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CRITICAL SUCCESS FACTORS AFFECTING CONTRACT ADMINISTRATION IN RESIDENTIAL BUILDING PROJECTS IN NORTHEAST ASIA

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ABSTRACT: The Critical Success Factor in the field of contract administration helps better contract performance (in the areas of Conflict Resolution, Client Satisfaction, Cost, Time and Quality Management). In this research, the researcher has explained the importance of identifying the critical success factor in contract administration. Completely 58 practical replies were succeeded after 67 planners functioning by electronic survey questionnaire. Modern research methodology and details of statistical techniques used for the data collection. By using factor analysis, 6-factor groups and 10 critical success factors are extracted. It is followed by regression analysis that illustrated various relationships between the factor groups/identified critical success factors and contract performance. An overview of key findings includes 1) the most influential factors vis-à-vis contract performance, 2) detailed observations about the relationship between variables in factor groups and contract performance and 3) relationship between the top 10 most critical success factors and contract performance.

I. INTRODUCTION

The construction companies are known as one of the strongest businesses in Northeast Asia. The construction business makes a significant contribution to the GDP (Gross Domestic Product), employing a considerable number of people on the site work and making strong interaction and bounds with the other economic sectors. However, the performance in these companies has been affected during the financial crisis and fluctuation in the economy of the market between 2012 and 2015. For the uncertainty in the market, it has been found to be challenging to measure the exact project performance. Project performance is related to various topics and issues such as time, cost, quality, customer satisfaction, output, and safety. Construction industries in Northeast Asia suffer from many problems and complex issues in performance. For example, construction of China COC system suffered from poor contract management has led to a delay for years. Poor project management is related to issues over deadlines, revision of drawings and change of the design. In addition, there are other reasons like lack of leadership, the inexistence of communication and good coordination, lack of motivation, improper supervision and monitoring or unwise decision making, political problems, and cultural barriers. These are all part of the reasons affecting construction project performance. A project can be a concept for the client. In the project, the contract is written to clearly state about ideas and concepts that have been discussed among the related stakeholders. A contract can bring all these stakeholders around a table to discuss and contemplate about the contribution of each stakeholder in a project. Barlow states (1998) that contract sets terms and conditions to show hierarchical linkage with different stakeholders in the construction projects (Cited in Li et al., 2001). For example, those who are bounded in a construction contract (Client and Contractor) need to have a strong and durable relationship. That requires highly cooperation and complex teamwork to manage the time, resources, quality and client satisfaction for better performance in the project (Harmon 2003). In this process, contracts provide a vital element in the projects that ensure a sound environment in the organization. They set out work with others and are essential in strengthening the relationship among all stakeholders in order to accomplish the project successfully. It also describes the exchange of construction materials and services for money (Mitropoulos and Howell, 2001).All in all, contracts are a complete set of detailed practical and official documents. According to the Theory of Project Management developed by Turner (2006), "Contract Management" is an essential component of project management. Not only in academia, but also in practice, it is widely recognized that the contract successful execution could be influenced by many factors and variables in the project. It is observed that some companies are more successful and others fail to fulfill some aspect of performances. In this regard, many scholars have studied critical success factors in a different types of projects. The critical success factor could be understood as the factors that contribute to predicting the success of the project. This term was firstly employed by Rockart (1982) in project management. The critical success factors are identified in various ways in project management; however, few studies are pursued in the field of contract administration. The aim of this research is therefore to identify the successful critical factors for contract administration in residential building projects in Northeast Asia. Given the fact that the construction industry is one of the most prominent industries in leading economic development in Northeast Asia, a better understanding of critical success factors in the contract administration is expected to benefit many companies, contributing to raising their competitiveness.

Contract Management Lifecycle:

In the contract management lifecycle, there are 5 key steps, that start from the preliminary identification of consequent planning, through the long-term management contract. Most of the time the contracting authority and responsible contractors put few efforts and pay attention to the better management of the contract unless a problem does not arise.

