Quantitative Model for Predicting the Referential Intention of Construction Management Services

Min Jeong, Ph.D.1; and Ghang Lee2

Abstract: Many companies pay a great deal of attention to existing customers’ referral intentions when they attempt to attract new customers. However, little is known about the necessary level of satisfaction of existing customers to understand when existing customers are likely to complete a referral and by what mechanism. This study assumed referral routes and established a model for predicting referral intentions based on the satisfaction level as described by the disconfirmation of expectation theory and the net promoter score theory. Then, the routes were verified by surveying 103 construction management (CM) clients using structural equation modeling, and the prediction model was tested by applying it to 194 CM clients using multinomial logistic regression. The results indicated that the accuracy rate of the prediction model was 79.3%. This model can be used effectively to attract new clients, particularly in fields where long-term services are provided, such as CM, because it allows service providers to predict customers’ referral intentions depending on their satisfaction levels.

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Introduction

In the flood of information regarding goods and services, word of mouth plays a decisive role in attracting new customers (Owen and Broooks 2009). In the construction management (CM) industry, in particular, referral intentions, that is, how much clients are willing to recommend a CM service to others, are far more crucial than in other service industries. CM entirely depends on existing clients’ repeat purchases and word of mouth instead of mass advertising when attracting new clients. Nevertheless, to date no study has examined a mechanism for when and how existing CM clients refer a CM service to other potential clients.

The satisfaction level of services is harder to evaluate than that of ‘ordinary goods’ (Anderson and Sullivan 1993) because the overall satisfaction with a service is determined by the differing satisfaction levels perceived by a customer throughout the course of services (Boulding et al. 1993; Gronroos 1984; Yi and La 2006). This is particularly true in CM services, which, unlike other types of services, are typically provided on a long-term basis, sometimes for a period exceeding ten years. Quite a few previous studies demonstrated a close relationship between client expectations, satisfaction, and referral intentions. Satisfaction is a result of the fulfillment of expectations and leads to referral intentions (Bowen and Chen 2001; Diehl and Poynor 2010; Gupta and Stewart 1996; Oliver 1999). This study hypothesizes that the long duration of a service may enable clients’ referral intentions to be predicted based on their expectations while consuming the service, thereby improving referral intentions actively by analyzing the current quality of the service.

The overall aim of this study is to analyze the causal relationship and correlation between expectations, satisfaction, and referral intentions within the CM field. The detailed objectives are as follows. First, the causal relationships between expectations and satisfaction in each phase of CM services are examined; then, a model for predicting CM customers’ referral intentions based on their satisfaction levels is proposed based on the relationship between satisfaction and referral intentions. This study examines the referral mechanism most common in CM services and proposes a quantitative model for predicting CM clients’ referral intentions based on two widely accepted theories of customer satisfaction: the disconfirmation of expectation theory and the net promoter score (NPS) theory. The expectation-disconfirmation theory is a major customer satisfaction theory that explains consumers’ perceived satisfaction as a result of positive or negative disconfirmation (i.e., difference) between expectations and performance (Maloney 2002; Oliver 1980; Parasuraman et al. 1985). NPS theory, developed by Reichheld (2003), is the basis of one of the most commonly used methods for quantitatively measuring the intensity of referral intentions. It categorizes the intensity of referral intentions of customers by asking one simple question, “How likely is it that you would recommend this company to a friend or colleague?”

This study is structured as follows. First, it examines the relationship between expectations, satisfaction, and referral intentions by reviewing previous studies. Then, it establishes a research model for the mechanism of referral generation in CM services based on the expectation-disconfirmation theory. The referral intention model is tested with 103 CM clients, who are the final decision-makers for the purchase of CM services using structural equation modeling. In the second part of this study, a logistic regression model that allows a CM service provider to predict CM clients’ future referral intentions based on current satisfaction levels is derived from the survey data. The accuracy of the referral intention prediction model is validated using another set of data from 194 CM clients. Based on the results, ways to promote customers’ enthusiastic referrals during or after the provision of service are suggested.
Previous Studies

