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INTEGRATION OF VALUE MANAGEMENT AND RISK ANALYSIS IN THE CONSTRUCTION PROJECT

Case study at social housing in the new administrative capital in Egypt

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Abstract

The study aims to integrate value engineering and risk management, to simulate the best relations between the efficiency of functional performance, quality level and the building cost. Those frameworks have been used separately on the projects for many years. There is an ideal proposal to integrating those frameworks to be an efficient technique to development the project performance. The study methodology will integrate elements between value engineering and risk management, which is the restructuring of the management system of projects, for consensus and exchange between different stages of design and implementation of the project. There is an ideal proposal to integrating those frameworks to be an efficient technique to development the project performance. The application of integrated risk and value methodologies makes the final cost of quality issues is more accurate results and analysis. The integration is applied to luxurious social housing in the new administrative capital in Egypt. It will apply the measuring tools for each methodology at the value analysis and risk approach. In addition, it identifies the unnecessary cost elements and finds effective alternatives. It is analysis through the indicator of the risk factors and providing the creative value ideas. Finally, the research outlines what it covered and presents its conclusions.

Keywords : value engineering; unnecessary cost; performance; risk management

Introduction

Overlapping development must be considered in the building management and construction projects and their diversity and complexity. Project Management is no longer a choice and process in front of investment institutions to work in intelligent ways. Instead, it has an increasing acceptance of practical applications and more experiences in a major project. The research aims to integrate value engineering with risk management to achieve the best relations between the function, quality, and cost for construction projects. The study will discuss the common factors between each of value engineering methodology and the risk management. It will focus to two main

disciplines at the project management systems to achieve effective outputs and flexibility's project. The integration methodology is applied to luxury social housing in the new administrative capital. It will apply the value engineering techniques to determine the value results. Then, it will analysis the risk factors terms according to the risk management process also to determine the risk analysis results. After that, the research will make a rational scientific analysis comparing between the two results in order to achieve the main goal of the study by the integration. (Amruta Chougule & A. K., 2014),

The study will apply the questionnaires - as a one of important tools at each term value and risk- are being made to determine the user needs and risk factors to which the project is faced. The questionnaires will be designed according to two levels. The first questionnaires will be oriented to the value and risk experts at the practical field to get more accurate indexes. The second one will be oriented to the end users for the pilot case study to get the satisfactions conditions. The main important factor at the study is an unnecessary cost to be able to find the effective alternatives which are evaluated. These elements were represented by the development of value engineering and risk management of the project. (Ali Bagheri Fard & K. G., 2013).

Value engineering technology is a scientific analysis to discuss three main terms function, quality and cost. The value ideas are achieving more quality levels according the users needs without any unnecessary cost. The value engineering process are achieved the through several stages: (data gathering, function analysis, creativity ideas, development, presentation). (Alphonse J. & Dell 'Isola., 1988).

On the other hand, the risk management play how to face the contingence cases in the projects without additional costs. It is a systematic process within the project's life cycle starting from agreements and deals between the stakeholders till the operation stages. The risk management process is risk definition of, risk analysis, qualitative analysis, quantitative analysis, development, response plan. (Fathi, A., 2006),

1. MATERIALS AND METHDES

1.1 value engineering and risk management

Value engineering techniques is a one of the smart tools. It plays about the main factors the function performance, quality level and the cost. It is able to oriented for both initial and running cost.(Attarde N. & L., 2016). The value studies apply through many stages based on the SAVE international organization. These stages are data gathering, function analysis, creativity ideas, evaluation, development and final presentation. (AL-Yousefi & A. S., 2011)

On the other hand, the risk management is the most appropriate tools to evaluated the construction projects progress by linked it with all external factors which are affected on directly or indirectly on the project cost and its process. (Devadass P.& Mootanah, 2013).

