Prediction of Delays in Construction Projects in Algeria

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Abstract

Project construction has never been a simple act, because it is conditioned by specific constraints of cost, time, quality, and it includes a degree of uncertainty. So, time is a vital aspect by which project success is judged; for this purpose, deadline compliance is a paramount question in project construction. In Algeria, delay has invaded the majority of projects. Therefore, it is necessary to give more importance to time management to reach the stage of projects success. As saying goes, "you can't manage what you do not measure"; the quantification or the prediction of delays appears necessary to arrive at a good mastery and a better management of time. The objective of this paper is to quantify the probability of delays in construction projects. For this reason, data from 30 public projects has been collected, and then categorized into 4 groups according to their types: school groups, college, high school, administrative buildings and economic infrastructures. Subsequently, the simple linear regression method is used to develop prediction model for the public projects in Algeria; to enable managers and practitioners to predict possible delays. This prediction is intrinsic to minimize the risks, to widen the field of reflection and especially to increase the chances of project success.

Keywords: Delay, Project Construction, Prediction, Project Management, Project Success, Algeria

Introduction

Project success is the ultimate goal of the various project stakholders; (Y.Frimpong 2003) defines Project success "as meeting goals and objectives as prescribed in the project plan. A successful project means that the project has accomplished its technical performance, maintained its schedule, and remained within budgetary costs".

Time is a vital aspect by which project success is judged; therefore, deadline compliance is a paramount question in project construction.

"One of the most important problems in the construction industry is delay; construction delays are considered one of the most frequently recurring problems in the industry" (Mahamid 2012). In Algeria, delay has invaded the majority of projects; "62% of projects have experienced timeotus" (Salhi.R 2018). For that reason, it's necessary to give more importance to time management. And as saying goes, "you can't manage what you do not measure"; the quantification or the prediction of delay appears necessary to arrive at a good mastery of project and a better management of time. because "the whole essence of controlling a project is to ensure delivery within a predetermined time and evaluating how long it will take to complete a project is the starting point of project control because it serves as a baseline to measure against". (Yakubu 2010).so to deal with this problem we have to answer the following questions:

Haw can we evaluate the time necessary for execution of project and haw can we predect delay in construction project?

Reasearch methodology

Data from 30 public projects in the region of Constantine -Algeria- has been collected, and then categorized into 4 groups according to their types(see table 1): school groups (8 projects), college (6 projects), high school (8 projects), administrative buildings and economic infrastructures (8 projects).Then, another classification has been down. For each groups; projects are classified according to their years of starting execution, 4 periods were introduced as follow: [2007-2008], [2009-2010], [2011-2012], [2013-2014]. Thus, we have calculated the sum of planned and actual durations (for the project that starting in the same period) (see table 2) then we have used this data to develop a prediction model using the simple linear regression.

Discusssion and results

Descriptive statistics of the public projects:

Data concerning actual and planned duration for each type of public projects were collected ; The descriptives statistics of these projects (see table1) shown that the mean of the planned duration for the 30 publics projects was 298,90 with standard deviation of 129,925 ; while the actual duration for the same projects was 1019,30 in mean and 618,108 in standard deviation. Regarding the type of projects; the mean was calculated and it is found as follows: for the administrative buildings and economic infrastructures; the mean of the planned duration was 399,75 and for the actual duration it was 1683,75. For the school groups; the mean of planned duration varied from 231,75 days to an actual duration of 1163,75 days. While the college varied from 278,67 planned days to 436,33 actual days. The mean of planned and actual duration for the high school were successively 280,38 days and 647,63 days.

From these results, we can notice that there is a large difference between the mean of the palanned and actual duration and high values of standard deviation.

These results confirmed the affirmation of (Al –Momani 2000) that the time required to complete construction of public projects is frequently greater than the time specified in the contract.