As described above, the concept for this research model is based on expectation-disconfirmation theory (Maloney 2002; Oliver 1980; Parasuraman et al. 1985) and NPS theory (Reichheld 2003). The expectation-disconfirmation theory, which is also known as the expectation-confirmation theory, was proposed by Oliver (Oliver 1980, 1993; Oliver and DeSarbo 1988). In this theory, satisfaction is determined by disconfirmation between prior expectations of products or services and their performance after consumption (Parasuraman et al. 1985). When perceived performance exceeds prior expectations, positive disconfirmation is established, which leads to satisfaction with the product or service. On the contrary, if perceived performance is below prior expectations, negative disconfirmation is established, leading to dissatisfaction. In addition, if perceived performance conforms to prior expectations, simple confirmation results. In other words, a customer’s expectation is an antecedent of satisfaction and acts as the standard of comparison for satisfaction (Jessie and Hong 2002; Oliver and DeSarbo 1988).

Customers with a higher level of positive disconfirmation, which means a higher satisfaction level, are more likely to have intense referral intentions and deliver positive word of mouth (Reichheld 2003; Wangenheim and Bayon 2004). Lam et al. (2004) argued in their study that the relationship between the satisfaction level and referral intentions is applicable not only to business-to-consumer relations, but also to business-to-business fields such as the CM industry. Moreover, customers with higher satisfaction levels have greater marketing power, helping companies reduce marketing costs (Bowen and Chen 2001).

One of the theories most widely used to quantitatively analyze the intensity of referral intentions is the NPS theory devised by Reichheld (2003). The theory categorizes customers into detractors, passively satisfied customers, and promoters by measuring the intensity of their recommendation of the services they have consumed on a scale of 0–10, based on the question, “How likely is it that you would recommend this company to a friend or colleague?” Those with a score of 0–6 are classified as detractors, who are known to be dissatisfied with the services or products of a company and deliver negative word of mouth to others. Those with a score of 7–8 are defined as passively satisfied customers, who are moderately satisfied with the services or products of a company, but are likely to be tempted into switching to a competitor. Those with a score of 9–10 are named promoters, who have strong intentions to recommend the services or products of a company and make continuous repurchases and deliver a positive word of mouth to others. Jeong and Lee (2010) have identified that the CM service as well follows the NPS theory and satisfaction, and referral intentions are closely correlated and that higher satisfaction levels lead to stronger referral intentions in the CM field. This study adopts and applies the NPS theory for constructing and analyzing the relationship between satisfaction and referral intention in CM services.

Another study of referral intentions was conducted by Wangenheim and Bayon (2004). They analyzed the behavior of customers who switched energy service providers. The results indicated that the switchers by referral showed higher overall satisfaction and loyalty than those attracted by advertising. These results revealed the importance of the route of customer acquisition as well as the type of new customers.

This study analyzes the relationship between the satisfaction level in each phase of a CM service lifecycle and referral intentions. Through this analysis, levels of expectation-disconfirmation, which can promote active referral intentions for attracting new clients, are examined, and a model for predicting these levels is established. For the analyses, the lifecycle of a CM service is divided into the predesign phase, design phase, construction phase, and post-construction phase following the most commonly accepted classification by the Project Management Institute (PMI 2004).

Conceptual Research Model and Hypothesis

According to the conceptual research model of this study, satisfaction in CM services is divided into process satisfaction and outcome satisfaction (Fig. 1), based on the concepts of process quality and outcome quality suggested by Yi and La (2006). Progress satisfaction is the customer satisfaction at each phase of a service, which is perceived during the process of consuming the service, while outcome satisfaction includes customers’ overall satisfaction as perceived after the completion of the service and referral intentions that are generated based on overall satisfaction.

As mentioned above, one of the main characteristics of CM services is that they are provided over a long period of time, often for two to three years or, sometimes, for more than ten years, from construction planning to completion. This differentiates CM services from other industries, such as hotel, department store, airline, and manufacturing industries, where short-term services are offered. On the other hand, this characteristic allows customer satisfaction levels to be considered in the middle of the provision of the service, thereby helping to improve service quality. This study attempts to develop a model for predicting CM service satisfaction levels that cause clients to engage in referrals, for the purpose of determining the effects of process satisfaction in CM services on outcome satisfaction.

