

# An International Index for Customer Satisfaction in the Construction Industry

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**Abstract:** *In a competitive business environment, like construction, achieving customer satisfaction has been identified as an important element for measuring project's success and sustaining competitive advantage. Traditionally, customers were expelled from the product development process. Little effort was done, in the past to identify the factors that lead to customer satisfaction and hence, use them for product improvement. Organizations that adopted that approach, encountered the risk of losing their customers. In construction, end-users of governmental housing projects were excluded from the design decision making process and accordingly, their requirements were not reflected in design. Although a number national customer satisfaction indices and barometers have been developed worldwide, they have their own limitations and shortcomings. This paper aims to develop an international index for customer satisfaction in the construction Industry. For the first time in construction literature, this research identified, validated and classified 45 drivers for achieving customer satisfaction in the construction industry.*

**Keywords:** *Customer Satisfaction, International index, Drivers, Construction Industry.*

## I. INTRODUCTION

Today's competitive environment entails that companies have to understand their customers' expectations and preferences and use them as a guide to improve their performance and achieve competitive advantage [1],[2],[3]. In dynamic business conditions, it is critically important to perceive and satisfy customer needs. When customer satisfaction is used as a measure for improvement, then the results will be more satisfactory and realistic [4]. Customer satisfaction is a key issue for every company wishing to increase its customers' loyalty and retention [5],[6],[7]. Traditionally, there has been a dominant perspective, especially among practitioners that customer satisfaction, in the long term, leads to customer loyalty and that loyal customers are profitable ones. This assumption was based on extensively cited research, which offered empirical evidence indicates that long-term satisfied customers are loyal ones and that (1) they generate more profit because they get accustomed to the product and use the service more; (2) they are less price sensitive and thus, companies can charge more; (3) they bring extra business through referrals and (4) they are more profitable because acquiring new customers is more costly than retaining them [8]. Mass production such as the development of governmental housing projects showed that customers were expelled from being part of the development of their housing units. In addition, the social and psychological needs of users in terms of their requirements, habits and traditions are not captured or reflected in design. Such practices produced units that do not achieve users' objectives or meet their expectations. As a result, either users reject these units or adapt them to accommodate their activities and fulfil their needs which eventually affect the sustainability of these buildings and the surrounding environment [9],[10].

This issue was proliferated by the traditional procurement approaches commonly adopted in construction projects which separate design

from construction and fail to satisfy meet customer expectations. Although different studies, techniques and concepts were developed (such as total quality management, robust design, reliability analysis, failure mode and effect analysis, function analysis, Tagushi methods and quality function deployment) [11] to ensure that the developed product fully satisfies customers' requirements, this area is still under researched in construction literature [12]. In addition, Torbica and Stroh [13] emphasised that the use of "soft" performance criteria such as customer satisfaction, is at an early evolutionary stage in construction. Furthermore, client satisfaction has not yet been fully prioritised as a critical issue in the construction industry [14]. Towards filling the gap in construction literature, this paper aims to develop an international index for customer satisfaction in the construction industry.

## II. RESEARCH OBJECTIVES AND METHODOLOGY

To achieve the abovementioned aim, a research methodology, consisted of literature review and case studies are designed to achieve four objectives.

(1) Building a comprehensive understanding of the research topic Including: (i) reviewing the concept of customer satisfaction, internal and external customers, relationship between customer satisfaction and retention and the strategic importance of customer satisfaction, (ii) Analyzing the current barometers and indices of customer satisfaction and their limitations, (iii) identifying the drivers that lead to achieving customer satisfaction in the construction industry. This objective was achieved through conducting in-depth literature review based on three directions. Firstly, since the topic of customer

satisfaction is traditionally searched in market research, the top leading journals in marketing and quality management were reviewed. Secondly, the top ranked construction management journals according to Chau [15] were reviewed. Similar studies by Chan et al. [16], [17], [18] and Li et al. [19] adopted similar methodology in their studies of factors affecting the success of construction projects, design/build and partnering projects respectively. Finally, other sources such as textbooks, academic journals, professional magazines, seminars and conferences proceedings, dissertations and theses as well as Internet and related websites were also reviewed.

(2) Validating the drivers identified from literature review through collecting and analyzing 30 international construction projects/organizations. The use of case studies confirmed many of the identified drivers and added new insights, which were not covered by current literature. These new insights were specific to the culture of the analyzed projects/organizations and their societies. Although, case studies confirmed 16 out of 45 drivers, which highlighted their importance and increased their credibility, other drivers that were merely identified by literature review are also of value to construction literature. By using more than one source of evidence (literature review and case studies), it was possible to improve the validity of the collected drivers and increase background knowledge [20],[21]. Literature review and case studies resulted in the identification of 77 drivers. The work was reviewed and refined by the author on regular basis to omit repeated drivers and merge similar ones, where the final result was 45 drivers.

(3) Classifying the identified and validated drivers into two categories. The first one was based on the different phases of the project life cycle namely: preparation, design, pre-construction, construction and use and then added organizational and management as an overall process throughout the different project phases. The second category classified drivers based of the construction industry contribution into product related drivers and service related drivers.

(4) Outlining research conclusions and recommendations useful to facilitate the achievement of customer satisfaction in the construction industry.

