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The Cost Risk Implementation on Design-build Project of Integrated Public Spaces Child Friendly in Capital of Jakarta

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Abstract. Jakarta area of 662.33 km2 with a population of 10,075,030 inhabitants and green open spaces 9.98%. The Jakarta government built a child-friendly integrated open space as facilities for playing. Providing of facilities was hoped suitable with time, cost, quality, accountability and proper financial governance. Based on the PU ministerial regulation number 19/PRT/M/2015 on the standards and guidelines for procurement the design and construction work on the integrated build and the PU ministerial regulation No. 07/PRT/M/2011 on standards and guidelines for procurement of construction works and consulting services of public works and the ministry of housing. RPTRA development at 123 locations in Jakarta was implemented base on the contract of design and build. The design study was influenced by the cost elements; the main strength (expert), skilled personnel, support personnel, major equipment and support. The construction fee relies on; expert implementation, hardware implementation, preparation work, land, buildings, courtyards, fences, complementary and governance capabilities for human resources in completing the construction activities to minimize the cost risk. Montecarlo simulations was conducted to determine the average unit price, model and analyze systems. In the cost contract, the percentage of design work stipulated 2.5%, build 97.5%. Base on regulation the minister of public work for design work cost 2.72%, build 97.28%. Then, actual cost for design 2.67% and build 97.33%.From the three reference was shown that there are differentiation one another. The acceleration of planning able to make the cost and time more efficient that impact on the implementation margin.

INTRODUCTION

Background of the problem

Jakarta with an area of 662.33 km2 and population 10,075,030 people [1] required the ideal area of green open space (RTH) 30 percent [2] while owned by DKI 9.98 percent [3]. To realize the green space is required commitment of the government of the special region of the capital Jakarta ensuring the fulfillment of these requirements. The child friendly integrated public space (RPTRA) as an effort to support Jakarta green and become a city worthy of children. Furthermore, the function of RPTRA as a service not only to the community but also to other citizens and also functions as a disaster service. [4] Child friendly integrated public space as one form of community center in DKI Jakarta. [5]

Based on Presidential Regulation no. 4 of 2015 on the fourth amendment of Presidential Regulation No. 54 of 2010 concerning procurement of goods/services of government then RPTRA development in 123 locations in Jakarta implemented by the design & build system. The principle of construction of state building based on the principle and principles [1]:

1. Utilization, safety, balance and harmony/harmony of buildings with the environment.

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2. Efficient, not excessive, effective and efficient, and in accordance with the required technical requirements and requirements.
3. Focused and controlled according to program plan/work unit, and function of each institution/ institution owner/user of building structure.
4. To the maximum possible use of domestic production by taking into account national capability/potential. under the terms of the terms of reference(KAK) [1] then the available RPTRA facility shall consist of:
   - The building consists of: multipurpose room, management room, lactation room, PKK room, pantry, library, and toilet.
   - Integrated yard work consists of: garden work creation of nutritional pools, gardens, shallow infiltration wells, tree plant, garden lights and garden fences.
   - Sport facilities: sports field futsal/badminton, jogging track, theater and reflection lane.
   - Children playground: swings, seesaws, skates and soon.

The ability of design by experts and implementation of development should consider the aspects of construction experts, materials and equipment, to identify the above things then the necessary stages include [1]:

1. Planning preparation phase includes: conducting data collection and field information, including topography, programming, interpretation outline of terms of reference, conducting literature study and consultation with local government concerning local regulation/building permit and conducting presentation/discussion at the moment submission of reports.
2. Developing a basic plan includes: Developing a site plan, developing a building design (floor plan, viewing and cutting), Developing a basic design landscape, establishing a cost estimate outline, arranging a permit to obtaining information on city planning/advise planning, description of building and environmental requirements, and IMB introduction from local government and conducting presentation/discussion at the time of submission of report result.
3. The stages of developing the development plan include: Overall basic design development (architectural, structural, mechanical, electrical and landscape architectural drawings).
4. Implementation stage: Implement what has been developed in the design.

LIBRARY REVIEW

Green Open Space

In general, open spaces in urban areas consist of green open space and non-green open spaces. The urban green open space is part of the open spaces of an urban area filled with plants, plants and vegetation (endemic and introduced) to support ecological, socio-cultural and architectural benefits that can provide economic benefits welfare) for the people [17]. The more green space available, can improve responsiveness and public health, and the environment is more desirable. [19] Based on Jakarta Provincial Regulation No. 1 of 2014 about the detailed spatial plan (RDTR) and zoning regulations (PZ). That the ideal green open space is 30% of the total area of DKI Jakarta [14], the provision of green space becomes very important along with the rapid progress and development of technology and development in major cities in Indonesia [16] currently.