Risk analysis is the define and evaluation of risks followed by determined of resources to reduce and monitor probability and impact of uncertain events to increase the achieving of the opportunities as shown in tables 01, 02, 03 and 04. (Fouzi Hossen A., 2006)

TABLE 1. Impact, Probability Rates and Values

Source: A Guide to the Project Management Body of knowledge,2017

Impact	
Rates	Values
V.H	0.8
H	0.4
M	0.2
L	0.1
V.L	0.05

Probability	
Rates	Values
V.H	0.9
H	0.7
M	0.5
L	0.3
V.L	0.1

TABLE 2. Risks Severity Matrix

Source: A Guide to the Project Management Body of knowledge,2017

Probability	Threats				
0.9	0.045	0.09	0.18	0.36	0.72
0.7	0.035	0.07	0.14	0.28	0.56
0.5	0.025	0.05	0.1	0.2	0.4
0.3	0.015	0.03	0.06	0.12	0.24
0.1	0.005	0.01	0.02	0.04	0.08
Impact	0.8	0.4	0.2	0.1	0.05

TABLE 3. Risks Severity Matrix

Source: A Guide to the Project Management Body of knowledge,2017

Add. Cost	S	
	Max	Min
2%	100%	40%
1.5%	40%	25%

1%	25%	10%
0.75%	10%	5%
0.25%	5%	0%

It can appear from uncertain events in the markets, project phases (design, development, implantation, or operation phase). (Feili, Nasiri & Akar, 2012).

The risk analysis applies through six stages as follow: (Griffin, L & Langdon, D 2006)

1- Plan Risk Management, the process of identify how to behavior risk management activities for a construction project.
2- Identify Risks, the process of determining which risks may affect the construction project and documenting their characteristics.
3- Qualitative Risk Analysis, the steps of prioritizing all risks for further analysis or action by evaluating and combining their probability of impact and occurrence.
4- Quantitative Risk Analysis, the steps of numerically analyzing the effect of defined risks on overall project goals.
5- Plan Risk Response, the steps of developing the proposed alternatives and actions to enhance the opportunities.
6- Monitor and Control Risks, the steps of implementing risk response plans, tracking defined risks, monitoring risks, and assessing risk process effectiveness throughout the project.

There are common factors between value engineering and risk management, which sets its objectives. These factors are the cost and the function performances.

1.2 Integrating value engineering and risk management

Via risk and value studies as major tools for achieving high quality levels and development the projects. Value engineering support the consultants to reduce, minimum cost function, and remove the unnecessary cost. Risk management is playing the fruitful solution and tool respond to risks. It was considered not only as a vexing problem in the implementation stage, but experience has shown the best solutions of the project. The uncertainty activity can apply its goals to completely eliminate by the way for determining the elements and activities that caused this uncertainty provides to be managed. (Mawu & Emelly, 2013).

There are same aims for value engineering and risk management, that two framework and techniques both increase the performance and value of the constructions project. (Wilson, DI, Pelham, N & Duffield, (2010). Those frameworks have been used separately on the projects for many years. There is an ideal proposal to integrating those frameworks to be an efficient technique to development the project performance. The application of integrated risk and value methodologies makes the final cost of quality issues is more accurate results and analysis. (Shahsav & Parvane, 2016),

The advantages that can be achieved through this integration include: (Ranesh Ahmed, Bushell John, Chileshe Nicholas, 2012)

1- Another method for understanding of the business requirements, including the agile needed to meet future issues.
2- A better understanding for definition of specific stakeholder needs.
3- Orientation of all proposals, alternatives and creativity ideas
4- Providing more value index for investment and achievement the end-user requirements.
5- Reducing the unnecessary cost through eliminate inefficiency and waste.

2. MATRIALS ANS TECHIQUES

2.1 Apply Value Engineering Techniques

A- Data Gathering

The pilot case study can be summarized as:

- Project Name: Social Housing in The New Administrative Capital In Egypt
- Project goals: Providing luxury unties by value price
- Project Duration: four years
- Estimated budget: 15471535 per one building
- Unite Area:180 Square meter per unite
- Project description: consist of ten buildings each building consists of ground floor and six typical floors.