### III. CUSTOMER SATISFACTION

#### 3.1 Background and Concept Development

The concept of customer satisfaction first came into existence in early 1980s in the USA. In mid 1990, transnational/multinational companies, which have their headquarters in one country and operates wholly or partially owned subsidiaries in one or more other countries, began to make surveys on customer satisfaction in China. The aim of this survey was threefold. Firstly, the need to gather regular information about the customers in large or medium-sized marketplaces to cope with the challenges they may meet in the process of economic globalization. Secondly, the necessity to sustain their competitive advantage as high quality service has become an important element for businesses to win, or

even keep an edge on competition. Finally, the importance of obtaining a quantified data from the customers to assess the employees' performance and efficiency at work [22].

#### 3.2 Definitions and Terminology

In order to define customer satisfaction precisely, a number of related terms have to be defined and explained.

##### 1) Client, Customer and End-user

Client is defined as a person who consults or employs the services of a professional as a lawyer or a doctor, where customer was defined as a person who buys regularly from the same store [23]. Since construction clients consult and employ construction professionals to design and construct their buildings, and buy the final product by paying the cost of design and construction, construction clients could be considered the customers of the construction industry. In addition, end-users of construction projects are the individuals or groups with a presumed right to use the project and perform activities within and around it for specified objectives. According to the close definitions of the client, customer and end-user, this research used these terms synonymously. This view is supported by literature focusing on the business side of construction [13],[24],[25],[26].

##### 2) Satisfaction, Expectation and Quality

Satisfaction is described as satisfying a desire or gratifying a feeling [27]. It is an emotional state produced by achieving some goals [28]. Others, Czepiel (1985 cited [29]) defined satisfaction as the result of some comparison process in which expectations are compared with what is actually received. It reflects the degree to which a customer believes that the possession and/or use of a service evoke positive feelings [30]. Expectation is described as achieving what is expected or hoped for [27]. It is viewed as predictions made by customers about what is likely to happen during the impending transaction or exchange. It is a desire or want of what customer feel that a service provider should offer rather than would offer [7]. Quality is defined as conformance to customer's requirements [31]. There are two kinds of quality namely, must be quality and attractive quality. Some products and services sell well albeit they are subject to a considerable number of complaints because they are highly attractive to customers, while others that receive few complaints do not sell at all because lack of appeal to potential customers. To achieve true customer satisfaction, industries must achieve both types of quality [32].

#### 3.3 External and Internal Customers

Every organization has two kinds of customers, namely external and internal. External customers are the customers who exist outside the organization and buy its product or service. They are the financial support of any organization. Every employee in the organization must know how his or her job enhances the total satisfaction of the external customer. Performance must be continually improved to retain existing customers and gain new ones.

Internal customers are important like external customers. Every function, whether it is engineering, processing or production, has an internal customer who receives a product or service and, in exchange, provides a product or service. Every person in a process is considered a customer of the preceding operation. Each worker's goal is to ensure that the quality meets the expectations of the next person. When that happens throughout the organization, internal customers will be satisfied and this will assure the achievement of external customer satisfaction [32],[33], [34].

### 3.4 Customer Satisfaction and Customer Retention

Customer satisfaction is a fundamental cornerstone to achieve customer retention. An organization develops a customer focus to be better able to satisfy its customers. Consequently, forward-looking organizations use customer satisfaction data to measure their success. Since measuring customer satisfaction alone is not enough, another important measure of success is customer retention. Albeit, the two concepts are complementary to each other, they are not necessarily synonyms. A customer satisfied is not always a customer retained. Customers may be delighted with a product but still end up buying the generic equivalent. This is to say that customers should be satisfied enough to be retained. To retain customers over the long term, organizations must turn them into partners, proactively seek their inputs rather than waiting for and reacting to feedback provided after a problem is occurred, and enhance the after sale services [5],[13],[26],[34].

### 3.5 The Strategic Importance of Customer Satisfaction

Traditionally, customer satisfaction has been studied within market research. In the past, no much effort was made to close the loops, i.e. to find out which specific factors are important to customer satisfaction and then take action for product improvements. One important reason for this was the view that considered gaining a new customer is more important than retaining old ones. It is, however, much more expensive and difficult to gain a new customer than to keep one who is satisfied and delighted with the company product [33]. Historically, customers were excluded from the product development process. The organizations, which adopted that approach, encountered the risk of getting their clients dissatisfied. In a competitive marketplace that is global in scope, such an approach could be disastrous ([5]). Today, the increasing recognition that clients are the most important asset of any organization and that they must be treated as the organization's top priority because they are the ones who pay the bills and the survival of any organization depends on them [5],[29], has actuated many industries to focus on their customers and involve them in the product development process. Understanding the customer's needs and expectations is essential to winning new businesses and keeping existing ones. Because of the importance to learn from other disciplines and adopt suitable concepts and techniques that enhance the performance of the construction industry, design and construction

firms adopted the Total Quality Management (TQM) approach, which aims at continual increase in customer satisfaction through the production of high quality products that meet customer expectations at continually lower real cost, on-time delivery and at outstanding service [34].