![Fig. 1. CM service conceptual model 1](image-url)
The first and second sets of hypotheses established in this study are with regard to process satisfaction. The first set examines the causal relationship between expectations and satisfaction levels in each CM service phase: that is, predesign, design, construction, and postconstruction phases. The first set of hypotheses is as follows:

H1. Expectations of CM services have a significant effect on process satisfaction in the services.
   H1.1 Expected of CM services have a significant effect on satisfaction in the predesign phase.
   H1.2 Expectations of CM services have a significant effect on satisfaction in the design phase.
   H1.3 Expectations of CM services have a significant effect on satisfaction in the construction phase.
   H1.4 Expectations of CM services have a significant effect on satisfaction in the postconstruction phase.

The second set of hypotheses, also involving process satisfaction, is about the causal relationship between process satisfaction in one CM service phase and that in the following phase. The hypotheses are as follows:

H2. The process satisfaction level in one CM service phase significantly influences that in the following phase.
   H2.1 The satisfaction level in the predesign phase significantly influences that in the design phase.
   H2.2 The satisfaction level in the design phase significantly influences that in the construction phase.
   H2.3 The satisfaction level in the construction phase significantly influences that in the postconstruction phase.

The third set of hypotheses is associated with the relationships between process satisfaction and outcome satisfaction with CM services. Based on the theory suggested by Boulding et al. (1993) and Yi and La (2006), overall satisfaction after a service is formed by experiences and satisfaction accumulated during the consumption of the service. The relations between overall satisfaction and satisfaction during each project phase are hypothesized as follows:

H3. The process satisfaction with CM services will have a significant effect on overall satisfaction.
   H3.1 The satisfaction level in the predesign phase has a significant effect on overall satisfaction.
   H3.2 The satisfaction level in the design phase has a significant effect on overall satisfaction.
   H3.3 The satisfaction level in the construction phase has a significant effect on overall satisfaction.
   H3.4 The satisfaction level in the postconstruction phase has a significant effect on overall satisfaction.

The last set of hypotheses is related to the overall satisfaction and referral intentions after a service. As discussed early in the introduction, referral intentions are critical for maintaining and recruiting new clients, particularly in CM, because word of mouth is the main means of advertisement. The following hypothesis is to test the relationships between overall satisfaction and referral intentions in CM:

H4. Referral intentions vary depending on the overall satisfaction level, a result of process satisfaction with CM services.

H5. Referral intentions will vary depending on the overall satisfaction level resulting from process satisfaction with CM services (Fig. 2).

The following sections describe the test method and the results of the above hypotheses.

Research Methodology

To verify the proposed hypotheses, empirical surveys were carried out. The survey respondents consisted of chief project managers of companies that had purchased CM services, and the surveys were carried out in Seoul and other parts of Korea. The surveys were divided into two parts to establish a CM service referral intention prediction model. The first survey was conducted to develop a referral intention prediction model, whereas the second was conducted to verify the proposed model. Both surveys were carried out by visiting each of the respondents by appointment and asking them to fill out the questionnaires (Appendix). The first survey was conducted in 2007, and the second was conducted in 2009 in order to examine different projects from those examined in the first survey. For statistical analysis of the results of the first survey, structural equation modeling was used to test the causal relationships between expectations, process satisfaction, overall satisfaction, and referral intentions. In addition, multinomial logistic regression was carried out to establish a referral intention prediction model based on the verified results of the causal relationships.

Hypothesis Test and Prediction Model Validation Method

The hypotheses suggested above are tested and analyzed in the following process:

1. A survey is conducted asking clients who have experienced CM services about their expectations, satisfaction levels, and referral intentions;
2. The validity and reliability of the data on fulfilled expectations, satisfaction levels, and referral intentions are tested. In structural equation modeling, the validity of the data is generally tested by conducting confirmatory factor analysis and
examining the goodness-of-fit of the model based on its results. The reliability of the data, which shows the accuracy of the measuring tools employed in the study, is tested based on Cronbach’s α.

3. The causal relationships between CM clients’ expectations, satisfaction levels, and referral intentions are tested using path analysis (structural equation modeling). Structural equation modeling can be used to analyze multiple independent variables for each dependent variable. Therefore, this technique is used to analyze the relationships between clients’ expectations, satisfaction levels, and referral intentions all at once.

