Factors Influencing the Delay of Road Construction Projects in Northern Mindanao, Philippines

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Abstract

Delayed construction project implementation is one of the most common problems that the government experiences all the time. With so many factors attributed in causing delayed infrastructure projects, there is a need to determine the most prevalent causes of the delay in project completion. This study evaluates the factors influencing the delay of road construction projects supervised by the Department of Public Works and Highways (DPWH) in Northern Mindanao. A total number of 139 completed road projects during year 2016 with 25 contractors were evaluated. Findings revealed that there were four factors that caused the delay of road construction projects; these are (1) road right of way, (2) change in quantity, (3) peace and order and (4) heavy rain.

***Keywords**:* delay, road construction, DPWH, factors of delay

1. Introduction

Roads contribute the economic development and growth of the nation. It connects from one place to another and facilitates smooth travel. Hence, people access roads several times in a day to perform their daily activities. Due to the crucial role of roads, people's daily activities are affected by road works. The consequences of road works include heavy traffic, increased likelihood of accidents and aggravated levels of dust and mud. It is understood that people may sacrifice the convenience of using road until road works are completed. It has always been a part of improving the quality of the roads to consider the complications experienced during road construction in contrast with the success of the road project. The delay in road construction has become a frequent challenge which further prolongs the aforementioned predicaments. It can cause a multitude of problems not only to road users, but also to the contractor, business owners, and the government.

The delay of projects is one of the challenges that the construction industry is facing. According to Assaf and Al-Hejji (2006), delay is the time overrun either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for the delivery of a project. Ahmed *et al.*, (2002) stated that the inability to complete projects on time and within budget continues to be a chronic problem worldwide. Delay is influenced with many factors; bad weather condition, equipment problems, and unavailability of material. Although the reasons for delays are relatively similar across developing countries, several factors specifically pertain to local industry, socio-economic background, cultural issues and project characteristics (Ogunlana and Toor, 2008). Delays are unpredictable in road construction projects especially at its initial stage. Therefore, timely completion of road construction projects is a key challenge that construction professionals face in reality. According to Safri (2009), delays in construction projects are considered one of the most common problems causing a multitude of negative effects on the project and its participating parties. Along with the delays, the frequently faced consequences are project failure, reduction of profit margin and loss of belief of citizen in government funded projects and among others. When delays occur, projects either accelerates or extends its duration beyond the scheduled completion date.

Northern Mindanao is an administrative region in the Philippines, designated as Region X. It is composed of five provinces; Camiguin, Misamis Oriental, Lanao del Norte, Bukidnon and Misamis Occidental. In 2015, DPWH Region X completed 103 road projects excluding the bridges. This agency handles the construction and maintenance of both national and local roads.

This study attempts to identify the factors that influence the delay in road construction projects in Northern Mindanao and to recommend ways to avoid or minimize the current problem of delays. The researchers reviewed previous studies about factors affecting delays of road projects. The researchers gathered data from the list of completed road projects together with its details from DPWH Region X in the year 2016.

2. Methodology

The study adopted the qualitative research method in examining the factors that influence road project delays. This research method was appropriate and useful for exploring factors that influence the completion of road projects in

Region X. The study also adopted the quantitative research method in analyzing the number of factors that was gathered from the list of road construction projects at DPWH Region X using statistical procedure. Document analysis was likewise used in this study.

2.1 Sample Year

The target year of the study is 2016 because it is in this year that the DPWH has a complete record which are uploaded in their electronic database. Therefore, for the most recent available, 2016 is the appropriate year to obtain the most accurate data for this study.

2.2 Data Collection Method

The primary data sources are documents collected from the list of completed road projects. This method was convenient since the documents were readily available at the DPWH. The secondary data sources were collected from previous related studies; technical journals, articles, and books.

2.3 Data Collection Instrument

A questionnaire in checklist form was designed to gather important data for the purpose of the study. The following data needed are the a) name of the road project; b) location of road project; c) duration of road project; d) cost of road project; e) contractor of the project; and f) reasons of delay (The choices were according to the data gathered from the previous studies.)

