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The Root Fators Cause Delays of Official Development Assistant Loan Construction Project: Empirical Analysis in Vietnam

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***Abstract*—This paper studies the critical causes of the schedule delay of the Official Development Assistant loan construction project (ODA construction project) in Vietnam based on both qualitative and quantitative approaches. We first identifies the common causes for project delays based on a large survey of the literature and deep interviews with experts and managers of the ODA construction projects. This primary identified causes then are reconfirmed and ranked their relative importance in explaining schedule delays of the ODA project based on a regression model. The empirical result first finds that the six factors, including lack of human resource of project, deficiency of technical issues of project, lack of cooperation and communication, weak government legal system, difficulties in land clearance and infrastructure relocation, and delay** of **provision of finance, are identified as the root causes for time overruns of the ODA infrastructure project. Second, comparing among the causes, low quality of human resource of project and deficiency of technical issues of project are emerged as the first and second most root causes for the ODA construction project delays.**

Keywords —ODA construction project; Schedule delays; Explanatory Factor Analysis; Regression

I. INTRODUCTION

The ODA projects have a vital role in the socioeconomic development process of developing countries. Vietnam is a typical example, in which the ODA project accounts for approximately 14% of total investment, and 50% of the government budget in the period of 2006-2010 [1]. Unfortunately, most of the proposed infrastructure projects using Official Development Assistance Loans (ODA) are plagued by severe time overruns. The delay of the ODA construction project can induce to both economic and social costs. In terms of economics, project delay has a propensity to escalate the costs involved and make the efforts futile. Furthermore, delays of infrastructure project can reduce social benefits because the people have to wait longer than necessary for the provision of public goods and services. Therefore, understanding the root causes of delays in the ODA construction projects has received the great attention of both researchers and policy-makers in many developing countries.

The main aim of this paper is to discover the root causes of the delay of the ODA construction projects in Vietnam. To obtain this, the qualitative methods including deep interviews, survey of literature and quantitative techniques consisting of factor analysis and regression are employed to underline the critical causes of ODA construction project delays.

This paper contributes the literature by twofold. First, this paper expands the current literature in terms of the ODA construction project. This is quite limited in the current literature of project management. Second, unlike the previous studies, identifying and ranking the relative importance of the critical causes of time overruns by using mean score approach, our paper is different by ranking and identifying the critical causes attributing ODA construction project delays based on regression technique.

This article organizes as follows. The section II presents the brief survey of the literature. The research framework and methodology are presented in section III. The empirical result and discussion are outlined in section IV. Conclusion and policy implication are provided in section V.

II. LITERATURE REVIEW

There are a large number of empirical studies investigating the main causes of time overruns of infrastructure projects. For example, Sambasivan and Soon [2], drawing the data of Malaysian construction industry, found that the main causes attributed to the delay of construction projects are the contractor's improper planning, poor site management by the contractor, inadequate client's finance and payments for completed work, inadequate experience of the contractor and shortage of material and labor supply. Alternatively, Ubani, et al. [3] used a large sample of the construction projects in the south eastern Nigeria, and found that the shortages of materials and external factors like government policies and inclement weather have a negative impact on the schedule performance. Le-Hoai, et al. [4] investigated the root causes of the delay raising during construction phase of projects in Vietnam, and they revealed that the slow decision

making, poor cooperation and communication between the construction parties, incompetency of the contractor and shortage of financial resource were main responsible for the schedule delay. Sweis, et al. [5] outlined the top ten factors inducing the time overruns in construction projects, including, presence of unskilled labors, shortage of technical professionals in the contractor's organization, improper technical study by the contractor during the bedding stage, poor planning and scheduling of the project by the contractor, too many change orders from owner, slow decision making from owner, delay in progress payments by the owner, ambiguities and mistakes in specifications and drawings, poor qualification of consultants, engineers and staff assigned to the project and severe weather conditions on the job site. Kaliba, et al. [6] identified the main causes of schedule delays in road construction projects in Zambia, including delay in payments by clients, financial difficulties on the part of contractors and clients, contract modification, economic problems, difficulties in materials procurement. Alinaitwe, et al. [7] conducted a research investigating the causes of delays in construction projects in Uganda's public sector, and they provided that changes in the work scope, delayed payments to contractors, poor monitoring and control and high inflation and interest rates are the five most important causes of delays.