4. A model for predicting referral intentions according to the overall satisfaction level in a causal relationship framework, where expectations are followed by process satisfaction and then by overall satisfaction, is derived using multiple logistic regression; and

5. The validity of the derived prediction model is verified by applying it to actual cases.

According to Rossomme (2003), decision makers can be divided into three types by their degree of influence over the decision-making process: namely, chief project managers, influencers, and end users. Chief project managers have the general right to make decisions regarding project management, exerting direct influence over CM selection. Influencers, commissioned to conduct part of the chief project manager’s duties, plan and carry forward detailed tasks required for project management. Therefore, influencers exercise indirect influence over CM selection by giving project managers their comments on review regarding CM. End users, generally classified according to their field of work, perform working-level duties. Among the three types of decision makers, this study surveyed chief project managers who exercise direct influence over CM selection.

The first survey was conducted with chief project managers to test the five sets of hypotheses described above regarding the relationships among expectations, process satisfaction, outcome satisfaction, and referral intentions in CM services. The first survey was distributed to a total of 106 chief project managers by individually visiting chief project managers with experience using CM services. Of the 106 questionnaires distributed, 103 were collected, which is a 97% response rate.

The chief project managers were asked to measure the process satisfaction level of basic CM services such as project management, time management, cost management, and quality management (CMAA 1993) in each phase of the CM service lifecycle. Each item was measured based on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). Overall satisfaction, which is outcome satisfaction in CM services, and referral intention were measured based on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree).

194 questionnaires collected from chief project managers were analyzed.

The second survey was conducted in the same manner as the first survey was. For the second survey, however, chief project managers in charge of different projects from those for the first survey were visited and questioned. A total of 216 questionnaires were distributed to chief project managers, and 194 were collected, which is an 89.8% response rate. In terms of the client type, 116 of them (59.8%) were new clients, whereas 78 (40.2%) were repurchasing clients. Moreover, 81 of the projects (41.8%) were business facilities, which were the most common type of project, as in the first survey. In addition, 91 of the subjects (46.9%) were in their forties, and 129 respondents (66.4%) were in administrative positions (Table 1).

<table>
<thead>
<tr>
<th>Table 1. Respondent Profiles for the First and the Second Surveys</th>
</tr>
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<tbody>
<tr>
<td>Characteristics of respondent</td>
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<tr>
<td>Customer type</td>
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<tr>
<td>Project type</td>
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<td>Age group</td>
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<td>Occupation</td>
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Reliability of the First Survey Data

The reliability and validity of the collected data were verified before the main analysis. Verification of the unidimensionality of the observed variables should take precedence in order to analyze the causal relationships among the constructs using structural equation modeling. Confirmatory factor analysis was conducted to verify the unidimensionality of the observed variables. The results showed acceptable standards of goodness-of-fit indices as follows: χ²/df(< 2), CFI(≥ 0.9), IFI(≥ 0.9), and RMSEA(≤ 0.05). Although χ²/df(> 2) and RMSEA(≤ 0.1) in the postconstruction phase exceeded the standard, it proved to be sufficiently acceptable for analyzing the causal relationship in each phase, given that the CFI and IFI, key goodness-of-fit indices, met the standard (Table 2).

After the confirmatory factor analysis, reliability analysis was conducted to verify the reliability of the questionnaire items. The results revealed Cronbach’s alpha values that were higher than 0.7, indicating high levels of reliability and consistency of the items (Table 3). A Cronbach’s alpha value of 0.6 or higher is commonly considered to suggest high levels of reliability and consistency for data from a survey (Lee 2008). Among the goodness-of-fit indices, the χ² and p value fell short of the standard, but χ² is not the absolute standard for testing goodness of fit because it varies according to the number of samples (Arbuckle 2006). The other
indices met the standard, indicating an acceptable level of explanatory power for the causal relationships described in the model.

After reliability analysis, correlation analysis was conducted between constructs. The results revealed positive directivity at the statistical significance level, except for the correlations between expectations and the postconstruction phase (0.166) and between the postconstruction phase and customer loyalty (0.160; Table 4).