The Bill of quantities of case study can be summarized as shown in table 04.

TABLE 4. Bill of quantifies
Source: Analysis by Authers

Works			Unit	Total Price
	1	Preliminary works	m^3	199900
	2	Concrete Works	m^3	5634300
Architectural works	3	Masonry works	m^2	
		Building works		1209000
		Plastering works		811500
		Painting works		492000
Interior works	4	flooring	m^2	
		Ceramic and Porcelain		984750
		Squirrel tiles		49500
	5	Marble works		
		Marble and Granite	m^2	107675
		Granite Cladding	m^2	110000
		Marble and Granite for stairs	m.L	122950
	6	Wood and aluminum works	m^3	1659200
	7	Plumbing works	m.L	841665
	8	Decorative works	unit	2137800
	9	Iron works	kg	80000
	10	Electrical works	unit	992795
Site works	11	Site works	m^3	38500
Total Price of Project			15471535	

B- Function Analysis

The function analysis stage is playing the important one at the value engineering job plan. The research will determine these items based on random questionnaire target the end-user. The questionnaire aims not only determine the project's functions but also calculate the weights for each. It results can be summarized as shown in table 05.

TABLE 5. Functions Weight
Source: Analysis the Questionnaire Results by Authers

Functions Weight		
Needs		Rates
1	Safety and Security	27%
2	Comfort	17%
3	Privacy	24%
4	Beauty	8%
5	Service Quality	14%
6	Functional Needs	10%
		100%

Then, the study will determine the main items or activity which effects on each function, in order to calculate the estimated ratio for each function. These relations must be linked to the end-user questionnaire ratio and cost estimation ratio. The relations can be summarized as shown in table 06 and 07.

TABLE 6. The relation between the activities and functions to present the End User Questionnaire ratios
Source: Analysis by Authers

Works			Unit	Total Price	End User View (Questionnaire result) 100%						
					27	17	24	8	14	10	
					Safety and Security	Comfort	Privacy	Beauty	Service Quality	Functional Needs	
	1	Preliminary works	m^3	199900	25%	17.5%	20.5%	15%	17%	5%	100%
	2	Concrete Works	m^3	5634300	18%	12%	30%	17.5%	18%	4%	100%
Architectural works	3	Masonry works	m^2								
		Building works		1209000	10%	10%	25%	8%	19%	28%	100%
		Plastering works		811500	10%	15%	25%		22%	28%	100%
Interior works		Painting works		492000	5%	10%	25%	13%	19%	28%	100%
	4	flooring	m^2								
		Ceramic and Porcelain		984750	10%	15%	25%		23%	27%	100%
		Squirrel tiles		49500	25%	17.5%	20.5%		17%	20%	100%
	5	Marble works									
		Marble and Granite	m^2	107675		15%		30%	15%	40%	100%
		Granite Cladding	m^2	110000		15%	20%	20%	15%	30%	100%
		Marble and Granite for stairs	m.L	122950		15%	20%	20%	15%	30%	100%
	6	Wood and aluminum works	m^3	1659200	22%	22%	18%	18%	20%		100%
	7	Plumbing works	m.L	841665	20%	20%	22%		20%	18%	100%
	8	Decorative works	unit	2137800		25%	15%	40%	15%	5%	100%
	9	Iron works	kg	80000	35%	10%	15%	10%	5%	25%	100%
	10	Electrical works	unit	992795	10%	20%	17%	10%	22%	21%	100%
Site works	11	Site works	m^3	38500	15%	10%	10%	10%	10%	20%	100%
Total Price of Project			15471535								

TABLE 7. The relation between the activities and functions to present the cost estimation ratios