The open green space other than as an environmental means can also serve for the protection of certain habitats or agricultural cultivation and also to improve atmospheric quality, the open green space aims to maintain the availability of land as water catchment areas [19]. In order to realize the commitment, the Provincial Government of the Special Capital Region of Jakarta guarantees the fulfillment of green open spaces and means of fulfilling the right of the child so that the child lives, grows, develops and participates optimally in accordance with human dignity and pride and gets protection from violence and discrimination, Child Friendly (RPTRA) [13] as an effort to support Jakarta into a city worthy of children. Furthermore, the function of RPTRA as a service not only to the community but also to other citizens and also functions as a disaster service.

Design and Build

Integrated Construction Work Design and build is all work related to the execution of building construction or other physical establishment, where the planning work is integrated with the construction implementation [18] (Attachment I of Regulation of Minister of Public Works and Public Housing Number: 19/PRT/M/2015 on

Standards and Guidelines for Procurement of Design and Build Integrated Construction Works. Design is a combination of design and development by a contractor in a job intended for the service provider to carry out its responsibilities well to produce output as expected by the owner as the project owner in the work.

Elements of Design Implementation

The elements of development implementers involved in development activities are: owner, service provider, (consultant of structural/architectural planners and contractors), and supervisory consultants.

1. Project Owner (owner)
2. The project owner or assignor is a person or body that has the funds and assigns tasks to those who have expertise and experience in the execution of the work so that the project results according to the goals and objectives set out [3]
3. Service Provider (Design Contractor)[27]
   - Planning Consultant: Scope the planning work includes architectural, structural, mechanical, electrical and plumbing planning, budgeting costs and provide necessary advice in the implementation of development.
   - Contractor: Contractor is a person or legal entity that receives a job and conducts work execution in accordance with the cost specified based on drawings of plans, regulations, and conditions.
   - Supervising consultants[26]
4. The supervisory consultant is a legal entity or individual, whether private or government agency that functions as an agency in charge of supervising and controlling the course of the project to achieve optimal results according to the requirements

Design (Detailed Engineering Design/DED)

The project criteria that will be planned must meet the requirements [1]:

1. The building form meets the functional requirements of the building and does not neglect the aesthetic aspects of the building.
2. Criteria appearance buildings, buildings reflect the function of multipurpose space (gathered), and pay attention to the appearance of buildings that apply the principles of architecture that is contextual and harmonious.
3. Natural lighting criteria for the room.
4. Criteria adequate air ventilation.
5. Security criteria from theft, earthquake, fire and others, prepare construction system/building structure, technical installation system (mechanical electrical).

Building (Built)

Building Construction work is in whole or in part a series of planning and/or implementation activities along with supervision covering the architectural, civil, mechanical, electrical, and environmental work of each other and its equipment to realize a building or physical form, functioning and running as expected at the beginning of the building planning.

RESEARCH METHODOLOGY

Based on the regulation of the minister of public works and people's housing No.19/PRT/M/2015 on standards and guidelines for procurement of integrated construction design and build (design and build method of design implementation is a method that describes the mastery of a systematic work completion from beginning to end stages/sequence of work (main) and description/workings of each type of main work activities and main supporting main occupations that can be technically accountable [6].

Place and time of study

Research on risk of implementation costs on design projects. That is, at 123 (one hundred and twenty three) project locations spread over the five administrative municipal areas of the special capital city of Jakarta conducted in June 2016 - January 2017[1].

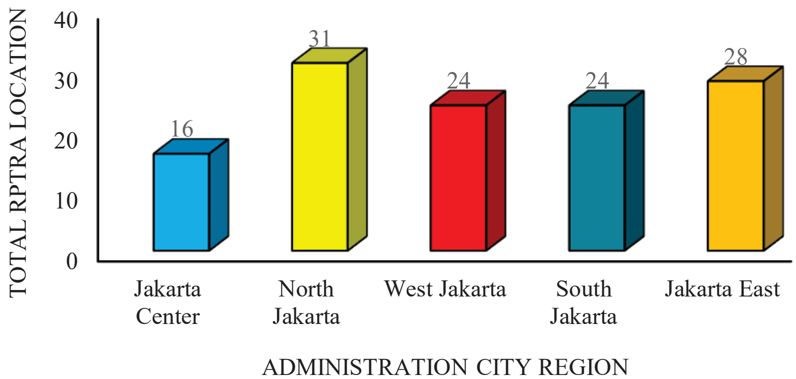

FIGURE 1. Composition of total location of RPTRA projects for each city

Data Collecting

Cost Design Composition

Based on contract design value between contractor PT. Jaya Konstruksi with PT. Arkonin KSO that the value of the participation with the composition of contractors 97.5%: a 2.5% for planning [7]

