UNRAVELING THE FACTORS AND IMPLICATIONS OF DELAYS IN URBAN DEVELOPMENT PROJECTS: A CASE STUDY OF BINH DUONG PROVINCE, VIETNAM

Bui Viet Thi[1], Bui Manh Hung[2], Do Thi Ngoc Tam[3], Nguyen Quoc Toan[4]*, Tran Ngoc Phu[5]

[1] Center of Construction Inspection and Consulting, Thu Dau Mot University, Urban Management Faculty, Hanoi Architectural University.
Email: thibv@tdmu.edu.vn
[2] Urban Management Faculty, Hanoi Architectural University.
Email: buimanhhung1150@gmail.com
[3] Architectural Faculty, Thu Dau Mot University.
Email: tamdtn@tdmu.edu.vn
[4] Faculty of Construction Economics and Management, Hanoi University of Civil Engineering.
Email: toannq@huce.edu.vn
[5] Urban Management Faculty, Hanoi Architectural University.
Email: Tranngoc_phu2003@yahoo.com

ABSTRACT: This article includes a detailed study with the objective to investigate the variables and effects associated with delays in urban development projects within Binh Duong Province, Vietnam. The research methodology employed in this study encompassed the administration of surveys to a sample size consisting of 486 experts and experienced firms. This approach was complemented by extensive literature reviews and the use of comprehensive questionnaires. The evaluation of project effectiveness involved the utilization of advanced data analysis tools, namely the Relative Importance Index (RII), Net Present Value (NPV), and Cost-Benefit ratio (B/C). The study's findings elucidate five notable variables that lead to project delays in Binh Duong Province: The discussion pertains to the unsuitable nature of the plans, the managerial capabilities, financial aspects, human resource considerations, and the intricate nature of the projects. The previously mentioned standards have been recognized as crucial elements necessitating focused efforts and enhancements in order to optimize project efficiency and mitigate delays. The study also emphasizes the financial ramifications of building delays on firms in the industry. More specifically, the findings suggest that delays accounting for 15% to 39% of the overall duration of civil projects and 8% to 39% of the overall duration of traffic projects can lead to significant financial losses for contractors. The results of this study highlight the importance for construction companies to carefully evaluate the effectiveness of their investments by considering the significant effects of delays. This will allow them to make well-informed choices when selecting projects. In all aspects, this study offers valuable insights into the various elements that exert influence on the occurrence of delays in urban development projects within Binh Duong Province. By comprehending these characteristics and their ramifications, contractors and stakeholders are able to employ efficacious tactics to alleviate delays, optimize project management methodologies, and choose appropriate projects that guarantee investment efficiency.

Keywords: Urban development projects, delays, Binh Duong province, Vietnam, Relative Importance Index (RII), Net Present Value (NPV), Cost-Benefit ratio (B/C), investment efficiency.

1. Introduction

The province of Binh Duong in Vietnam is currently undergoing a significant process of urbanization and infrastructure development. However, similar to several locations experiencing such expansion, the issue of delays in urban development projects has emerged as a significant worry. The previously mentioned delays have a significant impact on multiple stakeholders and impede the general advancement and well-being of the region. Gaining an understanding of the various variables that contribute to these delays and comprehending their ramifications is crucial for the successful implementation of project management strategies and the promotion of sustainable development. This article incorporates a comprehensive study with the objective to investigate the variables and repercussions associated with delays in urban development projects within Binh Duong Province. The current research offers a comprehensive examination of the primary factors that contribute to project delays and evaluates their implications for construction firms. By probing into these issues, it sheds light on the intricate and multifaceted nature of the construction sector within this particular location.

In order to conduct this study, a comprehensive survey was undertaken, encompassing a total of 486 professionals and established enterprises with substantial expertise in the field. By conducting literature studies and administering detailed questionnaires, researchers were able to determine the ranking of 21 characteristics that have an impact on the delays experienced in urban development projects. Critical variables that demand attention and improvement to boost project efficiency and prevent delays include factors such as inadequate planning, managerial capacity, financial resources, human resources, and project complexity. The comprehension of these elements provides construction companies and stakeholders with the ability to actively confront

the fundamental reasons for delays, resulting in enhanced decision-making processes and superior project outputs.

Moreover, this study addresses the financial considerations pertaining to building firms, extending its scope beyond the mere identification of causes contributing to delays. The findings indicate that delays in civil projects, accounting for 15% to 39% of the overall time, and in traffic projects, accounting for 8% to 39% of the overall time, can lead to significant financial losses for contractors. These comprehensive analyses allow contractors to carefully evaluate the effectiveness of investments by considering the significant effects of delays, so benefiting in the identification of appropriate projects.

The results of this study have practical consequences for professionals in project management, construction companies, and policymakers engaged in urban development projects. Through the examination and acknowledgment of the specific causes that contribute to delays in projects, stakeholders can implement methods that are helpful in optimizing project management practices, reducing delays, and enhancing the efficiency of investments.

This research contributes a valuable contribution to the ongoing scholarly conversation surrounding urban development in Binh Duong Province, Vietnam. This research endeavors to offer a thorough comprehension of the various elements that contribute to project delays and their associated consequences. Its objective is to provide guidance to decision-makers in adopting sustainable development practices, thereby promoting the ongoing expansion and prosperity of the region.

2. Literature Review

Many research studies conducted on various projects have undertaken an examination of project delays with the aim of identifying their underlying causes and devising strategies to mitigate their occurrence. These research investigations offer significant insights into the various elements that contribute to project delays and the subsequent financial ramifications.

In their study, Acebes, Pajares, and López-Paredes (2021) demonstrated the utilization of sophisticated classification and regression methodologies in the context of project management. Specifically, their research centered on the effective monitoring and control of project time and expense. (Acebes et al., 2021). In their comprehensive study, Heravi and Mohammadian (2017) examined the issues of cost overruns and delays in urban development projects in emerging nations. Based on the available data pertaining to emerging nations, including but not limited to Indonesia, United Arab Emirates, Saudi Arabia, Malaysia, Nigeria, and Iran, the researchers have arrived at the following conclusion: construction endeavors within these developing countries have persistently encountered challenges associated with issues of overcrowding, escalating costs, and protracted delays (Heravi & Mohammadian, 2017). In the research carried out by Abdussalam Shibani (2015), an examination was undertaken to identify and analyze the various elements that contribute to time and cost overruns in building projects within the context of Egypt. The aims of the study were successfully accomplished by employing a quantitative methodology that involved the utilization of valid questionnaires and online interactions with various stakeholders, including owners, consultants, contractors, and project management organizations. A total of sixty-three responses were obtained from individuals representing various roles within the construction sector in Egypt, including owners, consultants, project managers, and office engineers. The data collected in this research were subjected to analysis employing index weights, descriptive statistics, and correlation coefficients (Shibnai & Salah, 2015). The survey findings, which were assessed in terms of their perceived significance, indicated that there were five key factors contributing to the project's construction time exceeding the planned duration. These factors include inadequate labor productivity, insufficient communication and coordination among involved parties, instances of bribery, delays in disbursement processes, alterations in work orders, and a deficiency in workers' skill levels.

