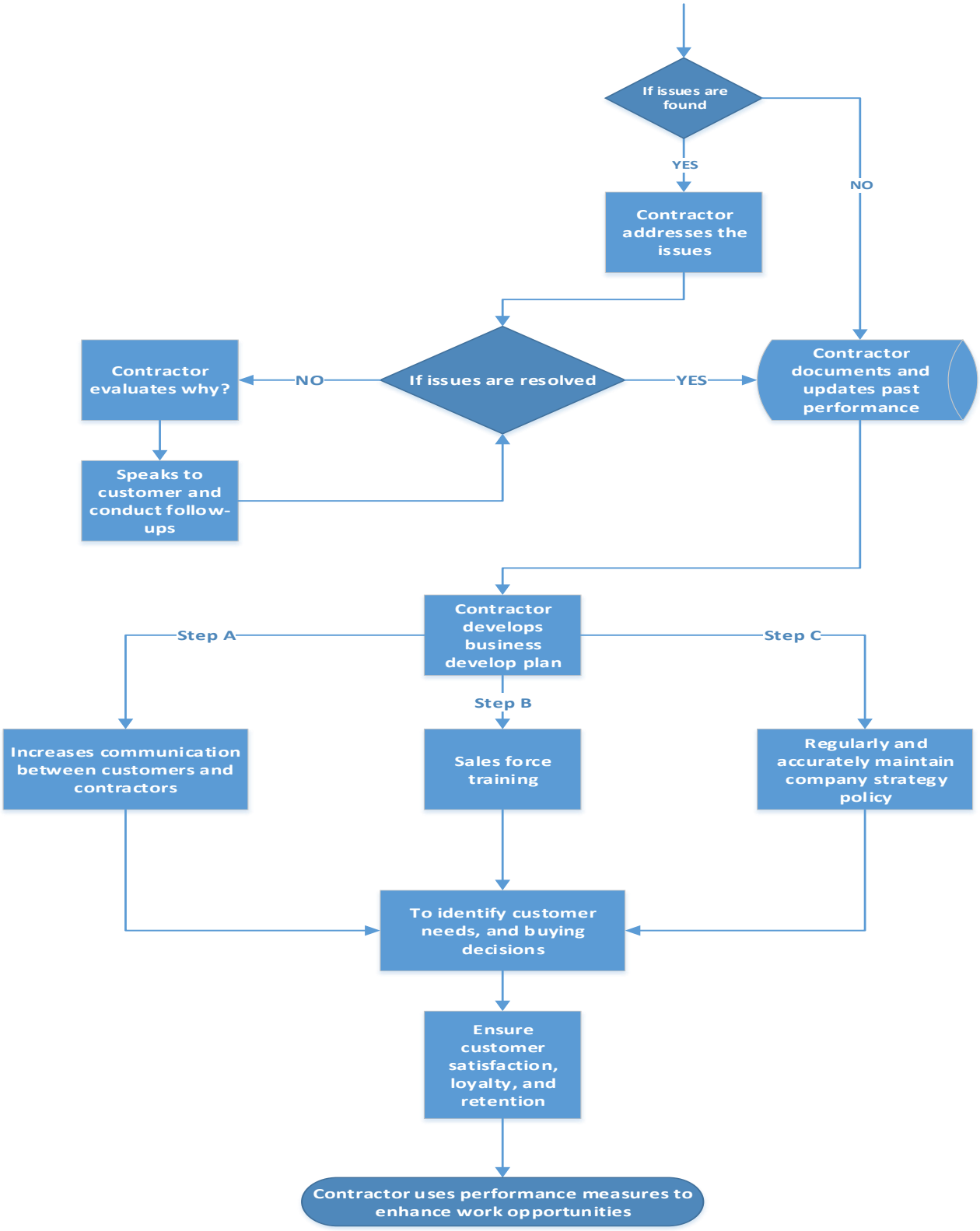
If issues are found
YES
NO
Contractor addresses the issues
If issues are resolved
NO
YES
Contractor evaluates why?
Speaks to customer and conduct follow-ups
Contractor documents and updates past performance
Contractor develops business develop plan
Step A
Step B
Step C
Increases communication between customers and contractors
Sales force training
Regularly and accurately maintain company strategy policy
To identify customer needs, and buying decisions
Ensure customer satisfaction, loyalty, and retention
Contractor uses performance measures to enhance work opportunities

5.3.1 Performance Report for Contractor 1

SIMPLAR INSTITUTE

Contractor 1

Contractor's Performance Report

KEY PERFORMANCE MEASUREMENTS:

Rated on a scale of 1-10 (with **10-being the best** and **1-being the worst**).