Related the ODA construction project, JICA [8] studied major causes of the delays of the Japanese ODA loan projects, with a particular focus on four countries in South-East Asia and South Asia, including Vietnam. The main causes of the delay of Japanese ODA loan are relating to land acquisition, selection of contractor and consultant, project designing, construction procedure, project planning, lack of operation capacity of contractor, delay in payment, change in plan and other unexpected events.

III. METHODOLOGY AND DATA PRESENTATION

A. The research framework and data collection

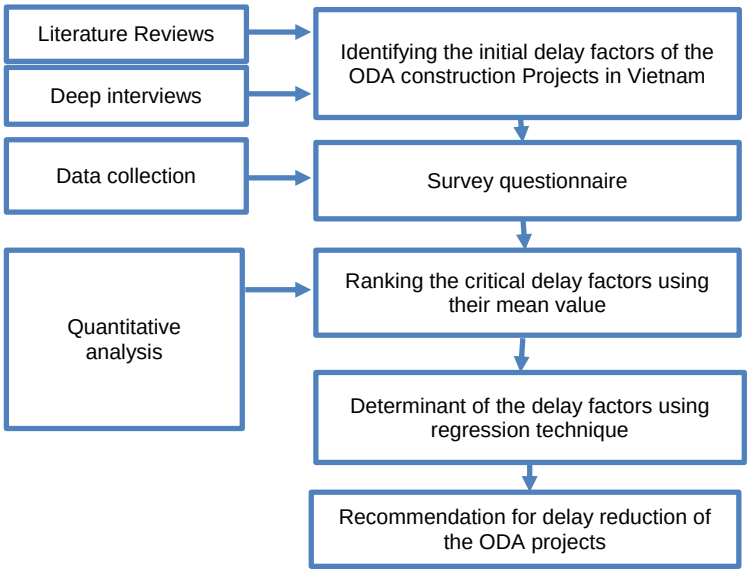

Fig 1. *Research framework*

To identify the critical causes leading to time overruns of the ODA construction projects, we intend to use both qualitative and quantitative methods. The analytical framework for this study is illustrated in Figure 1.

As shown in Figure 1, the paper first uses qualitative methods to identify the main causes of the delay in the ODA construction project. We survey a considerable number of the empirical studies in the literature to outline the primary causes of the delay. These primary causes then we continues to revise and complement based on a large number of deep interviews with the managers and experts in the past and current ODA construction projects. The officially identified causes of the delay are presented in Table 1.

The questionnaire survey then is designed to collect the primary data from 50 ODA construction projects in Vietnam from 2007 to 2015. In the questionnaire, the top managers of each the ODA construction project are asked to rank the relative importance of each identified cause in explaining the delay of the ODA construction project that they have implemented, using the five-point scale (1 = none importance, 2 = minor importance, 3 = medium importance, 4 = moderate importance, and 5 = most importance). Table 3 describes the main profile of responders in our dataset. We first remark that to provide the reliable results, our sample is collected randomly from the multiple ODA construction projects in different mega cities of Vietnam. In addition, to have a comprehensive view of the critical causes of the delay, our responders are chosen based on multiple criteria, such as professional education, professional positions, and experience project management as shown in Table 2. More specifically, the responses of the ODA construction projects are involved: (1) Project Manager (12%), professional expert (14%), representative of donor (18%), involving staff of state government department (30%) and representative of contractor (26%). the most of responses is from master (37%) and undergraduate (41%). In terms of the participant experience, the rate of responses, which has more than 11 years of the work experience in project management, is approximately 71%.

