Investigating Partnering Performance in the Vietnamese Construction Industry

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1 Introduction

With the global integration and economic boom in recent decades, the Vietnamese construction industry has faced many new challenges, such as increased competition from foreign firms, more exacting quality standards, rapid development of new technologies, increased risks of globalization, and development of information technology. The adversarial relationships between project parties from the traditional contract arrangements have caused many difficulties. The new contract arrangement will help construction enterprises to improve their competencies and competitive advantages. Partnering concept, as a key for the study, could be considered to be useful in the Vietnamese context.

Partnering could not only reduce the principal constraints between traditional contract parties [23], but also promote cooperation and improve the competitiveness of construction parties. It is an innovative concept in construction firms [11]. Due to the multidisciplinary knowledge and skills of parties participating in a construction

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J. N. Reddy et al. (eds.), *ICSCEA 2019*, Lecture Notes in Civil Engineering 80,
https://doi.org/10.1007/978-981-15-5144-4_88

project, partnering evolves as a cooperative strategy that could supplement and modify the traditional boundaries between independent organizations in a competitive market [14].

Although the partnering concept has been widely applied in construction from the late 1990s and early 2000s, it has not been understood and widely used by parties in the Vietnamese construction industry. Evidence for the adoption of this new arrangement has been limited to anecdotes. Thus, it is necessary to conduct an in-depth study to encourage the use of partnering in construction projects.

The main aim of this paper is to develop a model that practitioners can easily employ to evaluate the level of partnership success. The model, developed using logistic regression technique, converts the qualitative performance of success factors (SFs) into the quantitative value of the chance of partnering success in a specific context. It can also serve as a tool to help practitioners in developing, adjusting and improving their strategies to enhance partnering performance.

2 Success Factor for Partnering in Construction

Rockart [25] defined critical SFs as "*those few key areas of activity, in which favorable results are absolutely necessary for a particular manager to reach his/her goals*". Boynton and Zmud [3] defined critical SFs as "*those few things that must go well to ensure success for a manager and an organization*", and accordingly, they represented managerial or organizational areas which should be given special and continual attention to ensure high performance.

Since the partnering concept became popular, researches about SFs in implementing this procurement type have been intensive. Crane et al. [13] proposed a partnering process model that consisted of five phases and various SFs were identified to ensure successful partnering in each phase. Larson [20] surveyed 291 construction projects and suggested that a comprehensive approach should be applied to partnering in construction projects and that top management support for teamwork across organizations is critical to success. Cheng et al. [8] proposed a partnering framework and identified critical SFs based on a review of partnering literature. Several aspects of research about SFs were presented in Cheng and Li [9] and Cheng et al. [10, 11] to facilitate the implementation of partnering through a proposed model. SFs were investigated for a certain stage, of which four common SFs were top management support, open communication, effective coordination, and mutual trust. Black et al. [2], using a UK-wide postal questionnaire survey, indicated that partnering can and does work, but all project participants must rethink their attitudes and work to make projects more efficient, successful and free from conflict. Also based on research in the UK construction industry, Beach et al. [1] presented a conceptual framework of SFs. They reviewed the context of four categories of key elements in the literature (i.e. commitment, processes, tools, and outcomes) appeared to fit into the outcome category. Three new aspects of successful partnering were identified: best value, service, and dependency. In the Taiwanese context, Chen and Chen [6] and Chen et al.

[7] identified and assessed critical factors as certain requirements that must be met for partnering to be successful. Chan et al. [5] based on the case study of six selected projects and developed a best practice partnering framework for the Hong Kong context. Focusing on mainland China, Tang et al. [28] presented the finding from a study that was conducted to develop and test a partnering model, which revealed the relationships between critical SFs of partnering and demonstrated their importance to construction.

Most of the completed work has been context-specific. Moreover, research about the application of the partnering concept in Vietnam has not received much attention, either from the international research community in general or from the local researchers in particular. Only one study has attempted to fill the gap. Le-Hoai [21] identified twenty-eight SFs for partnering in the Vietnamese construction industry through a questionnaire survey. These SFs will be used in this paper to develop a prediction model.