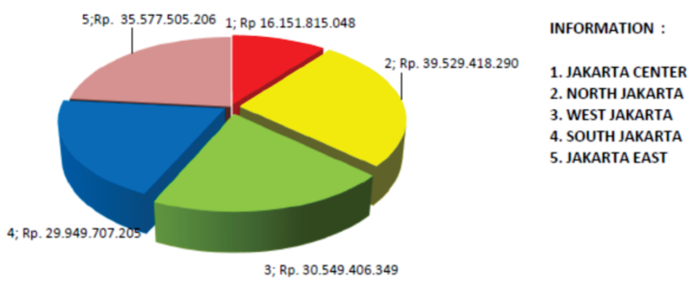

FIGURE 2. Composition of Contract Value of RPTRA for City Administration

Technical Specifications of Structural Work

All materials used in this work shall comply with the conditions specified in AV 1941 and the General Regulations of Building Materials (PUBB) or the provisions already recognized in the field of development in general[5]:

1. Preparation and Measurement Jobs.
2. Land Works.
3. Work of substructure: work of sub structure includes foundation, sloof block.

Technical Specification of Mechanical Works

Electrical and Plumbing [5]

1. Scope of mechanical works include: Air system design consists of; Split AC system (adjustable area), mechanical/fan ventilation system, waste water treatment system.
2. Scope of electrical works includes; power supply and distribution systems, building and outside lighting systems, power contact stop systems, fire detection and alarm systems, installation and installations ystems, local computer network systems (LAN), grounding systems and installations of electrical equipment and building protection and lightning strikes.
3. Plumbing design system includes; design of clean water system, design of used water system, dirty water and ventilation, design of clean water system, source of clean water from PDAM or other sources accommodated on raw water tank (RWT), then treated and the result is stored on Clearwater tank (CWT) design of used water system, Dirty and vent system biotech and system design.

RESULT AND DISCUSSION

One of the models that can be applied in project cost estimation is Monte Carlo simulation approach. Monte Carlo simulation is an approach used in modeling and analyzing systems that contain risks and uncertainties.

Component Cost Elements (WBS)

In risk management of implementation in the design of RPTRA of Jakarta capital city, the cost elements include:

1. Design Cost.
   Design fee is taken based on the maximum amount of direct costs (remuneration) for S1, S2, S3 based on professional experience and certification, based on attachment 1 of circular letter of minister of public works dated 13 March 2013 No.03/SE/M/2013[8]
2. Cost of Design Expert
   The cost of design experts is a component of costs incurred for detail engineering design (DED) work that contains more specific engineering data including: Data collection plan and field information, land investigation data, urban plan information, problem identification and potential, development design, design development for architectural aspects, structural aspects, mechanical, plumbing &electrical aspects.

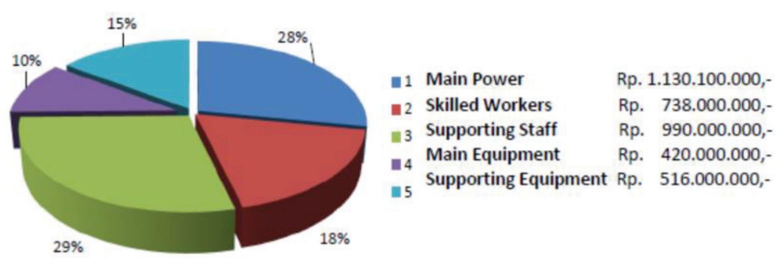

FIGURE 3.The cost of the design engineer (Detailed engineering design)

The amount of planning fee refers to the contract of PT. Jaya construction with PT. Arkonin - KSO that the amount of participation and profit sharing is 2.5% (Rp 3,793,934,370.-.) Planning and 97.5% (Rp. 147,963,440,436.-.) implementation [8].

Referring to the Minister of Public Works Regulation Number 45/PRT/M/2007 concerning Technical Guidance of State Building Construction on the percentage of the cost component of the construction of a state building classification is not simple, that for contracts with a value of 100 s/d 250 Billion the maximum construction planning value is 2.72%. So KSO between PT. Jaya Konstruksi with PT. Arkonin is still in accordance with the rules of the Technical Guidance of State Building [8].

Actual Cost of Building Work (Build)

Actual cost of building work at build work describe in table 1.