Source: Analysis by Authers

Works			Unit	Total Price	Cost Estimation (Value team) 100%						
					13.4	16.1	23.60	16.35	18.63	11.78	11.78
					Safety and Security	Comfort	Privacy	Beauty	Service Quality	Functional Needs	
	1	Preliminary works	m^3	199900	49975	34982.5	40979.5	29985	33983	9995	
	2	Concrete Works	m^3	5634300	1014174	676116	1690290	986002.5	1014174	225372	
Architectural works	3	Masonry works	m^2								
		Building works		1209000	120900	120900	302250	96720	229710	338520	
		Plastering works		811500	81150	121725	202875		178530	227220	
Interior works		Painting works		492000	24600	49200	123000	63960	93480	137760	
	4	flooring	m^2								
		Ceramic and Porcelain		984750	98475	147712.5	246188		226493	265882.5	
		Squirrel tiles		49500	12375	8662.5	10147.5		8415	9900	
	5	Marble works									
		Marble and Granite	m^2	107675		16151.25		32302.5	16151.3	43070	
		Granite Cladding	m^2	110000		16500	22000	22000	16500	33000	
		Marble and Granite for stairs	m.L	122950		18442.5	24590	24590	18442.5	36885	

	6	Wood and aluminum works	m^3	1659200	365024	365024	298656	298656	331840	
	7	Plumbing works	m.L	841665	168333	168333	185166		168333	151499.7
	8	Decorative works	unit	2137800		534450	320670	855120	320670	106890
	9	Iron works	kg	80000	28000	8000	12000	8000	4000	20000
	10	Electrical works	unit	992795	99279.5	198559	168775	99279.5	218415	208486.95
Site works	11	Site works	m^3	38500	5775	3850	3850	13475	3850	7700
Total Price Of Project			15471535		2068060.5	2484758.3	3651437	2530090.5	2882986	1822181
			15439514							

Finally, The Analysis will allocate the unnecessary cost by comparing between the end-user questionnaire ratio and cost estimation ratio as shown in table 07.

TABLE 7. Allocate The Unnecessary Cost
Source: Analysis by Authers

Function Weight				Difference between two results
Needs		Questionnaire result	Value team resalt	
1	Safety and Security	27%	13.37%	13.63
2	Comfort	17%	16.9%	0.1
3	Privacy	24%	23.60%	0.4
4	Beauty	8%	16.35%	-8.35
5	Service Quality	14%	18.63%	-4.63
6	Functional Needs	10%	11.78%	-1.78
		100%		100%

from the compression above, the Beauty and Service Quality have the highest values which means that they have unnecessary cost.

C- Creativity Idea

From the function analysis of the previous phase that the unnecessary cost is allocated in the highest values in Beauty function and the Service Quality function.

It was found that the cost analysis which was analyzed before for each function in concrete works, decorative works and wood and aluminum works. The concrete works are out of the research scope because it is mainly under the civil works. The decorative works also are out of research because consist of a verity item related on the different point of views. The study will propose creative ideas for wood and aluminum works as shown in table 08.

TABLE 8. Creative ideas and evaluation matrix
Source: Analysis by Authers

Needs										
A	Safety and Security	A								
B	Comfort	A2	B							
C	Privacy	AC	C	C						
D	Beauty	AD	BD	CD	D					
E	Service Quality	A	BE	CE	DE	E				
F	Functional Needs	AF	F	CF	F	EF	F			
	wights	6	2	7	4	4	5	28		
	Alternative %	21.43	7.14	25	14.29	10.71	17.86	Total	Quality	Cost	V=Q/V Value Index
Alternative	U-PVC	6	1	3	4	5	5		410.7	1600	0.26
		128.57	7.14	75	57.14	53.57	89.29				
	Doors and windows of poly wood	5	3	5	4	2	4		310.7	2200	0.14
		107.14	21.43	125	57.14	21.43	71.43				

Function A is much important than B =2A
Function A is important than B =A
Function A& B are same importance =AB
Function B is important than A =B
Function B is much important than A =2B