Identify need and planning	Tender and quotation process	Evaluation of offers and negotiation	Contract award	Contract management
Successful contract management is significantly dependent upon what happens during the planning, tendering, evaluation and award phase				• Relationship Management • Negotiation contract variations • Claim management • Contract management roles and responsibilities • Managing Risk & Resolution • Project Delivery • Payment terms & Invoicing • Managing contract disputes • Contract administration • Progress measurement & Report • Insurance & Bonds • Contract completion

Table 1 Contract Management Lifecycle

Communication And Coordination:

"Davey et al. (2001) communication are one of the critical success factors for effective working relationships between client and contractor organizations". Forming a proper and noble communication is an essential component of the relationship among the indulged parties in the contract. It's proved by the international practices that lack or ineffective communication can cause problems related to lack of trust, concern about the performance in the project with respect to the execution of the contract. All these concerns arise from those who are managing the contract from both contractor and client because they fail to set up a proper communication mechanism to discuss those issues which are making the conflict in the project or to explain the contractors the concern, goals, and intentions of the client in each project.

Communications are the fundamental steps that a construction manager can interact with the rest of the project shareholder or indulged parties in the project to attain the shared goal in the project Orlikowski (1994). To communicate effectively with the direct contractor or other subcontractors in the project is greatly reliant on the abilities of the construction management group (Shohet and Frydman, 2003). The first key for the communication is that shall start right after the contract is signed by finishing the end up meetings, continues information exchange policy must be set for both client and contractor. Usta (2005) notices, "it is essential to 'open' the boundaries of the relationship because it can relieve stress and enhance adaptability, information exchange, joint problem solving, and promise better outcomes".

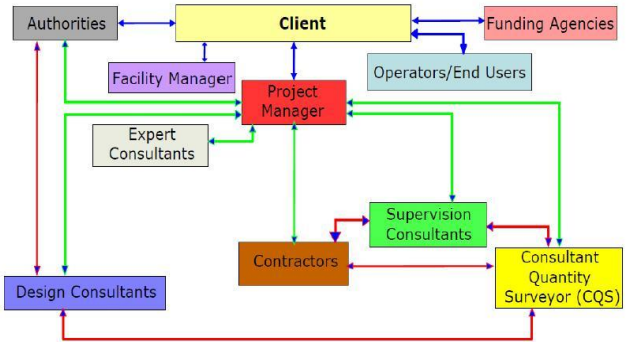

Figure 1 Relationship framework in a project

II. METHODOLOGY

The core focus of this research is to find and identify the critical success factors in contract management (CFS) for building projects in Northeast Asia and to see how the contractor apply these factors on their current project (Checking current situation of the building construction project in Northeast Asia A decent or noble contract management system is firmly convinced in contributing to the well-organized and sustainable development of the company.

The objective of this section is to explain the process of structural research so that new researchers can carry out further studies. In this research, the researcher has used a quantitative method with a questionnaire used to capture the opinions of the correspondent.

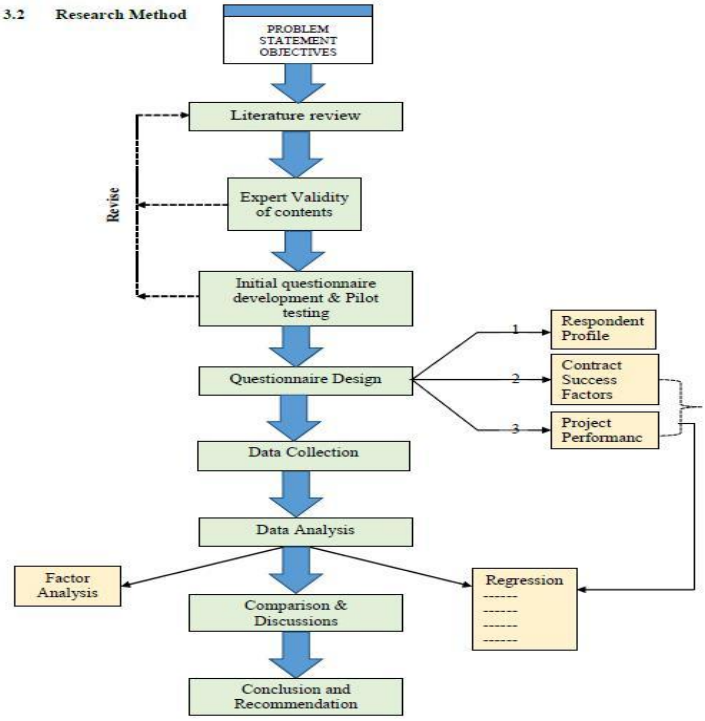

Figure 1.1 Research Frameworks

Top 10 Critical Success Factors in Contract Administration:

The top 10 success factors among 6 critical success factors (with respect to their mean criticality indices), ranked in descending order of criticality, are shown in Table 1.1. Table 1.1 also provides category and criticality ranking for these CSFs.

No.	Critical Success Factors	Min	Max	Mean	Criticality Index
1	Project manager experience and familiarity with the project	2	5	**4.17**	**4**
2	Clear condition of the final project acceptance and closeout	2	5	**4.14**	**4**
3	Good communication and collaboration among your teamwork	2	5	**4.13**	**4**
4	Financial stability of client	1	5	**4.09**	**4**
5	On time response for inquiries	2	5	**4.09**	**4**
6	Competency of contract engineer	3	5	**4.06**	**4**
7	Having a standard operational procedure for each work	2	5	**4.05**	**4**
8	Understanding of owner contract management procedures and process	2	5	**4.02**	**4**
9	Strong leadership/team management	2	5	**4.01**	**4**
10	Problem solving system	2	5	**3.93**	**3**
	Valid N (list wise)				

Relationship between Contract Performance (Conflict Resolution) and Top 10 success factors

Now, multiple regressions are performed. The first aspect of contract performance is conflict resolution. It examines whether there is a significant relationship between the variables of Top 10 success factors and conflict resolution here. From the SPSS factor analysis; we have Top 10 success factors in contract administration as independent variables and conflict resolution as dependent variables. First of all, the model fit of multiple regressions should be verified. In order to evaluate the strength of the relationship, we should look at R2 and Adjusted R2. According to the output, Adjusted R2should be lower than R2. It means that the number of sample sizes and independent variables is adequate. In my analysis, Adjusted R2shows 0.003 being lower than 0.083 in R2, demonstrating that 0.3% of the variation in the relationship could be found in a linear regression model.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.288[a]	.083	.003	.606

Table 1.2 Multiple Regression Output for Conflict resolution

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.220	11	.384	1.044	.413[b]
	Residual	46.687	127	.368		
	Total	50.906	138			

Table 1.3 Significance value of Conflict resolution

Table 1.3 shows the relationship between Top 10 success factors and conflict resolution. The F-value is calculated by dividing the Mean Square Regression by the Mean Square Residual and it has turned out to be 1.044. The P-value = 0.413>0.05 is associated with the yielded F-value is self-evident to state that the relationship is not supported with 41.3% confidence level. It means that the set of these factors do not predict conflict resolution as much as to conclude that it has a statistically significant relationship with conflict resolution.

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.807	0.38		10.031	0
project manager experience and familiarity with the project	0.014	0.091	0.022	0.155	0.877
Clear condition of the final project acceptance and closeout	-0.036	0.068	-0.057	-0.528	0.599
Financial stability of client	0.007	0.086	0.017	0.084	0.933
Strong leadership/team management	0.015	0.092	0.029	0.164	0.87
Competency of contract engineer	-0.127	0.064	-0.212	-1.994	0.048
good communication and collaboration among your teamwork	0.041	0.078	0.067	0.532	0.596
On time response for inquiries	-0.026	0.085	-0.039	-0.304	0.762
Understanding of owner contract management procedures and process	0.112	0.069	0.184	1.625	0.107
Having a standard operational procedure for each work	-0.041	0.074	-0.063	-0.556	0.579
Problem solving system	0.076	0.091	0.119	0.837	0.404

