The Panay-Guimaras-Negros Bridge Project: An Assessment

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Abstract: Studies have shown that enormous transportation infrastructure projects recurrently underperform when actual cost and benefits are compared to the forecasts utilized in project proposals. The projected costs have been shown to be commonly underestimated while forecasted demand, overestimated. In this research, an ambitious project in the Western Visayas Region is assessed. The Panay-Guimaras-Negros Bridge Project intends to connect the islands via inter-island bridges that span a length of approximately 23 km. In this study, the PGN project is placed in the distribution of previously completed projects of the same scale and lessons are drawn from their experience. Moreover, Reference Class Forecasting is tackled in order to improve risk assessment in transportation infrastructure project proposals. If project proponents wish to reduce the level of risk from 50% to 20%, then a 12.4 billion to 29.7 billion Peso increase in the proposed budget should be added in order to avoid cost overrun.

Key words: Forecast Inaccuracies, Reference Class Forecasting, Cost Underestimation

1. INTRODUCTION

The Philippines is a developing country which needs to make an efficient use of its resources. According to the Department of Budget and Management of the Philippine government, a total of 213.5 billion pesos or approximately 10% of the 2.265 trillion 2014 national budget is allocated to the Department of Public Works and Highways. From this share, approximately 38% is allocated to the regional offices where Region 6 or the Western Visayas region is allotted the second largest share next to the CALABARZON region, adjacent to the National Capital Region.

The Panay-Guimaras-Negros Bridge Construction Project (PGN Bridge Project) aims to connect the three main islands of the Western Visayas Region namely, Panay, Guimaras, and Negros as seen in Figure 1. Steel and suspension bridges are to be constructed that would accommodate four-lane roadways (Sun Star Bacolod, 2012). Promoting for this project started way back in 2005 (Dangcalan, 2012). Recently in 2012, nineteen congressmen from the Visayas issued a joint resolution urging the president to prioritize the PGN Bridge project (Burgos, 2012). The resolution stated that the trans-link bridges will foster new economic opportunities, reduce transportation costs, improve accessibility, and enhance the tourism industry in the region (Burgos, 2012). They also mentioned that the current administration should not only focus all its resources in the National Capital Region but also provide assistance for the progress and development of other regions (Yap, 2012). The lawmakers added that based on the latest census of the National Statistics Office (NSO), the Visayas islands have a larger population than the National Capital Region (NCR). Despite this, the NCR gets the bulk of the national budget. Finally, they expressed that for an archipelagic country like the Philippines, a *unified well-integrated economy* is needed in order for goods and services to be transported efficiently (Burgos, 2012).

Figure 1. Map of Western Visayas Region

There have been several studies concerning the PGN Bridge Project. The first study was performed by the Japan International Cooperation Agency (JICA) in 1999. JICA estimated the total cost of the 23.19 km megaproject to be approximately 53 billion pesos. It connects Panay to Guimaras via a 2.59 km bridge while Guimaras is linked to Negros by a 20.6 km bridge (Manila Bulletin, 2012). In another study in 2010, the Department of Public Works and Highways (DPWH) estimated the total cost of the project to be around 28.5 billion pesos. Unlike the JICA proposal, this study recommended a total of 13.16 km of bridges connecting the three main islands; 3.6 km Panay-Guimaras Bridge at 9.44 billion pesos and 9.56 km Guimaras-Negros Bridge at 19.18 billion pesos. In this proposal, the town of Leganes in Iloilo is connected to Buenavista in Guimaras while the town of San Lorenzo in Guimaras is connected to Pulupandan in Negros Occidental (Burgos, 2012). At this time, the proponents of the project has expressed that the PGN Bridge Project is now more realizable due to the smaller amount of funds needed. However, this same study was updated by the DPWH in 2011 and found that the total cost has increased by more than a hundred percent to 54 billion pesos. They also added that there are no funds currently available for the PGN Bridge project (Yap, 2012). In early 2012, the local government coordinator for the project had a meeting with KGC Ltd., Japan which conducted the study in 2008 (Guadalquiver, 2012). This just shows the amount of interest in the project where project proponents have looked into several sources of funding, from PPP to ODA and JICA (Dangcalan, 2012). The PGN project is also included in the Western Visayas Regional Development Plan as a Major Inter-District or Regionwide Proposed Infrastructure Programs for 2011 to 2016 (RDC VI and NEDA VI, 2011).