## IV. REVIEW OF CUSTOMER SATISFACTION BAROMETERS AND INDICES

### 4.1 The Swedish Customer Satisfaction Barometer (SCSB)

In 1989, the SCSB was developed as the first national-level measurement system of customer satisfaction [35]. It contains two primary antecedents of satisfaction namely: (1) perceived performance (value) or the level of quality received relative to the price or prices paid, and (2) customer expectations regarding that performance or how well the customer expected the product or service to perform. The first antecedent is a common denominator that customers use to compare between brands and categories alike and usually captures more recent experience, while the other antecedent captures the customer's prior consumption experience with a firm's product, service, advertising and word-of-mouth information [36]. The consequences of the SCSB are either (1) customer complaints if the customer is not satisfied with the product or service delivered or (2) an increase in customer satisfaction which reduces complaints and increase customer loyalty, see figure (1).

#### 1) The American Customer Satisfaction Index (ACSI)

The ACSI was developed in 1994 in accordance with the SCSB to serve as a national cross-company and cross-industry instrument for measuring the quality of goods and services as experienced by the United States residents [37]. In the ACSI model, customer expectations, perceived quality and perceived value were introduced as the antecedents of customer satisfaction and customer loyalty and complaint behavior as consequences, see figure (2) [38]. Fornell et al. [37] stated that the inclusion of both perceived quality and perceived value into the ACSI model provides important diagnostic information. As the impact of value increases relative to quality, price is a more important determinant of satisfaction. As quality is component of value, the model also links quality directly to value [36].

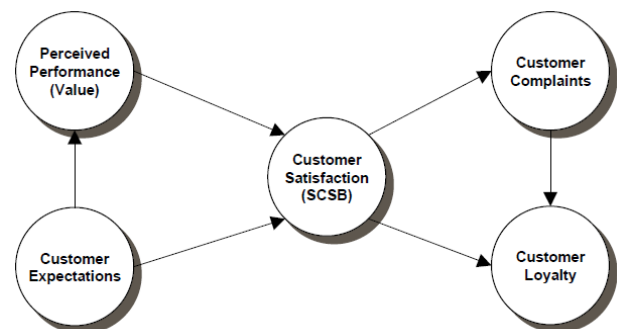


FIGURE 1  
The SCSB [35]



FIGURE II  
The ACSI [38]

4.2 The European Customer Satisfaction Index (ECSI)

The European Foundation for Quality Management (EFQM) introduced the ECSI which links customer satisfaction to its determinants, and in turn, to its consequences, namely customer loyalty. The determinants of customer satisfaction are: perceived company image, customer expectation, perceived quality and perceived value for money, see figure (3) and table (1). The ECSI appeared in 1999 and is adapted from the SCSi [35] and the ACSI [37]. The model has been validated across a number of European countries and many industries.

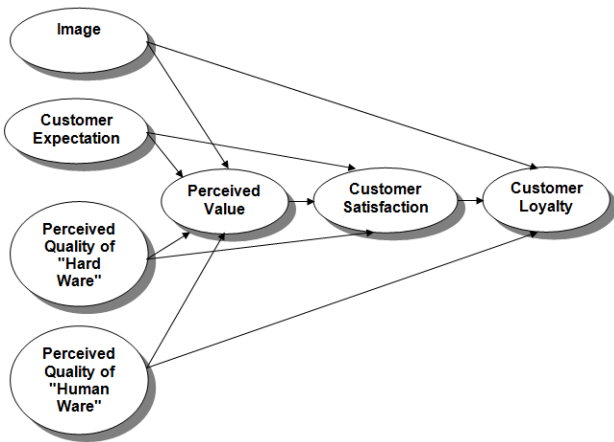


FIGURE III  
The ECSI [35],[37]

TABLE I  
Components of the ECSI (Compiled by the author)

Image	It relates to the brand name and what kind of general associations the customers get from the product, brand or company.
Customer Expectations	It relates to the prior anticipations of the product or company in the eyes of the customer.
Perceived quality	It is conceptually divided into two elements: hard ware, which consists of the quality of the product / service attributes, and human ware which represents the associated customer interactive elements in services.
Perceived value	It is concerned with the value for money aspects as they are experienced by the customer.

4.3 The New Norwegian Customer Satisfaction Barometer (New NCSB)

The first NCSB model was identical to the ACSI with the exception that it included corporate image and its relationships to customer satisfaction and customer loyalty. In keeping with the evolution in marketing from a transactional to a relational orientation among service providers, the NCSB model was expanded over time to include a relationship commitment construct. The construct has evolved to focus on both the affective and calculative components of commitment. While the affective component is hotter or more emotional, the calculative component is based on colder aspects of the relationship such as switching costs. The commitment constructs are modelled as mediating the effects of satisfaction on loyalty, see figure (4) [36],[39], [40].

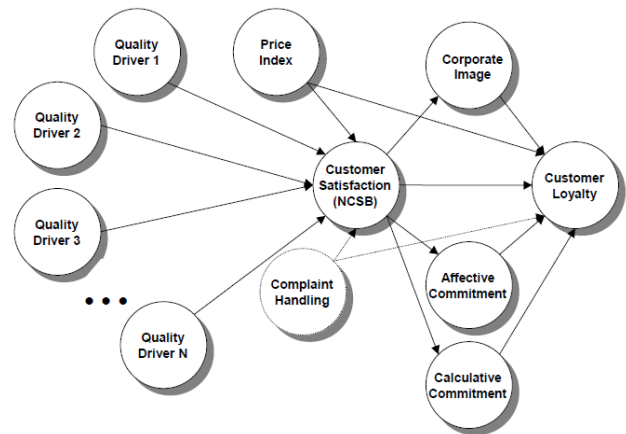


FIGURE IV  
The New NCSB [36]

In addition to the above mentioned indices and barometers, the importance of achieving customer satisfaction triggered other nations to develop their own instruments such as the German Barometer, Norwegian Customer Satisfaction Barometer (NCSB), Korean Customer Satisfaction Index (KCSI), and Malaysian Customer Satisfaction Index (MCSI). Moreover, Brazil, Argentina, Mexico, Canada, Australia, Hong Kong and some regions like Taiwan, are striving to build their own customer satisfaction systems [38].