Table 1.4 Parameter estimates for Conflict resolution

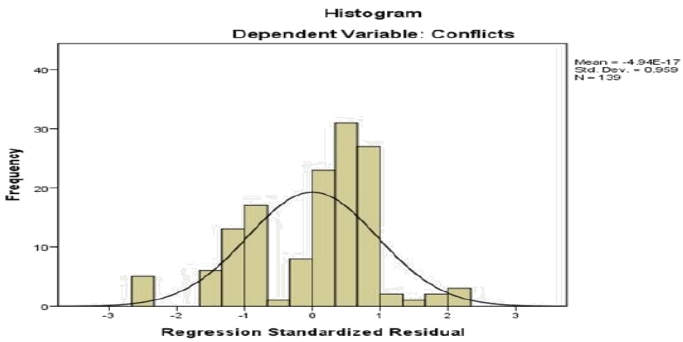

Figure 1.2 Conflict resolution

Relationship between Contract Performance (Client Satisfaction) and Top 10 success factors.

The second aspect of contract performance is Client Satisfaction. Client Satisfaction is also one of the dependent variables here. Table 2 below illustrates the model fit of multiple regressions. As explained earlier, it is to verify the significance of the relationship between both dependent and independent variables. In this Table, the value of Adjusted R2 is 0.182, being lower than the value of R2being 0.247. Therefore, the number of sample sizes and independent variables is adequate. In my analysis, it demonstrates that 18.2 % of the variation in the relationship could be found in a linear regression model.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.497[a]	.247	.182	.671

Table 2 Relationship among Client satisfaction and Top 10 success factors

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.339	.420		7.947	.000
project manager experience and familiarity with the project	.146	.100	.188	1.456	.148
Clear condition of the final project acceptance and closeout	-.067	.075	-.087	-.893	.373
Financial stability of client	.038	.096	.073	.402	.688
Strong leadership/team management	.061	.102	.096	.595	.553
Competency of contract engineer	-.209	.071	-.284	-2.956	.004
good communication and collaboration among your teamwork	.192	.086	.253	2.230	.027
On time response for inquiries	-.092	.094	-.114	-.984	.327
Understanding of owner contract management procedures and process	-.003	.076	-.004	-.038	.970
Having a standard operational procedure for each work	-.101	.082	-.127	-1.227	.222
Problem solving system	.156	.100	.199	1.548	.124

Table2.1 Parameter estimates for Client Satisfaction

The level that the histogram below matches normal distribution is shown in figure 1.3 below. This gives us a sign of how well our sample can predict a normal distribution in the contract administration success factors. In this chart, we can easily understand that the data is normally distributed and we can suggest that there is a strong relationship among these variables (Client Satisfaction and Top 10 success factors). Therefore, Client Satisfaction is

supported by the independent variables of Top 10 success factors.

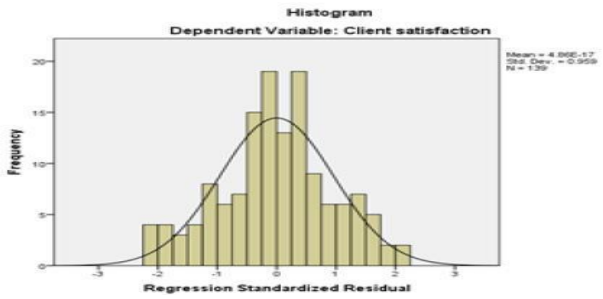

Figure 1.3 Client Satisfactions

Relationship between Contract Performance (Quality) and Top 10 success factors The third part in the analysis of contract performance is with Top 10 success factors is quality in the current projects. Quality is the dependent variable here. As explained earlier, it is to verify the significance of the relationship along with the contract administration factors. In this Table, the value of Adjusted R2 is 0.197, being lower than the value of R2being 0.261.