Ability to successfully achieve client scope objectives and deliverables (1-10)	**8.9**
Ability to manage project cost	**8.5**
Ability to manage project schedule	**7.4**
Quality of work	**9.1**
Ability to proactively identify, communicate, and mitigate potential risk items	**8.2**
Overall professionalism and responsiveness to requests	**9.2**
Ability to follow client rules & regulations	**9.5**
Overall client satisfaction of the firm and project team	**8.1**
Percentage of customers that would hire the contractor again	**86%**
Number of surveys received	**11**

CUSTOMER COMMENTS:

- "Really good company… would love to work again with them!"
- "They preplanned well, and they conducted more pre-functional checks than any other contractor."
- "Kept the duct covered up and clean!"
- "They are proactive in identifying issues and fixing them."
- "They provided maintenance services even after the warranty period ended."

Performance Measurements Verified by

UNC CHARLOTTE

KU THE UNIVERSITY OF KANSAS

5.3.2 Performance Report for Contractor 2

SIMPLAR INSTITUTE

Contractor 2

Contractor's Performance Report

KEY PERFORMANCE MEASUREMENTS:

Rated on a scale of 1-10(with **10-being the best** and **1-being the worst**).

Ability to successfully achieve client scope objectives and deliverables	**9.2**
Ability to manage project cost	**9.0**
Ability to manage project schedule	**8.7**
Quality of work	**9**
Ability to proactively identify, communicate, and mitigate potential risk items	**8.6**
Overall professionalism and responsiveness to requests	**9.2**
Ability to follow client rules & regulations	**9.0**
Overall client satisfaction of the firm and project team	**9.0**
Percentage of customers that would hire the contractor again	**100%**
Number of surveys received	**23**

CUSTOMER COMMENTS:

- "One of the best I've ever seen. I've been doing this for 30 years, and I don't say this lightly... Contractor 2 is the best!"
- "After many years of working with them, they continue to be the best. If we have a difficult request or special need, they always make it happen."
- "They always produce. They push the latest technology and are the leading edge".
- "Some other contractors have good projects and bad projects... Contractor 2 has a homerun on every single project."
- "Their employee retention rates are very high."

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5.3.3 Performance Report for Contractor 3

SIMPLAR INSTITUTE

Contractor 3

Contractor's Performance Report

KEY PERFORMANCE MEASUREMENTS:

Rated on a scale of 1-10 (with **10-being the best** and **1-being the worst**).

Ability to successfully achieve client scope objectives and deliverables (1-10)	**8.8**
Ability to manage project cost	**7.3**
Ability to manage project schedule	**7.8**
Quality of work	**9.0**
Ability to proactively identify, communicate, and mitigate potential risk items	**8.0**
Overall professionalism and responsiveness to requests	**9.0**
Ability to follow client rules & regulations	**9.0**
Overall client satisfaction of the firm and project team	**8.5**
Percentage of customers that would hire the contractor again	**67%**
Number of surveys received	**5**

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CHAPTER 6: CONCLUSIONS AND LIMITATIONS

6.1 Conclusions

This thesis provides significant evidence that with the use of performance measures such as customer satisfaction can help contractors to exist with the predominant challenges faced in the industry. The low-bid industry which is a popular procurement system where contractors are chosen solely on price can possess a series of challenges and drawbacks both for the owner and the contractors.

In this study, the researcher collected customer satisfaction data through surveying sheet metal contractors' customers (mostly general contractors) to measure the level of satisfaction and to identify positive aspects of the contractors' past performance.