4.4 Analysis and Limitations of Current Customer Satisfaction Barometers and Indices

Although the abovementioned barometers and indices have their strengths and contributions towards achieving customer satisfaction, they have some limitations and shortcomings. Firstly, they are fundamentally similar as measurement models. In spite of having some obvious distinctions in their structures and variables selection, their results cannot be compared with each other. Secondly, as these models were developed from their own nationals' perspectives to facilitate cross-company comparisons or serve as predictor for companies' market value [1], [41], [42], [43] it became difficult to generalise their use worldwide. Every barometer or index took the full advantages of other nations' model and adapted them to suit their own needs. Therefore, a comparison and analysis of the differences among these existed barometers and indices seems to be indis

pensable and valuable [38]. For instance, the relative strength of the ACSI over ECSI is its ability to detect the efficacy of a firm's complaint handling capabilities by including a customer complaint construct. However, researchers have found that the construct of customer expectation used in the ACSI has less impact in the model (e.g. [6],[36]). Thus, they suggested using corporate image (used in ECSI) to replace customer expectation. Finally, all these barometers and indices were developed outside the construction industry and because of the unique nature of the construction industry in terms of its customers, products and services provided, these models and indicators are not sufficient to be used in the construction industry.

## V. THE INTERNATIONAL INDEX FOR CUSTOMER SATISFACTION IN CONSTRUCTION

### 5.1 Definition and need for the Index

Index is defined as a systematic guide to items contained in or concepts derived from a collection of documents, group of documents, or set of objects arranged in a known or stated order. It is an organised guide to the contents of a topic in a certain arrangement, which represents the contents, references, page numbers, etc., for accessing the contents of that topic [44]. The International Index for Customer Satisfaction (hereinafter referred to as "the Index" or "IICS") is a comprehensive list of all drivers, extracted from literature review and case studies, for achieving customer satisfaction in the construction industry. The need for the index emerges from the necessity to achieve customer satisfaction in construction and fill the gap in construction literature as well as overcome the limitation of the current customer satisfaction barometers and indices. This index is designed to be applied worldwide and enable the different players of the construction industry to contribute towards achieving customer satisfaction at the different phases of the project life cycle. The developed index represents a synthesis that is novel and creative in thought and adds value to the knowledge in a manner that has not previously occurred in construction literature.

### 5.2 Development of the IICS

#### 1) Identification, Validation and Classification of Customer Satisfaction Drivers in Construction

Towards developing the IICS, it is crucial to identify, validate and classify the drivers that lead to customer satisfaction in construction. Literature review and case studies identified 77 drivers. The work was reviewed and refined by the author on a regular basis to omit repeated drivers and merge similar ones. The result was 45 drivers, where 16 out of them were validated by cases studies. Table (2) lists the identified drivers and indicates whether they were identified from literature or case studies or both. A number of approaches were used to classify the factors that lead to customer satisfaction in construction. For instance, Kärnä, et al. [2] classified them as: quality assurance and handover, environmental and safety at work, personnel, cooperation and site supervision and subcontracting. Within this research, the identified drivers were classified into two categories. The first one was

based on the different phases of the project life cycle, namely: preparation phase, design phase, pre-construction phase, construction phase, use phase, and added organizational and management as an overall process throughout the project life cycle. The second category classified drivers based of the construction industry contribution into product related drivers and service related drivers, see table (2).

#### 2) Rationale of Preparation Customer Satisfaction Drivers (Nos. 1, 2, 3, 4, 5, 12, 30 & 33)

The early stages of the construction project are crucial to its success [45]. This is because the decisions made during these stages influence the characteristics and form of the project. Hence, the early involvement of project customers in the design decision making process helps understanding their culture and traditions as well as identifying their requirements [3],[24] which affect project design, quality, lead-time and cost [87]. In addition, this enables the project team to adopt customer's perceptions rather than focusing on objective reality [46]. Within the preparation stage, the project team plays an important role towards orienting and supporting project customers to the optimum solution of their project [29]; [47]). These practices help maintaining consistent communication between customers' needs and design input [14] which ultimately enable developing a project that satisfies customers' needs and fulfils their requirements. These drivers were supported by a number of case studies. The Washington Suburban Sanitary Commission (WSSC) is a bi-county agency in Maryland established to provide water supply and wastewater treatment services for approximately 1.7 million people in Montgomery and Prince George's Counties. Towards (1) staying attuned to what customers' value, their desired services and service levels, (2) proving a world class service that satisfies its customers and (3) improving its relation with the customer base, the commission adopted a creative approach to customer satisfaction. A survey questionnaire was designed and tested to identify five areas of customers focus, namely: water quality, WSSC brand awareness, core service, communication and billing concerns. Through identifying and segmenting the served population and adopting real-time data analysis software, the commission was able to understand customers' better and to implement meaningful improvement in customer services [48]. Another example is a 400 housing projects designed in the United Arab Emirates by a foreign consultant, who have not investigated, adequately the traditions, habits and culture of the end-users. After the practical completion of the project, the users carried out significant changes in order to meet their requirements such as privacy and the ability to add more rooms for future increase in their family sizes [3]. Abdellatif and Othman [10] highlighted in their study about the sustainability of low-income housing projects, that the absence of end-users during the briefing and design process obstructs them from explaining their requirements and impedes architects from understanding their culture and traditions.