TABLE 9. Cost and Quality Situations
Source: Analysis by Authers

Cost		Quality	
Situation	Total L.E.	Situation	Total unite
Before Creative Idea	1659200	Before Creative Idea	310.7
After Creative Idea	1475200	After Creative Idea	410.7
Saving Value	184000	Quality Growth	410.7
Saving Percentage	11.09%	Quality Growth Percentage	32.19%

2.2 Apply Risk Management Techniques

The U-PVC alternative is a highest value index that means this alternative will add more value by reduce the cost and improve the quality as shown in table 09.

A- Identify Risks

1- The project site consists of a lot of rocks that had to be removed before starting the excavation activities.
2- Mismanagement of the project, which caused the start of implementation on the time.
3- Delay for approving the levels of public utilities as electricity, water and sewage, which led to the delay in the works of the layout activities such as electricity, sewage and all activities that depend on that.
4- Miscoordination between the architecture and the structure schemes.
5- Electricity transformer crashes during the working period, this led to increase the project duration.
6- Lack of coordination of resource management to provide the raw materials on the time, which effects on the project time and completion rate.

B- Qualitative Risk Analysis

The study will evaluate the probability of the risks and its impacts as shown in table 10. The level of qualitative evaluation of probability and impact is carried out according to the table no 01.

TABLE 10. Qualitative Risk Analysis
Source: Analysis by Authers

ID	Work package	Dry Cost L.E	Electricity transformer crashes		Miscoordination of Drawings		Lack of coordination of resource		Delay for approving levels		Mis management		Rocks	
			(P)	(I)	(P)	(I)	(P)	(I)	(P)	(I)	(P)	(I)	(P)	(I)
1	Preliminary works	199900	M	H	V.L	L	V.L	L	H	V.H	V.L	L	H	V.H
2	Concrete Works	5634300	M	H	L	M	V.L	L	H	V.H	V.L	L	L	L
3	Walls works	2512500	V. L	L	M	H	L	M	V.L	L	V.L	L	V.L	L
4	Flooring works	1034250	M	M	H	V.H	M	M	V.L	L	M	M	V.L	L
5	Marble works	340625	M	H	L	L	M	M	L	L	M	M	V.L	L
6	Wood and aluminum works	1659200	M	H	L	L	M	L	V.L	L	V.L	L	V.L	L
7	Plumbing works	841665	M	H	M	V.H	L	L	V.H	V.H	L	L	M	H
8	Decorative works	2137800	L	L	V.L	L	M	L	V.L	L	V.L	L	V.L	L
9	Iron works	80000	H	H	V.L	L	L	L	V.L	L	V.L	L	V.L	L
10	Electrical works	992795	L	M	L	M	M	M	H	V.H	M	M	M	H
11	Site works	38500	V. L	L	M	M	L	L	H	V.H	L	L	M	H
Total Dry Cost		15471535												

C- Quantitative Risk Analysis

In This stage, the study will convert the qualitative levels and rates to quantitative values as per tables no 01 and 02 as shown in table 11.

