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New Direction of Subway Stations Evaluation Using Value Strategies

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Abstract : This paper attempts to enhance the quality level on subway stations in order to achieve their goals and objectives by applying value evaluation strategies. The transportation factor is one of the major aspects to become a sustainable city. Especially over the past decades, the multi-modal traffic interchanges are becoming new main points of urban level. The subway stations have a special role in people's lives. It serves a lot of people every day, it also considers as the gateway to the world's great cities and the point of contact for remote towns. Therefore, the research attempts to rectify the current problems at the subway stations by activating value evaluation as a new direction. The study analyses one of subway station in Egypt as a pilot case study. It uses a scientific path starting with theoretical and analytical studies as the materials and methods. Then, an applied Study as a result in each term. Results obtained during analysis of the case study, which is based on the value evaluation criteria, can be used as framework for development of other significant railway stations. . Finally, the research outlines what it covered and presents its conclusions.

KEYWORDS: Subway stations; Value; Evaluation criteria; Sustainable city

Introduction

The transportation factor is presenting one of the major aspects to become a sustainable city. The concept of sustainable transport is developments that meet the needs of the present without compromising the ability of outlook generations to meet their end user needs. It urges to achieve the three pillars, which are economic, social and environmental. (Keeble, 1988) At the transportation aspect, environmental impacts are presented as critical address that can challenge the sustainability of cities (Miller, De Barros, Kattan, & Wirasinghe, 2016) Many sustainable developments, specifically in cities, requires new appropriate infrastructure and this require investment. The governments lately cannot provide such investment at the levels require. (Sharma & Newman, 2017) At this case of projects, it is very important to integrate with value strategies to guarantee does not appear unnecessary cost. The value methodology and its strategies is playing a vital role in the three major issues which are quality, function and cost. (Anderson et al., 2014).

On the other hand, the subway stations are one of the major transportation issues and have a special role in people's lives. It serves a lot of people every day, it also considers as the gateway to the world's great cities and the point of contact for remote towns. In practical field, there are not evaluation tools for the subway station focusing on the three pillars which are affected directly on the investment. The study attempts to rectify the current problems at the subway stations by activating value evaluation as a new direction. The study believes that the value strategies as evaluation tools will draw the roadmap for developing the upcoming subway stations. Therefore, many subway stations on the local level in Egypt often suffer from poor operation factor as a directly result from its quality of the functions. Therefore, the study identifies the perceptions of Architectural aspects as helpful factors that can be used in evaluation process via value strategies. The perceptions of Architectural aspects of subway station will be presented with the two main pillars. The study will analysis these pillars at the materials

and methods on theoretical part of the research. The first pillar is function; it consist of transportation, commercial and culture aspects. The second pillar is form; it is consisting of aesthetics criteria in the station. The study will present each one and how achieve its goals. Meanwhile, the value approach strategies will be presented at theoretical part based on the SAVE international organization methodology. It will analysis the job plan when use the value tools to evaluate any process and get more valuable alternatives. In turn, we will be able to determine which station by a clear process can guarantee the quality level for upcoming projects. The research will employ the Cairo Fair subway station at Cairo city as a pilot case study. It consists of five level, street level, ticket level, intermediate level, platform level and under platform level. It will analysis the case study based on its cost and apply all architectural aspects on it. The main objective of this research is to establish a framework as new Direction of Subway Stations Evaluation using value strategies. The research will model the relations based on value strategies and create a new evaluation process for upcoming subway stations. Finally, we will finalize the research by drawing conclusions from all theoretical, analytical and applied aspects. We will also make recommendations with regard to the current situation and propose further research directions related to the topic.

I. MATERIALS and METHDES

1- ARCHITECTURAL ASPECTS FOR SUBWAY STATIONS

Structures and buildings should be united to achieve the structural art an architectural concept. It also needs to aesthetic criteria. (E.M Kido, 2014) The core architecture aspects are function and forms. The appropriate coordination between building architectural form and structure with function is reflected in related criteria to form and function. [(Radford, Srivastava, & Morkoç, 2014) The study will present the architectural aspects which are needed for the end-user as follow:

1-1 First pillar: Function

(1) Transportation.

The transportation function is the most important one. In many countries such as Japan for the modern stations designed by new technics for passenger transit have been transformed into many functional spaces serving a set of purposes (E.M Kido, 2014). Recently, European stations have acquired these multifunctional aspects. Not only provide link with other nodes but also for serving a shops and other centres. At the subway stations very significant is relation between form and function. In the facts, transportation function depends on the accessibility of the station, quality of stations building and its landmark value, proper information system, visibility of the entrance, the quality of the hall, concourses and platforms.

1- Accessibility: The stations should be accessible to all users; therefore, universal design is playing as a vital vehicle in to achieve the accessibility as international codes. Recently, the subway stations are equipped with barrier-free access through elevators, escalators, signs for all users. Services and facilities responding to universal design should have aesthetic values.