This study looks into the proposed PGN bridge project, a project which will definitely put the region on the limelight when it is fully realized. However, first, the evaluation of the project through cost-benefit analysis should be examined. It has been mentioned in previous studies that most projects of this scale fail and therefore, no matter how prudent the estimates are calculated, human bias is still incorporated. This research intends to place the PGN project in the distribution of previously completed projects of the same scale from which lessons may be drawn from their experiences. Moreover, the Reference Class Forecasting (RCF), as devised by Flyvbjerg, is tackled in order to improve risk assessment in transportation infrastructure project proposals, such as the proposed PGN project.

2. LITERATURE REVIEW

Industrialization and progress are supplemented by costly infrastructure projects with the envisioned purpose of acting as catalysts for growth and development of nations. However, as more of these projects are built, much resource is being wasted instead, due to the poor performance of these expensive projects (Anguera, 2006; Gómez-Ibáñez, 2000; Flyvbjerg, 2003). Flyvbjerg (2014) also mentioned that the best practice in the field of megaproject planning and forecasting may be thought of as an outlier while the norm is a disaster. The problems caused by these projects are very intricate and influential (Oades and Dimitriou, 2006). Therefore, much attention is needed in the planning of such risky endeavors. Proper monitoring, evaluation, and international comparison or interaction are needed to identify which projects comply with the demand and cost forecasts, and other projected impacts (Chapulut, Jeannesson-Mange, and Taroux, 2007; Van den Bergh, 2007; Nakamura, 2000). Proficient planning complemented by ethical politicians, planners, and project proponents will result in improved decision making; therefore, projects that deserve to be built are built and those that do not, will be abandoned.

A problem, observable in the field of transportation, is that there is much politics in the planning and approval of projects (Flyvbjerg, 2003; Giuliano, 2007; O'Toole, 2006). Increase in politics entails more competition. This sort of competition, especially with regards to public funds, drives project proponents to carefully manipulate their project proposals in order to outdo proposals from others. Blown up figures shown in proposals are definitely attractive to the decision makers. However, these forecasts are biased where the real and unbiased information behind the projects are kept from the public. All these results in less cooperation among government units and the professional expertise of consultants are often ignored due to fact that projects are habitually evaluated through political influence of the proponents (O'Toole, 2006; Flyvbjerg, 2003) or through the personal monetary benefits, gains, or bribes obtained from each of the projects. Inefficient decisions are thus often carried out.

3. METHODOLOGY

With the astounding results from previous studies concerning the cost overruns and demand shortfalls of transportation megaprojects, a project like the PGN bridge project should receive the necessary precautions with regards to its cost and performance. The cost-benefit analyses are based on forecasts and hence caution should be exercised. However, no matter what advanced modelling tools are used, some degree of optimism bias is incorporated in the forecasts used in project proposals. In order to avoid this, Flyvbjerg advocated the use of RCF technique. It is a method which takes the *outside view* of the specific project being evaluated. It looks into the results of a similar class of previously completed projects, thus avoiding the stages in planning where bias may be incorporated (Flyvbjerg, 2006). The method consists of the following three steps: (Flyvbjerg & COWI, 2004).

1. *Identify a similar reference class of completed projects which is comparable to the project being evaluated.*
2. *Establish a probability distribution for the reference class with a sufficient number of samples.*
3. *Compare the project with the established distribution and predict the most probable outcome for the project being evaluated.*

4. RESULTS

The proposed PGN Bridge Project may be considered a megaproject due to its enormous size and the colossal capital investment required. It rivals those projects included in Flyvbjerg's database consisting of more than 200 transportation projects all over the world with costs varying from $1.5 million to $8.5 billion. The cost of the PGN project costs between 28.5 billion PHP (2010) and 54 billion PHP (2011) and has been petitioned in congress since 2005 pioneered by a JICA project study made in 1999. Due to the long planning stage, Flyvbjerg has shown that projects of this magnitude are risky, both in terms of revenue and economics where managers often cited that poor forecasting, poor risk identification, and cost escalation are the main reasons for exceeding the budget. In fact, 86% of the 258 transportation projects in the database suffered cost overruns. Table 1 shows some results of the study by Flyvbjerg (2007). It indicates that a bridge project will experience a cost escalation of 33.8% in constant prices, on the average. Park and Papadopoulou (2012) have also made a study identifying twenty seven causes of cost overruns in Asia.

Table 1. Average cost escalation in 258 transportation infrastructure projects in constant prices

Project type	Number of projects (n)	Quartiles (25/50/75%)	Average cost escalation (%)	Standard deviation
Rail	58	24/43/60	44.7	38.4
Bridges and tunnels	33	-1/22/35	33.8	62.4
Roads	167	5/15/32	20.4	29.9
All projects	258	5/20/35	27.6	38.7

(Flyvbjerg, 2007)

The distribution of cost overruns, in constant prices, for the fixed link projects, which includes bridges, in UK and non-UK areas is shown in Figure 2. It can be verified that most of the fixed link projects suffer cost overruns. Majority of these projects experience cost escalations of 20% to 40% whereas the maximum escalation reached more than 280%.