TABLE I. THE MAIN CAUSES OF ODA CONSTRUCTION PROJECT DELAYS IN VIETNAM

Variables	Critical Factors	Critical Factor Explanation
PL	**Vietnamese legal system**	
PL1	Regulations of construction, finance and other areas are inconsistent	• Technical standards for urban railway system are uncompleted • Emergent cases related to cost overrun are not mentioned in published regulations • Regulations for cost control have been applied for both kinds of projects which are sponsored by state budget and ODA loans • Taxation regulations are unclear and insufficient
PL2	Changes in regulations and delays in the issuance of implementing guidelines	• Publishing regulations is unable to keep up with requirements in practical, which causes many difficulties when applying them
PL3	Changes of capital allocation and relending policy between the central state and local government	• The local government must re-lending ODA loans from the state government at higher interest rate, with short period. This changes will produce negative pressure to project which is reliant mainly on ODA loans
PL4	Cost control activities, payment procedures and exchange rates	• The currency used for contract payment is decided by sponsors while Vietnam Dong used for taxation payment process. Thus, payment duration heavily depends on consideration period among parties, associated to capital expense and exchange rate. • Payment to contractors was delayed due to financial constraint on the part of the implementing organization and payment of custom duties was delayed. • The local currency portion supposed to be taken care of by the local government came to be in short supply.
HH	**Cooperation and communication between state government and donors**	
HH1	Lending and receiving, adjusting and supplementing loans processes	• Much time spend to satisfy all regulations identified by involving parties to ensure their expense is approved
HH2	Donors' involvement in bidding process, contract implementation, environmental management and funds usage.	• Donors often require Vietnamese government follow their regulations and demands even though some of them are not consistent with Vietnamese regulations. Therefore, several meetings arranged to make the agreement between parties before start of construction work.
BT	**Land Clearance and Infrastructure Relocation**	
BT1	Local communities' support to ODA projects	• Some ODA projects do not meet local community expectations, site clearance cannot be implemented smoothly in short period

BT2	Social security policies relating to site clearance compensation, resettlement of local residents and vocational guidance	• Setting up reasonable price unit for site clearance compensation and producing solutions to support household economic sectors affected by site clearance contribute significantly to project delays
BT3	Relocation of technical infrastructure	• Relocation of technical infrastructure often takes amount of time. Some of them may remain in construction site. • In the case of special technical infrastructure such as power transmission line and water supply pipe, they must be experienced assessment and approval process associating with technical design and quality control during the relocating process
BT4	The compatible between master urban plan and infrastructure plan	• Inaccurate land management and usage • Inaccurate survey and design
KT	**Project Technical Issues**	
KT2	The quality of project design	• Much time spent for forestry environmental impact assessment • There are design changes (changes in the positions of base, position of stations, crossing structure) • The project scope is changed because of other civil engineering construction works of higher urgency are prioritized
KT2	Lack of operation capacity of contractor	• Contractors do not have enough required experiences, so their works are not completed as schedule. • Much time is consumed to obtain the approval of authority parties relating to the procedure of retender and employment of new contractor • Contractors lack of deep understanding associating to project characteristics such as project context
KT3	Project database systems	• Project database system is not totally completed. Administrative work has not been paid sufficient attention, so there is much dissimilarity in project management process between the donors, local government and contractors
KT4	Geological features, population density	• Works delayed due to difficulties relating to the soft ground not initially expected. • The start of construction works were delayed due to additional geological surveys • Dense population has affected on construction solutions, traffic coordination plan and occupational safety plan
KT5	Construction technology	• New operating technology and high technology equipment used are imported from foreign countries, so much time consumed to training and technology transfer. • Project schedule partly depends on equipment supply process
TC	**Project Financial Issues**	
TC1	Capital allocation	• Capital allocation does not keep up with practical schedule and ODA disbursement progress • Capital demand is rearranged for every single year, so much time is consumed to obtain the approval relating to capital allocation of authority parties