Therefore, the number of sample sizes and independent variables is adequate. It also demonstrates that 19.7 % of the variation in the relationship could be found in a linear regression model.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.498	11	2.500	4.080	.000[b]
	Residual	77.812	127	.613		
	Total	105.309	138			

Table 2.2 Significance value of Quality performance

Now, we look into which individual factors are significant. Table 2.2 presents parameter estimates for quality. In the first row, we can see that the significance level is given to sig=0.00, being lower than 0.05 for the constant co-efficiency. With 100% confidence, it shows that each of these Top 10 success factors has a statistically significant relationship with the quality. In this case, only one of the P-value showing lower than 0.05 is 0.04 in the factor of competency of contract engineer. Therefore, we can state that the competency of a contract engineer is statistically significantly related to quality.

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.685	.490		5.481	.000
project manager experience and familiarity with the project	.198	.117	.217	1.696	.092
Clear condition of the final project acceptance and closeout	-.020	.088	-.022	-.232	.817
Financial stability of client	.091	.112	.147	.815	.416
Strong leadership/team management	.004	.119	.005	.031	.975
Competency of contract engineer	-.241	.082	-.278	-2.921	.004
good communication and collaboration among your teamwork	.224	.100	.250	2.230	.028
On time response for inquiries	-.056	.109	-.059	-.513	.609
Understanding of owner contract management procedures and process	-.027	.089	-.031	-.306	.760
Having a standard operational procedure for each work	-.020	.096	-.022	-.213	.832
Problem solving system	.195	.117	.212	1.665	.098

Table 2.3 Parameter estimates for Client Satisfaction

The level that the histogram below matches the normal distribution is shown in figure 1.4 below. This gives us a sign of how well our sample can predict a normal distribution in the contract administration success factors. In this chart, we can easily understand that the data is normally distributed and we can suggest that there is a strong relationship among these variables (Client Satisfaction and Top 10 success factors). Therefore, Client Satisfaction is supported by the independent variables of Top 10 success factors.

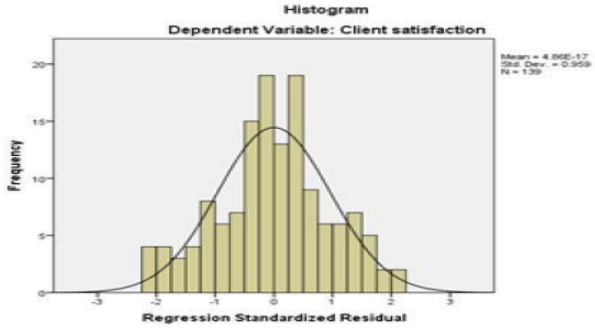

Figure 1.4 Client Satisfactions

Relationship between Contract Performance (Quality) and Top 10 success factors The third part in the analysis of contract performance is with Top 10 success factors is quality in the current projects. Quality is the dependent variable here. As explained earlier, it is to verify the significance of the relationship along with the contract administration factors. In this Table, the value of Adjusted R2 is 0.197, being lower than the value of R2being 0.261. Therefore, the number of sample sizes and independent variables is adequate. It also demonstrates that 19.7 % of the variation in the relationship could be found in a linear regression model.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.498	11	2.500	4.080	.000[b]
	Residual	77.812	127	.613		
	Total	105.309	138			

Table 2.4 Significance value of Quality performance

Now, we look into which individual factors are significant. Table 2.4 presents parameter estimates for quality. In the first row, we can see that the significance level is given to sig=0.00, being lower than 0.05 for the constant co-efficiency. With 100% confidence, it shows that each of these Top 10 success factors has a statistically significant relationship with the quality. In this case, only one of the P-value showing lower than 0.05 is 0.04 in the factor of competency of contract engineer. Therefore, we can state that the competency of a contract engineer is statistically significantly related to quality.