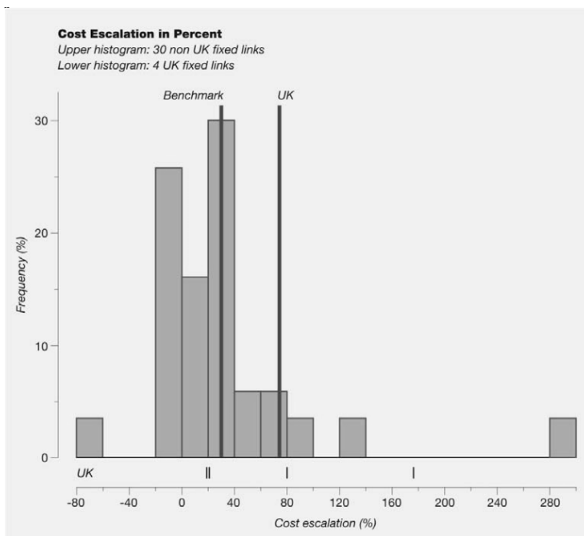

Figure 2. Cost overrun in UK (N=4) and non-UK (N=30) fixed-link projects (Flyvbjerg, 2007)

The histogram shown in Figure 2 forms the basis for the necessary increase in budget for a given acceptable level of risk of cost overrun. Figure 3 illustrates that for a 50% likelihood of cost overrun happening, the required increase in budget, in constant prices, is almost 20%, whereas for an acceptable level of 10%, the required uplift is 100% of the original budget.

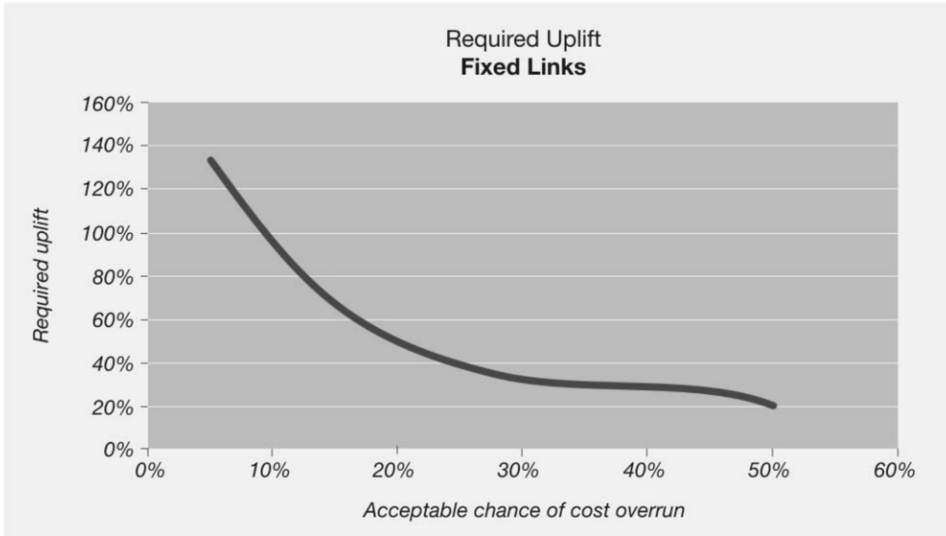

Figure 3. Required uplift as a function of the maximum acceptable level of risk for cost overrun, fixed links
(Flyvbjerg, 2007)

In a study by Roxas and Chalermpong (2008), 129 road and bridge projects from Thailand and the Philippines were compiled to form a database similar to Flyvbjerg. Out of all the projects, 85 are from the Philippines, where 60 are road projects and 25 are bridge projects costing between 98 million PHP and 17 billion PHP, far smaller in project size than Flyvbjerg's database. Information on forecasted and actual cost and demand were obtained from different institutions and government agencies. However, only the cost data were noted as there were no actual demand records kept for transportation projects in the Philippines. Table 2 shows the mean cost overrun of bridges is larger than that of road projects. Despite the small values of cost overruns, the standard deviation values for costs are significantly large.