TABLE 1. Realization cost of building work (Build)

Job description	Minimum Education	Minimum skill certificate	Number of Experts	Time of Implementation (Month)	Remuneration Cost	Amount
2. Build (implementation of Construction)						
A. Expert						
A.1. Experts						
Project Manager	S1 Civil Engineering	Expert of Building Technique of Madya Building, Group A	1	6	26,400,000	158,400,000
Site Manajer	S1 Civil Engineering	Expert of Building Technique of Madya Building, Group B	5	6	22,900,000	137,400,000
Landscape Expert	S1 Landscape	Landscape Engineering Expert	5	5	22,900,000	114,500,000
Occupational Safety K3 Engineer	D3 K3	Young K3 Engineering Expert	1	5	15,000,000	75,000,000
A.2. Technical Staff						
Civil Executor		D3 Civil	5	5	12,000,000	300,000,000
Measurers		D3 Geodesy	5	5	10,000,000	250,000,000
Drafter		STM	5	5	9,000,000	225,000,000
B.						
B.1.						
Passenger car			2	6	10,000,000	120,000,000
Pick up car			5	5	10,000,000	250,000,000
Scaffolding			100	5	30,000,000	15,000,000,000
Theodolite			5	5	15,000,000	375,000,000
Digital camera			10	6	2,000,000	120,000,000
B.2. Ancillary equipment						
Laptop			6	6	6,000,000	216,000,000
Computer			5	6	4,000,000	120,000,000
Printer			5	6	2,000,000	60,000,000
Call			5	6	2,000,000	60,000,000
Office stationary			5	6	3,000,000	90,000,000
C. Physical Work			Luas	Lokasi		
C.1. Preparatory work						
Location Preparation Facilities			144	123	625,829	11,084,680,000
C.2. Land maturation						
Land clearing Accuracy Compaction			940	123	285,000	32,951,700,000
C.3. Building						
Structure Architecture MEP			144	123	3,351,000	59,352,912,000
C.4. Work Page						
Jogging track Playground			140	123	557,000	9,935,940,000
C.5. Fence Works						
Fence around			135	123	525,000	8,717,625,000
C.6. Words						
Drainage Futsal field Water sources			137	123	475,000	7,998,382,500
		Amount				147.712.539.500

Cost realization Design (Design)

In the design planning process occurs some changes in the composition of time caused by the difficulties that occur during re-survey and planning changes include:

1. Changes in type and shape of the foundation after more detailed field inspection due to different field conditions example of foundation changes from cough to minipile due to soil at the site of former swamps.
2. Extension of time planning details due to time change and change usage.

In the construction implementation there are several components that support for the completion of development implementation. Each activity has risk value that can change value weather increase or decrease in accordance with realization of work field. While the risk of development cost include: implementation expert, implementation equipment, and preparation work, maturation land, building works, job pages, fence works and fittings works.

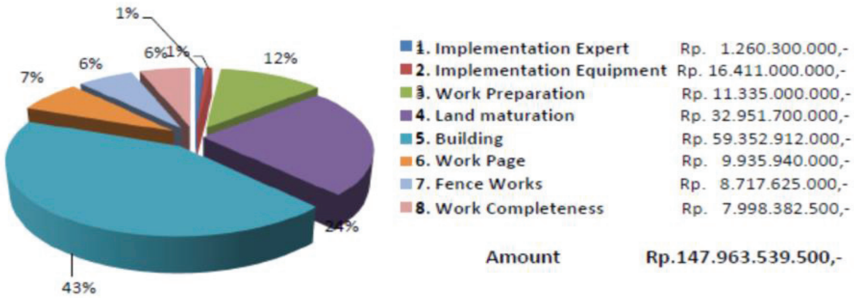

FIGURE 4. The cost of building construction cost of the child friendly integrated public spaces (RPTRA)

Calculating price for building type

Monte Carlo Simulation

Based on the calculation of the cost of planning and development costs in the above calculation. The price per type building with reference to the contractor's offer and location unit calculation approach using Monte Carlo. To find the value of the unit price of the allocation with the system containing elements that include the possibility factor. The model used is the Monte Carlo model. The basis of the Monte Carlo simulation is the probable element experiment by using a random sample (random). This method is divided into 5 stages [10]:

- Make possible distributions for important variables.
- Build a cumulative possibility distribution for each variable in the first stage.
- Specifies the random number interval for each variable.
- Make a random number.
- Create a simulation of the experimental circuit and make probability Distribution Function *(pdf)* and Cumulative distribution function *(cdf)*.