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.685	.490		5.481	.000
project manager experience and familiarity with the project	.198	.117	.217	1.696	.092
Clear condition of the final project acceptance and closeout	-.020	.088	-.022	-.232	.817
Financial stability of client	.091	.112	.147	.815	.416
Strong leadership/team management	.004	.119	.005	.031	.975
Competency of contract engineer	-.241	.082	-.278	-2.921	.004
good communication and collaboration among your teamwork	.224	.100	.250	2.230	.028
On time response for inquiries	-.056	.109	-.059	-.513	.609
Understanding of owner contract management procedures and process	-.027	.089	-.031	-.306	.760
Having a standard operational procedure for each work	-.020	.096	-.022	-.213	.832
Problem solving system	.195	.117	.212	1.665	.098

Table 3 Parameter estimates for Quality

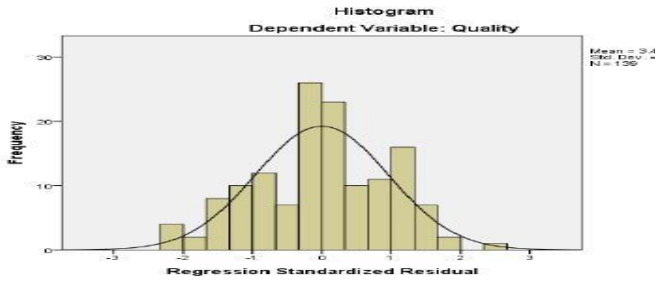

Figure 1.4 Quality data distribution

Relationship between Contract performance (Cost) and Top 10 success factors

The fourth aspect of contract performance is cost. It is also one of the dependent variables of contract performance in this analysis. By the multiple analysis techniques, we can have more information about our data. Like in regression analysis on contract performance and contract administration we can have some information wither analysis is fit in terms of sample size and independent variable numbers or not? The answer comes from comparing the values in Adjusted R2 and R2. In this Table, the value of Adjusted R2 is 0.262, being lower than the value of R2 is 0.321. Therefore, it is valid to state that the number of sample size and independent variables is adequate. It means that 26.2 % of the variation in the relationship could be found in a linear regression model.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30.348	11	2.759	5.450	.000[b]
	Residual	64.285	127	.506		
	Total	94.633	138			

Finally, we look into which individual factors are significant. Table 3 presents parameter estimates for cost. In the first row, we can see that the significance level is given to sig=0.00, being lower than 0.05 for the constant co-efficiency. With 100% confidence, it shows that each of these Top 10 success factors has a statistically significant relationship with cost. In this case, there are two P-values showing lower than 0.05. They are the competency of contract engineers and good communication and collaboration among your teamwork. Each of these factors shows 0.048 and 0.001 respectively. Therefore, we can state that these two factors reliably predict the value in the dependent variable of cost, demonstrating that they are statistically significantly related to cost.

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.950	.445		4.380	.000
project manager experience and familiarity with the project	.143	.106	.165	1.345	.181
Clear condition of the final project acceptance and closeout	.060	.080	.070	.754	.452
Financial stability of client	.045	.101	.076	.442	.659
Strong leadership/team management	.077	.108	.110	.713	.477
Competency of contract engineer	-.150	.075	-.183	-2.000	.048
good communication and collaboration among your teamwork	.324	.091	.382	3.549	.001
On time response for inquiries	.049	.099	.054	.494	.623
Understanding of owner contract management procedures and process	-.020	.081	-.024	-.248	.805
Having a standard operational procedure for each work	-.033	.087	-.037	-.372	.710
Problem solving system	.065	.106	.074	.608	.545

Table 3.1 Parameter estimates for Cost

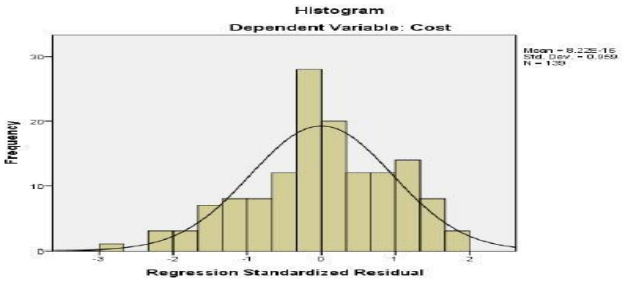

Figure 2 Cost data distribution model

Relationship between Contract Performance (Time) and Top 10 success factors

The fifth aspect of contract performance is time. Time is considered as the last dependent variable here. By comparing the values in Adjusted R2 and R2, we will examine the model fitness. Table 3.2 shows, the value of Adjusted R2 is 0.137, being lower than the value of R2being 0.206. The model is fit and the sample size and the number of independent variables are adequate. The table shows that 13.7 % of the variation in the relationship could be found in a linear regression model.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.970	11	1.815	2.989	.001[b]
	Residual	77.138	127	.607		
	Total	97.108	138			

