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Case Study on National Highway Construction Using Bot

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Abstract: ***The public-private partnership (PPP) models that have been used in procuring the National Highways projects include Build- Operate-Transfer (BOT) (Toll) and BOT (Annuity) models.... This paper focuses on the various approaches that have been used for financing of PPP road projects in India. To assess the risks involved in BOT PROJECT by studying a specific case of Implementation of integrated road development program me (IRDP) in the city on built, operate & transport (BOT) basis. To Study the individualistic approach of the involved parties. BOT has been one of the recent innovations in project finance. The Build-Operate Transfer (BOT) scheme is a limited recourse financing technique. Many have adopted this approach as an alternative to traditional public financing for infrastructure development projects. This study examines the type of SOCIAL risk due to, force shutdown of toll booths due to public riots. This paper mainly representing the risk in BOT due to political & public pressure. A case study of IRDP project implemented in municipal corporation area through BOT is studied in details.***
Keywords: BOT, Public private partnership, lumpsum, concessionaire's

I. INTRODUCTION

The BOT (Build, Operate, and Transfer) approach has been widely employed to implement infrastructure projects by many developed and developing countries around the world (Walker and Smith, 1995). The good financing project is one of the critical factors in BOT contract delivery system. Only with good load bank can a BOT project be carried out (Chang and Chen, 2001). In the process of the financing planning, there are many assessment methods such as NPV (net present value), BCA (benefit cost analysis), IRR (internal rate of return), and PBY (pay back year) can be used to evaluate the financing project of the BOT projects (Finnerty, 1996). To meet this need, in 1999, the Ministry of Traffic and Communication (MOTC) in Taiwan has developed a model for financing and evaluation of bidders' proposal. The SLR (self-liquidation ratio) index has been applied to assess financing project of BOT projects based the Act for Facilitation of Private: Participation in Infrastructure Projects (AFPPIP). Prior studies show that the B/C analysis has been widely used to evaluate the economical or financial effectiveness of an investment project (Daniel, 2002; Hanspeter, 1973; Asensio and Roca, 2001; Xing and Wu, 2000), SLR and B/C are indifferent in their definitions.

However, can SLR be used to evaluate the financial project of the BOT project? This issue is seldom to explore from the past studies (Chang & Chen, 2001; Lu, 2000; Wu, 2002). The purpose of this paper is to introduce a new finance model in order to analyze the financial project of the BOT project. The paper is organized as follows: Section I introduces motivation, purpose of this research; Section II details problem statement; Section III develops the new finance model; and Section IV concludes this paper.

II. THE MODEL

The government can calculate royalty as lump sum fee or depending on the output, total revenue of the BOT project (Wu, 2002). Whereas, the royalty as lump sum fee is easier used than other methods for public sector (Kang, et al., 2002). The royalty depends on the total revenue or the output of the BOT project in operation efficiency of the private sector is better than other methods (Wu, 2002). In this section, we will develop the models which calculate royalty depending on the total revenue and the output of the BOT project.

Build Operate Transfer, BOT In recent years, a growing trend emerged among governments in many countries to solicit investments for public projects from the private sector. The main reasons for this trend are a shortage of public funds and a hands-off approach of government agencies. The Build Operate Transfer (BOT) approach is an option for the government to outsource public projects to the private sector [2] Background, The first official private facility development under the name "Build Operate Transfer" was used in Turkey in 1984, by Prime Minister Ozal, as part of an enormous privatization program to develop new infrastructure [2]. However, the BOT approach was used as early as 1834 with the development of the Suez Canal. This revenue-producing canal, financed by European capital with Egyptian financial support, had a concession to design, construct, and operate assigned to the Egyptian ruler Pasha Muhammad Ali [3]

Definition, In the BOT approach, a private party or concessionaire retains a concession for a fixed period from a public party, called principal (client), for the development and operation of a public facility. The development consists of the financing, design and construction of the facility, managing and maintaining the facility adequately, and making it sufficiently profitable. The concessionaire secures return of investment by operating the facility and, during the concession period, the concessionaire acts as owner. At the end of the concession period, the concessionaire transfers the ownership of the facility free of liens to the principal at no cost [4]. BOT projects are very useful in bidding situations. By implementing these methodologies, the company or the government can share the risk of the project [5]. BOT projects include a wide array of public facilities with the primary function to serve public needs, to provide social services and promote economic activity in the private sector. The most common examples are roads, bridges, water and sewer systems, airports, ports and public buildings [2]. Figure 1 shows stages of BOT project.