Furthermore, numerous researches have been conducted to examine the various aspects that influence the advancement of projects, encompassing both financial and temporal deviations. In their study, Odediran, Adeyinka, and Eghenure (2012) examined the various factors that impact the successful completion of construction projects in Nigeria. These factors were categorized into three distinct groups: factors occurring prior to contract signing, factors occurring after contract signing, and elements that are commonly observed throughout the project lifecycle (Odediran et al., 2012). Shete and Kothawade (2016) examined the occurrence of cost and schedule overruns in building projects within the Indian context. In their study, Naveenkumar and Prabhu (2016) explored the many factors that contribute to cost overruns and schedule delays in building projects implemented in India. Shah (2016) investigated the factors contributing to project delays and cost overruns in three countries: Australia, Malaysia, and Ghana (Shah, 2016). In another study conducted by Hamed Samarghandi et al. (2016), an investigation was undertaken to examine the factors contributing to delays and cost overruns within the context of Iran (Samarghandi et al., 2016).

According to the findings of KV, V, and Bhat (2019), the primary factors leading to delays in Indian construction projects are related to finance. The study emphasizes the significance of issues such as delayed payments and design modifications. The findings of the study yielded valuable insights into the factors contributing to project delays across different project types in India. Additionally, the study proposed solutions for mitigating these delays, which can be applied not just in India but also in other developing countries as well (KV et al., 2019). A research investigation undertaken by Shrivas and Singla (2022) examined the crucial elements that contribute to delays in construction projects in India. The study uses the interpretive structural modeling approach to identify twelve critical components and their interrelationships. The findings of the study indicate that delays in building projects can be attributed to the absence of appropriate construction methods and sequencing. The model utilized in the study yielded valuable insights pertaining to the implementation of efficient techniques for mitigating delays. These strategies encompassed various domains, including project management planning, contract strategy, and site management (Shrivas & Singla, 2022).

Durdyev and Hosseini (2020) conducted an extensive literature analysis encompassing 97 papers, wherein they identified a total of 149 factors contributing to delays in construction projects. The investigation unveiled several prevalent variables, including deficient communication, insufficient planning, budgetary constraints, and material scarcity. These findings offer a significant comprehension of the critical domains that necessitate attention in order to mitigate delays in building projects (Durdyev & Hosseini, 2020). Adam, Josephson, and Lindahl (2015) conducted a systematic review in order to examine the occurrence and rationale behind cost and time overruns in big construction projects, with a specific focus on the viewpoint of the customer. This research investigated and demonstrated the impacts of cost overruns and extended time delays. The objective of the study was to provide insights into the interconnectedness of these aspects and the influence of customers on the criteria of cost, time, and sustainability (Adam et al., 2015).

Although previous research has thoroughly examined the factors contributing to project delays and cost overruns, there remains a dearth of analysis regarding the investment efficiency of firms responsible for implementing projects, specifically in the context of delays in urban development projects. This article examines and analyses the underlying factors contributing to delays, with the aim of assessing the detrimental effects associated with such delays. The main challenge at hand is the examination of investment efficiency for different types of building investment projects in metropolitan locations that experience delays. In addition, several offered solutions aim to reduce the delay of building investment projects in metropolitan areas and minimize financial losses incurred by investors and firms involved in project implementation.

3. Research Methodology

The paper employs a mixed methodology, incorporating both survey and analytical research approaches, to ascertain the various reasons that contribute to the delays observed in urban development projects. Additionally, it seeks to evaluate the adverse consequences incurred by construction firms in Binh Duong province as a result of these delays. In order to examine the primary factors contributing to project delays and evaluate the efficacy of investments in various project types, the authors conducted a comprehensive analysis utilizing a sample of 486 surveys, contracts, cost estimates, and progress tables. The implementation process encompasses several key steps, namely identifying the factors that contribute to construction delays, performing comprehensive surveys, analyzing the collected data, and subsequently rating these elements based on their significance. Also, an assessment of the investment efficiency is performed to evaluate the extent of harm resulting from the aforementioned construction delays.

Step 1: Select potential causes of construction delays in urban areas for assessment. The total of 21 factors affecting the delays were proposed by the research team, classified into 5 main groups as follows:

Table 1. Factors affecting the delays

Stageof project	Related group	Potential causes	Symbol	Source
Prepare to invest	Government	Delays in obtaining construction permits and problems related government	N1	(Aibinu & Odeyinka, 2006; Marzouk, El-Dokhmasey, & El-Said, 2008; Marzouk & El-Rasas, 2014; Sambasivan & Soon, 2007)
Do	Investor	The time of project implementation is not reasonable	N2	(Cox, 2007; Hai, Toan, & Van Tam, 2022; Toan, Thuy, et al., 2022)
		Too much adjustment during construction and unnecessary interventions	N3	(Toản & Thúy, 2021; Toor & Ogunlana, 2008)
		Late payment and settlement	N4	(Assaf & Al-Hejji, 2006; Hai et al., 2022; Toan, My, et al., 2022)
		Lack of finance	N5	(Dayı, 2010; Toan & Thuy, 2022)
	Construction unit	Lack of Management Capacity	N6	(Frimpong, Oluwoye, & Crawford, 2003; Sweis et al., 2008; Toan, Thuy, et al., 2022)
		Inappropriate construction plans and methods	N7	(Frimpong et al., 2003; Sweis et al., 2008; Toan, Thuy, et al., 2022)
		Incompetent subcontractors	N8	(Koushki, Al-Rashid, & Kartam, 2005; Sanni-Anibire, Mohamad Zin, & Olatunji, 2022)
		Lack of construction machinery or construction equipment is not modern	N9	(Khan & Gul, 2017; Odeh & Battaineh, 2002; Sambasivan & Soon, 2007)
		Lack of skilled human resources	N10	(Assaf & Al-Hejji, 2006; Grime & Wright, 2016; Van, Quoc, & Le Dinh, 2021)
	Advise unit.	Lack of design experience	N11	(Cox, 2007; Khan & Gul, 2017; Toản & Thúy, 2021)
		The drawing has many errors	N12	(Marzouk et al., 2008; Sanni-Anibire et al., 2022; Toan & Thuy, 2022)
		Insufficient surveying prior to project planning and design	N13	(Frimpong et al., 2003; Toan & Thuy, 2022)
		Drawings are slow to approve	N14	(Doloi et al., 2012; Marzouk & El-Rasas, 2014)
	Other factors	The coordination between the investor, the design unit and the construction unit are not smooth	N15	(Sanni-Anibire et al., 2022; Sweis et al., 2008)
		Lack of construction materials, or rare, hard to find materials	N16	(Al-Kharashi & Skitmore, 2009; Doloi et al., 2012; Toan, My, et al., 2022)
		Complexity and ambiguity of the project	N17	(Khan & Gul, 2017; Toor & Ogunlana, 2008)
		Weather element	N18	(Koushki et al., 2005; Toản & Thúy, 2021)
		Disease	N19	(Arditi, Akan, & Gurdamar, 1985; Grime & Wright, 2016)
		Clearance	N20	(Sambasivan & Soon, 2007; Van et al., 2021)
		Socio-economic characteristics of the project area	N21	(Dung, Toan, & Trang, 2021; Frimpong et al., 2003; Van et al., 2021)

Step 2: Survey and assess the delay status of urban works in Binh Duong province.