Table 3.2 Significance value of Time performance

So which individual factors are significant among all? Table 3.2 presents parameter estimates for time. In the first row, we can see that the significance level is given to sig = 0.00, is lower than 0.05 for the constant co-efficiency. With 100% confidence, it shows that each of these eleven success factors has a statistically significant relationship with time. In this case, there are three P-values showing lower than 0.05. They are firstly project management experience and familiarity with the project, secondly competency of contract engineer and thirdly problem-solving system. Each of these factors shows 0.006, 0.037 and 0.017 respectively.

Therefore, we can state that these three factors can be significant factors to affect the time dimension of contract performance.

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.610	.488		5.360	.000
project manager experience and familiarity with the project	.323	.116	.367	2.774	.006
Clear condition of the final project acceptance and closeout	-.067	.087	-.077	-.771	.442
Financial stability of client	-.007	.111	-.012	-.063	.950
Strong leadership/team management	-.015	.119	-.021	-.126	.900
Competency of contract engineer	-.173	.082	-.208	-2.111	.037
good communication and collaboration among your teamwork	-.116	.100	-.135	-1.157	.249
On time response for inquiries	-.056	.109	-.061	-.516	.607
Understanding of owner contract management procedures and process	.074	.089	.088	.837	.404
Having a standard operational procedure for each work	.015	.096	.016	.155	.877
Problem solving system	.283	.117	.321	2.430	.017

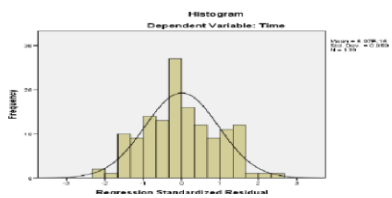

Figure 2.1 Time data distribution model

III. CONCLUSIONS

From the regression analysis relating to various relationships, those Top 10 variables in Critical Success Factors and the Contract performance aspects may have. The contract performance variables are (1) Conflict resolution (2) Client satisfaction (3) Quality of the work in building projects (4) Cost management system (5) Time management.

According to regression analysis, there are three key findings. First, among six Critical Success Factors, it is found that Communication Factors has a statistically significant relationship with Contract performance. Second, detailed observations about the relationship between each variable in every 6 Critical Success Factors and each aspect of 5 contract performance highlighted that each aspect of contract performance has a statistically significant relationship with different sets of the individual independent variable. Third, it is also found there is a strong relationship among Top 10 Critical Success Factors and all 5 aspects of Contract performance, except Conflict Resolution.

In Northeast Asia construction culture, seniority takes precedence over the trust. This means that construction is done based more on relationships rather than technical or knowledge. There is no independent judgment to be made among workers, even if they are familiar with technical knowledge, and it is customary that they follow boss orders and instructions.

Suggestions:

- Contract administration is a vital part of contract management and plays an important role in project success. As it is identified, there are certain sets of critical success factors that contribute to the betterment of contract performance. In order to improve some aspects of contract performance, it is recommended to pay close attention to key sets of factors. By doing so, it is expected to benefit these construction managers and engineers who are devoted to contract administration.
- Having understood the construction culture in Northeast Asia and the outcome of this research, it is known that communication is the strongest factor to influence contract performance. In a large-scale construction project such as building, there are many contracts and subcontracts at a different stage of work (e.g., structure work, architecture work, interior design). Each of them has separate contracts, and in order to manage all these contracts, we need to have better communication spanning internal and external stakeholders. Therefore, further research should be undertaken in investigating more on relationship management and communication within the different contracts and subcontracts, in order to find which factors can affect better contract performance.
- Further studies can be conducted more for the improvement of this research to make a system or a framework for better management of contract administration. We will be benefitted from such further studies in better foreseeing the performance of contract administration.

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