3 Level of Partnering Success

Many studies (e.g., [8, 12, 13, 26]) have been conducted to measure the success of partnering in construction. The studies have identified many criteria for measuring partnering success. Cheng et al. [8] proposed that performance measures could be subjective or objective and these measures should help to set useful monitoring, control, evaluation, and correction of variations and improvements. The frequently-used measures were related to cost, schedule, quality, safety, litigation, profit, stakeholders, and community. Accordingly, collecting various measures to estimate the level of partnering success seems to encounter many difficulties, such as reliability of answers of respondents about the measures due to the sensitivity of data, limited time of respondents due to tight working schedule, and inertia of practitioners against scientific researches. The surveyed scale must be easy for respondents to respond with acceptable accuracy for the research purpose.

Several researches used a qualitative scale to estimate the measures of success and, then, estimate the success level in management. Handa and Adas [17] built a model to predict organizational effectiveness, and Han et al. [16] used a seven-point scale to predict profit performance when selecting candidate international construction projects. Success or lack of success in performance was likely to be subjectively estimated based on respondents' perceptions. Menches and Hanna [24] asked respondents to rate the performance of projects on a two-point scale: successful and less-than-successful. Chan et al. [4] requested respondents to rate their perceptions of partnering success on a five-point Likert scale (1 = "strongly disagree" and 5 = "strongly agree").

In order to overcome the difficulties and guarantee the acceptable accuracy, a ten-point scale was employed whereby respondents assigned the ratings of 1 for "completely unsuccessful" to 10 for "completely successful". Iyer and Jha [18] have

adopted a ten-point scale to subjectively estimate schedule performance of construction projects in India. Koksal and Arditi [19] also used a ten-point scale to rate the overall condition of construction company in a research on company decline.

4 Methodology

4.1 Questionnaire Survey

An empirical survey was conducted to investigate SFs for partnering application in the Vietnamese construction industry. Respondents were requested to rate the contribution of the factors to the partnering success according to a five-point Likert scale from 1 (not significant) to 5 (extremely significant). With the level of partnering success, respondents were asked to rate on a ten-point scale from 1 (completely unsuccessful) to 10 (completely successful). Data were collected through answers based on project information that respondents participated. Practitioners in the sample were identified through construction companies' web-pages and charters, project case analyses, professional fora, and personal relationships.

The questionnaires were hand-delivered, posted or sent through e-mails. The primary participants in this study were from clients, consultants and contractors working in the Vietnamese construction industry. More than 300 questionnaires were distributed. As a result, 79 valid questionnaires were received with a response rate of approximately 24%. The collected data were analyzed using SPSS statistical software. Cronbach's alpha coefficient of internal consistency yielded a value of $0.887 > 0.70$, which is considered to be reliable.

The data set includes 79 observations. In particular, 20.3%, 59.5% and 20.3% of the data sample are from clients, contractors and consultants, respectively. Thus, over 50% of respondents were from contracting firms. In terms of job position, 12.7% of respondents were senior managers, 49.4% were functional managers, 32.9% were project team members, and 5.1% were partnering facilitators. There were four experience-related groups: less than 5 years with 15.2%, 5–10 years with 36.7%, 10–15 years with 40.5%, and more than 15 years of experience with 7.6%. Regarding the origin of organizations, foreign companies accounted for 32.9% (26 responses), and the rest (53 answers or 67.1%) were from Vietnamese companies.

The ratings given to partnering success by respondents were all above 5, with a median value of 8 and a mean value of 7.66. All of these values seem to suggest that partnering has been successfully applied in the Vietnamese context.

4.2 Model Development Process

The data set of twenty-eight SFs for partnering in the Vietnamese construction industry and the level of partnering success, collected from the questionnaire survey, was used to develop a prediction model. The tests of Kendall's coefficients of concordance were all significant at 0.000. It confirms a response consensus within each respondent group. The p-values from Spearman rank correlation tests are all less than 0.05. Thus, they lead to the conclusion that there was a significant agreement between pairs of respondent groups on the ranking of SFs. Analysis of variance (ANOVA) tests between respondent groups on the level of partnering success showed insignificant differences at the 0.1 level. Since there was a good statistical agreement between respondent groups, all data could be aggregated for further analysis. Factor analysis was performed to reduce the number of variables. The extracted components were used as the independent variables in the logistic regression model. Component scores represented the components in the regression analysis.

Validation is a very important step in the application of logistic regression technique. A new model should be tested with the cases that are independent from the cases used in its development [19]. Therefore, the data set was randomly divided into two sets: building and testing sets corresponding to a ratio of 90/10 (71 cases used for building and 8 cases used for testing).