Principal: The principal is usually a government agency, a local or federal government body that recognizes the need for a public facility but is unable to financially support the project. Concessionaire: The concessionaire is the owner of the facility during the concession period and realizes profits on the initial investment through the usage of the facility. Investors: Financing issupplied by the private sector and the investors include both shareholders and lenders. Contractor. The contractor is responsible for the construction of the project and for hiring subcontractors, suppliers and consultants. Operator. The operator is in the concessionaire's service and manages the operational stage of the facility [6]. Advantages. The most important advantages of BOT are utilization of private sector's investment instead of public sector's, transferring all the risk to private sector, transferring technical knowledge is one of the most important benefits of this method for developing countries, political resistance in using private sector is less than other methods because project will owned by the government finally [7]. Disadvantages, These kinds of projects are very complicated from the viewpoint of technical and financial issues and need high level experts and consultants, increasing expenditures of users in operation time, contrast between benefits of private sector with public sector.

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III. LITERATURE SURVEY

1) Chao-Chung Kang Assistant Professor Department of Business Administration Providence University 200, Chung-Chi Rd., Shalu, Taichung Hsien, 433, Taiwan Fax: 886-4-2631-1187 E-mail: cekang@pu.edu.tw The purpose of this paper is to develop new financial models of BOT projects to replace the SLR (self-liquidation ratio) since SLR cannot be used to analyze BOT projects. In this paper, we use the financial cash flow concept and mathematical analytical method to develop the PCCR (private construction cost ratio), GCCR (government construction cost ratio), ongoing royalty, and GFRR (government finance recovery ratio) for the BOT finance policy decision model. Also, we explore the relationships among the PCCR. GCCR, ongoing royalty, and GFRR models.
2) Szu-Chi Huang Master Institute of Traffic and Transportation National Chiao Tung University 114, 4F, sec. 1, Chung Hsiao W. Rd., 100, Taipei, Taiwan The BOT (Build, Operate, and Transfer) approach has been widely employed to implement infrastructure projects by many developed and developing countries around the world (Walker and Smith, 1995). The good financing project is one of the critical factors in BOT contract delivery system. Only with good load bank can a BOT project be carried out (Chang and Chen, 2001). In the process of the financing planning, there are many assessment methods such as NPV (net present value), BCA (benefit cost analysis), IRR (internal rate of return), and PBY (pay back year) can be used to evaluate the financing project of the BOT projects (Finnerty, 1996). To meet this need, in 1999, the Ministry of Traffic and Communication (MOTC) in Taiwan has developed a model for financing and evaluation of bidders' proposal. The SLR (self-liquidation ratio) index has been applied to assess financing project of BOT projects based on the Act for Facilitation of Private Participation in Infrastructure Projects (AFPPIP).
3) Cheng-Min Feng Professor Institute of Traffic and Transportation National Chiao Tung University 114, 4F, sec. 1, Chung Hsiao W. Rd., 100, Taipei, Taiwan Prior studies show that the B/C analysis has been widely used to evaluate the economical or financial effectiveness of an investment project (Daniel, 2002; Hanspeter, 1973; Asensio and Roca, 2001, Xing and Wu, 2000), SLR and B/C are indifferent in their definitions. However, can SLR be used to evaluate the financial project of the BOT project? This issue is seldom to explore from the past studies (Chang & Chen, 2001, Lu, 2000, Wu, 2002) The purpose of this paper is to introduce a new finance model in order to analyze the financial project of the BOT project. The paper is organized as follows: Section I introduces motivation, purpose of this research: Section II details problem statement; Section III develops the new finance model; and Section IV concludes this paper.
4) MarjanBashiriM.Eng student of project management in university of Calgary Marjanb874@yahoo.com ShabnamEbrahimi Selection of a project delivery system which enhances quality, reduces cost, and speeds up the project is one of the best ways of optimization and prevention of wasting national funds. Consequently, it is essential for every owner to select appropriate project delivery system considering her financial, managerial, and expert capabilities, as well as level of other parties' commitment to the project to accomplish the project with best quality, least time, and cost. In this paper, three project delivery system including BOT, BOOT, and PPP are examined according to their nature, advantages, disadvantages, scope of application, and an analytical comparison is made between them. Since, every project is unique and has its own specification, it is concluded that optimized project delivery system should be selected according to owner requirements, project specifications and characteristics, environmental conditions, and project's practical principles.
5) Maryam FazlaliM.Eng student of project management in university of Calgary fazlalim@gmail.comNowadays, major changes are being occurred in the methods of project execution around the world. Research and experience indicate that selection of best project delivery system can reduce project's cost and time up to twelve and thirty percent respectively. Therefore, selection of project delivery system is one of the most important project strategic decisions which will be conducted at the end of feasibility studies and coincident with making decision about method of project's financial provisions. Hence, considering this important point and in order to select the appropriate system that best complies with the owner's and project's requirements, studying and distinguishing different project delivery systems is necessary. Project Delivery System, Project delivery system is a general term which describes method of combination and organization of design, procurement, and construction services of project in addition to operation, commissioning. and maintenance which can be executed by owner or other parties. In other words, project delivery system determines sequence of project's processes, contractual relationships, and area of obligations and commitments of main parties. The main difference between various types of project delivery system is distribution of project's risks between different parties who are involving in project