The purpose of the survey is to evaluate the magnitude of the elements that contribute to delays in construction projects. In order to accomplish this, an online questionnaire is taken into consideration. Participants are requested to evaluate every possible factor contributing to delays using a number rating system ranging from “1” to “5”. A rating of “1” signifies a non-severe or minimal impact, while a rating of “5” denotes the most severe or significant impact. The preferred technique for producing and conducting questionnaires was determined to be the Google Forms platform, based on a realistic methodology of random selection. This choice was made due to the platform’s broad usage and user-friendly design. A total of 1250 questionnaires were sent out in the format of an online survey, leading to the acquisition of 486 questionnaires, which corresponds to the intended sample size for analysis. The survey invitations have been distributed to a comprehensive list of individuals involved in building projects throughout Binh Dương province. This list encompasses project owners, consulting units, construction contractors, material supply contractors, and government offices.

Step 3: Rank the importance of factors causing delays.

Kometa, Olomolaiye, and Harris (1994) employed the relative importance index method to determine the significance of the cases and evaluate the impact of the delay (Kometa et al., 1994). This method is described by the following formula:

$$RII = \frac{\sum W}{A \times N} \quad (1)$$

In which: W is the weight that respondents choose for each factor and ranges from 1 to 5.

A is the highest level (i.e., 5 in this case).
N is the total number of respondents.
Step 4: Analyze the data

The survey was carried out over a period of 60 days. A total of 1250 individuals were selected to participate in the survey, out of which 486 valid and completed responses were received. Table 2 presents an overview of the data collected from the survey participants, encompassing their respective years of professional experience, educational background, and professional certifications. The findings have been outlined as follows :

Table 2. Description of information of the surveyor

Information	Quantity	Ratio %
Number of years of experience		
Less than 3 years	52	10,70
3 years-4 years	87	17,90
5 years-10 years	104	21,40
10 years-15 years	115	23,66
Over 15 years	128	26,34
Academic level		
High school	85	17,49
Colleges	121	24,90
University	248	51,03
After university	32	6,58
Working array		
Investor	146	30,04
Design unit	121	24,90
Construction unit	219	45,06
(Source: Authors)		

Based on the findings shown in Table 2, it can be observed that the respondents possess extensive professional experience and are engaged in diverse projects, project delivery methods, and project ownership. Additionally, it is worth mentioning that the respondents may be affiliated with different parties, such as owners, designers, or contractors. Therefore, the responses provided by these individuals exhibit a wide range of perspectives and are deemed to be reliable and precise.

Table 3. Rating table of factors affecting civil works

Factors affecting	Ratio of choosing person					RII	Rating
	1	2	3	4	5		
Delays in obtaining construction permits and problems related government	8	12	24	42	14	0,684	19
The time of project implementation is not reasonable	4	5	32	45	14	0,72	14
Too much adjustment during construction and unnecessary interventions	7	12	25	39	17	0,694	18
Late payment and settlement	5	8	19	30	38	0,776	6
Lack of finance	0	7	21	32	40	0,81	3
Lack of Management Capacity	1	4	18	35	42	0,826	2
Inappropriate construction plans and methods	2	5	15	20	58	0,854	1
Incompetent subcontractors	5	4	29	37	25	0,746	7
Lack of construction machinery or construction equipment is not modern	3	6	32	33	26	0,746	7
Lack of skilled human resources	1	2	25	41	31	0,798	4
Lack of design experience	5	10	36	23	26	0,71	15
The drawing has many errors	5	13	32	23	27	0,708	16
Insufficient surveying prior to project planning and design	5	11	30	25	29	0,724	12
Drawings are slow to approve	5	10	30	27	28	0,726	11
The coordination between the investor, the design unit and the construction unit are not smooth	5	9	29	25	32	0,74	10
Lack of construction materials, or rare, hard to find materials	5	10	29	21	35	0,742	9
Complexity and ambiguity of the project	2	8	29	19	42	0,782	5
Weather element	2	18	27	32	21	0,704	17
Disease	3	15	25	32	25	0,722	13
Clearance	2	22	32	31	13	0,662	21
Socio-economic characteristics of the project area	5	20	25	31	19	0,678	20
(Source: Authors)							

Table 4. Rating table of factors affecting traffic works

Factors affecting	Ratio of choosing person					RII	Rating
	1	2	3	4	5		
Delays in obtaining construction permits and problems related government	8	12	23	42	15	0,688	21
The time of project implementation is not reasonable	4	4	32	45	15	0,726	14
Too much adjustment during construction and unnecessary interventions	7	12	21	39	21	0,71	18
Late payment and settlement	5	8	19	32	36	0,772	6
Lack of finance	0	7	21	33	39	0,808	3
Lack of Management Capacity	1	4	18	35	42	0,826	2
Inappropriate construction plans and methods	2	5	15	21	57	0,852	1
Incompetent subcontractors	5	4	29	35	27	0,75	7
Lack of construction machinery or construction equipment is not modern	3	6	35	33	23	0,734	11
Lack of skilled human resources	1	2	25	41	31	0,798	4
Lack of design experience	5	12	32	23	28	0,714	17
The drawing has many errors	5	13	29	23	30	0,72	15
Insufficient surveying prior to project planning and design	5	11	28	25	31	0,732	12
Drawings are slow to approve	5	10	29	27	29	0,73	13
The coordination between the investor, the design unit and the construction unit are not smooth	5	9	29	23	34	0,744	8
Lack of construction materials, or rare, hard to find materials	5	10	29	21	35	0,742	9
Complexity and ambiguity of the project	2	8	29	21	40	0,778	5
Weather element	2	18	27	38	15	0,692	20
Disease	3	15	25	35	22	0,716	16
Clearance	1	12	27	35	25	0,742	9
Socio-economic characteristics of the project area	5	15	25	31	24	0,708	19

(Source: Authors)

Tables 3 and 4 present an overview of the elements that contribute to the delayed progress of civil works and technical infrastructure activities. The RII (Relative Importance Index) approach is employed to assess the magnitude of the causes contributing to the delay. Table 3 presents the Relative Importance Index (RII) values for the 20 criteria, as ranked by the respondents. A higher RII number indicates a greater level of importance for the factor in question. The findings indicate that the primary elements contributing to the observed outcomes are excessive order modifications and time-consuming decision-making processes carried out by proprietors, both of which exhibit values exceeding 0.70. Based on the findings presented in Table 3, it can be inferred that several aspects such as the planning elements and construction methods employed by the contractor, the contractor's financial difficulties, payment and settlement issues, as well as the availability of human resources, significantly impact the project's timeline and potential for delays. The survey findings exhibit an important resemblance in Table 4 with regard to traffic works and technical infrastructure.

Step 5: Evaluate the investment efficiency of the construction contractor when the project is delayed progress.