TABLE 11. Quantitative Risk Analysis
Source: Analysis by Authers

ID	Work package	Dry Cost L.E	Electricity transformer crashes			Miscoordination of Drawings			Lack of coordination of resource			Delay for approving levels			Mismanagement			Rocks		
			(P)	(I)	(S)	(P)	(I)	(S)	(P)	(I)	(S)	(P)	(I)	(S)	(P)	(I)	(S)	(P)	(I)	(S)
1	Preliminary works	199900	0.5	0.4	0.2	0.1	0.1	0.01	0.1	0.1	0.01	0.7	0.8	0.56	0.1	0.1	0.01	0.7	0.8	0.56
2	Concrete Works	5634300	0.5	0.4	0.2	0.3	0.2	0.06	0.1	0.1	0.01	0.7	0.8	0.56	0.1	0.1	0.01	0.3	0.1	0.03
3	Walls works	2512500	0.1	0.4	0.2	0.5	0.4	0.2	0.3	0.2	0.06	0.1	0.1	0.01	0.1	0.1	0.01	0.1	0.1	0.01
4	Flooring works	1034250	0.5	0.2	0.1	0.7	0.8	0.56	0.5	0.2	0.1	0.1	0.1	0.01	0.5	0.2	0.1	0.1	0.1	0.01
5	Marble works	340625	0.5	0.4	0.2	0.3	0.1	0.03	0.5	0.2	0.1	0.3	0.1	0.03	0.5	0.2	0.1	0.1	0.1	0.01
6	Wood and aluminum works	1659200	0.5	0.4	0.2	0.3	0.1	0.03	0.5	0.1	0.05	0.1	0.1	0.01	0.1	0.1	0.01	0.1	0.1	0.01
7	Plumbing works	841665	0.5	0.4	0.2	0.5	0.8	0.4	0.3	0.1	0.03	0.9	0.8	0.72	0.3	0.1	0.03	0.5	0.4	0.2
8	Decorative works	2137800	0.3	0.1	0.3	0.1	0.1	0.01	0.5	0.1	0.05	0.1	0.1	0.01	0.1	0.1	0.01	0.1	0.1	0.01
9	Iron works	80000	0.7	0.4	0.28	0.1	0.1	0.01	0.3	0.1	0.03	0.1	0.1	0.01	0.1	0.1	0.01	0.1	0.1	0.01
10	Electrical works	992795	0.3	0.2	0.06	0.3	0.2	0.06	0.5	0.2	0.1	0.7	0.8	0.56	0.5	0.2	0.1	0.5	0.4	0.2
11	Site works	38500	0.1	0.1	0.1	0.5	0.2	0.1	0.3	0.1	0.03	0.7	0.8	0.56	0.3	0.1	0.03	0.5	0.4	0.2
Total Dry Cost		15471535																		
Average Ratio OF (S)					0.14			0.13			0.05			0.28			0.04			0.11

D- Plan Risk Response

Plan risk and response will depend on the risk severity (S) as mentioned before in tables no. 02 and 03.

There are three cases as follows:

1- Yellow area: It means at the monitoring list. This list not effect on the project if occurred. The management team in the project must be consider these risks through the project implementation phase to remove it.
2- Gray area: It means at the risk response list. This list effect on the project if occurred. The management team must be planed for that in the project to remove it. The risk response has many approaches mentioned at project's bid, transfer risk to another side., etc.
3- Green area: It means at risk contingency list. This list will effect on the project. It will be added to the quantitative list and calculate the additional cost to cover this risk if occurred.