5 Factor Analysis

Factor analysis was employed to analyze the latent relationships between a large number of SFs [22]. All twenty-eight SFs were appropriate for factor analysis because their communalities were higher than 0.5. The result of Bartlett's test of sphericity tests the hypothesis that the correlation matrix is an identity matrix. The hypothesis was rejected with the significance level at 0.000 with a Chi-square value of 1258.335 [15]. Kaiser-Meyer-Olkin measure of sampling adequacy was satisfactory with the value of 0.685 [27]. Therefore, the factor analysis method was approached for the data. Principal component analysis was used to extract components.

Latent root criterion (eigenvalue greater than 1) and varimax orthogonal rotation technique were adopted. Eight components were extracted after rotation. Figure 1 shows the scree plot of the analyzed factors. With eight extracted components, 71.5% of variance can be explained. Table 1 shows the rotated component matrix which contains the loadings of SFs on each component.

Loading is the correlation of a variable on a component and indicates the degree of correspondence between the variable and the component. The patterns of extracted components were characterized by the factors which have high loadings (> 0.5) on the components. The first component, consisted of early implementation of the partnering process (0.507), commitment to continuous improvement (0.673), acting consistently with objectives (0.734), dedicated team (0.556), flexibility to change (0.732),

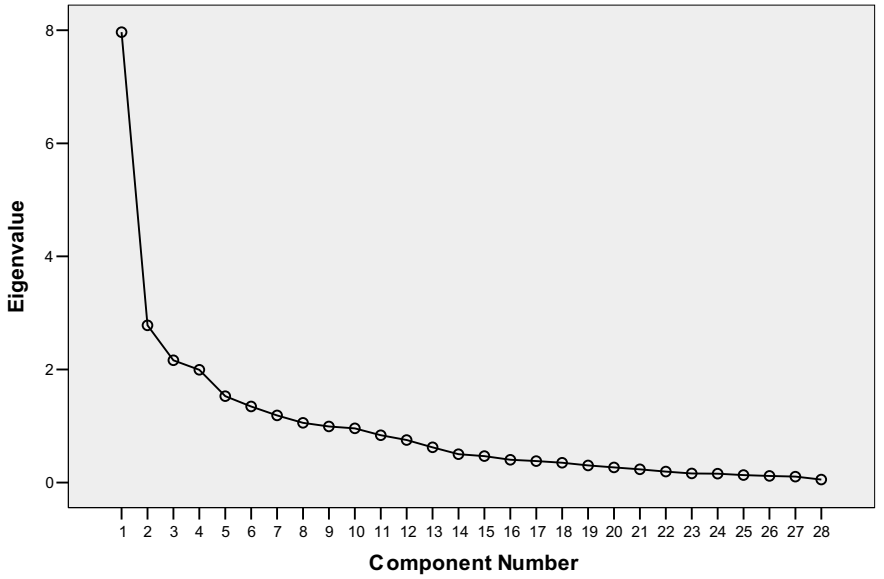

Fig. 1 Scree plot

total cost perspective (0.576), and creativity of the partnering team (0.752), could be named "dedication". The second component was named "readiness" because it consisted of mutual trust between parties (0.528), effective communication (0.544), good cultural fit (0.618), company wide acceptance about the partnering (0.847), and technical expertise (0.699). The third and fourth components were named "coordination" and "teamwork", respectively. The third component comprised questioning attitude about assumptions (0.637), educated and trained personnel for partnering (0.637), and effective coordination (0.715), while the fourth component included mutual trust between parties (0.524), partnering experience (0.735), and joint problem solving (0.814). Similarly, "sufficiency" and "leading" were the names given to the fifth and sixth components, respectively. The fifth component comprised adequate resources (0.753) and effective conflict resolution process (0.750), while the sixth component comprised long-term commitment (0.510), commitment from top management (0.650), financial security (0.658), and equity (0.581). "Balance" component consisted of commitment to quality (0.645), empowerment of stakeholders (0.574), and adequate partnering team building (0.806). The last component had only one factor, i.e. clear understanding about scope and objectives (0.844), and was thus named "clarity".

Component scores have been used to represent the components in the following analysis. The weight of a factor on a component indicates the unique contribution of the factor to the score of this component. The coefficients in Table 2 are the weights of the factors used to calculate the component scores.