IV. PROJECT METHODOLOGY

A. Method of Manufacturing Process

This chapter will cover the details explanation of methodology that is being used to make this project complete and working well Many methodology or findings from this field mainly generated into journal for others to take advantages and improve as upcoming studies. The method is use to achieve the objective of the project that will accomplish a perfect result. In order to evaluate this project, the methodology based on System Development Life Cycle (SDLC), generally three major step, which is planning. implementing and analysis.

B. Planning

To identify all the information and requirement such as hardware and software, planning must be done in the proper manner. The planning phase have two main elements namely data collection and the requirements of hardware and software

C. Data Collection

Data collection is a stage in any area of study. At this stage WE planned about the projects resources and requirements, literature studies and schedule to get more information.

In this study. All the materials are collected from journal, texts book and research papers gathered from libraries and Internet.

Within the data collection period we have found the study about the Automatic car parking in the Internet and do some research about the project related. Once I got the project manual, we tried to find out the electronic component and other materials and some of equipment to be used.

While planning, we have done the research about the project related, which including with study about the mechanical & civil components such as Rack & Pinion, Round pipe, DC gear motor, microcontroller kit etc. The study is not just for the function of the component but the types of small circuit build by each component related.

V. CONCLUSIONS AND RESULTS

In this paper, we explore the concept of financial cash flow of the non-BC objects and the BOT projects. Also, we use the financial engineering method develop a new finance model in which the value of GCCR, PCCR, ongoing royal and GFRR were obtained to modify the drawbacks of SLR.

The SLR has been used to evaluate financial project of BOT projects Taiwan. The result indicates that, from the viewpoint of the public sector, the SL index, that is BCA, cannot be used to evaluate financial project of the BOT project Moreover, we find the relationship among PCCR, GCCR, ongoing royalty, am GFRR. But the SLR cannot provide the relationship of private-host utility.

The results of these two models show that the annual royalty value an GFRR* value of model I and II are different in variables () that g-xx 1+0and)thRt-x0x 1+a*. Also it shows that there exists relationship among the PCCF GCCR, ongoing royalty, and GFRR.

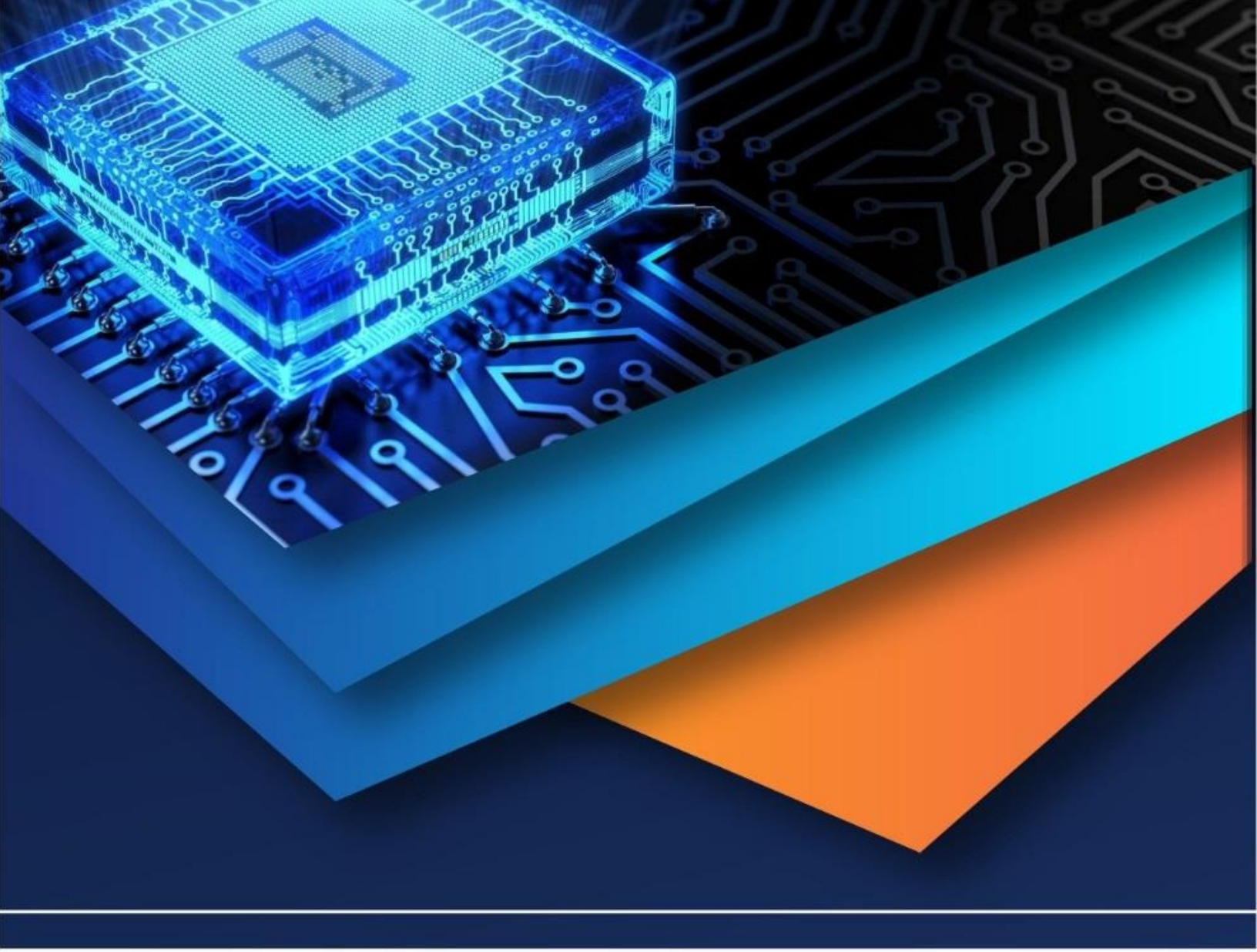
The new finance model for of the BOT project in this paper we have developed could be applied to the BOT project practice. Some issues of this paper ca be explored for future study,