3) *Rationale of Design Customer Satisfaction Drivers (Nos. 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 30 & 33)*

Bowen et al. [49] stated that two objectives have to be met in order to achieve customer satisfaction. Firstly, the translation of customer requirements into a design that specifies technical characteristics, functional performance criteria and quality standards and secondly, the completion of the project within a specified time and in the most cost effective manner. Barrett and Stanley [50] stated that providing customers with expert presentation and visualization of design such as 3D modeling and walk through enables the customer to imagine and interact with the designed facility. One of the pressing problems that lead to cost overrun, time delay, conflicts and disputes and ultimately customer dissatisfaction as well as project failure is the poor quality and defective design [6],[51], [52]. In addition, Tang et al. [47] believe that clients are satisfied when the engineering consultant firm can produce quality design free of defects, where Fauzi et al. [53] agreed that the level of defects will impact inversely with occupant's satisfaction. Moreover, customer satisfaction could be achieved when construction professionals (i.e. architects, design engineers, contractors, suppliers) adhere to customer requirements and meet special needs [54],[55]. Mustapha and Bintaher [56] stated that the needs of the occupants may change over time; therefore designers should adopt customer perception and be able to meet their emerging needs and tailor mass customization products to meet their expectations more closely [26]. Furthermore, Male et al. [57] confirmed through analysis of a number of case studies that architects are more likely to gain kudos from peer approval than from the satisfaction of their clients and may ignore the role of the client and behave unilaterally, which lead to customer dissatisfaction. Towards achieving customer satisfaction, it is crucial to adapt to changes in the business environment, market demand and meet the needs of customers who appear at later stages of the project life cycle [3] and consider the environmental requirements and impacts of the building [58],[59]. This driver was supported by a case study of Portakabin, UK that succeeded in developing new products in response to its existing market growth. It focuses on Portakabin Wardspace accommodation, an effective way of meeting the increasingly demanding and highly specific requirements of the healthcare industry. These buildings have attractive layouts, good aesthetic qualities both internally and externally. They are energy efficient with positive impacts on the environment [60]. Another example was found in a project designed to be a commercial building in Abu Dhabi, United Arab Emirates. Once the design was completed and the building license was issued, the client received an offer to lease the building for 20 years if the design was changed to a medical centre provided with the latest technological equipment and facilities. Because of the lack of market demand for commercial buildings and the business opportunity offered, the client changed the project design accordingly [3].

4) *Rationale of Pre-Construction Customer Satisfaction Drivers (Nos. 4, 12, 14, 15, 16, 17, 30 & 33)*

The pre-construction phase is one of the vital stages in the construction process. This is because within this phase the detailed information necessary for construction is prepared in sufficient details to enable a tender or tenders to be obtained. In addition, it includes the identification of the building procurement approach to be used and the application for statutory approvals as well as identification, evaluation and appraisal of collected tenders and submission of recommendations to the project client [61]. Accordingly, producing coordinated and correct construction documents [62] and specifying up-to-date and available materials [63] are essential for reducing delays, contradictions and conflicts during the construction process which ultimately leads to customer satisfaction. Moreover, when whole project life cycle is considered [64] including financial, environmental and social costs during planning, design, construction, operation, maintenance, renewal and rehabilitation stages a number of benefits will lead to achieve customer satisfaction. These benefits include for example:

- ensuring that business needs justify project cost,
- optimizing the total cost by balancing initial capital and running costs,
- identifying risks that may affect achieving project objectives, and
- promoting discussion and recording of decisions about the durability of materials and components at the outset of the project [65].

Ramus et al. [66] stated that adopting flexible procurement approach plays a significant role towards achieving customer satisfaction. This is because these approaches can help reducing the time traditionally needed for design and preparing tender documents, reducing the rapidly spiralling cost of construction, minimizing the high interest rate period, meeting client's demands of better value for money and an earlier return on investment. In addition, flexible procurements approaches helps utilizing the vast amount of knowledge and practical experience of contractors at early stages of the project life cycle which makes a valuable contribution to a successful outcome. Woodford Prison, Northwest of Brisbane, Australia was a successful example of adopting the design and construct contract which enabled the implementation of the concept of partnership between different project participants. The mission of the partnering team was to construct a secure and safe facility for the management of all high and medium classified prisoners. The facility is intended to exhibit excellence in design and quality of construction which will serve as a model for best practice for future correctional centers procurement and operation. All parties commit to working together in a spirit of good faith, cooperation, open communication and timely responsiveness that respects the role and enhance the reputation of each partner. Accordingly, the project was completed six

months ahead of program, on budget, with no head contract variations or contractual dispute. It won the Master Builders Australia 1996 National Partnering Award for the commercial sector [67].