Table 1 Rotated component matrix

Success factors	Component							
	1	2	3	4	5	6	7	8
Mutual trust between parties	−0.053	**0.528**	−0.121	**0.524**	−0.013	0.343	0.131	−0.193
Effective communication	0.068	**0.544**	0.194	−0.105	0.440	0.406	−0.034	−0.024
Adequate resources	0.203	−0.006	0.232	0.078	**0.753**	0.314	−0.192	0.164
Long-term commitment	0.207	0.408	0.279	0.154	−0.110	**0.510**	−0.116	0.431
Commitment from top management	0.035	−0.122	0.181	0.124	0.340	**0.650**	0.004	0.066
Clear understanding of scope and objectives	0.147	−0.066	0.138	−0.033	0.189	0.001	0.058	**0.844**
Early implementation of the partnering process	**0.507**	0.464	−0.068	0.349	0.074	−0.019	0.316	0.266
Commitment to continuous improvement	**0.673**	−0.008	−0.007	0.283	0.286	0.006	0.069	0.039
Acting consistently with objectives	**0.734**	−0.135	0.466	−0.014	0.012	0.211	−0.034	−0.199
Dedicated team	**0.556**	0.068	0.248	−0.061	0.453	0.031	0.066	0.154
Flexibility to change	**0.732**	0.092	0.045	0.075	0.051	0.074	0.192	0.016
Commitment to quality	0.464	0.211	0.154	0.098	0.069	−0.036	**0.645**	0.218
Total cost perspective	**0.576**	0.202	0.253	−0.128	−0.097	0.057	0.132	0.209
Good cultural fit	0.485	**0.618**	0.297	0.266	−0.063	−0.087	−0.075	−0.127
Company wide acceptance about the partnering	0.152	**0.847**	0.049	0.125	−0.001	0.148	0.031	−0.092
Technical expertise	0.086	**0.699**	0.142	−0.224	0.246	−0.075	−0.012	0.377
Financial security	0.066	0.191	−0.137	−0.112	0.183	**0.658**	0.014	−0.167

(continued)

Table 1 (continued)

Success factors	Component							
	1	2	3	4	5	6	7	8
Questioning attitude about assumptions	0.219	0.175	**0.637**	0.095	−0.026	0.139	0.292	0.226
Empowerment of stakeholders	0.394	0.009	0.252	−0.065	−0.253	0.182	**0.574**	0.103
Creativity of partnering team	**0.752**	0.281	0.157	−0.079	0.226	−0.062	0.244	0.173
Equity	0.014	0.138	0.182	0.231	−0.010	**0.581**	0.306	0.415
Mutual vision, goals/objectives	−0.078	0.412	0.211	0.415	0.329	0.344	0.151	0.052
Effective conflict resolution process	0.137	0.150	−0.039	0.020	**0.750**	0.144	0.180	0.050
Educated and trained personnel for partnering	0.147	0.356	**0.637**	0.210	0.109	0.066	0.248	0.030
Effective coordination	0.313	−0.004	**0.715**	0.019	0.252	0.004	0.168	0.149
Adequate partnering team building	0.149	−0.095	0.297	0.178	0.191	0.014	**0.806**	−0.102
Partnering experience	0.158	−0.083	−0.086	**0.735**	−0.068	0.137	0.305	0.085
Joint problem solving	−0.019	0.161	0.209	**0.814**	0.076	0.015	−0.043	−0.131

Extraction method: Principal Component Analysis
Rotation method: Varimax with Kaiser Normalization
Bold values: Factor loadings are larger than 0.5

6 Logistic Regression

6.1 Model Development

Logistic regression is a conditional probability approach, while multinomial logistic regression is an extension of binomial logistic regression. The chances of occurrence of a particular value of the response variable are compared with the chances of occurrence of the reference value of the response variable. In this study, the reference value was level 10 of the scale of success. Forward entry stepwise method was used to identify the significant variables. The logistic regression model was developed with the success level as the dependent variable and all eight extracted components