Table 2. Average cost escalation in 85 Philippine transportation infrastructure projects (in constant prices)

Project type	Number of projects (n)	Average cost escalation (%)	Standard deviation
Road	60	2.70	36.21
Bridges	25	11.91	35.02

(Roxas & Chalermpong, 2008)

The distribution of cost overruns in bridge projects in the Philippines is shown in Figure 4. A class specific to bridges is identified separately for the prupose of this study in order for the identified reference class to be more comparable to the proposed PGN project. Most projects, as indicated in Figure 4, exceed their forecasted costs. Most of the cost escalations do not exceed 50% of the projected costs. However, there is no guarantee that overruns will always be in this range as experience suggests that cost escalations of more than 100% may also occur.

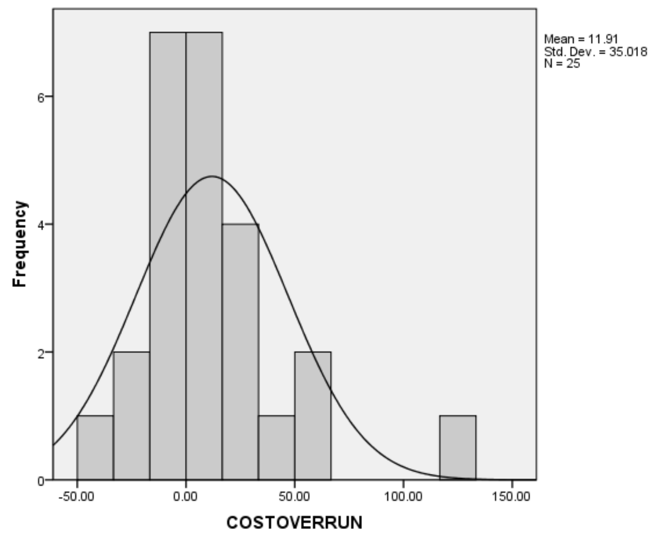

Figure 4. Cost overrun in Philippine bridge projects

The required increase in the forecasted cost of a bridge project can be derived from Figure 5. It can be verified that for a 50% chance of cost overrun, about 12% of the forecasted cost should be added, while at a 10% level of risk, the required uplift is approximately 60%, in constant prices.

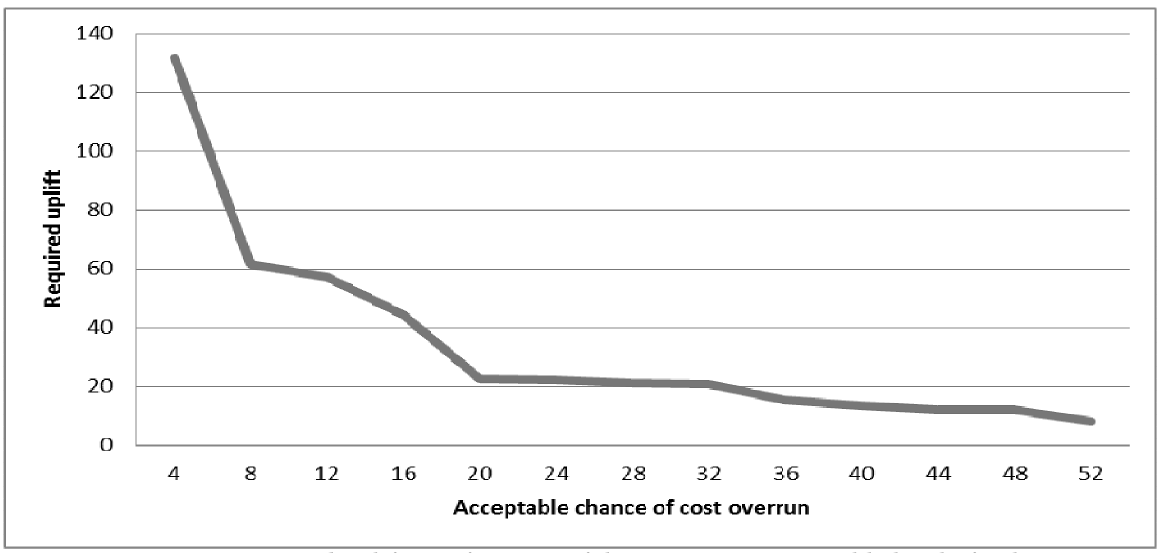

Figure 5. Required uplift as a function of the maximum acceptable level of risk for cost overrun, bridges in the Philippines

Despite differences in the required increase in budget for bridge projects, the two studies agree that most transportation projects almost always exceed their allocated budget for various reasons. This fact when coupled with the underperformance of the projects in terms of revenue, results in significant losses. Therefore, a project in its planning stage should be subjected to the RCF modelling technique. This way, a more realistic cost projection based on the performance of previously completed projects is derived. These values may then be used in the cost-benefit analyses so that a proposal may be evaluated more accurately and truthfully. Therefore, projects proposals that deserve to be built are built, while those that do not, are rejected.