The primary elements influencing the progress of the project, which have the potential to impede its advancement, are identified by the writers based on the findings of the survey. The extent of the delay will have an impact on both the investment efficiency of the project and the profitability of the business. This study attempts to assess the investment efficiency of civil construction projects and transport infrastructure projects based on a specific formula (Heravi & Mohammadian, 2017):

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \cdots + \frac{CF_n}{(1+r)^n} = \sum_{t=0}^{n} \frac{CF_t}{(1+r)^t} \quad (3)$$

In which: CF_0: initial cost of the project.
CF_t : net cash flow at year/month *t*
r: interest rate or discount rate (%) (3%/year at bank deposit interest rate with maturity is not more than 2 months).

This study additionally evaluates the investment effectiveness of civil construction projects and transport infrastructure projects by examining the ratio between benefits and costs, as determined by a specific formula (Adam et al., 2015):

$$B/C = \frac{PV(B)}{PV(C)} = PI \quad (3)$$

In which: PI: profit index.

PV(B): current benefit price

$$PV(B) = \sum_{t=0}^{n} \frac{CiFt}{(1+r)^t} \quad (4)$$

PV(c): current cost price

$$PV(C) = \sum_{t=0}^{n} \frac{CoFt}{(1+r)^t} \quad (5)$$

CiFt: cash inflow

CoFt: cash out.

r: interest rate or discount rate (%) (3%/year at bank deposit interest rate with maturity is not more than 2 months).

Principle: Projects with PI>1 will be accepted for investment and vice versa projects with PI<1 will be rejected.

4. Analysis 0f Damage by Delay

The authors conduct an evaluation of the investment efficiency for two civil works. The educational institution under consideration is Minh Tan Secondary School, located in the Dau Tieng District of Binh Duong Province, Vietnam. Furthermore, the medical facility being referred to is the inter-ward medical station situated between Phu Hoa and Phu Loi wards, within Thu Dau Mot City, Binh Duong Province.

In the event of timetable delays, each project incurs supplementary expenses associated with material price fluctuations, increased management costs, machinery expenditures, and penalties imposed by the investor. The specific values are obtained by referring to the tables provided,

Table 5. Statistical of indicators of Minh Tan Secondary School
Unit: 1.000 VND

Time	1st	2nd	3rd	4th	5th	6th	7th (QT)	Sum
Turn over	3.813.551	4.999.504	9.503.826	6.273.435	6.317.802	4.305.513	1.755.999	36.969.631
Cost	3.614.740	4.738.867	9.008.366	5.946.384	5.988.438	4.081.055	1.664.454	35.042.304
Over balance (CFi)	198.811	260.638	495.460	327.051	329.364	224.458	91.545	1.927.327
NPV								1.892.062
PV(B)	3.794.578	4.949.882	9.362.683	6.149.519	6.162.199	4.178.578	1.695.750	36.293.189
PV(C)	3.596.757	4.691.831	8.874.581	5.828.928	5.840.946	3.960.738	1.607.346	34.401.127
B/C								1,06

(Source: Authors)

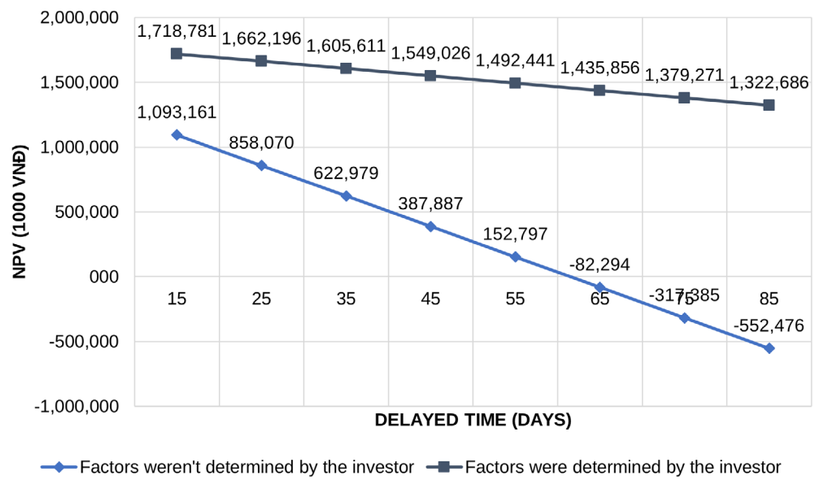

Figure 1. Value NPV versus each delay segment at Minh Tan secondary School
(Source: Authors)

Table 6. BC's calculation for each delayed stage at Minh Tan Secondary School
Unit: 1.000 VND

Delay progress (day)	15	25	35	45	55	65	75	85
PV(B)	36.293.189	36.293.189	36.293.189	36.293.189	36.293.189	36.293.189	36.293.189	36.293.189
PV(C)	35.200.028	35.435.119	35.670.210	35.905.301	36.140.392	36.375.482	36.610.573	36.845.664
B/C	1,03	1,02	1,02	1,01	1,00	0.99	0,99	0,99
(Source: Authors)								

Table 7. BC's calculation for each delayed stage at Minh Tan Secondary School
(Late due to factors from the investor)
Unit: 1.000 VND

Delay progress (day)	15	25	35	45	55	65	75	85
PV(B)	36.293.189	36.293.189	36.293.189	36.293.189	36.293.189	36.293.189	36.293.189	36.293.189
PV(C)	34.486.004	34.542.589	34.599.174	34.655.759	34.712.344	34.768.929	34.825.514	34.882.099
B/C	1,05	1,05	1,05	1,05	1,05	1,04	1,04	1,04
(Source: Authors)								

NPV 0 with 56 late days in Figure 1, and B/C 1 with 56 late days in Tables 6, and 7, respectively. Figure 1 and Table 7 exhibit the delayed project to investor factors that will be approved for investment.

By the same calculation for Phu Hoa-Phu Loi inter-ward medical station, we have the following result:

Table 8. Statistical table of indicators of Phu Hoa - Phu Loi inter-ward medical station
Unit: 1.000 VND

Time	1st	2nd	3rd	4th	5th (QT)	Sum
Turn over	2.646.300	2.530.200	2.528.504	2.197.720	690.315	10.593.039
Cost	2.508.341	2.398.294	2.396.686	2.083.147	654.327	10.040.795
Over balance (CFi)	137.959	131.906	131.818	114.573	35.988	552.244
NPV						543.388
PV(B)	2.629.863	2.498.867	2.481.681	2.143.625	669.141	10.423.177
PV(C)	2.492.762	2.368.594	2.352.304	2.031.872	634.257	9.879.788
B/C						1,06
(Source: Authors)						