Explanation of the 5 stages are as follows:

TABLE 2. Random Number Interval for Each Variable

Name Architec	Typ Design	typ Num	Price (P)	Probability distribution P/ ∑P	Comulatif	Interval Random Number
Arkonin	3	6	7,455,412,173	0.0491	0.0491	01-51
Aboday	1	13	16,136,896,891	0.1063	0.1555	52-102
Tonton	9	12	14,407,040,085	0.0949	0.2504	103-152
Nataneka	7	10	12,423,324,484	0.0819	0.3323	153-203
UI	10	13	16,013,544,235	0.1055	0.4378	204-254
Andramatin	2	10	12,082,728,272	0.0796	0.5174	255-305
WKA	11	13	16,147,504,657	0.1064	0.6238	306-356
ASOC	4	12	14,988,406,780	0.0988	0.7226	357-407
HAP	6	8	9,945,418,021	0.0655	0.7881	408-458
SSA	8	11	13,532,523,739	0.0892	0.8773	459-509
Hadi Prana	15	15	18,624,575,469	0.1227	1.0000	510-561
Total		123	151,757,374,806	1,0000		

1. Make a random number
   To create a random number we can use Microsoft Excel software by starting the command using a random number with the formula: "= RAND () * (Min-Min) + Min", for random numbers from 1- 561, RAND () * (Min-Min) + Min" command.

TABLE 3. Random Number Interval (Activity 1-5)

Name Architect	Arkoninin	Aboday	Tonton	Nataneka	UI
Activity	**1**	**2**	**3**	**4**	**5**
Min	1,236,355,852	1,235,093,262	1,194,583,740	1,236,120,786	1,225,652,040
Max	1,242,568,695	1,241,299,761	1,200,586,674	1,242,332,448	1,231,811,095
1	1,240,490,416	1,239,621,695	1,197,390,127	1,236,157,212	1,230,614,995
2	1,240,984,468	1,239,863,816	1,198,941,807	1,241,651,343	1,231,708,869
3	1,240,773,908	1,239,829,311	1,198,378,363	1,239,804,727	1,231,162,522
4	1,240,978,218	1,239,849,139	1,198,459,477	1,240,496,884	1,231,502,090
.	....	....	....	....	....
.	....	....	....	....	....
560	1,240,913,856	1,239,847,879	1,198,449,618	1,240,361,389	1,231,273,680
561	1,240,913,856	1,239,847,879	1,198,449,618	1,240,361,389	1,231,273,680
562	1,240,913,856	1,239,847,879	1,198,449,618	1,240,361,389	1,231,273,680

TABLE 4. Random Number Interval (Activity 6-10)

Name Architect	Andramatin	WKA	ASOC	HAP	SSA
Activity	**6**	**7**	**8**	**9**	**10**
Min	1,202,231,463	1,235,905,164	1,242,788,729	1,236,961,366	1,224,078,284
Max	1,208,272,827	1,242,115,743	1,249,033,898	1,243,177,253	1,230,229,431
1	1,202,924,761	1,236,416,803	1,248,729,625	1,241,918,754	1,228,564,683
2	1,206,961,655	1,239,106,931	1,248,775,130	1,242,661,325	1,229,940,152
3	1,205,392,713	1,237,920,585	1,248,757,470	1,242,578,888	1,229,282,214
4	1,205,486,555	1,238,459,430	1,248,769,252	1,242,602,365	1,229,719,752
.	....	....	....	....	....
.	....	....	....	....	....
560	1,205,468,516	1,238,344,566	1,248,759,726	1,242,598,413	1,229,668,761
561	1,205,468,516	1,238,344,566	1,248,759,726	1,242,598,413	1,229,668,761
562	1,205,468,516	1,238,344,566	1,248,759,726	1,242,598,413	1,229,668,761

- Create a simulation of the experimental circuit and make probability Distribution Function (pdf) and Cumulative distribution function (cdf)

We can create a simulation of the price per architecture by taking random numbers from the table above, How to determine the demand is determined by the random number.

TABLE 5. Random results (Activity 1-5)

Name Architect	Arkoninin	Aboday	Tonton	Nataneka	UI
Activity	**1**	**2**	**3**	**4**	**5**
Min	1,236,355,852	1,235,093,262	1,194,583,740	1,236,120,786	1,225,652,040
Max	1,242,568,695	1,241,299,761	1,200,586,674	1,242,332,448	1,231,811,095
1	1,241,406,689	1,239,769,146	1,195,328,265	1,236,714,108	1,229,053,978
2	1,241,527,571	1,241,273,001	1,200,176,496	1,241,925,738	1,228,285,593
3	1,237,327,782	1,241,194,296	1,197,021,899	1,241,315,614	1,227,419,626
4	1,237,813,651	1,241,264,056	1,198,851,337	1,241,760,549	1,228,086,310
5	1,237,489,737	1,241,256,206	1,198,238,039	1,241,362,557	1,227,709,568
....	....	....	....	....	....
....	....	....	....	....	....
559	1,237,504,027	1,241,258,196	1,198,547,506	1,241,481,304	1,227,846,498
560	1,237,504,027	1,241,258,196	1,198,547,506	1,241,481,304	1,227,846,498
561	1,237,504,027	1,241,258,196	1,198,547,506	1,241,481,304	1,227,846,498