Table 1: descriptive statistics of the public projects

Project category	Number of project	Duration		
			Planned	Actual
Administrative buildings and economic infrastructures	8	Min Max Sum Mean SD	152 826 3198 399,75 212,464	699 2342 13470 1683,75 527,612
School groups	8	Min Max Sum Mean SD	213 243 1854 231,75 15,526	490 1777 9310 1163,75 481,771
College	6	Min Max Sum Mean SD	213 304 1672 278,67 40,377	243 639 2618 436,33 134,464
High school	8	Min Max Sum Mean SD	152 365 2243 280,38 76,599	253 1188 5181 647,63 286,062
All	30	Min Max Sum Mean SD	152 826 8967 298,90 129,925	243 2342 30579 1019,30 618,108

Table 2: Classification of the public Project according to the year of starting execution

Project category	Period	SPD	SAD	Number of project	Total
Administrative buildings and economic infrastructures	2007/2008	1769	8228	4	8
	2009/2010	1247	4543	3	
	2011/2012	182	699	1	
School groups	2011/2012	456	1380	2	8
	2013/2014	1398	7930	6	
College	2011/2012	1064	1734	4	6
	2013/2014	608	884	2	
High school	2009/2010	365	640	1	8
	2011/2012	1513	4029	6	
	2013/2014	365	512	1	

*SPD: Sum of planned duration, SAD: Sum of actual duration

Linear regression

The simple linear regression was used to develop an equation that describes the relationship between the actual and the planned duration.

The planned duration was the independent variable (explanatory variable) and the actual duration was the dependent variable (explained variable).

The equation of the line of regression used to predict actual duration based on the planned duration was:

Y= 4,396X-1021,567……..(1)

Coefficient of correlation: R=0,848…… (2)

Coefficient of determination: R^2=0,718…… (3)

F(1,8)=20,410; p-value=0,002……..(4)

The calculated Fisher statistic was F(1,8) = 20,410 and the p-value found was 0,002<0,01 (see table 4); so, the model is significant at the level of 99%, in other words, there is a strong relationship between the planned and the actual durations; this strong relationship is already confirmed by the regression coefficient R=0,848 (see table 3)

The coefficient of determination of this equation (R^2=0,718) indicate that the planned duration explain a hight percent of the actual duration (71,8% of the variation in actual duration was predictable from the planned duration).

From these results, we can say that the model is appropriate for the prediction of actual duration and it can help the owners in the choice of contractors before awarding contract.

Figure 1: scatter plot of actual duration (AD) versus planned duration (PD) for public projects

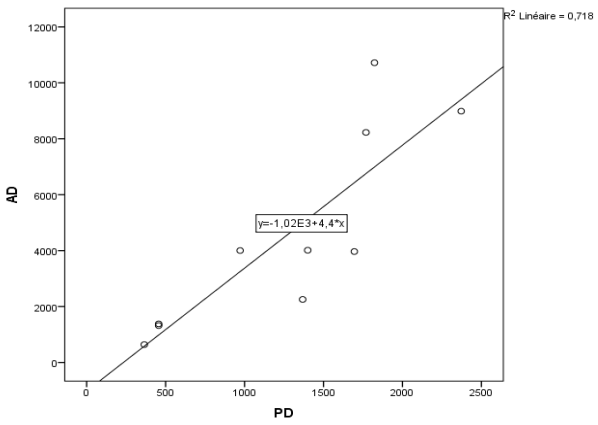

Table 3 : Model summary

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0,848[a]	0,718	0,683	1996,447	0,718	20,410	1	8	0,002
a. Predictors: (Constant), Planned duration									

Table 4: ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	81349848,691	1	81349848,691	20,410	0,002[b]
	Residual	31886411,309	8	3985801,414		
	Total	113236260,000	9			
a. Dependent Variable: Actual duration						
b. Predictors: (Constant), Planned duration						

Table 5: the coefficients of the line of regression

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1021,567	1385,667		-0,737	0,482
	Planned duration	4,396	0,973	0,848	4,518	0,002
a. Dependent Variable: Actual duration						

Conclusion

"The success of projects depends on their accomplishment in the expected time, with the least cost and the best quality" (Salhi.R 2018). In Algeria, time delay is one of the most recorded problems in construction project. Therefore, the quantification of the actual duration and the prediction of delays appear necessary for a good mastery of project time.

Data from 30 public projects were collected and categoriesed into 4 groups: school groups, college, high school, administrative buildings and economic infrastructures and then classified into 4 periods according to the year of sarting construction. The information concerning the durations has been gathered and the comparison of the actual and the planned durations shows that there is a large difference between the mean of the palnned and actual duration and high values of standard deviation.

A simple linear regression was used to predict the actual duration based on the planned duration. The tests used proved that the developed equation is statistically significant at the level of 99% and that the model is appropriate for the prediction of actual duration and it can be used by the owners before awarding contract, to minimize the risk of delay and to increase the chances of project success.

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