The researcher used customer satisfaction as an indicator and a performance measurement tool to track customers' perceptions of the contractor's overall performance. These results and tools will help contractor to strengthen their position in the market and enhance their performance by enhancing their value proposition (price and performance) and encourage owners to think about other determinants to evaluate contractor's performance besides price.

The survey structure was based on the previous NHF (2006) study which was aimed at improving customer loyalty by surveying contractors and customers. The previous study asked both contractors and customers to rate contractor's performance on a scale of 1-10.

The final model consists of clear identification of customers' needs and a flow chart to depict the contractor's perspective of how the survey results can be utilized.

The final model also consists of performance reports for the contractors who participated in the survey. These performance reports act as an evaluation of the contractor's past performance.

The model can help the contractor identify the customer's goals, perceptions, and objectives which will increase work opportunities. It motivates the contractor to undergo management changes and employ goal-oriented strategies.

The primary findings of this research are the common traits of high-performing contractors identified by customers which can distinguish high-performing contractors from low-performing contractors. This can have a huge impact on the contractor's performance, and this is supported by the analyses of the literature review and NHF past study (2006). The critical factors which are identified as traits are:

- Proactive
- Performance
- Quality
- Responsiveness
- Technology
- Schedule
- Workforce
- Cost
- Goal-oriented
- Leadership

6.2 Challenges and Limitations

The researcher faced various challenges right from the beginning of this research which was to collect surveys from customers (general contractors) which is time consuming and demanding. Even though the data collection process was conducted for a period of six months from 89 customers, a response rate of 44% was achieved. This posed a challenge to conduct statistical analyses due to small sample size.

Since, this is a pilot study there is no previous study or research to benchmark the results which would have helped identify more traits of high-performing contractors. It would have guided us to reasonably compare our satisfaction results with other high performing contractors to identify their business proposition and value in the industry and determine other factors to help high performing contractors indicate value to the owners.

The biggest challenge with this research was to motivate owners to look beyond price and consider value and performance. These are traits of high-performing contractors. There is a small percentage of owners who are ready to evaluate performance in other procurement systems. Even though this research pertains or interests that small percentage. For contractors to survive in low-bid they would need to this shift from considering price as the only measurement and consider other performance measurements to survive in competition.

6.3 Future Recommendations

This research provides evidence for contractors to use customer satisfaction to measure performance and survive in a low-bid industry. For future research, there can be use of other performance measures. In the low-bid system, contractors can utilize

performance measures such as customer retention, word-of mouth, benchmark, facility maintenance, and others to survive.

The communication between contractors and customers is most important. Finally, conducting year-to-year surveys to always be aware of customer needs and objectives which can help contractor to enhance their performance.

The researcher conducted surveys through emails and phone calls. The researcher found that the response rate of the survey when received through phone calls was higher than emails. So, for future work, researchers should implement more phone calls to obtain survey responses.

Further research should motivate owners to look beyond price and consider value and understands the risks of low-bid industry. For contractors to survive in competition, it is recommended to conduct more follow-ups with issues found to ensure customer satisfaction which would help them in building a customer base who would look beyond price.

This research is limited to sheet metal contractors but there are various industries where a low-bid procurement system is being applied and this research can be implemented to non-sheet metal contractors. The survey consists of eight customer satisfaction measures but for future work identifying other measures to determine level of customer satisfaction and other key indicators which might help high-performing contractors perform better.

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APPENDIX A: LIST OF PERFORMANCE FACTORS

1. Accurate billings
2. Adherence to schedule
3. Approach to changes in scope of work
4. Approach to problem solving
5. Attitude of workers
6. Bid price
7. Bonding capacity
8. Budget performance
9. Business relationship
10. Certifications
11. Communication with customer
12. Control of subcontractors
13. Customer service
14. Design capability
15. Documentation
16. Financial stability
17. Follow-through on problems
18. Guarantee of work
19. Industry knowledge
20. Innovation
21. Integrity
22. Job site management
23. Job clean-up
24. Licenses
25. Life-cycle cost
26. Negotiate contracts
27. On-time performance
28. Past experience with contractor
29. Productivity
30. Professional employees
31. Project execution plan
32. Project management skills
33. Project status reporting
34. Quality of contractor's management
35. Quality of work
36. Reliability
37. Reputation
38. Resolving issues
39. Resources to get job done
40. Responsive to changes
41. Safety performance