<table>
<thead>
<tr>
<th>Phases</th>
<th>Cronbach’s alpha value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expectation</td>
<td>0.788</td>
</tr>
<tr>
<td>Predesign phase</td>
<td>0.882</td>
</tr>
<tr>
<td>Design phase</td>
<td>0.855</td>
</tr>
<tr>
<td>Construction phase</td>
<td>0.877</td>
</tr>
<tr>
<td>Postconstruction phase</td>
<td>0.841</td>
</tr>
</tbody>
</table>

Table 3. Reliability Analysis

Covariance structural analysis, namely path analysis, was conducted to examine the causal relationships between factors with process-oriented and outcome satisfaction levels involved in Hypotheses 1–4, using an AMOS 7.0 package (Fig. 3). Before the analysis, the goodness of fit of the overall structural modeling was tested, and the results showed fit statistics and fit indices as follows: $\chi^2 = 249.631 \text{(df = 202, } p = 0.013(\geq 0.05)), \text{ IFI = 0.966(} \geq 0.9), \text{ TLI = 0.960(} \geq 0.9), \text{ CFI = 0.965(} \geq 0.9), \text{ RMSEA = 0.048(} < 0.1)$. Even though $\chi^2$ and $p (0.013)$ were below the standard of 0.05, $\chi^2$ is not an absolute standard for fit evaluation because it varies depending on the number of samples, according to Arbuckle (2006). The other fit indices proved to be suitable for the standard, indicating that the model has sufficient explanatory power for the causal relationships discovered. The results are illustrated in Table 5.

Table 4. Means, Standard Deviations, and Correlation Matrix

<table>
<thead>
<tr>
<th>Phases</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Interconstruct correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Expectation</td>
<td>3.871</td>
<td>0.52804</td>
<td>1</td>
</tr>
<tr>
<td>Predesign phase</td>
<td>4.120</td>
<td>0.47026</td>
<td>0.702$^a$</td>
</tr>
<tr>
<td>Design phase</td>
<td>3.939</td>
<td>0.57218</td>
<td>0.583$^b$</td>
</tr>
<tr>
<td>Construction phase</td>
<td>4.052</td>
<td>0.48503</td>
<td>0.525$^d$</td>
</tr>
<tr>
<td>Postconstruction phase</td>
<td>3.880</td>
<td>0.24657</td>
<td>0.166</td>
</tr>
<tr>
<td>Overall satisfaction</td>
<td>3.76</td>
<td>0.834</td>
<td>0.530$^j$</td>
</tr>
<tr>
<td>Referral intention</td>
<td>7.87</td>
<td>1.690</td>
<td>0.611$^o$</td>
</tr>
</tbody>
</table>

$^a p < 0.01.$

$^b p < 0.05.$

Testing of the Hypotheses

Fig. 3. Path model of the hypotheses
Twelve hypotheses were studied, 8 were selected, and the remaining 4 were rejected. The selected hypotheses can be summarized as follows. Expectations of CM services proved to be predictive of satisfaction in the predesign phase. This presumably indicates that satisfaction is a result of positive disconfirmation during the earliest phase of the CM service. It is influenced by how expectations are fulfilled during service.

Process satisfaction in one phase had an effect on satisfaction with the following phase, suggesting continuity of process satisfaction. The satisfaction in the design-phase, for instance, influenced that in the construction phase. The satisfaction resulting from positive disconfirmation of expectations had an effect on overall satisfaction. In other words, satisfaction during the predesign and construction phases had a causal relationship with overall satisfaction, which, in turn, had a causal relationship with referral intentions.

In comparison, there was no causal relationship found between expectations of CM services and satisfaction in the design and postconstruction phases, also process satisfaction. This is presumably because the predesign and construction phases deeply involve CM services, whereas the design and postconstruction phases involve such services much less than they involve design firms or professional facility management services.

In short, expectations of CM services have an effect throughout the project, indicating that process satisfaction occurs over time. Such continuous process satisfaction proved to have a causal relationship with overall satisfaction and then referral intentions. In the design and postconstruction phases, during which design firms or facility management services take charge rather than CM services because of the nature of CM practices, expectations had a weak causal relationship with outcome satisfaction.