5) *Rationale of Construction Customer Satisfaction Drivers (Nos. 4, 12, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30 & 33)*

The construction phase consists of two main stages namely, mobilization and construction to practical completion. Within the mobilization stage, the contractor is selected, the building contract is issued and the site handover to the contractor is arranged. In the later stage, the actual construction work is carried out and the bulk of the project fund is spent. In addition, this stage includes contract administration, providing the contractor and/or specialists with further information when needed [61]. Customer satisfaction could be achieved during the construction phase when the contractor performance is according to the approved rates and the project progress is within the agreed timeframe, cost and quality standards [3],[5],[26],[29], [47],[68],[69],[70]. The development of Phoenix Sky Harbour International Airport Terminal 2, Arizona, USA is an example that ascertains these drivers as the designer and contractor performance using a design-build method enabled the project to be completed quickly and as inexpensive as possible without compromising the required quality standards [71]. In addition, providing quality product and service through skilled work force, quality workmanship and good supervision contributes greatly to customer satisfaction [2],[47],[52],[68],[69]. Through applying a number of quality measures and Health and Safety (H&S) procedures, Portakabin, UK positioned itself at the top end of the modular building market in Europe. Examples of these measures and procedures included providing customers with wide range of tangible products and support services, offering total solutions such as planning and project management, H&S training and advice as well as access to disabled and running comprehensive customer satisfaction survey every month [72]. Moreover, maintaining mutual relationship between the contractor and the customer [68],[69] and preserving a collaborative environment between the construction team [73],[74] helps reducing conflicts and increasing trust which ultimately keeps the customer satisfied. Furthermore, adopting a strategy for reducing project waste, energy consumption and down time [75] and adhering to H&S procedures to reduce or eliminate site accidents and injuries [68],[69] are cornerstone elements that when adopted by the construction team helps achieving customer satisfaction. For example, Morgan Lovell, UK's leading interior design office, fit out and refurbishment specialist provides energy management solutions to its customers and believes that implementing systems such as ISO5001 is a powerful means for achieving customer satisfaction through monitoring and managing energy usage as well as working to be best practice in terms of environmental performance [76]. Finally, providing contractors with accurate and timely information and having agreed procedures about managing change orders [2] ensures smooth construction process and r

educes disputes and conflicts between the project team.

6) *Rationale of Use Customer Satisfaction Drivers (Nos. 4, 12, 29, 30, 31, 32 & 33)*

The use phase of the construction project includes a number of activities, namely, administration of the building contract after the practical completion and making final inspection, assisting building users during the initial occupation period and reviewing project performance in use [61]. Customer satisfaction during this phase could be achieved through successful delivery of after sale service offered once the building is completed [5],[13],[25],[26],[34],[54]; This includes repairing of defects and deficiencies noticed during handover inspection and workability of handover materials and maintenance manual [2]. Examples of such services are the quick response to customer enquires within 24 hours and answer calls within four rings as well as compensate clients for any delays caused by the contractor [77]. In addition, maintaining long term relationship through continuous communication helps in responding to client requirements, user needs, business opportunities, and technology improvement [3],[5],[26],[54].

7) *Rationale of Organizational and Management Customer Satisfaction Drivers (Nos. 4, 12, 30, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44 & 45)*

Although customer satisfaction could be achieved throughout the different phases of the project life cycle, the organizational and management drivers play an active role towards supporting other drivers towards achieving customer satisfaction in construction. This could be accomplished through mastering management tools and techniques such as project management, communication management, participation, partnership, commitment, lean management and anti-bribery [29],[68],[69],[78],[79] which increase the efficiency and effectiveness of the construction process and ultimately achieve customer needs and requirements. For example, through adopting Lean Projects Management, Robert Woodheads Ltd. succeeded during the construction of five children's centre projects for Nottinghamshire Country Council, UK to complete these projects ahead of programme, below budget and at the required quality standards [80]. In addition, applying the British Standard for Partnership (BS 11000) helped Network Rail delivers capital works programme at reduced cost [81]. Moreover, engineering consulting firm's professionalism, competitiveness and innovativeness [55], [55] helps building and improving organizational image and brand reputation [6] which increased stakeholders' confidence and satisfaction. DB Construction, UK is a key player within the construction industry with particular focus on civil engineering, substructure works, highway works and ground works. The company believes that through becoming ISO certified in several key areas is a primary requirement for competing for the future, demonstrating transparency to customers and accountability for all works undertaken by the organization [82]. Another example, Hewden construction company, UK adopted the SWOT analysis to increase its competitiveness and

innovation in a difficult market which enabled the company to fulfill its customers' needs [83]. Moreover, Improving communication transfer amongst participants or project network [84] and continuous examination of quality system to ensure its response to ever-changing customer requirement and expectation [5] helps organizations to gain customer satisfaction through flexible and prompt handling of customer queries and complaints [26],[29], [75] as well as resolving conflicts [79]. For example, Connaught Partnership Ltd. which provides a range of asset management and compliance services in the UK, improved the communication with its customers through using the latest technology, a WEB based system that controls the way maintenance work is allocated and delivered, measures residents satisfaction and presents a complete audit trail visible to involved parties [85]. Furthermore, continuous updating of changed government and regulation codes [62] and proper communication and coordination between government authorities and design firms over planning and approvals [3] plays an active role in developing a project that is in line with statutory regulations which facilitate its approval and getting the building permit in shorter time. Finally, reducing project risk through process improvement, auditing practices and quality control helps adding better value to project stakeholders. In addition, managing supply chain through adopting Key Performance Indicators (KPIs) derived from 40 projects helped Lovell construction company, UK to show promising performance in H&S, staff retention, understanding customer needs, keeping to cost targets and quality of products and services [86].