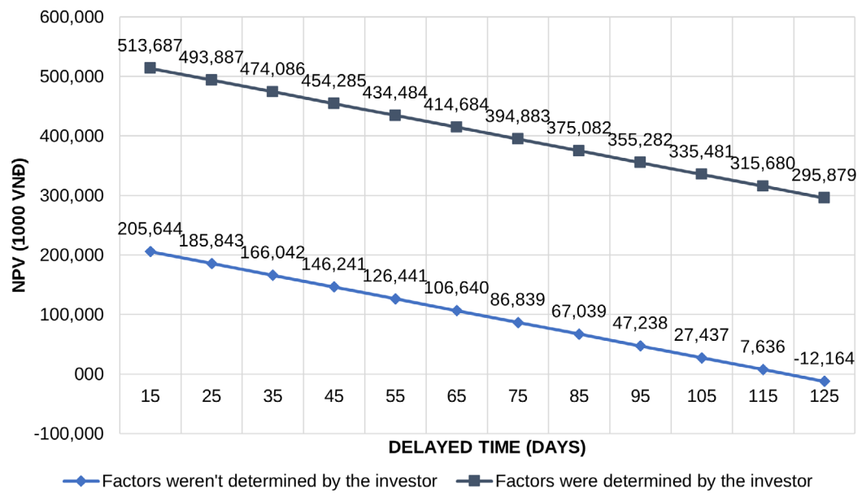

Figure 2. Value NPV versus each delay segment at Phu Hoa – Phu Loi inters – ward medical station
(Source: Authors)

Table 9. BC's calculation for each delayed stage at Phu Hoa - Phu Loi inter-ward medical station
Unit: 1.000 VND

Delay progress (day)	15	25	35	45	55	65	75
PV(B)	10.423.177	10.423.177	10.423.177	10.423.177	10.423.177	10.423.177	10.423.177
PV(C)	10.217.533	10.237.334	10.257.135	10.276.935	10.296.736	10.316.537	10.336.337
B/C	1,020	1,018	1,016	1,014	1,012	1,010	1,008
Delay progress (day)	**85**	**95**	**105**	**115**	**125**		
PV(B)	10.423.177	10.423.177	10.423.177	10.423.177	10.423.177		
PV(C)	10.356.138	10.375.939	10.395.740	10.415.540	10.435.341		
B/C	1,006	1,005	1,003	1,001	0,999		
(Source: Authors)							

Table 10. BC's calculation for each delayed stage at Phu Hoa - Phu Loi inter-ward medical station
(Late due to factors from the investor)
Unit: 1.000 VND

Delay progress (day)	15	25	35	45	55	65	75
PV(B)	10.423.177	10.423.177	10.423.177	10.423.177	10.423.177	10.423.177	10.423.177
PV(C)	9.909.489	9.929.290	9.949.091	9.968.892	9.988.692	10.008.493	10.028.294
B/C	1,052	1,050	1,048	1,046	1,043	1,041	1,039
Delay progress (day)	**85**	**95**	**105**	**115**	**125**		
PV(B)	10.423.177	10.423.177	10.423.177	10.423.177	10.423.177		
PV(C)	10.048.094	10.067.895	10.087.696	10.107.497	10.127.297		
B/C	1,037	1,035	1,033	1,031	1,029		
(Source: Authors)							

In Figure 2. NPV <0 with 119 late days, in Table 9, 10, B/C <1 with 119 late days. Figure 2. and Table 10 can show the delayed project by factors from investor will be accepted for investment.

Then, the authors conduct an evaluation of investment efficiency for 2 traffic works: District Committee Road - Dau Tieng District - Binh Duong Province and Road 4B- Dau Tieng District - Binh Duong Province. The results in tables 11, 12, 13, 14, 15 and 16 are shown as follows:

Table 11. Statistical table of indicators of District Committee Road
Unit: 1.000 VND

Time	1st	2nd	3rd	4th	5th	6th (QT)	Sum
Turn over	2.439.920	2.439.920	2.439.920	2.439.920	1.829.941	609.980	12.199.601
Cost	2.301.811	2.301.811	2.301.811	2.301.811	1.726.359	575.453	11.509.056
Over balance (CFi)	138.109	138.109	138.109	138.109	103.582	34.527	690.544
NPV							680.137,4
PV(B)	2.427.781	2.415.703	2.403.684	2.391.726	1.784.871	591.997	12.015.761
PV(C)	2.290.360	2.278.965	2.267.627	2.256.345	1.683.840	558.487	11.335.623
B/C							1,06
(Source: Authors)							

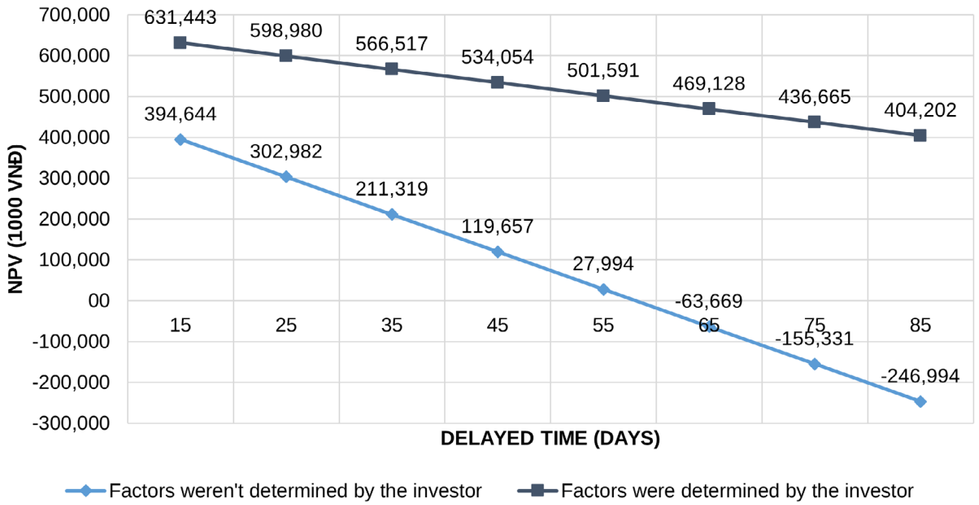

Figure 3. Value NPV versus each delay segment at District Committee Road
(Source: Authors)

Table 12. BC's calculation for each delayed stage at District Committee Road
Unit: 1.000 VND

Delay progress (day)	15	25	35	45	55	65	75	85
PV(B)	12.015.761	12.015.761	12.015.761	12.015.761	12.015.761	12.015.761	12.015.761	12.015.761
PV(C)	11.621.116	11.712.779	11.804.442	11.896.104	11.987.767	12.079.430	12.171.092	12.262.755
B/C	1,034	1,026	1,018	1,010	1,002	0,995	0,987	0,980
(Source: Authors)								

Table 13. BC's calculation for each delayed stage at District Committee Road
(Late due to factors from the investor)
Unit: 1.000 VND

Delay progress (day)	15	25	35	45	55	65	75	85
PV(B)	12.015.761	12.015.761	12.015.761	12.015.761	12.015.761	12.015.761	12.015.761	12.015.761
PV(C)	11.384.318	11.416.781	11.449.244	11.481.707	11.514.170	11.546.633	11.579.095	11.611.558
B/C	1,055	1,052	1,049	1,047	1,044	1,041	1,038	1,035
(Source: Authors)								

In Figure 3. NPV <0 with 56 late days, in Table 11, 12, B/C <1 with 56 late days. The Figure 3 and Table 12 can show the delayed project by factors from investor will be accepted for investment.