### Table 5. Path Analysis Results of the Hypotheses

<table>
<thead>
<tr>
<th>H</th>
<th>Path</th>
<th>Direction</th>
<th>Path coefficient</th>
<th>T-value</th>
<th>Selected/rejected</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>H1.1 expectation → satisfaction in design</td>
<td>+</td>
<td>0.875&lt;sup&gt;a&lt;/sup&gt;</td>
<td>8.916</td>
<td>Selected</td>
</tr>
<tr>
<td>H1</td>
<td>H1.2 expectation → satisfaction in design</td>
<td>+</td>
<td>0.382&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.000</td>
<td>Selected</td>
</tr>
<tr>
<td>H1</td>
<td>H1.3 expectation → satisfaction in construction</td>
<td>+</td>
<td>0.706&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.295</td>
<td>Selected</td>
</tr>
<tr>
<td>H1</td>
<td>H1.4 expectation → satisfaction in postconstruction</td>
<td>+</td>
<td>0.313&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.845</td>
<td>Selected</td>
</tr>
<tr>
<td>H2</td>
<td>H2.1 satisfaction in design → satisfaction in design</td>
<td>+</td>
<td>0.308&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.370</td>
<td>Selected</td>
</tr>
<tr>
<td>H2</td>
<td>H2.2 satisfaction in design → satisfaction in construction</td>
<td>+</td>
<td>0.470&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.531</td>
<td>Selected</td>
</tr>
<tr>
<td>H2</td>
<td>H2.3 satisfaction in construction → satisfaction in postconstruction</td>
<td>+</td>
<td>0.480&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.297</td>
<td>Selected</td>
</tr>
<tr>
<td>H3</td>
<td>H3.1 satisfaction in design → overall satisfaction</td>
<td>+</td>
<td>0.826&lt;sup&gt;a&lt;/sup&gt;</td>
<td>8.711</td>
<td>Selected</td>
</tr>
<tr>
<td>H3</td>
<td>H3.2 satisfaction in design → overall satisfaction</td>
<td>+</td>
<td>0.391</td>
<td>13.256</td>
<td>0.000</td>
</tr>
<tr>
<td>H3</td>
<td>H3.3 satisfaction in construction → overall satisfaction</td>
<td>+</td>
<td>0.628</td>
<td>25.567</td>
<td>0.000</td>
</tr>
<tr>
<td>H3</td>
<td>H3.4 satisfaction in postconstruction → overall satisfaction</td>
<td>+</td>
<td>0.313</td>
<td>12.325</td>
<td>0.000</td>
</tr>
</tbody>
</table>

<sup>a</sup><sub>p < 0.01</sub>, <sup>b</sup><sub>p < 0.05</sub>.

### Derivation of a Prediction Model

The path analysis in the above section shows that the overall satisfaction and referral intention have a strong causal relation. Based on this finding, a prediction model for predicting the future referral intentions of clients depending on their overall satisfaction level was developed to provide CM service providers with a means to assess and effectively manage the current status of CM services.

Multinomial logistic regression was carried out to verify H5 “Referral intentions will vary depending on the overall satisfaction level resulting from process-oriented satisfaction with CM services.” The clients were categorized into three groups—detractors, passively satisfied customers, and promoters—by their referral intention according to the NPS theory. The prediction model was developed using multinomial logistic regression because this study had three dependent categories—detractors, passively satisfied customers, and promoters.

In multinomial logistic regression, one of the categories is selected and set as the base category, which is compared with the others. Generally, the one with the greatest number of cases is selected as the base category to minimize prediction errors. In this study, the group of promoters was chosen as the base category as they comprised the largest proportion (n = 44, 42.7%).

Next, the model fit was analyzed to verify the significance of the model. Table 6 shows the results. According to the results, −2 log likelihood of the final model was 26.036, which increased by 49.383 compared with the null model that was described as constant only. Considering the degree of freedom, the difference between this value and 0 was large enough (p = 0.000) to suggest the model was statistically significant. This revealed that there were one or more independent variables influencing the differences between promoters and passively satisfied customers and those between promoters and detractors.

Then regression coefficient estimates were examined to see which independent variable had an effect. Table 7 shows the results. An independent variable describing overall satisfaction influences the differences between promoters and detractors and those between promoters and passively satisfied customers.