### 5.3 The key principles behind the International Index for Customer Satisfaction in Construction

Since the developed index will be applied throughout the project life cycle, and because of the diversity of drivers to achieve customer satisfaction during each phase, the international index for customer satisfaction in construction is based on a number of key principles as follows:

#### 1) Whole Project Perspective

The IICS is developed to cover the whole life of the project from the preparation phase to the use phase. It is intended to utilise the different drivers identified through literature review and case studies in a way that helps achieving customer satisfaction through (1) proper understanding of customers' requirements, traditions and culture, (2) quality design that reflects customers' requirements, considers environmental factors and adapts to emerging customers' needs, (3) coordinated and correct construction documents which specify updated materials and adopts flexible procurement approach, (4) quality construction service delivered by competent construction team, (5) successful delivery of after sale service and finally (6) professional, competitive and innovative design firms, construction firms and supply chain that are capable to deliver a successful project that fulfils customers' needs and exceed their expectations.

#### 2) Dynamic and Flexible Approach

The need to meet customers' expectations and fulfil their needs throughout the project life cycle necessitated that the process of achieving customer satisfaction be an ongoing process and that the identification, validation and classification of customer satisfaction drivers be a dynamic and live process that is continually developed. The proposed index has to be dynamic and flexible to integrate emerging drivers deemed necessary to achieve customer satisfaction during the different project phases.

#### 3) Overall Customers Involvement

Successful achievement of customer satisfaction relies upon the involvement of the right people having the right information at the right time. Best results are achieved when the concerned parties are working in a collaborative environment and sharing unified and agreed objectives. Involving the project customers emphasizes that their views, objectives and requirements are well understood and adequately reflected throughout the different phases of the project life cycle. In addition, their participation in the decision making process ensures their commitment to implement the selected decision.

#### 4) Coordination, Collaboration and Communication

The need for effective coordination and collaboration between project customers is essential for delivering a product that satisfies its users. The project customer (i.e. client, user, etc.) who proposes a change to the project design or suggest an improvement to enhance the project performance has to inform other customers in order to have a shared vision and agreed decisions. Decisions adopted by project customers have to be circulated to all parties in order to arrange for implementation. In order to close the loop, project customers have to be fed back with learned lessons, comments and corrective actions taken during the implementation and monitoring functions in order to improve the design and construction process in future projects.

#### 5) Creativity

The need to achieve customer satisfaction in an innovative manner entails the generation of creative solutions that accomplish customers' needs and requirements at the most cost-effective manner. This includes learning from other industries that showed successful achievement of customer satisfaction. In addition, adopting successfully proven idea generation and decision making techniques such as Delphi technique and Brainstorming sessions as well as the participation of different project customers helps creating conducive atmosphere where innovative and unusual ideas are developed, see figure (5).

## VI. CONCLUSIONS AND RECOMMENDATIONS

Achieving customer satisfaction has been identified as a key factor for measuring construction projects' success and an important challenge that encounters today's construction industry. Traditionally, customers were excluded from the product development process. Little effort was done in the past, to reveal the factors that lead to customer