TABLE 6. Random results (Activity 6-9)

Name Architect	Andramatin	WKA	ASOC	HAP
Activity	**6**	**7**	**8**	**9**
Min	1,202,231,463	1,235,905,164	1,242,788,729	1,236,961,366
Max	1,208,272,827	1,242,115,743	1,249,033,898	1,243,177,253
1	1,204,451,295	1,237,307,558	1,245,235,716	1,241,749,708
2	1,204,268,463	1,240,796,036	1,247,322,534	1,242,528,484
3	1,204,259,588	1,240,678,013	1,245,670,160	1,242,506,972
4	1,204,260,801	1,240,758,387	1,246,909,599	1,242,515,059
5	1,204,260,565	1,240,719,005	1,246,903,876	1,242,513,364
....	....	....	....	....
....	....	....	....	....
559	1,204,260,639	1,240,727,057	1,246,905,514	1,242,513,448
560	1,204,260,639	1,240,727,057	1,246,905,514	1,242,513,448
561	1,204,260,639	1,240,727,057	1,246,905,514	1,242,513,448

There are 3 conditions (pesimistic, optimistic and most likely) because project costs are assumed to be triangular distributed. Monta Carlo simulations use optimistic (a), most likely(c), and pessimistic (b) parameters, where a<c<b. The minimum cost and maximum cost of each project activity as a basis for determining the number of iterations and x random values. Calculation of the number of iterations (Taha, 1997):

$$\text{Number of iterations:} N = \left(\frac{s \, x \, \sigma}{\varepsilon}\right)^2 \tag{1}$$

$$\text{Error Value:} \varepsilon = \frac{s \, x \, \sigma}{\sqrt{N}} \tag{2}$$

$$\text{Standard Deviation:} \sigma = \frac{\sqrt{\Sigma(\overline{X}-X_i)^2}}{N} \tag{3}$$

From the value of x random obtained pdf and cdf, formula (Taha, 1997): pdf (5)

1. 1. if $x < a : 0$
2. 2. if $a \leq x \leq c : \frac{2(x-a)}{(b-a)(c-a)}$
3. 3. if $c < x \leq b : \frac{2(x-a)}{(b-a)(c-a)}$
4. 4. if $b < x : 0$ (6)
5. 1. if $x < a :$
6. 2. if $a \leq x \leq c : \frac{2(x-a)}{(b-a)(c-a)}$
7. 3. if $c < x \leq b : 1 - \frac{2(x-a)^2}{(b-a)(c-a)}$
8. 4. if $b < x : 1$

$$\text{Mean} \quad (x) = \frac{a+b+c}{3} \tag{4}$$

The output of Monte Carlo simulation is plot *probability distribution function (pdf)* and *cumulative distribution function (cdf)* risk based cost estimation. And phase analysis and data interpretation. Here's the price of the results from the simulation.

TABLE 7. Price per type of architecture based on number of per type

Name Arch	Type Design	Price/type (P)	Min Price	Max Price
Arkonin	3	1,242,568,695	7,418,135,112	7,455,412,173
Aboday	1	1,241,299,761	16,056,212,407	16,136,896,891
Tonton	9	1,200,586,674	14,335,004,884	14,407,040,085
Nataneka	7	1,242,332,448	12,361,207,861	12,423,324,484
UI	10	1,231,811,095	15,933,476,514	16,013,544,235
Andramatin	2	1,208,272,827	12,022,314,631	12,082,728,272
WKA	11	1,242,115,743	16,066,767,134	16,147,504,657
ASOC	4	1,249,033,898	14,913,464,746	14,988,406,780
HAP	6	1,243,177,253	9,895,690,931	9,945,418,021
SSA	8	1,230,229,431	13,464,861,120	13,532,523,739
Hadi Prana	15	1,241,638,365	18,531,452,592	18,624,575,469
	Total		150,998,587,932	151,757,374,806
	Average		145,611,201,127	153,274,948,554

Given the formula total error: $\varepsilon = \frac{3\sigma}{\sqrt{N}}$ (5)

From the results of the above data specify N to determine the number of iterations before performing a random number for each activity.