With three categories of dependent variables (1, 2, and 3) and Category 3 functioning as the base one, as in the hypotheses here, the following logit function can be established:
By substituting the values in Table 8, the following multinomial logistic regression models for predicting clients’ intentions to recommend a CM service to colleagues and others based on a given overall satisfaction level were derived:

\[
P(Y = j|x) = \frac{e^{\theta_j(x)}}{\sum_{k=1}^{3} e^{\theta_k(x)}}, \quad j = 1, 2, 3
\]  

(1)

The overall satisfaction levels of the group of customers were categorized into very high (5 out of 5 points), high (4 out of 5 points), and moderate (3 out of 5 points). The odds of becoming a promoter, passively satisfied customer, or detractor could be predicted based on the overall satisfaction level. The following were the results of applying given conditions to the logit functions with the overall satisfaction being moderate (3 out of 5 points):

\[
\ln \frac{P(\text{Detractor})}{P(\text{Promoter})} = 10.605 - 3.178\times (\text{Overall Satisfaction Level})
\]

\[
\ln \frac{P(\text{Passively Satisfied})}{P(\text{Promoter})} = 5.494 - 1.425\times (\text{Overall Satisfaction Level})
\]

(2)

\[
\ln \frac{P(\text{Passively Satisfied})}{P(\text{Promoter})} = 0
\]

The following conditional probability equation for the outcome categories could be drawn from the functions above:

\[
P(\text{Detractor}|x) = \frac{e^{1.071}}{e^{0} + e^{1.071} + e^{1.219}} = 0.399\,39.9\%
\]

\[
P(\text{Passively Satisfied}|x) = \frac{e^{1.219}}{e^{0} + e^{1.071} + e^{1.219}} = 0.463\,46.3\%
\]

\[
P(\text{Promoter}|x) = \frac{e^{0}}{e^{0} + e^{1.071} + e^{1.219}} = 0.136, 13.6\%
\]

(4)

In other words, the odds of a client with a moderate level of overall satisfaction becoming a detractor were 39.9%, and those of becoming a passively satisfied customer and a promoter were 46.3%, the highest odds, and 13.6%, respectively (Fig. 4).

Similarly, for customers whose overall satisfaction level was high (4 out of 5 points) or very high (5 out of 5 points), the odds of becoming a promoter were 51.6 and 83.2%, respectively (Table 9). As indicated in Table 8, the odds of becoming a promoter, passively satisfied client, or detractor could be predicted based on the overall satisfaction level, a result of process satisfaction in CM services.

Validation of the Referral Intention Prediction Model

To validate the derived prediction model, the accuracy of the predicted model was tested by conducting a second survey. In order to verify the reliability of the questionnaire items, reliability analysis was conducted. The results showed Cronbach’s alpha values higher than 0.7, indicating high levels of reliability and consistency of the items (Table 8).

According to the results, 68 out of 194 respondents showed very high levels of overall satisfaction (5 out of 5 points). Among them, 62 were categorized as promoters, whereas 5 were classified as passively satisfied customers and 1 as a detractor, respectively. The cases of high overall satisfaction level (4 out of 5 points) and moderate level (3 out of 5 points) were organized in the same manner (Table 10).

To test the accuracy of the model for predicting customers’ referral intentions, the prediction model established based on the results of the first survey of 103 clients (Table 9) was compared with the results of the second survey of a different group of 194 clients (Table 8). The prediction model based on the first survey predicted 57 (83.2%) of clients with a very high level of overall satisfaction (five out of five points) would be promoters. According to the results of the second survey, the validation data, 62 of the 68 clients with a very high level of overall satisfaction were categorized as promoters, indicating a prediction accuracy of 91.2%.

The accuracy of predicting promoters in the other cases based on the NPS methodology was analyzed in the same manner. The results revealed that the accuracy in cases of clients with a high level of overall satisfaction (4 out of 5 points) was 80.3%, whereas

<table>
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<th>Table 8. Reliability Analysis of the Second Survey</th>
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| Table 9. Prediction of Referral Intentions Based on Overall Satisfaction Levels |
|----------------------------------|--|--|--|
| Overall satisfaction level       | Odds of becoming a promoter (%) | Odds of becoming a passively satisfied customer (%) | Odds of becoming a detractor (%) |
| Very high (5 points)             | 83.2 | 16.3 | 0.4 |
| High (4 points)                  | 51.6 | 42.0 | 6.2 |
| Moderate (3 points)              | 13.6 | 46.3 | 39.9 |