Table 2 Component score matrix

Success factors	Component							
	1	2	3	4	5	6	7	8
Mutual trust between parties	−0.032	0.184	−0.090	0.269	−0.039	0.172	0.159	−0.154
Effective communication	−0.060	0.144	0.049	−0.078	0.157	0.097	−0.029	−0.093
Adequate resources	0.020	−0.090	0.054	0.020	0.328	0.053	−0.169	0.035
Long-term commitment	0.045	0.064	0.052	0.059	−0.241	0.262	−0.219	0.257
Commitment from top management	−0.005	−0.149	0.031	0.027	0.067	0.337	−0.043	−0.013
Clear understanding about scope and objectives	−0.022	−0.069	−0.031	−0.029	0.037	−0.054	−0.048	0.554
Early implementation of the partnering process	0.119	0.145	−0.258	0.148	−0.008	−0.073	0.090	0.135
Commitment to continuous improvement	0.256	−0.066	−0.179	0.124	0.102	−0.015	−0.076	−0.026
Acting consistently with objectives	0.276	−0.162	0.209	−0.053	−0.112	0.153	−0.193	−0.225
Dedicated team	0.135	−0.049	0.023	−0.065	0.188	−0.065	−0.053	0.016
Flexibility to change	0.272	−0.036	−0.147	0.008	−0.045	0.056	−0.008	−0.049
Commitment to quality	0.028	0.038	−0.090	−0.023	0.019	−0.082	0.320	0.060
Total cost perspective	0.172	0.010	0.036	−0.097	−0.144	0.032	−0.050	0.082
Good cultural fit	0.124	0.208	0.105	0.116	−0.098	−0.116	−0.180	−0.143
Company wide acceptance about the partnering	−0.006	0.310	−0.053	0.053	−0.057	−0.008	−0.019	−0.100
Technical expertise	−0.089	0.261	0.021	−0.117	0.102	−0.188	−0.024	0.214
Financial security	0.068	−0.002	−0.168	−0.066	0.001	0.376	0.021	−0.142

(continued)

Table 2 (continued)

Success factors	Component							
	1	2	3	4	5	6	7	8
Questioning attitude about assumptions	−0.086	−0.001	0.329	−0.030	−0.097	0.001	0.056	0.053
Empowerment of stakeholders	0.059	−0.059	0.033	−0.107	−0.198	0.132	0.264	−0.004
Creativity of partnering team	0.205	0.041	−0.088	−0.079	0.064	−0.095	0.032	0.031
Equity	−0.076	−0.033	−0.031	0.063	−0.135	0.299	0.107	0.232
Mutual vision, goals/objectives	−0.150	0.113	0.039	0.166	0.120	0.062	0.061	−0.032
Effective conflict resolution process	−0.040	0.016	−0.144	−0.017	0.411	−0.060	0.145	−0.039
Educated and trained personnel for partnering	−0.135	0.089	0.350	0.031	0.007	−0.089	0.056	−0.088
Effective coordination	−0.054	−0.074	0.402	−0.065	0.079	−0.103	−0.014	−0.017
Adequate partnering team building	−0.133	−0.067	0.086	−0.013	0.143	−0.069	0.489	−0.180
Partnering experience	0.044	−0.055	−0.194	0.339	−0.067	0.093	0.104	0.048
Joint problem solving	−0.061	0.058	0.097	0.389	0.023	−0.059	−0.108	−0.113

as the potential independent variables. The seventy-one projects in the building set were used to develop the multinomial logistic regression model.

Table 3 presents the model fitting information. Both the Akaike information criterion (AIC) and the Bayesian information criterion (BIC) indicated that the final model achieved a better fit than the intercept-only model. Furthermore, the likelihood ratio test, significant at the 0.05 level, implied that the final model was significantly different from the model with the constant only or that the null hypothesis that all the predictor effects were zero could be rejected.

Table 3 Model fitting information

Model	Model fitting criteria			Likelihood ratio tests		
	AIC	BIC	−2 Log Likelihood	Chi-Square	df	Sig.
Intercept only	258.572	269.886	248.572			
Final	159.486	216.053	109.486	139.087	20	0.000

The goodness of fit test measures the fitness of the data collected for the model being proposed [19]. The Pearson and deviance tests were included. The finding of non-significance favors the conclusion that the model adequately fitted the data. The pseudo R^2 values are not goodness-of-fit tests, but rather attempt to measure the strength of association of the independent variables and the dependent variable. Cox-Snell and Nagelkerke are the two common relevant values to report. Based on the produced results, the model accounted for between 85.9 and 88.6% of variability in the dependent variable.

Another way to investigate whether the model fits with data or not is the classification table. The classification table (see Table 4) presents the observed and predicted groups. The overall correct rate of the model was 63.4%. The lowest prediction rate was at level 6 with the correct percentage of 37.5. The next was at level 8 with the correct percent of 46.2. The highest correct percentage was for level 5 and the second was level 10. Level 7 ranked third with 68.8% correct. A possible explanation is that it was not really hard for participants to rate levels 5, 7, and 10 because these values represented poor, average and very excellent performance outcomes, respectively. It was more difficult to rate intermediate values like 6 and 8. Level 9 represents very good performance but it still needs a little more effort to reach the level of excellence. Thus, rating level 9 is likely to be easier than level 8. Focusing on the distribution of the predicted groups against the observed groups, the predicted level outputs were distributed around the observed level with the deviation value of ± 1 level. This has possibly resulted from the difficulty in deciding a specific score for a subjective performance level. In general, it can be concluded that the final model achieves an acceptable fit with the data.