Table 14. Statistical table of indicators of 4B Road
Unit: 1.000 VND

Time	1st	2nd	3rd	4th	5th	6th (QT)	Sum
Turn over	1.484.247	2.968.494	3.710.617	3.710.617	2.226.370	742.123	14.842.468
Cost	1.400.233	2.800.466	3.500.582	3.500.582	2.100.349	700.116	14.002.328
Over balance (CFi)	84.014	168.028	210.035	210.035	126.021	42.007	840.140
NPV							826.443,7
PV(B)	1.476.863	2.939.030	3.655.510	3.637.323	2.171.536	720.244	14.600.506
PV(C)	1.393.267	2.772.670	3.448.594	3.431.437	2.048.619	679.476	13.774.062
B/C							1,06
(Source: Authors)							

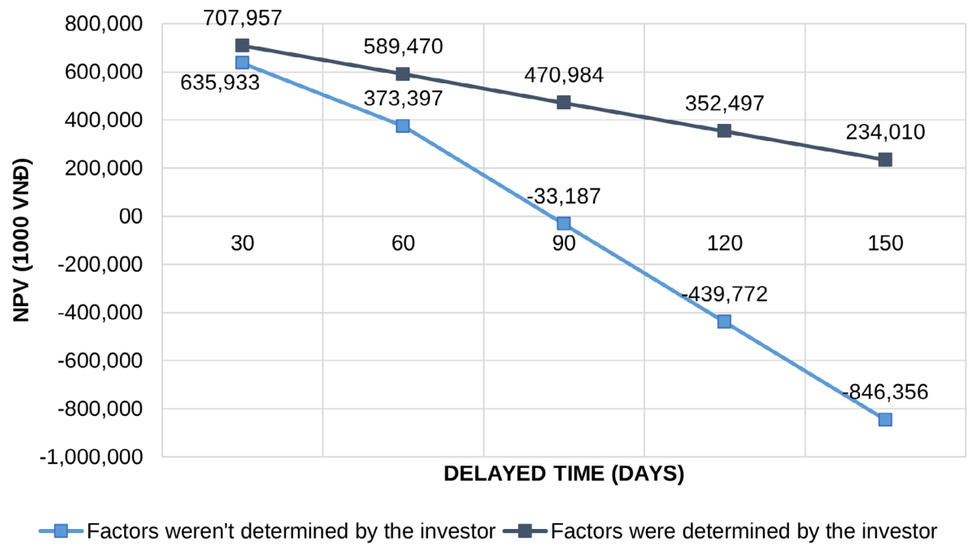

Figure 4. Value NPV versus each delay segment at 4B Road
(Source: Authors)

Table 15. NPV's calculation for each delayed stage of 4B Road
Unit: 1.000 VND

Delay progress (day)	30	60	90	120	150
PV(B)	14.600.506	14.600.506	14.600.506	14.600.506	14.600.506
PV(C)	13.964.573	14.227.109	14.633.693	15.040.277	15.446.862
B/C	1,046	1,026	0,998	0,971	0,945
(Source: Authors)					

Table 16. BC's calculation for each delayed stage at 4B Road (1000VND)
(Late due to factors from the investor)
Unit: 1.000 VND

Delay progress (day)	30	60	90	120	150
PV(B)	14.600.506	14.600.506	14.600.506	14.600.506	14.600.506
PV(C)	13.892.549	14.011.035	14.129.522	14.248.009	14.366.495
B/C	1,051	1,042	1,033	1,025	1,016
(Source: Authors)					

In Figure 4 NPV <0 with 82 late days, in Table 15, 16, B/C <1 with 82 late days. Figure 4 and Table 15 can show the delayed project by factors from investor will be accepted for investment.

Based on the data presented in Tables 5, 8, 11, and 14, it can be inferred that when the Net Present Value (NPV) is greater than zero (NPV > 0), the building progress is proceeding as planned and the investment is yielding positive outcomes. In the event of a delay in development, it can be observed from Figures 2, 3, and 4 that there will be a steady drop in investment efficiency as measured by the net present value (NPV). The drop in investment efficiency can be attributed to various factors, including the costs associated with penalizing the investor as stipulated in the initial contract agreement, as well as the expenses incurred in managing operations, maintaining machinery, procuring materials, and addressing labor inefficiencies. Accordingly, Minh Tan Secondary School

will experience a significant financial setback due to a delay of 56 days. Similarly, the Phu Hoa - Phu Loi Inter-ward Medical Centre has encountered a delay of 119 days, while the District Committee Road has seen a delay of 56 days. Additionally, the 4B Road has been delayed by 82 days.

With regard to the data presented in Figures 1, 2, 3, and 4, it is evident that when there is a delay in progress caused by contractor errors, the efficiency of investment experiences a significant decline in comparison to delays caused by variables unrelated to the investor.

The data shown in Tables 5, 11, and 14 indicate that there is no variation in the penalty cost relative to the contract. However, the administrative cost and machine costs exhibit changes. Hence, by implementing sound construction plans and employing appropriate construction methods, the aforementioned hazards can be reduced to a significant extent.

6. Discussion

The current study evaluated the variables influencing the occurrence of delays in urban development projects within the geographical context of Binh Duong province, Vietnam. This inquiry aims to clarify the primary causes that contribute to project delays, which can have substantial ramifications for the efficacy and financial viability of those initiatives. This section will provide a comprehensive analysis and interpretation of the findings obtained from the study. Additionally, this section addresses the practical consequences, acknowledges the limits of the present work, and proposes potential avenues for future research.

7. Implications

The impacts of the study's findings hold practical significance for contractors, businesses, and investors involved in urban development endeavors. The initial step involves identifying the primary categories of causes that contribute to delays. This process offers stakeholders useful insights into areas that may be targeted to address delays and enhance project efficiency. By taking proactive measures to address these factors, project managers have the ability to minimize delays, decrease related expenses, and improve the overall performance of the project.

Second, the study places significant importance on the financial consequences of delays, highlighting the necessity of precise cost estimation and risk evaluation throughout the process of project design and implementation. Contractors and investors must thoroughly evaluate the potential ramifications of project delays on profitability and exercise informed judgment when it comes to project selection and resource allocation. The implementation of project management solutions that effectively consider and address delays can significantly contribute to achieving improved financial outcomes for all relevant stakeholders. Contractors have the capacity to apply the findings in order to evaluate the potential ramifications of delays on their financial viability. The research emphasizes that delays in civil projects, ranging from 15% to 39% of the entire time, and delays in traffic projects, ranging from 8% to 39% of the total time, can result in significant financial losses. Equipped with this knowledge, contractors are able to make well-informed judgments on project selection and prioritization, taking into account the potential hazards that may arise from delays.

8. Limitations

This study offers significant insights into the factors that influence and impede urban development projects. However, it is important to recognize certain limitations associated with this research. The study experts utilize a sample size of 486 and experienced firms as their primary source of data, which may not adequately capture the full range of perspectives and interests of the various parties involved in these initiatives. Further research may benefit from the inclusion of a larger sample size in order to augment the generalizability of the results.

Secondly, the study examines significant survey-based data-gathering systems, which may be susceptible to response bias and limitations in response accuracy. By integrating supplementary data sources, such as project records and archival data, a more comprehensive comprehension of the causes that contribute to delays might be attained.