2.4 Data Collection Procedures

The researchers utilized a document review. Document review is a procedure that provides information with an organized technique for identifying, analyzing, and evaluating the needed information from the existing documents. The researchers collected the data from the list of completed road projects. The questionnaire was then answered. To answer the objective of the study, the reasons of delay of the road project were tabulated and evaluated.

The questionnaire was analyzed in two sections. The first section was taken from the basic information of the road project – the name of the project, location, duration, cost, and the contractor. The second section, on the other hand, was analyzed if the road project experienced delay. This section also contained identified information on the factors that influence delay of the road

project. The study validated the data from previous studies to explore factors that caused delays in road construction projects supervised by the DPWH Region X.

2.5 Gathering and Analysis of Data

Under the guidance of the DPWH Region X, the researchers segregated the road projects gathered in year 2016 which experienced delays according to their actual and planned completion date. From the segregated delayed road construction projects, all the data needed for the study was collected with the use of the questions which were answered according to the document given. From the collected data, the researchers tabulated all the reasons of delay in road construction projects. From the reasons of delay tabulated, the researchers segregated the road construction projects according to their reason of delay. With the use of the questionnaire and tabulation, the researchers enumerated the number of road construction projects based on their reasons of delay and duration. Using statistical method, the researchers compared the difference between successful projects and delayed projects. Let:

$$D_{success}\% = \frac{Total\ no.\ of\ Projects - No.\ of\ delayed\ Projects}{Total\ No.\ of\ Projects} \text{ x } 100 \quad (1)$$

$$D_{delayed}\% = \frac{Total\ no.\ of\ Projects - No.\ of\ Successful\ Projects}{Total\ No.\ of\ Projects} \text{ x } 100 \quad (2)$$

The values were tabulated and the data gathered were then interpreted.

A number of causes were gathered after thorough review of the data from previous studies. The tabulated data from previous studies were compared and validated against the data gathered from the list of completed road projects. Other causes found on the list but were not mentioned on the data from previous studies were also added to arrive at a final number of causes studied in this present research.

The researchers used the relative importance index (RII) to determine the hierarchy of the reason of delay. The factors of delay were rated from 1 to 6 with its corresponding value of time extension in calendar days. The duration in calendar days were classified as none, up to 30, beyond 30 up to 60, beyond 60 up to 90, beyond 90 up to 240, and beyond 240. The formula below served as the basis for calculating the *RII*:

$$RII = (\sum_{i=1}^{n} P_i U_i) \frac{1}{N(n)} \quad (3)$$

where:

Pi = The factor's rating from 1 to 6
Ui = The number of projects that experienced the reason of delay
N = Total number of delayed projects
n = The maximum achievable score. (i.e. 6)

3. Results and Discussion

3.1 Location of Road Projects

The researchers gathered 139 completed road projects in 2016. Table 1 shows the number of road projects in each location. More than half (79) of the said number of road projects are constituted by Bukidnon with 56.84% of the total number, followed by Misamis Oriental and Lanao del Norte with 33 and 14 road projects with a percentage of 23.74% and 10.07%, respectively. Misamis Occidental has 12 road projects with 8.63% of the total number. Lastly, Camiguin has only one road project with 0.72% of the total number.

Table 1. Location of the road projects in Region X

Location	Frequency	Percentage (%)
Bukidnon	79	56.84
Misamis Oriental	33	23.74
Lanao de Norte	14	10.07
Misamis Occidental	12	8.63
Camiguin	1	0.72
Total	139	100

3.2 Contractor of the Road Projects

A contractor is a person or company that accepts a contract to deliver materials or labor to accomplish a project. Table 2 presents the 25 contractors of the 139 road projects in 2016.