The parameters related to the model's coefficients are tabulated in Table 5. The Wald test results show that only "dedication" is significant at success levels from 5 to 8 (reference level is 10) at 0.05. At the 0.1 level, "balance" is significant at success level 7. "Teamwork" and "sufficiency" are significant at success level 9 at 0.05. For an exploratory purpose, the selected level of significance is 0.1.

The negative coefficients for "dedication" indicate that an increase in the variable value for this component decreases the likelihood of success of partnering being at

Table 4 Classification table

Observed level	Predicted level						Percent Correct
	5	6	7	8	9	10	
5	7	1	0	0	0	0	87.5
6	2	3	3	0	0	0	37.5
7	0	1	11	4	0	0	68.8
8	0	0	2	6	5	0	46.2
9	0	0	0	3	10	3	62.5
10	0	0	0	0	2	8	80.0
Overall percentage	12.7	7.0	22.5	18.3	23.9	15.5	63.4

Table 5 Parameter estimate

Partnering success level	Effect	B	Std. Error	Wald	df	Sig.	Exp(B)
5	Intercept	−1.171	2.283	0.263	1	0.608	
	Dedication	−10.312	2.749	14.074	1	0	0
6	Intercept	0.849	1.741	0.238	1	0.626	
	Dedication	−9.997	2.643	14.302	1	0	0
7	Intercept	3.062	1.399	4.788	1	0.029	
	Dedication	−7.114	2.245	10.04	1	0.002	0.001
	Balance	1.777	1.068	2.766	1	0.096	5.911
8	Intercept	3.057	1.35	5.126	1	0.024	
	Dedication	−3.445	1.703	4.094	1	0.043	0.032
9	Intercept	0.827	1.321	0.392	1	0.531	
	Teamwork	1.455	0.661	4.847	1	0.028	4.285
	Sufficiency	2.193	1.001	4.799	1	0.028	8.96

Note The reference category is 10

the current level. This implies that, by contrast, the likelihood of achieving partnering success at level 10 increases. The opposite is the case for "balance", "teamwork", and "sufficiency", i.e. any increase in the values of the variables decreases the likelihood of achieving a higher level of partnering success. The large values for the coefficients of "dedication" (−10.31; −9.99; −7.11; −3.44) indicate a strong effect of the component on the success of partnering. From the results in this research, any improvement in the performance of dedication will improve partnering performance.

At level 9, "teamwork" and "sufficiency" are significant in the stepwise logistic regression model. It is surprising that at this level, an increase in the component value will diminish the chances of improving partnering performance. Perfect performance is very difficult despite a laudable goal to reach, in which level 9 is a very satisfactory and healthy degree of achievement for any partnership. Thus, at this level, devoting an effort to maintaining the current state is a wiser decision than trying to improve to a higher state. At the near perfection, all aspects in a partnership should be considered together. Focusing on any particular feature could lead to deterioration in the outcome of the partnering.

6.2 Model Validation

The developed model should be tested with the cases independent from the cases used in building the model. Eight testing cases were employed in this section. Using the highest probability as the cut-off criterion to classify the testing cases, the results of classification are displayed in Table 6. The observed and predicted categories

Table 6 Model validation

Testing case	Probability of predicted level	Success level		Correct?
		Observed	Predicted	
1	0.458	8	7	No
2	0.629	9	9	Yes
3	0.584	6	5	No
4	0.470	7	8	No
5	0.408	7	7	Yes
6	0.420	8	8	Yes
7	0.690	7	7	Yes
8	0.817	7	7	Yes
Correct percentage				5/8 = 62.8%

Note Highest probability is the cut-off criterion

were presented in the table. The computed probability of each predicted level was also included. There were five correctly-classified cases, which corresponds to the correct prediction rate of 62.8% over the testing sample. Only three cases, out of eight cases, were misclassified. However, the misclassification is not serious because the deviations are only 1-level distance. Again, a possible explanation for the results is the difficulty in deciding a specific score for the subjective performance level ratings.

6.3 Discussions of Modeling Results

The results from logistic regression analysis suggest that only four components have a significant contribution to the performance of partnering in the current Vietnamese context. The four components are dedication, teamwork, sufficiency, and balance.