1) To develop finance model for PCCR, GCCR, subsidy, and GFRR for BO projects. Because the model in this paper cannot be used to analyze operating revenu associate with deficit of the BOT project.
2) To construct finance model of the BOT project according to the private sector viewpoint.
3) To develop bargain model of the royalty and the proportion of the construction cost for BOT projects by using game theory or mathematical programming. L illustrate the model I and II, the empirically case should be explored for future study.

REFERENCES

[1] ShaSn-Ying Wu, (2002) Royalty Models for the BOT Projects of Transportation a structure, Master thesis of the Institute of Traffic and Transportation, National
[2] hàoTùng University. Chao-Chung Kang, Cheng-Min Feng, and Szu-Chi Huan2002) "Develop of the Royalty Model of BOT Projects: The Lump sum case Proceedings of the 17th annual conference for the Chinese Institute of Transportatio Taiwan, 66-74 (in Chinese). Chao-Chung Kang, Cheng-Min Feng, and Szu-Chi
[3] Huang, (2003) "Develop of the BOT Finance Model- the GFRR, PCCR, GCCR, and royalty Model", Transportation Planning Journal Quarterly. (in Chineseforthcoming).
[4] Asensio, J. and Roca, O., (2001, October) "Evaluation of Transportation Infrastructure Projects Beyond Cost-Benefit Analysis. An Application to Barcelona's 5th Ring Road", International Journal of Transport Economics, Vol. XXVIII, No. 3, 387-402.
[5] Barzel Y. (1997) Economic Analysis of Property Rights, Cambridge University Press.

[6] Chang, L. M. and Chen, P. H., (2001) "BOT Financial Model: Taiwan High Speed Rail Case", Journal of Construction Engineering and Management, Vol. 127, No. 3, 214-222
[7] Daniel, J. 1., (2002) "Benefit-Cost Analysis of Airport Infrastructure: the Case of Taxiways, Journal of Air Transportation Management, Vol. 8, 149-164. in Project Management, Project
[8] Finnerty, J. D., (1996) Project Financing: Asset-Based Financial Engineering New Management Journal, Vol. 33, No. 1, 27-36. York:John WileyFarrell, M.,(2001) "Financial Engineering
[9] Hanipeter, G., (1973) Cost-Benefit Analysis and Public Investment in Transport A & Sons, INC. Survey, Lond
[10] MATTI SIEMIATYCKI. Journal of the American Planning As-sociation,2011(1)43-58. Reference to a book:
[11] PETER SHERIDAN. EPPPL 2,2010:92-103.
[12] M. Wu, Y.Y. Chen: Industrial Technology & Economy, (2012) No. 2, p48.
[13] L. Zhong: Technology and Management, (2013) No.1, p80
[14] L. Li: The South of China Today, (2013) No.5, p121.
[15] Z.P. Ma: China Investment, (2012) No.8, p109.
[16] X.C. Yu: Study on the education of accounting, (2012) No.3, p95.
[17] Z.L. Zhao: Economic Forum, (2012) No.1, p95.
[18] G.F. Zhao: Market Modernization, (2013) No.5, p194.



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