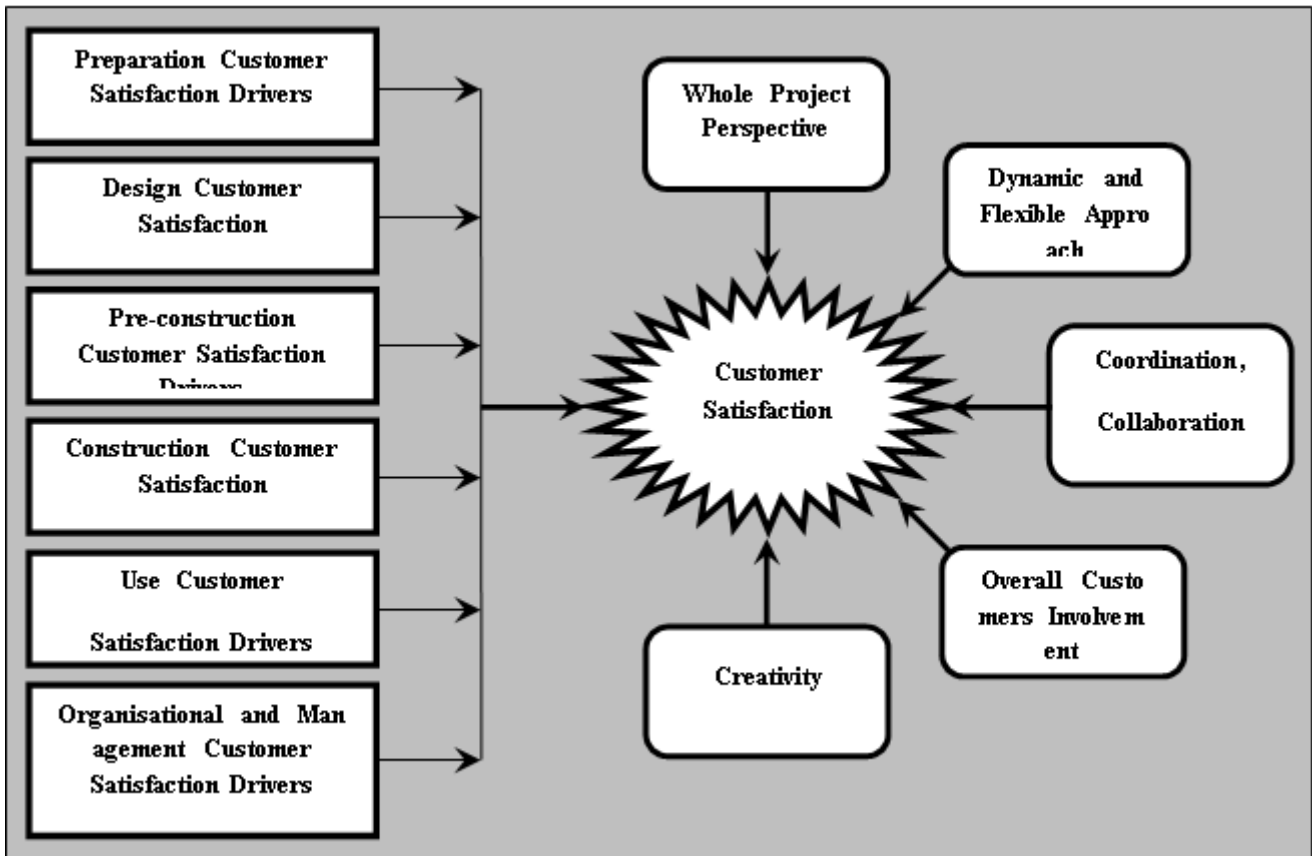


FIGURE V  
 International Index for Achieving Customer Satisfaction in Construction (Developed by the Author)

satisfaction and then proceed for product improvements. This could be attributed to the view that considering a new customer is more important than retaining old ones. As a result, organizations that adopted that approach, encountered the risk of getting their customers dissatisfied. In a dynamic business environment, like construction, it became crucial for design and construction companies to understand their customers' requirements and use them as a guide to improve their performance and achieve competitive advantage. This perspective emerged from the important role played by customers as the core of the construction process and a driving force for improvement which necessitated achieving their satisfaction and getting their requirements attained.

During the course of this research, literature review and analysis of 30 case studies showed that the topic of customer satisfaction is under researched in construction literature and its use as criteria for measuring project success and gaining competitive advantage is at an early evolutionary stage in construction. In addition, although a number of models and indicators have been developed worldwide to measure customer satisfaction, they have some limitations and shortcomings such as they were developed from their national perspectives and outside the construction industry. Due to the uniqueness of the construction industry in terms of its nature, customers, products and services, these models and indicators are not sufficient to be used in

the construction industry. These limitations called for dev

elopment of an international Index that includes all drivers that lead to customer satisfaction in the construction industry. Accordingly, this research identified 45 drivers for achieving customer satisfaction in the construction industry, in which 16 drivers were validated through analysis of case studies. These drivers were then classified into two categories based on the project's phase and the construction contribution (product / service). The developed index represents a novel synthesis that adds value to the original body of knowledge in a manner that has not previously occurred in construction literature. Based on the above, the research comes to the following recommendations.

- Escalating the awareness of the importance of achieving customer satisfaction as an active tool for increasing market share and achieving competitive advantage in construction.
- Integrating customer satisfaction in the design and construction firms' strategic plan and offer all facilities, resources and senior management support needed to ensure achieving its objectives.
- Employing the customer satisfaction drivers identified through this research at the different phases of the project life cycle and offering the resources, facilities and timeframe needed to ensure that customers' requirements in each phase are accomplished.
- Encouraging and supporting research in this area at undergraduate and graduate level to produce

graduates who properly understand the importance of achieving customer requirements.

- Initiating a link between academics and construction professionals as well as learning from other industries to exchange innovative ideas towards achieving customer satisfaction in the construction industry.

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TABLE II  
DRIVERS OF ACHIEVING CUSTOMER SATISFACTION IN CONSTRUCTION (DEVELOPED BY THE AUTHOR)

No.	Customer Satisfaction Drivers (CSDs)	Source		Classification of Customer Satisfaction Drivers							Based on the industry's contribution		
		Literature Review	Case Study	Based on the project's phase									
				Preparation related drivers	Design related drivers	Pre-construction related drivers	Construction related drivers	Use related drivers	Organizational and Management related drivers	Product Related		Service Related	
CSD 1	Early customer involvement in the briefing and design decision making process [3],[24].	X		X							X		X
CSD 2	Adopting customer's perceptions rather than focusing on objective reality [46].	X		X								X	X
CSD 3	Proper understanding of different customer's requirements and culture which affect project's design, quality, lead-time and cost [3],[10],[87].	X	X	X								X	X
CSD 4	Client orientation and support [29],[47]	X		X		X		X		X		X	X
CSD 5	Maintaining consistency and communication between customer needs and design input [14].	X		X								X	X
CSD 6	Developing quality design free of defects and quality facility [6],[47],[51],[52],[53].	X		X								X	X
CSD 7	Translating customer needs into a design, which specifies technical characteristics, functional performance criteria and quality standards [49].	X		X								X	
CSD 8	Compliance to customer requirements and meeting special needs [54],[55].	X		X								X	X
CSD 9	Designers consider the customer's role and behave jointly [57].	X		X								X	X