The required percentage increase in budget for the case of PGN project is shown in Table 3. The PGN bridge project costs 54 billion PHP according to the latest cost forecast. If it is subjected to the RCF technique, then the projected cost may be expected to increase by the amounts indicated in Table 3. In case a 20% level of risk is acceptable for the project proponents, therefore the expected amount should be increased by 55%, in real terms, instead of the original estimate of 54 billion pesos. This adjusted cost is what should be reflected in the cost-benefit analysis of the project. Note that the results of Flyvbjerg are utilized since the projects in his database are more comparable with the PGN bridge project in terms of cost and size. The maximum cost in the Roxas and Chalermpong (2008) database is only 17 billion PHP, which is just one third of the forecasted cost of the PGN project. Despite the disparity in the required allowance for cost escalation in the project between the two studies, the fact remains that a significant amount is to be added to the forecasted cost in order to lessen the risk assumed. Table 3 shows the different percentage increases in budget for a specific level of risk acceptable to all the stakeholders.

Table 3. PGN Project Proposal budget uplifts for a certain acceptable level of risk

Database	Acceptable level of risk			
	50%		20%	
Flyvbjerg	+23%	12.4B PHP	+55%	29.7B PHP
Roxas and Chalermpong	+10%	5.4B PHP	+23%	12.4B PHP

Given these results, the cost-benefit analysis of the PGN bridge project, and other projects as well, should incorporate the necessary increases in projected costs as suggested by the RCF technique. The more truthful cost may now be contrasted against the benefits and hence a better evaluation of transportation project proposals can be implemented. Doing so will reduce the economic risks associated with such costly investments.

4. CONCLUSION

In this research, the long experience of other countries in constructing megaprojects has been reviewed. Flyvbjerg, through his large database of transportation megaprojects, has well illustrated the landscape of megaprojects construction. He disclosed that around 90% of the projects experience cost overruns where up to 50% overruns are common and greater than 50% are not uncommon. He also noted that the cost overruns have been constantly high for the 70-year period all over the world. On the other hand, he revealed that benefits are overestimated making megaprojects risky on two fronts. He suggested the implementation of the RCF technique in the project proposal stage of such projects. In the case of the Philippines, 60 road and 25 bridge projects were included in the database. Majority of the projects experienced cost overruns. These projects exceeded their forecasted costs by 2.7% and 11.91% respectively, on the average. Despite the smaller average cost overrun in local projects compared to the study of Flyvbjerg, the large standard deviation values indicate that transportation infrastructure provision is still risky. In this regard, if in case the PGN project proposal becomes a full blown feasibility study, the RCF technique should be employed in order to get the risk assessment right. The PGN project has been studied by JICA and DPWH with varying projected costs and designs. The costs range from 53 billion pesos in 1999, 28.5 billion in 2010, and 54 billion in 2011. This just shows the uncertainties in this kind of project. Different designs and alignments have different associated costs, but even if everything has been finalized, there is still no guarantee that costs will not change. Unforeseen problems will be encountered along the way, and together with these problems are unpredicted cost adjustments that pile up resulting in large cost overruns. The Philippines does not have experience in constructing a project of such magnitude. Therefore, we have no formula for success, just like most of the other failed projects in Flyvbjerg's database. Therefore, it does not look promising to look into the experience of others in megaproject construction. It is clear that the effects of megaproject provision are extensive. If the megaproject construction fails, which is highly probable, many sectors are greatly affected. Furthermore, Flyvbjerg mentioned that it is easier to enumerate projects that failed than projects which have succeeded.

The project proponents and the national government should justify the necessity for the project. The 54 billion peso current estimated cost of the project is 25% of the DPWH national budget. If a 20% acceptable level of risk is adopted, then the PGN project will expend approximately one-third of the national DPWH allocation since a 55% increase on the original project cost will be added; the national budget will for certain be severely affected. Private capital through PPP could help obtain funding. Questions like what should be done about the PGN project may be posed. Does the region, or the Philippines, urgently need it? Have the basic needs of the constituents been provided for, that this project will be prioritized? It has been mentioned that infrastructure provision is a way of delivering service to the people. However, for the case of the PGN project like other megaprojects that have been built, it is more of a risk due to the fact that large standard deviations exist for both cost overruns and benefit shortfalls in megaproject construction. It is with great caution that in planning such projects, this study suggests that forecasting with care and truthfulness be accomplished by moral proponents and planners.

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