Table 2. List of contractors with corresponding number of projects

No.	Contractors	No. of Projects
1	Adfil Corporation	1
2	AI BADR Construction	1
3	Al Hussein Construction	5
4	Algon Engineering Construction	2
5	Brillantes Construction	3
6	C'zarles Construction and Supply	5
7	Cavdeal	1
8	DCM Enterprises	2
9	DL Enterprises	3
10	Equi-Parco Construction	16
11	Gicar Construction Incorporated	1
12	Grace Construction Corporation	8
13	HSO Construction Corporation	5
14	Jejor's Construction Corporation	12
15	JT Gamolo Construction	1
16	Lanao Builder and Enterprises	5
17	Legacy Construction	2
18	M. Montesclaros Enterprises Incorporated	30
19	Mafil Builder, Incorporated	3
20	Mindanao Rock – 2nd LBC	7
21	Pyramid Consolidated	1
22	UKC Builders	4
23	Ulticon Builders	12
24	Ven Ray Construction	7
25	WDM Construction and Supplies	2
	Total Projects	139

3.3 Road Distribution Frequencies

A contractor is important to make the project possible. Each had different approach in completing the road construction projects. This section introduces the distribution of the road projects to each contractor.

In Table 3, majority of the contractors handled one to six road projects which represents 72% of the total number of contractors. Another 20% of the contractors handled seven to 12 road projects. Lastly, having the same percentage, both 13 to 18 and 26 to 30 road projects were handled by 4% of the contractors. This result simply means that the road projects were evenly distributed to each contractor.

Table 3. Road projects distribution

No. of Road Projects	Frequency	Percentage (%)	Cumulative Percentage (%)
1 – 6	18	72	72
7 – 12	5	20	92
13 – 18	1	4	96
19 – 24	0	0	96
25 – 30	1	4	100
Total	25	100	

3.4 Number of Delayed Road Projects

Figure 1 shows 97 road projects representing 69.78% of the total number of road projects which experienced delays. About 42 road projects representing 30.22% were completed without any suspension.

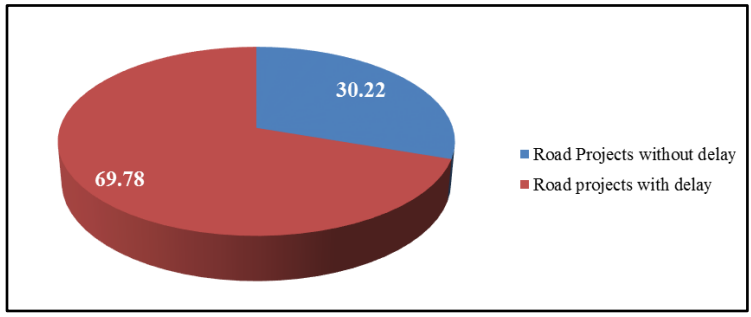

Figure 1. Road construction projects in 2016

3.5 Profile of Delayed Road Projects

In Table 4, 82 delayed road projects experienced the road right of way (RROW) problem. Next, 32 delayed road projects experienced the problem of change in quantities. Another 22 delayed road projects had extended the project time because of heavy rain. Lastly, 12 road projects were suspended due to peace and order problem.

Table 4. Reason of delay

Reasons	Frequency	Percentage (%)	Rank
RROW	82	84.54	1st
Change in Quantities	32	32.99	2nd
Heavy Rain	22	22.68	3rd
Peace and Order	12	12.37	4th

3.6 Relative Importance Index

In Table 5, it can be observed that RROW problem has an RII value of 0.656 and is ranked first. The findings of other studies such as of Patil *et al.*, (2013) and Santoso and Seong (2016) both considered RROW or land acquisition as the main cause why road projects experience delay.

Table 5. Relative Importance Index

Reason of Delay	Degree of Relative Importance						Total No. of Delayed Road Projects	$\sum W$	RII = $\sum W/(6*N)$	Rank
	1	2	3	4	5	6				
RROW	15	0	18	18	35	11	97	382	0.656	1st
Change in Quantities	65	20	12	0	0	0	97	141	0.242	2nd
Peace and Order	85	1	1	3	4	3	97	140	0.241	3rd
Heavy Rain	75	22	0	0	0	0	97	119	0.204	4th

To the affected owners who do not allow the entry of the contractors to their properties, a certification from the barangay captain or the city/municipal mayor should be presented. To address the specific conditions of this problem, the contractors should also be provided with a copy of approved parcellary survey or right of way (ROW) plan which shows the affected lots and improvements. A parcellary survey identifies the affected lots within ROW limits in the detailed road design plans approved by the DPWH secretary or his authorized representative. Furthermore, parcellary survey separates the affected lots for the purpose of registering them in favor of the government.