42. Schedule of fees
43. Size of contractor
44. Skill of workforce
45. Stable personnel start to end of job
46. Teamwork
47. Timely billings
48. Timely closeouts
49. Trust
50. Union work
51. Value of work
52. Warranty

APPENDIX B : CUSTOMER SATISFACTION SURVEY QUESTIONNAIRE

The University of North Carolina at Charlotte and the **University of Kansas** collect and document past performance information. The contractor listed below is participating in a process to identify the satisfaction of their past customers. You have been identified as a client for whom they have previously performed work. We would greatly appreciate **30 seconds** of your time to complete this survey.

PERFORMANCE EVALUATION OF:

Contractor:	**${e://Field/Contractor}**
Key Personnel:	**${e://Field/CriticalPersonnel}**
Project Name	**${e://Field/ProjectName}**
Location:	**${e://Field/City}, ${e://Field/State}**
Scope of Work:	**${e://Field/ScopeOfWork}**
Completion Date:	**${e://Field/CompletionDate}**

1. Would you **hire ${e://Field/Contractor} again**?

- o Yes (1)
- o No (2)

2. What is the reason you would hire/not hire them again?

3.

Please rate each criterion on a scale of 1 to 10 with **10 being the best** and **1 being the worst**. Please rate each of the criteria to the best of your knowledge. If you do not have sufficient knowledge of past performance, please leave it blank.

	Best 10 (1)	**9** (2)	**8** (3)	**7** (4)	**6** (5)	**5** (6)	**4** (7)	**3** (8)	**2** (9)	**Worst 1** (36)
Ability to successfully achieve **client scope objectives** and **deliverables** (1)	O	O	O	O	O	O	O	O	O	O
Ability to **manage project cost** (2)	O	O	O	O	O	O	O	O	O	O
Ability to **manage project schedule** (3)	O	O	O	O	O	O	O	O	O	O
Quality of work (4)	O	O	O	O	O	O	O	O	O	O
Ability to **proactively identify, communicate** and mitigate potential risk items (5)	O	O	O	O	O	O	O	O	O	O
Overall professionalism and **responsiveness** to requests (6)	O	O	O	O	O	O	O	O	O	O
Ability to follow **client rules** and **regulations** (7)	O	O	O	O	O	O	O	O	O	O
Overall **satisfaction** of the firm / individual (8)	O	O	O	O	O	O	O	O	O	O

4. Has there been any **warranty issues** related to water intrusion?

- o Yes (1)
- o No (2)
- o Don't know (3)

5. Please explain the issues regarding commissioning / close out.

---

6. Were you **satisfied with the commissioning and close out stage** of the project?

- o Yes (1)
- o No (2)

7. Please explain the issues regarding commissioning / close out.

_____

8. What is your **role / job title**?

- ○ Senior Executive (CEO, CFO, COO, CIO, etc.)
- ○ Vice President or Assistant Vice President
- ○ Regional Manager/ Director/ Local Office Supervisor
- ○ Other _____
- ○ Project Team Member/ Crew Member
- ○ Facility Manager
- ○ Project Lead/ Crew Lead

9. About how many **years of professional / industry experience** do you have?

- ○ Less than 5 years
- ○ 5 - 9 years
- ○ 10 - 19 years
- ○ 20 - 29 years
- ○ 30 - 39 years
- ○ 40 - 49 years
- ○ More than 50 years

10. What is your **generational** affiliation?

- ○ Traditionalist (born prior to 1946)
- ○ Baby Boomer (born 1946-1964)
- ○ Generation X (born 1965- 1978)
- ○ Generation Y (born 1979-1997)
- ○ Generation Z (born 1998 - present)

11. Any overall **comments or recommendations**?

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