As shown in table 12

TABLE 12. Plan Risk Response
Source: Analysis by Authers

ID	Work package	Dry Cost L.E	Electricity transformer crashes				Miscoordination of Drawings				Lack of coordination of resource				Delay for approving levels				Mismanagement				Rocks				Total adding cost
			(P)	(I)	(S)	Add cost	(P)	(I)	(S)	Add cost	(P)	(I)	(S)	Add cost	(P)	(I)	(S)	Add cost	(P)	(I)	(S)	Add cost	(P)	(I)	(S)	Add cost	
1	Preliminary works	199900	50%	40%	20%	1999	10%	10%	1%	499.75	10%	10%	1%	499.75	70%	80%	56%	3998	10%	10%	1%	499.75	70%	80%	56%	3998	3998
2	Concrete Works	5634300	50%	40%	20%	56343	30%	20%	6%	42257	10%	10%	1%	14086	70%	80%	56%	112686	10%	10%	1%	14086	30%	10%	3%	14086	112686
3	Walls works	2512500	10%	10%	1%	6281.25	50%	40%	20%	25125	30%	20%	6%	18844	10%	10%	1%	6281.3	10%	10%	1%	6281.3	10%	10%	1%	6281	6281.3
4	Flooring works	1034250	50%	20%	10%	103425	70%	80%	56%	20685	50%	20%	10%	10343	10%	10%	1%	2585.6	50%	20%	10%	10343	10%	10%	1%	2585	2585.6
5	Marble works	340625	50%	40%	20%	3406.25	30%	10%	3%	851.56	50%	20%	10%	3406.3	30%	10%	3%	851.56	50%	20%	10%	34063	10%	10%	1%	851.5	851.56
6	Wood and aluminum works	1659200	50%	40%	20%	16592	30%	10%	3%	4148	50%	10%	5%	12444	10%	10%	1%	4148	10%	10%	1%	4148	10%	10%	1%	4148	4148
7	Plumbing works	841665	50%	40%	20%	8416.65	50%	80%	40%	16833	30%	10%	3%	2104.2	90%	80%	72%	16833	30%	10%	3%	2104.2	50%	40%	20%	8416	16833
8	Decorative works	2137800	30%	10%	3%	5344.5	10%	10%	1%	5344.5	50%	10%	5%	16034	10%	10%	1%	5344.5	10%	10%	1%	53445	10%	10%	1%	5344	5344.5
9	Iron works	80000	70%	40%	28%	1200	10%	10%	1%	200	30%	10%	3%	200	10%	10%	1%	200	10%	10%	1%	200	10%	10%	1%	200	200
10	Electrical works	992795	30%	20%	6%	7445.96	30%	20%	6%	7446	50%	20%	10%	9928	70%	80%	56%	19856	50%	20%	10%	9928	50%	40%	20%	9928	19856
11	Site works	38500	10%	10%	1%	96.25	50%	20%	10%	385	30%	10%	3%	96.25	70%	80%	56%	770	30%	10%	3%	96.25	50%	40%	20%	385	770
Total Dry Cost		15471535																									
Average Ratio OF (S)					0.14				0.13				0.05				0.28				0.04				0.11		
																					Adding Cost = 173553.96						

E- ***Monitor and Control Risks,***

From the plan risk response stage, the delay for approving the levels of public utilities risk is in the green area. This risk needs additional cost as contingency. By calculate the additional cost for each activity as shown in table 12 will be 173,553.96 EGP.

CONCLUSION

The study presents the steps for the integration methodology between value engineering and risk managements. Through applying the value methodology on the case study which not only raised the value index and improve the function performance but also reduce the unnecessary cost. On the other hand, the risk management techniques determine the risk types and analyze both of quantitative and quantitative terms to calculate the severity for each to get the additional cost. The study summarized the integrations as shown in table 13.

TABLE 13. Summarize The Integrations
Source: Analysis by Authers

Risk Management Analyses	Value Engineering Analyses
Adding cost (+)	Removing cost (-)
173553.96 EGP	184000 EGP
Saving = 10446.04 EGP	
Adding Value, improve Quality	
Apply Risk management	

On the regulations side:

The Responsible authority must be committing all the stakeholders by apply the integration methodology. It will guarantee achieving the main three factors in the social housing projects. The first factor is project budget, by applying the integration will remove any additional costs such as contingency and any uncertainty action. This integration will increase the project value index by reduce the unnecessary cost. The second factor is quality, by using the value techniques will improve the all the end-users requirements such as functions, behavior, needs and performance. The third factor is time, by analyze the risks that guarantee the project duration as planned.

On the government polices:

The government authority must be committing the investors by present their proposals in the upcoming projects including the integration techniques which present the economics factors for their investments and end-users fordable. The government must enact economic laws that reduce the unnecessary costs mainly in the construction sector. The construction industry is one of the economic indexes have measured the economic developments on the international levels.

On the invertor side:

The integration as mentioned above for the government side will provide healthy construction industry. It will be fruitful environment for local

investors and the international one that works to attract investments to Egypt. It will add value and make the new cities as am iconic.

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