- Standard deviation of standard deviation

$$\text{Standard Deviation: } \sigma = \frac{\sqrt{\Sigma(\bar{X}-X_i)^2}}{N}$$

- Determining the total error <2% is used the formula
  "= max+min/2"
- Specifies $N=\left({}^{3\sigma}/_{\varepsilon}\right)^2$

Specifies the actual error (true error)
Analyze Monte Carlo simulation results from 11 activities:
Once the population standard deviation is obtained, it can be $\varepsilon = \frac{3\sigma}{\sqrt{N}}$

From random 561 iteration beside, obtained the parameters of Monte Carlo simulation result:

TABLE 8. Parameters of Monte Carlo simulation result

Parameters	Value
Average (average total cost prediction) =	151,101,034,003.85
Median	151,101,170,651.13
Median and average differences –	-
The population standard deviation	4,946,365.28
The actual error	**626,507.12**
% Error actually	0.0004%
Kurtosis	**492.66**
Skewnes	-21.19

2. Creatingprobability Distribution Function *(pdf)* and Cummulative distribution function *(cdf)*

Taken the total cost of Monte Carlo simulation results from iteration 1 to 37 iterations with a fixed total value (in this case from 1 to 37 iterations), arranged sequentially from lowest to highest. Next use the formula that can be seen the result below [11]:

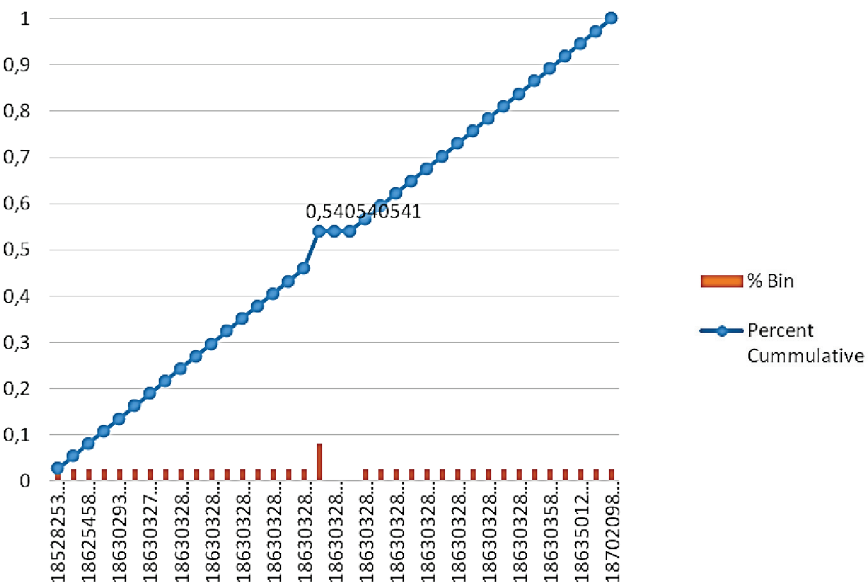

FIGURE 5. Cumulative distribution function (CDF)

Sensitivity analysis techniques for design projects should be considered to assess the feasibility of project implementation activities resulting from changes in changes affecting the feasibility of the design work, the stages of sensitivity analysis techniques [12]:

3. Identify the factors of change (changes in project planning costs, decreased development costs, and increases in material costs or prices) that may or may occur in design projects.
4. The changes will certainly affect how much influence on the price of pertics architectural planning, whether achieved target cost allocation.

TABLE 9. Probability distribution function (PDF)

Cost	Cumulative	% Cumulative	Bin	% Bin
150,987,770,036	1	2.70%	1	2.70%
151,096,704,466	2	5.41%	1	2.70%
151,100,747,708	3	8.11%	1	2.70%
151,100,908,437	4	10.81%	1	2.70%
151,101,150,593	5	13.51%	1	2.70%
151,101,161,534	6	16.22%	1	2.70%
151,101,163,213	7	18.92%	1	2.70%
151,101,168,799	8	21.62%	1	2.70%
151,101,170,630	9	24.32%	1	2.70%
151,101,170,643	10	27.03%	1	2.70%
151,101,170,649	11	29.73%	1	2.70%
151,101,170,651	12	32.43%	1	2.70%
151,101,170,651	13	35.14%	1	2.70%
151,101,170,651	14	37.84%	1	2.70%
151,101,170,651	22	59.46%	8	21.62%
151,101,170,651	22	59.46%	0	0.00%
151,101,170,651	22	59.46%	0	0.00%
151,101,170,651	22	59.46%	0	0.00%
151,101,170,651	22	59.46%	0	0.00%
151,101,170,651	22	59.46%	0	0.00%
151,101,170,651	22	59.46%	0	0.00%
151,101,170,651	22	59.46%	0	0.00%
151,101,170,651	23	62.16%	1	2.70%
151,101,170,651	24	64.86%	1	2.70%
151,101,170,651	26	70.27%	2	5.41%
151,101,170,651	26	70.27%	0	0.00%
151,101,170,653	27	72.97%	1	2.70%
151,101,170,662	28	75.68%	1	2.70%
151,101,170,706	29	78.38%	1	2.70%
151,101,170,758	30	81.08%	1	2.70%
151,101,173,109	31	83.78%	1	2.70%
151,101,174,094	32	86.49%	1	2.70%
151,101,180,632	33	89.19%	1	2.70%
151,101,335,230	34	91.89%	1	2.70%
151,101,903,296	35	94.59%	1	2.70%
151,118,987,945	36	97.30%	1	2.70%
151,124,371,404	37	100.00%	1	2.70%