Finally, this study primarily focused on the province of Binh Duong in Vietnam. Hence, the extent to which the findings can be applied to other locations or countries may be constrained. Future research endeavors may involve examining various geographical regions in order to evaluate and contrast the elements that contribute to delays in urban development projects.

9. Directions for Future Research

In order to enhance the comprehension of aspects influencing urban development initiatives, future research endeavors may delve into the subsequent domains :

Comparative Analysis: The conduct of comparative research including several provinces or regions within Vietnam would facilitate the discernment of regional disparities in the determinants of delays. This approach acknowledges that project success can be influenced by various elements, which may differ based on the unique attributes of different locations, such as the presence of infrastructure, the capacity of the labor, or the regulatory frameworks in place. By comprehending these fluctuations, policymakers and practitioners possess the ability to customize strategies and solutions to particular situations, thereby efficiently tackling the distinctive issues encountered by each region.

Long-Term Effects: Conducting an investigation of the enduring impacts of delays on the sustainability and quality of urban development projects might yield significant insights. The primary focus of this study related to the immediate financial consequences associated with delays. However, it is crucial to acknowledge the wider repercussions that should be taken into account. Evaluating the environmental, social, and economic ramifications that surpass mere profitability can yield a comprehensive comprehension of the repercussions stemming from delays. One potential consequence of delays in infrastructure projects is the potential for an increase in carbon emissions or the disruption of the social fabric within communities. The comprehension of these enduring consequences might enhance the decision-making procedures and underscore the need for punctual project finalization.

The investigation of incorporating emerging technology, such as artificial intelligence (AI) and data analytics, into urban development projects has the potential to greatly improve the management and reduction of delays. Artificial intelligence (AI) and data analytics have the potential to facilitate predictive modelling, risk analysis, and decision-making procedures. For example, machine learning algorithms have the capability to examine past project data in order to detect patterns and forecast possible delays, enabling stakeholders to adopt preemptive actions. In addition, the utilization of real-time monitoring and data-driven insights has the potential to facilitate effective allocation of resources, optimization of schedules, and timely identification of concerns that have the potential to result in harm. Future research may explore the deployment and efficacy of these technologies in alleviating delays and minimizing damage in urban development projects.

By conducting an in-depth investigation into these specific areas of inquiry, scholars and practitioners have the opportunity to enhance their comprehension of the various elements that influence the occurrence of delays in urban development projects. This knowledge has the potential to influence decision-making based on evidence, improve practices in project management, and make significant contributions to the overall success and long-term viability of urban development programs.

10. Conclusions

The article provided a comprehensive analysis of the key causes contributing to delays in urban development construction projects within Binh Duong province, Vietnam. A prolonged delay in time results in a decrease in investment efficiency throughout project implementation. Enterprises engaged in the execution of urban development initiatives must meticulously identify the significant reasons contributing to project delays, particularly the faults attributable to the contractor. These variables contribute to significant cost losses. It might be argued that it is imperative to minimize risks for all individuals involved in order to enhance the quality of a project and provide advantages for the project's proprietor.

Delays in project completion can be linked to various factors, including issues pertaining to the planning and construction methods employed, design considerations, payment-related matters, and the quality of workmanship exhibited by the personnel involved. These errors have the potential to extend the duration of the project and have a negative impact on both the cost and the quality of the work. Several fundamental tips for preventing these problems include:

1) Should choose construction consulting firms with valuable experience and the capacity to execute numerous similar projects..

2) Regularly manage, update progress, and take appropriate measures.

3) The collaboration of investors, design professionals, and construction firms is a highly effective approach for efficiently addressing challenges.

4) The NPV numbers vary depending on the individual aspects of each project. If the duration of civil projects is extended from 15% to 39% of the overall project time, and the duration of traffic projects is extended from 8% to 39% of the whole project time, the contractor will experience a loss in profitability.

5) In the event that project progress is hindered by reasons attributed to the investor or delayed site

clearance, it is anticipated that the Net Present Value (NPV) will see a gradual reduction over time.

6) In the context of urban transport and technical infrastructure projects, the number of work items is significantly lower compared to civil projects. However, the execution of these projects is hindered by the intricate and challenging construction conditions arising from the impact of site clearance. This factor contributes to the delay of progress in comparison to civil projects.

7) The happening of a contractor's error leading to a delay in development can significantly diminish the efficiency of investment, in comparison to other elements emerging from the investors.

References

Acebes, F., Pajares, J., & López-Paredes, A. (2021). Statistical Learning Techniques for Project Control. In *Project Management and Engineering Research: AEIPRO 2019* (pp. 189-204). Springer. https://doi.org/10.1007/978-3-030-54410-2_14

Adam, A., Josephson, P.-E., & Lindahl, G. (2015). Implications of cost overruns and time delays on major public construction projects. In *Proceedings of the 19th International Symposium on Advancement of Construction Management and Real Estate* (pp. 747-758). Springer. https://doi.org/10.1007/978-3-662-46994-1_61

Aibinu, A. A., & Odeyinka, H. A. (2006). Construction delays and their causative factors in Nigeria. *Journal of construction engineering and management, 132*(7), 667-677. https://doi.org/10.1061/(ASCE)0733-9364(2006)132:7(667)

Al-Kharashi, A., & Skitmore, M. (2009). Causes of delays in Saudi Arabian public sector construction projects. *Construction Management and Economics, 27*(1), 3-23. https://doi.org/10.1080/01446190802541457

Arditi, D., Akan, G. T., & Gurdamar, S. (1985). Reasons for delays in public projects in Turkey. *Construction Management and Economics, 3*(2), 171-181. https://doi.org/10.1080/01446198500000013

Assaf, S. A., & Al-Hejji, S. (2006). Causes of delay in large construction projects. *International journal of project management, 24*(4), 349-357. https://doi.org/10.1016/j.ijproman.2005.11.010

Cox, R. F. (2007). The use of project specific websites as a virtual office. *Digital library of construction informatics and information technology in civil engineering and construction*. https://www.researchgate.net/profile/Robert-Cox-15/publication/228792656_The_Use_of_Project_Specific_Websites_as_a_Virtual_Office/links/00b7d515306d0414aa000000/The-Use-of-Project-Specific-Websites-as-a-Virtual-Office.pdf

Dayı, S. (2010). Schedule delay analysis in construction projects: A case study using time impact analysis method. In. Middle East Technical University. http://etd.lib.metu.edu.tr/upload/12612823/index.pdf

Doloi, H., Sawhney, A., Iyer, K., & Rentala, S. (2012). Analysing factors affecting delays in Indian construction projects. *International journal of project management, 30*(4), 479-489. https://doi.org/10.1016/j.ijproman.2011.10.004

Dung, N. T. T., Toan, N. Q., & Trang, V. P. L. (2021). Solutions To Promote Diversification Of Investment Capital For Road Transport Development In Vietnam. *International Journal of Economics and Finance Studies, 13*(2), 108-130. http://www.agbioforum.org/sobiad.org/menuscript/index.php/ijefs/article/view/774

Durdyev, S., & Hosseini, M. R. (2020). Causes of delays on construction projects: a comprehensive list. *International Journal of Managing Projects in Business, 13*(1), 20-46. https://doi.org/10.1108/IJMPB-09-2018-0178