TC2	Fluctuations in exchange rates and inflation	• Due to long project duration, exchange rates and inflation can raise material cost. Much time consumed for approval procedures of costs arising from procurement of construction materials
TC3	Mobilizing additional funding	• Some donors have faced difficult economic conditions, which lead to a decline in financing for Vietnamese infrastructure projects • Due to project scope changes and additional work, the total capital increase significantly. Much time needed to mobilizing additional funding
NL	**Project Human Resource**	
NL1	Qualified human resources	• Lack of highly qualified experts for ODA project
NL2	• Work quality and productivity	• Qualification of staff is not similar, which is seen as constraints for team work, coordination between departments. This issue directly affects on project schedule
NL3	Working skills	• Working skills relating to use foreign language, supporting management software usage and approach high technology of project member are limitations. Thus, project information is not transferred smoothly among parties • Poor change management skills produce constraints to update new policies and adjustments effectively

TABLE 2. PARTICIPANT DEMOGRAPHICS

Characteristics	Categorization	Percentage
Position	Project manager	12%
	Professional expert	14%
	Donors' representative	18%
	Assigned staff of State department	30%
	Assigned staff of contractor	26%
Education background	Professor	10%
	Doctor	12%
	Master	37%
	Undergraduate	41%
Work experience	Less than 5 year	12%
	6-10 years	17%
	11-15 years	31%
	More than 15 years	40%

B. Empirical model

Our purpose is to not only identify the root causes of ODA construction project delays but also to rank the relative importance of them. To obtain these purposes, the collected data then is used to rank the relative importance of each cause based on their mean score. Furthermore, it is striking to note that these identified causes can be interconnected and simultaneously impact on the schedule delay of the ODA project. This poses a challenge in ranking the root causes of the schedule delay. To overcome this,

we propose to use Explanatory Factor Analysis (EFA) technique. The EFA is a multivariate statistical method used frequently to explore the underlying structure of a large number of variables or to uncover the hidden theory behind the observed data [9] Therefore, EFA technique employed to uncover the hidden theoretical structure of the identified causes attributing the delay of the ODA construction project.

Furthermore, to provide a reliable result of ranking the relative importance of each cause, a regression model developed. This model has two benefits. First, it allows us to test the hypothesis of whether the identified causes actually affect the delays of the ODA construction project based on statistical inference. Second, this model is able to quantify how much each identified cause explains time overruns of ODA construction projects. Therefore this model is valid in ranking the relative importance of each identified cause leading the schedule delay. The empirical regression model is presented as follow:

$$\text{Log(MD)}_i = \beta_0 + \sum_{i=1}^{8} \beta_k F_i + u_i \qquad (1)$$

Where MD_i is a vector of the dependent variable, measuring the numbers of months that the ODA construction project i is delayed. F_i are the matrix of the identified factors explaining for the delay of the ODA construction project i. These factors are extracted by the EFA method. u_i are the error terms.

IV. EMPIRICAL RESULT AND DISCUSSION

A. Ranking the delay causes of the ODA construction project: the mean score approach

Table 3 describes the ranking of the each identified cause of the schedule delay of the ODA construction project in Vietnam using their mean score. As shown in Table 3, the shortage of technical component of project, including poor quality of project design, lack of operation capacity of contractors, difficulty of geological features and population density, is identified as the most important cause of project delays. Second, the empirical result shows that the cooperation and communication component, including lending and receiving, adjusting and supplementing loans processes, donors' involvement in bidding process, contract implementation, environmental management and funds usage, has a large impact on the schedule delay of the ODA construction project in Vietnam. Third, quality of human resource of the project related to quality of manager, worker, and productivity has a crucial role in ensuring the schedule of the ODA project. Finally, the difficulty in land clearance and infrastructure relocation can induce a huge delay of the ODA construction project.