RROW problem is also provided with a copy of the permit to enter duly received or acknowledged but disapproved or unsigned by the owner. Lastly, there should be a list of the properties, lots, or structures affected by the RROW. In a personal interview, Engr. Ian Macabudbud (2017, February 24) mentioned that many informal settlers living in an area which is a problem in some road construction projects because of possible conflicts between the

contractors and the informal settlers and sometimes political issues become involved.

Change in quantities was ranked 2nd with an RII value of 0.242. The findings of other studies such of Kamanga and Steyn (2013), Wafa and Singh (2016), Kaliba *et al.*, (2009), and Pathiranage and Halwatura (2010) mentioned that change of quantities or specification contributes to road construction delays. Since the document on the list of road projects did not specify details in change in quantities, the researchers instead interviewed Engr. Ian Macabudbud to ask for the specific details of this problem. Change in quantities will result to variation order which has two conditions: as-staked plan and as-built plan. As-staked plan includes changes in plans due to the actual field condition. An example of this problem is the existing structures that will be affected by the road construction and were not foreseen on the original plan.

Another condition of variation order is the as-built plan. This condition has three classes: additive, reactive and extra work. If the actual plan needs more money because the actual quantity is greater than the estimated quantity, then it is considered as an additive variation order. Reactive variation order is the opposite of additive variation order since with it, the estimated budget is greater than the actual budget. On the other hand, extra work is the solution to the aforementioned classes of as-built variation orders.

Peace and order problem had an RII value of 0.187 and was ranked 3rd. The findings of other studies such of Oguya and Muturi (2016) confirmed that conflict in the location could contribute to the delay of road project execution. The safety of the workers is the priority, thus, if there is a sudden conflict in an area which involves military activity and the like, the road construction should be suspended until the matter settles down. This problem should be provided with a certification from the Philippine National Police (PNP) commander and confirmed by the regional director of the concerned Department of the Interior and Local Government (DILG) that peace and order situation in the area is already stable and evidence must be attached. Evidences include pictures, police report, and project engineer's incident report of the peace and order situation.

Heavy rain had an RII value of 0.204 and is ranked 4th. Pathiranage and Halwatura (2010), and Akomah and Jackson (2016) determined that bad weather or heavy rain is the main factor affecting delay in the road construction time. Bad weather can cause delay in a road construction project because it can stop the workers to work not only due to discomfort but also

due to safety issues. Heavy rains can also cause damage and add consequences such as collapse of excavations, and damage of exposed building finishing; impassable roads; and malfunctioning equipment. It is crucial to check on the critical path method (CPM) before considering that the road project needs time extension due to heavy rain. The contractor will request a time extension if the road project has negative slippage due to this problem. Documents include certification or monthly weather report from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), pictures or images with caption of the location or station showing the affected site, and the certified copy of road project logbook.

4. Conclusions and Recommendation

The study gathered the data from DPWH Region X on its completed road projects in the year 2016. A total of 139 completed road projects were listed wherein about 70% of these projects were delayed before completion. The study was able to confirm that the following factors were the reasons for the delay of project implementation: 1) road right of way; 2) change in quantities; 3) heavy rain; and peace and order.

This research revealed two factors that could have been avoided before projects were constructed namely RROW, and peace and order situation of the area. It is, therefore, recommended that in order to avoid delays in road project execution, DPWH should be able to determine that RROW problems are resolved. Another recommendation is to assure that location of road project is free from peace and order conflict by providing clearance for military or related agency. A comparative study may be also conducted to determine and identify area specific that may cause delay of road project execution of DPWH projects. Another findings of this study also revealed that peace and order situation delayed the road project implementation. This factor is experienced in Mindanao due to political instability. It is also necessary for DPWH to understand actual situations of project to be constructed.

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