Dedication is vital for nearly all levels of performance in the Vietnamese context. Uniting thoughts, actions and effort to achieve successful partnering is essential. The role of dedication is very important, especially when there is a chance to improve the level of performance. Dedication in the Vietnamese context comprises various essential factors, such as creativity, cultural fit, flexibility, and commitment. These factors are clearly important for new and less-experienced participants toward the partnering concept, who have achieved low success levels and are hoping for improvement. By way of contrast, with perfect or nearly perfect partnership arrangement, all factors have contributed very well to success. As such, no factor plays a dominant role in the partnering process.

Surprisingly at level 7, focusing more on balance in a partnership offers less chance to achieve better performance. The balance component relates to team building and empowerment in the partnership. A possible explanation is that, at the intermediate level, it is necessary to focus on other problems rather than the balance of partnership.

In the current Vietnamese context, to improve the performance from the average level, partners should concentrate on dedication to their partnership rather than pay attention to building a team with equal/fair empowerment.

Another surprising result is that teamwork and sufficiency have a negative impact on the effort to improve at level 9. A possible explanation is that level 9 is a nearly perfect level of performance. As such, participants have good experience with the concept and the mechanism being applied has run well. Any change will disturb the equilibrium of the mechanism under the current conditions.

7 Recommendations

Based on data collected from partnering projects in Vietnam, the effect of SFs on the level of success was modeled using multinomial logistic regression. The schematic diagram for the improvement of partnering performance in the Vietnamese construction industry is presented in Fig. 2. Recommendations can be extracted as below.

In the current context in Vietnam, with partnering projects achieving low and average performance (from 5th to 8th grades), the most important factors needing attention are related to dedication. Improving the dedication of partners will increase the probability of achieving better performance.

At average performance (level 7), focusing on the improvement of balance in the partnership (team building, empowerment) could decrease the probability of achieving better performance. It is best to equally improve all aspects of partnering, especially dedication.

At very good performance (level 9), focusing on the improvement of teamwork and sufficiency will diminish the chance of further performance improvement. At this level, all factors must work very well, and thus, for the current situation in Vietnam, efforts should be devoted to maintaining the current level rather than trying to achieve an absolutely perfect level of performance (level 10).

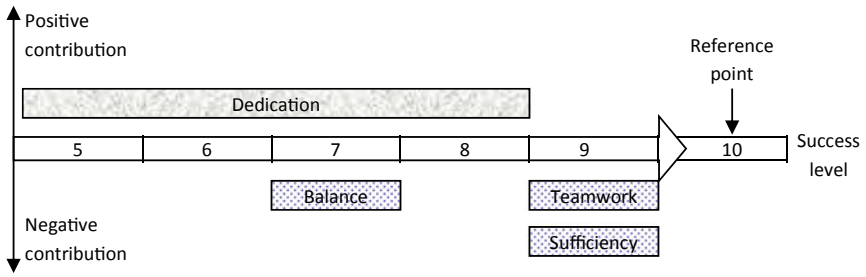

Fig. 2 Scheme diagram of partnering in the Vietnamese construction industry

Furthermore, using the logistic regression model proposed in the study, it could calculate the probability of achieving each success level. Practitioners can make decisions regarding which success level could be performed in their partnership. The maximum probability can be used as the cut-off criterion. It implies that the achieved success level is the level which has the highest chance of occurrence.

Participants can also use the procedure of the proposed logistic regression model to improve their partnering process by evaluating the impact of each factor on the probability of success level. The evaluation will allow participants to decide to devote more attention to, or put greater effort on, managing the significant factors in order to increase the chance of achieving better performance outcomes.

8 Conclusions

The results from this study show that partnering has been successfully applied in the Vietnamese construction industry. The rating given to partnering success by respondents in the survey (i.e. professionals involved in partnering projects) has a median value of 8/10 (mean value of 7.66). Emerging from this is the utility of partnering a viable procurement option in Vietnam.

Twenty-eight SFs associated with partnering performance in the Vietnamese construction industry were employed to construct a model to predict the level of partnering success. Using factor analysis, twenty-eight SFs were grouped into eight components: dedication, readiness, coordination, teamwork, sufficiency, leading, balance, and clarity. These eight components were used as independent variables for the logistic regression model.

The regression model, which included four components, namely dedication, teamwork, sufficiency, and balance, had a significant influence on the partnering performance level. The potency of each significant component varied with the level of success. It has been demonstrated that the final model is applicable in practice. The logistic regression model can be used by practitioners to convert qualitative performance data on related SFs into quantitative values of the chance of partnering success in a specific context. The model can also be used to measure the performance of partnering and enhance the performance of partnering by identifying the impact of significant factors on the performance of partnering.