B. The explanatory factor analysis for the identified causes of the ODA construction project

The EFA technique is used in order to explore the hidden underlying structures among the identified causes of the schedule delay, and its result is provided in Table 4. Before discussing the result of the EFA, we first evaluate the validity of our EFA model using some criteria suggested by the literature. As shown in Table 5, The Kaiser-Meyer-Olkin (KMO) index reports at 0.65, which was higher than the criteria of 0.5 as recommended by Jr, et al. [9]. Furthermore, the Bartlett's Test of Sphericity is statistically significant at 1% level [9]. These figures demonstrate that our EFA model is valid and reliable.

Turing to the result of the EFA, it shows that there are the six factors extracted from 21 initial identified causes, with their loading coefficients > 0.5 [9]. In addition, the six extracted factors explain a large ratio of the total variance of the initial variables, approximately 70.45% as shown in Table 5. More specifically, the factor 1 is constituted by 5 initial identified causes, including KT1, KT2, KT3, KT4, KT5, and we named this factor as "Project Technical Issues". The factor 2, including the NL1, NL2, NL3, is named as "Project Human Resource". The factor 3 is combined by the PL1, PL2, PL3, PL4, and we name this factor as "Government Legal System". The factor 4 is included the TC1, TC2, TC3, and is named as "Project Financial Issues". The factor 5, including the BT1, BT2, BT3, BT4, is labeled as "Land Clearance and Infrastructure Relocation". The final factor is constituted by the HH1, HH2 and called "Cooperation and Communication"

C. The ranking of the critical causes of the schedule delay: the regression analysis approach

To gain a deep insight into the root causes of the schedule delay of the ODA construction project, we continue to employ a regression model as described in equation (1) above. As noted above, the regression model can have two benefits. First, it allows testing the hypothesis of whether the identified causes have a significant effect on ODA project delays based on statistical inference. Second, it can quantify how much each identified cause explains the schedule delay of the ODA construction project, which is robust in ranking the relative importance of each identified cause of the schedule delay.

The result of the regression model is presented in Table 5, where the dependent variable is measured the numbers of the months that a ODA construction project is delayed, and the explanatory variables are the six factors extracted by the EFA method. It is striking to note that the six extracted factors summarize all the information of the initial identified causes of the schedule delay. We first note that all the coefficients of the six extracted factors are statistically significant. In other words, these factors are identified the common causes of the schedule delay of the ODA construction project. However, the level of the effect of each extracted factor on the schedule delay is very different. Comparing the magnitude of the estimated

coefficients in Table 5, we find that the human resource of project is the first most important cause of the schedule delay of the ODA construction project. For example, the deficiencies in human resource of project can lead the project schedule to overrun by 27.4%. This result is highly statistically significant at 1% level. The second most cause of the delay of the ODA construction project is the deficiencies in technical issues of project. This is demonstrated in Table 5, in which the deficiencies in technical issues of project can induce the schedule of the ODA project to overrun by approximately 22.2%. This result is also statistically significant at 1% level. Similarly, the government legal system and cooperation and communication are identified as the third and four most common cause of the delay of the ODA construction project. The inefficient government legal system and weak cooperation and communication among partners can cause for the project schedule to extend by 19% and 15% respectively. The last two causes are the financial issues of project and land clearance and infrastructure relocation. Their deficiencies can cause for the project schedule to delay by 14.8% and 13% respectively.