Frimpong, Y., Oluwoye, J., & Crawford, L. (2003). Causes of delay and cost overruns in construction of groundwater projects in a developing countries; Ghana as a case study. *International journal of project management, 21*(5), 321-326. https://doi.org/10.1016/S0263-7863(02)00055-8

Grime, M. M., & Wright, G. (2016). Delphi method. *Wiley statsref: Statistics reference online, 1*, 16. https://doi.org/10.1002/9781118445112.stat07879

Hai, D. T., Toan, N. Q., & Van Tam, N. (2022). Critical success factors for implementing PPP infrastructure projects in developing countries: the case of Vietnam. *Innovative Infrastructure Solutions, 7*, 1-13. https://doi.org/10.1007/s41062-021-00688-6

Heravi, G., & Mohammadian, M. (2017). Cost overruns and delay in municipal construction projects in developing countries. *AUT Journal of Civil Engineering, 1*(1), 31-38. https://doi.org/10.22060/ceej.2017.12189.5163

Khan, R. A., & Gul, W. (2017). Emperical study of critical risk factors causing delays in construction projects. In *2017 9th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS)* (Vol. 2, pp. 900-906). IEEE. https://doi.org/10.1109/IDAACS.2017.8095217

Kometa, S. T., Olomolaiye, P. O., & Harris, F. C. (1994). Attributes of UK construction clients influencing project consultants' performance. *Construction Management and Economics, 12*(5), 433-443. https://doi.org/10.1080/01446199400000053

Koushki, P., Al-Rashid, K., & Kartam, N. (2005). Delays and cost increases in the construction of private residential projects in Kuwait. *Construction Management and Economics, 23*(3), 285-294. https://doi.org/10.1080/0144619042000326710

KV, P., V, V., & Bhat, N. (2019). Analysis of causes of delay in Indian construction projects and mitigation measures. *Journal of Financial Management of Property and Construction, 24*(1), 58-78. https://doi.org/10.1108/JFMPC-04-2018-0020

Marzouk, M., El-Dokhmasey, A., & El-Said, M. (2008). Assessing construction engineering-related delays: Egyptian perspective. *Journal of Professional Issues in Engineering Education and Practice, 134*(3), 315-326. https://doi.org/10.1061/(ASCE)1052-3928(2008)134:3(315)

Marzouk, M. M., & El-Rasas, T. I. (2014). Analyzing delay causes in Egyptian construction projects. *Journal of advanced research, 5*(1), 49-55. https://doi.org/10.1016/j.jare.2012.11.005

Naveenkumar, G., & Prabhu, V. (2016). Factors influencing time and cost overruns in construction projects. *International Journal of Innovative Research in Science, Engineering and Technology, 5*(4), 6468-6473. https://doi.org/10.15680/IJIRSET.2016.0504254

Odediran, S. J., Adeyinka, B. F., & Eghenure, F. O. (2012). A study of factors influencing overruns of construction projects in Nigeria. *Jornal of Architcture, Planning & Construction Management, 2*(2), 20-36. https://www.researchgate.net/publication/282247866_A_STUDY_OF_FACTORS_INFLUENCING_OVERRUNS_OF_CONSTRUCTION_PROJECTS_IN_NIGERIA

Odeh, A. M., & Battaineh, H. T. (2002). Causes of construction delay: traditional contracts. *International journal of project management, 20*(1), 67-73. https://doi.org/10.1016/S0263-7863(00)00037-5

Samarghandi, H., Mousavi, S., Taabayan, P., Mir Hashemi, A., & Willoughby, K. (2016). Studying the Reasons for Delay and Cost Overrun in Construction Projects: The Case of Iran. *Journal of Construction in Developing Countries, 21*(1), 51. http://hdl.handle.net/10388/11493

Sambasivan, M., & Soon, Y. W. (2007). Causes and effects of delays in Malaysian construction industry. *International journal of project management, 25*(5), 517-526. https://doi.org/10.1016/j.ijproman.2006.11.007

Sanni-Anibire, M. O., Mohamad Zin, R., & Olatunji, S. O. (2022). Causes of delay in the global construction industry: a meta analytical review. *International Journal of Construction Management, 22*(8), 1395-1407. https://doi.org/10.1080/15623599.2020.1716132

Shah, R. K. (2016). An exploration of causes for delay and cost overrun in construction projects: A case study of Australia, Malaysia & Ghana. *Journal of Advanced College of Engineering and Management, 2*(1), 41-55. http://doi.org/10.3126/jacem.v2i0.16097

Shete, A. N., & Kothawade, V. D. (2016). An analysis of cost overruns and time overruns of construction projects in India. *International Journal of Engineering Trends and Technology, 18*(1), 53-72.

Shibnai, A., & Salah, K. (2015). *Time and cost overrun in construction projects in Egypt*. https://www.researchgate.net/profile/Dr_Abdussalam_Shibani/publication

Shrivas, A., & Singla, H. K. (2022). Analysis of interaction among the factors affecting delay in construction projects using interpretive structural modelling approach. *International Journal of Construction Management, 22*(8), 1455-1463. https://doi.org/10.1080/15623599.2020.1728486

Sweis, G., Sweis, R., Hammad, A. A., & Shboul, A. (2008). Delays in construction projects: The case of Jordan. *International journal of project management, 26*(6), 665-674. https://doi.org/10.1016/j.ijproman.2007.09.009

Toan, N. Q., My, H. N. T., Tam, N. V., Anh, P. X., Hai, D. T., & Thuy, N. T. (2022). How do contractors select material suppliers for construction projects? Evidence from Vietnam. *Archives of Civil Engineering, 68*(3), 273-288. https://doi.org/10.24425/ace.2022.141885

Toan, N. Q., & Thuy, N. T. (2022). Hanoi urban transportation projects risk assessment. *Transportation Research Procedia, 63*, 2695-2702. https://doi.org/10.1016/j.trpro.2022.06.311

Toản, N. Q., & Thúy, N. T. (2021). Đánh giá rủi ro cho các dự án giao thông đô thị tại Hà Nội. *Tạp chí Khoa học Công nghệ Xây dựng (KHCNXD)-ĐHXDHN, 15*(3V), 177-185. https://doi.org/10.31814/stce.nuce2021-15(3V)-15

Toan, N. Q., Thuy, N. T., Hai, D. T., & Anh, P. X. (2022). Comparing the risk management standpoint between the project participants for the urban road transport projects in Hanoi. *Archives of Civil Engineering, 68*(2), 275-295. https://doi.org/10.24425/ace.2022.140642

Toor, S. U. R., & Ogunlana, S. O. (2008). Problems causing delays in major construction projects in Thailand. *Construction Management and Economics, 26*(4), 395-408. https://doi.org/10.1080/01446190801905406

Van, T. N., Quoc, T. N., & Le Dinh, L. (2021). An analysis of value chain in the Vietnam construction industry. *International Journal of Sustainable Construction Engineering and Technology, 12*(3), 12-23. https://penerbit.uthm.edu.my/ojs/index.php/IJSCET/article/view/8577