TABLE 10. Sensitivity analysis with production decrease off 10%

Architectural Type	Price	Discount Factor		NPV for calculating with production decrease at 10 % (Rp.000).			
		5%	10%	Total benefit t	Total cost	deviation	NPV 5%
Arkonin	1,242,568,695	0.950	0.900	1,242,568,695	1,180,440,261	62,128,435	59,022,013
Aboday	1,241,299,761	0.903	0.810	1,241,299,761	1,120,273,034	121,026,727	109,226,621
Tonton	1,200,586,674	0.857	0.729	1,200,586,674	1,029,352,999	171,233,674	146,811,472
Nataneka	1,242,332,448	0.815	0.656	1,242,332,448	1,011,887,544	230,444,905	187,698,815
UI	1,231,811,095	0.774	0.590	1,231,811,095	953,151,944	278,659,151	215,621,139
Andramatin	1,208,272,827	0.735	0.531	1,208,272,827	888,191,557	320,081,270	235,289,146
WKA	1,242,115,743	0.698	0.478	1,242,115,743	867,415,749	374,699,994	261,666,980
ASOC	1,249,033,898	0.663	0.430	1,249,033,898	828,634,608	420,399,291	278,901,479
HAP	1,243,177,253	0.630	0.387	1,243,177,253	783,511,730	459,665,523	289,703,925
SSA	1,230,229,431	0.599	0.349	1,230,229,431	736,583,804	493,645,627	295,563,872
Hadi Prana	1,241,638,365	0.569	0.314	1,241,638,365	706,244,016	535,394,348	304,532,355
				9,858,021,142	7,879,347,696	1,978,673,446	1,494,237,665
					NPV		1,494,237,665

Based on the above data, then;

1. Under normal conditions a design project can and is feasible to run because it meets the criteria of investment feasibility.
2. In the event of the condition (i) there is a decrease in implementation performance by10%, the design project is still feasible to run even though there is a significant decrease in net profit.

Work Added Less

In principle for the design and build work of the RPTRA project is already set in the contract.

The added work and/or less work can occur in accordance with the development of the field conditions at the time of planning as well as at the time of execution in view of the growing needs of the working conditions.

1. Added work includes: Planned drawings cannot be implemented in full development such as: land for elevation of building and yard elevation, fence fitting. In the planning, it is not displayed but on the implementation should be implemented such as: the installation of the arise due to landslides, which borders the river, the construction of bridges, asphalting roads and so on.
2. Less work includes: Construction of new fences is not implemented with consideration to keep using the old fence because it is still good, Decrease in elevation of buildings and yard with consideration of the height of the location around the development. Changes in the shape of the building due to field conditions.

In the calculation of added work less calculated and known together between contractors as implementers and planners with construction management consultants and approved by the owner as the owner of the job.

CONCLUSIONS

After discussing the primary and secondary data for risk implementation. Implementation in the design of the Jakarta Capital City (RPTRA) Integrated Public Space. Integrated Spatial Design (RPTRA) designed with the design and build system can be described as follows:

1. Cost contract of design 2,5%,build 97,5%, with regulation to the minister of public work design cost 2,72%,build 97,28%, Actual cost design 2,67 % and build 97,33%.Based on ministerial decree number 45/PRT/M/2007 concerning technical guidance of state building. Building on the percentage of the cost component of the construction of a country building classification is not simple, for contracts with a value of 100 s/d 250 billion the amount of construction planning services is 2.50% up to 2.72%.
2. The Monte Carlo analysis is used to make simulations of the actual price trial circuit and make probability distribution function (pdf) and cumulative distribution function (cdf).
3. Sensitivity analysis is used to identify change factors in the design project including changes in project planning costs, reduction of construction prices, and the rising costs or material prices that may or may

occur in design projects. So the big influence on the price of pertics architectural planning, whether achieved target cost allocation.

SUGGESTIONS

To the Project Manager it is suggested that:

1. If the design and build system is implemented, it can be observed the pattern of costing arrangements in planning and implementation given that the contractor is given the flexibility to innovate the planning by referring to the terms of reference (KAK) and the work plan and requirements (RKS), This shows that the design work and build systems are binding each other for cost governance.
2. To improve the performance of the costs risk of implementation on the design project. The main priority is the human resource planning or expertise and resources in the implementation. It is expected that the acceleration of planning can make the cost and time more efficient that impact on the implementation margin.

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