| Table 10. Validation Data on the Referral Intention Prediction Model |
|----------------------------------|--|--|--|
| Overall satisfaction level       | Respondent | Promoter | Passively satisfied customer | Detractor |
| Very high (5 points)             | 68 | 62 | 5 | 1 |
| High (4 points)                  | 99 | 41 | 49 | 9 |
| Moderate (3 points)              | 27 | 5  | 10 | 12 |
| Total                            | 194| 108| 64 | 22 |
that in those with a moderate level of overall satisfaction (3 out of 5 points) was 75.0%. In other words, the prediction model showed a high accuracy of 82.1% in predicting promoters (Table 10). The results also revealed accuracies of 83.3% in predicting passively satisfied clients among those with a high level of overall satisfaction (4 out of 5 points) and 90.9% in predicting detractors among those with a moderate level of overall satisfaction (3 out of 5 points) According to the results, the average accuracy of the prediction model was 79.3%, indicating its high reliability (Table 11).

### Conclusions

The aim of this study was to establish a model for predicting clients’ referral intentions according to their overall satisfaction levels based on process satisfaction with CM services, typically provided on a long-term basis, and to verify the accuracy of the model using verification data. The major findings are as follows.

First, 103 chief project managers at construction companies with experience using CM services were surveyed regarding expectations, satisfaction, and referral intentions. The results showed that process satisfaction in CM services significantly influenced outcome satisfaction: that is, overall satisfaction and referral intentions. The results also revealed the continuity of satisfaction from expectations for CM service, customer satisfaction at each CM phase, and referral intentions, it did not determine how expectation factors vary depending on the client. Studies of this subject are useful not only for attracting clients by increasing expectations based on the characteristics of each client, but also for enhancing client referral intentions by satisfying them and managing their expectations properly. This study also has limitations in that it did not determine how the duration of CM services, that is, long-, mid-, and short-term CM services influences clients’ referral intentions. All these are topics for future studies.

### Limitations

This study has limitations in that it failed to take into account different characteristics of different types of projects, although it encompassed various types of projects in its analysis. In addition, it did not factor in the differences between new and existing clients of CM services. Future studies will help to improve the accuracy rates of referral intentions. Although this study examined the relationships between CM clients’ expectations, satisfaction, and referral intentions, it did not determine how expectation factors vary depending on the client. Studies of this subject are useful not only for attracting clients by increasing expectations based on the characteristics of each client, but also for enhancing client referral intentions by satisfying them and managing their expectations properly. This study also has limitations in that it did not determine how the duration of CM services, that is, long-, mid-, and short-term CM services influences clients’ referral intentions. All these are topics for future studies.

### Appendix. Questionnaires on Client Satisfaction and Referral Intention of Construction Management Services

A questionnaire was developed based on the findings from previous studies. Twenty-two variables were used to measure customer expectations for CM service, customer satisfaction at each CM phase, overall satisfaction, and referral intentions.

Note: Prediction (P) = prediction of referral intentions based on overall satisfaction levels (Table 9); Actual (A) = validation data on the referral intention prediction model (Table 8); Accuracy: \( \frac{(P - |P - A|)}{P} \times 100 \).
Construct 1: Client expectations for the CM service

X1  Clients’ value satisfaction  Five-point scale
X2  Contents of the proposal  Five-point scale
X3  Appropriate staff allocation  Five-point scale
X4  Contracting process and contracted conditions  Five-point scale

Construct 2: Client satisfaction with the predesign phase

X5  Project management  Five-point scale
X6  Time management  Five-point scale
X7  Cost management  Five-point scale
X8  Quality management  Five-point scale

Construct 3: Client satisfaction with the design phase

X9  Project management  Five-point scale
X10  Time management  Five-point scale
X11  Cost management  Five-point scale
X12  Quality management  Five-point scale

Construct 4: Client satisfaction with the construction phase

X13  Project management  Five-point scale
X14  Time management  Five-point scale
X15  Cost management  Five-point scale
X16  Quality management  Five-point scale

Construct 5: Client satisfaction with the postconstruction phase

X17  Project management  Five-point scale
X18  Time management  Five-point scale
X19  Cost management  Five-point scale
X20  Quality management  Five-point scale

Construct 6: Overall satisfaction

X21  Overall satisfaction  Five-point scale

Construct 7: Referral intention

X22  Referral intention  Eleven-point scale

References