V. CONCLUSION

This paper investigates the critical causes of the schedule delay of the ODA construction project in Vietnam based on both qualitative and quantitative approaches. Our empirical result first shows that six factors, including lack of human resource of project, deficiency of technical issues of project, lack of cooperation and communication, weak government legal system, difficulties in land clearance and infrastructure relocation, and delay of provision of finance, are identified as the root causes for the time overrun of the ODA construction project. Second, comparing among the causes, we find that low quality of human resource of project and deficiency of technical issues of project such as quality of project design, capacity of contractors, geological features, and population density are emerged as the first and second most common causes for the schedule delay of the ODA construction project. To ensure the ODA construction project will be carried out on schedule, several recommendations are produced. Firstly, quality and productivity of human resources should improve by several ways. For example, training workshops should be taken placed regularly, which will enrich knowledge, experience and working skill to all project members. Furthermore, responsibilities and rights of all participants should be identified clearly in detail. Secondly, authorized parties should establish detailed criteria regarding experience, knowledge, construction technology and other sources such as equipment for contractor selection to make sure that selected contractor has enough capacity to conduct project. Improving communication and cooperation among parties including donors, state government, contractors and communities is a good solution to avoid misunderstanding and overlap. Importantly, solutions related to project survey, engineering, procurement and construction should be assessed carefully and approved by authorized participants.

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TABLE 3. RANKING THE MAIN CAUSES OF THE ODA CONSTRUCTION PROJECT DELAYS IN VIETNAM

Variables	Explanation	Mean	Ranking
KT4	Geological features, population density	3,87	1
HH2	Donors' involvement in bidding process, contract implementation, environmental management and funds usage	3,79	2
KT1	The quality of project design	3,67	3
KT2	Lack of operation capacity of contractor	3,64	4
KT3	Project database systems	3,56	5
KT5	Construction technology	3,54	6
HH1	Lending and receiving, adjusting and supplementing loans processes	3,53	7
NL1	Qualified human resources	3,50	8
BT2	Social security policies relating to site clearance compensation, resettlement of local residents and vocational guidance	3,41	9
NL2	Work quality and productivity	3,41	10
BT3	Relocation of technical infrastructure	3,39	11
NL3	Working skills	3,36	12
TC1	Capital allocation	3,24	13
BT1	Local communities' support to ODA projects	3,17	14
BT4	The compatible between master urban plan and infrastructure plan	3,16	15
PL4	Cost control activities, payment procedures and exchange rates	3,16	16
TC2	Fluctuations in exchange rates and inflation	3,07	17
PL1	Regulations of construction, finance and other areas are inconsistent	3,04	18
TC3	Mobilizing additional funding	2,93	19
PL2	Changes in regulations and delays in the issuance of implementing guidelines	2,87	20
PL3	Changes of capital allocation and relending policy between the central state and local government	2,70	21

TABLE 4. THE DELAY FACTORS EXTRACTED BY EFA

	Factors					
Variables	**1**	**2**	**3**	**4**	**5**	**6**
KT4	.858					
KT1	.831					
KT3	.790					
KT5	.754					
KT2	.750					
NL1		.875				
NL2		.852				
NL3		.829				
PL4			.849			
PL2			.804			
PL1			.803			
PL3			.741			
TC1				.857		
TC3				.826		
TC2				.773		
BT1					.792	
BT2					.789	
BT4					.723	
BT3					.711	
HH1						.837
HH2						.824
KMO	0.65					
Eigenvalue	1.525					
Explained Variances	70.45%					
Pro(Bartlett)	0.000					

TABLE 5. THE EFFECT OF FACTORS ON ODA CONSTRUCTION PROJECT DELAYS

Dependent variable: Log(Monthly Delay)		
Variable	**Coefficients**	**Ranking**
Constant	–.760	
	[0.407]	
Project Technical Issues	.222***	2
	[0.055]	
Project Human Resource	.274***	1
	[0.047]	
Government Legal System	.190***	3
	[0.058]	
Project Financial Issues	.148***	5
	[0.053]	
Lan Clearance and Infrastructure Relocation	.130**	6
	[0.052]	
Cooperation and Communication	.158***	4
	[0.053]	
Observations	150	
R-square	0.525	

Note:

1. *** and ** denote the significance at 1% and 5% level, respectively
2. The values in square bracket are robust standard errors