References

1. Beach R, Webster M, Campell KM (2005) An evaluation of partnership development in the construction industry. Int J Proj Manag 23:611–621
2. Black C, Akintoye A, Fitzgerald E (2000) An analysis of success factors and benefits of partnering in construction. Int J Proj Manag 18:423–434
3. Boynton AC, Zmud W (1984) An assessment of critical success factors. MIT Sloan Manag Rev 25(4):17–27

4. Chan APC, Chan DWM, Chiang YH, Tang BS, Chan EHW, Ho KSK (2004) Exploring critical success factors for partnering in construction projects. J Constr Eng Manag 130(2):188–198
5. Chan APC, Chan DWM, Fan LCN, Lam PTI, Yeung JFY (2006) Partnering for construction excellence—a reality or myth? Build Environ 41:1924–1933
6. Chen WT, Chen TT (2007) Critical success factors for construction partnering in Taiwan. Int J Proj Manag 25:475–484
7. Chen WT, Huang YH, Lin CL, Mortis L (2008) A framework of critical factors for construction partnerships in Taiwan. In: ICC 2008 Proceedings, IEEE Communication Society, pp 5553–5557
8. Cheng EWL, Li H, Love PED (2000) Establishment of critical success factors for construction partnering. J Manag Eng 16(2):84–92
9. Cheng EWL, Li H (2001) Development of a conceptual model of construction partnering. Eng Constr Archit Manag 8(4):292–303
10. Cheng EWL, Li H, Love PED (2002) Construction partnering process and associated critical success factors: quantitative investigation. J Manag Eng 18(4):194–202
11. Cheng EWL, Li H, Love PED, Irani Z (2004) Strategic alliances: a model for establishing long-term commitment to inter-organisational relations in construction. Build Environ 39:459–468
12. Cheung SO, Suen HCH, Cheung KKW (2003) An automated partnering monitoring system—partnering temperature index. Autom Constr 12:331–345
13. Crane TG, Felder JP, Thompson PJ, Thompson MG, Sanders SR (1997) Partnering process model. J Manag Eng 13(3):57–63
14. Crowley LG, Karim MA (1995) Conceptual model of partnering. J Manag Eng 11(5):33–39
15. Hair JF, Black WC, Babin BJ, Anderson RE (2009) Multivariate data analysis, 7th edn. Prentice Hall
16. Han SH, Kim DY, Kim HK (2007) Predicting profit performance for selecting candidate international construction projects. J Constr Eng Manag 133(6):425–436
17. Handa V, Adas A (1996) Predicting the level of organizational effectiveness: a methodology for the construction firm. Constr Manag Econ 14:341–352
18. Iyer KC, Jha KN (2006) Critical factors affecting schedule performance: evidence from Indian construction projects. J Constr Eng Manag 132(8):871–881
19. Koksal A, Arditi D (2004) Predicting construction company decline. J Constr Eng Manag 130(6):799–807
20. Larson E (1997) Partnering on construction projects: a study of the relationship between partnering activities and project success. IEEE Trans Eng Manag 44(2):188–195
21. Le-Hoai L (2009) Partnering in construction: the views and experiences of foreign and local participants in Vietnamese market. Unpublished PhD Thesis, Pukyong National University, Busan, South Korea
22. Le-Hoai L, Lee YD, Lee JY (2008) Delay and cost overruns in Vietnam large construction projects: a comparison with other selected countries. KSCE J Civil Eng 12(6):367–377
23. Loraine RK (1994) Project specific partnering. Eng Constr Archit Manag 1(1):5–16
24. Menches CL, Hanna AS (2006) Quantitative measurement of successful performance from the project manager's perspective. J Constr Eng Manag 132(12):1284–1293
25. Rockart JF (1979) Chief executives define their own data needs. Harv Bus Rev, March–April, pp 81–92
26. Rowlinson S, Cheung FYK, Simons R, Rafferty A (2006) Alliancing in Australia—no-litigation contracts: a tautology? J Prof Iss Eng Educ Pract 132(1):77–81
27. Sharma S (1996) Applied multivariate techniques. John Wiley & Sons Inc
28. Tang W, Duffield CF, Young DM (2006) Partnering mechanism in construction: an empirical study on the Chinese construction industry. J Constr Eng Manag 132(3):217–229