2- Information: Although, there are many announcements in the stations spaces such as verbal announcements, there is very important to add more information which is visual, various signs, posters, plasma displays, etc. It is vital aspect that the information signs have clear messages, easy to understand, and that their size is appropriate. This information adds additional quality to station design.

3- Quality of station building: Main station architectural program include: station building, entrance, hall and circulation areas, such as concourses, platforms with canopies, many other services and facilities including shopping malls, shops and post office. Also it includes outdoor environments such as cafes, station plaza, fast food restaurants and street in front of station.(Ewa Maria Kido, 2005)

4- Quality of station entrance: The architecture design for the station entrance is must be clear design, well visible entrance and should be harmonized with their surroundings. About the front area of the station entrance should be located a plaza. It provides direct vehicular access to the station. The entrance design must be providing a shelter for people waiting for a bus or taxi. The entrance should be designed as practical solutions to enable traffic flow and achieve symbolic element of the station. Many designs are using the glazing facades to provide a clear orientations and easy movement. (E.M Kido, 2014)

5- Quality of station hall and concourse: Generally, the station spaces such as station ticket halls, entrance, concourses, station plaza and platforms need a good relation and should be located without ambiguity or obstruction.

The movement through all spaces and elements not only should be visible and clearly define but also easily found by passengers. The architecture design must be achieved ease of movement, comfort and speed in the all circulation through the station. Commercial and services facilities location at the at circulation areas runs counter to allow good flow of passengers. (Ross, 2000)

6- Quality of stations platform: The Architecture design aspects for the platform should be harmonized with other spaces of the station; this horizontality will provide total design and high quality of stations parts. The Platforms length is generally calculated by train length, while the width is determined according to the number of passengers.(Ewa Maria Kido, 2005)

(2) Commercial.

The commercial side of metro stations are very important part when describing the city's characters. It became attraction spaces for tourists. Commercial spaces bring revenue to rail operators. There are more functions have been added such as hotels, restaurant, retails and leisure. Many activities should be achieved such as small size walk-in units, kiosks, small shops, small size walk-in units, trade stands, vending machines, , ATMs, promotional activities, internet facilities and public telephones.(Edwards, 2013)

1- Shops: Lately, the subway stations have become offering several attractions and experiences as a transportation node. One of the most important functions is shops. Therefore, the shops present the core of commercial function at the stations. Commercial developments should be designed as "concentrated shopping malls" that will great spaces integrated with public areas of the station.(Edwards, 2013)

2- Advertisements: Advertisements are certain in their design. It should be a part of whole design approach. It associates on the context of the station environment and its culture. It is playing a vital role to enhance the value of the station image. (Ashihara, 2018)

(3) Cultural.

Cultural is as public art. It is well play a significant role in enhancing image of the station. The different companies which work in the stations understand the importance value of introducing a culture and design into stations. Cultural and art have become a part of cultural value of the rail brand design. In many countries like Europe, some transport agencies have introduced a "percent for the art" policy, based on a fixed percentage (from 0.5% to about 1%) of all budgets for new developments allocated to the purposes of art. (Edwards, 2013)

1-2 Second pillar: Form

The station form is the shape of its buildings. It consists of eleven items under the aesthetics criteria umbrella as follows:

1- Size and scale: Building size, its interiors design and visual weight generated by their impression. The size of station depends on how many passengers use it. The scale is perceived in comparison to human scale. Some stations such as large European railway terminals, like London's St Pancras, Paddington or Victoria, they were designed to provide adequate space for passengers and also to impress by their large scale. (Ching, 2007)

2- Proportion: Proportion means station building should have harmonious shape. There are favored proportions, such as golden ratio 1.6 to 1. The architects developed it based on the analysis of buildings which are generally considered as beautiful, such as "modular" system by Le Corbusier. (Corbusier, 2000)

3- Space: The design of space in subway station should possess a direction. The architects can achieve this approach by a sequence in which one space comes after another. This means that directionality is very important at the stations. It enables users to move through it, rest, purchase tickets, prepare before embarking for a travel and after arriving at the destination. (Ching, 2007)

4- Visual weight: Visual weight is strong related with lightness of structures Visual weight is referred to when we speak about the lightness of structures. As Holgate pointed out, visual weight of areas and volumes is of major importance in many factors such as the unity, balance, and composition of built forms. It is influenced by light, color, and texture. (Holgate, 1992)

5- Light: The light and shadow are emphasized on the nature of the form. Light also identify the texture and color. The spaces quality is influenced by changes in the angle and color of the daylight. Light at the subway station is very necessary to provide the architecture concepts. (Holgate, 1992)

6- Texture: Texture is adding more values for the surfaces. The texture could be rough or smooth. The architects determine which one you need in their designs based on the needs and functions for each faces and surfaces. Texture also has effect on the visual weight that means the faces

with smooth materials are less than those which have rough materials. (Holgate, 1992)

7- Color: Colors have effect on the visual weight. Many colors, which are (warm), provide spaces visually smaller, while(cool) colors provide them visually larger. At the subway station, colors can be created by using many aspects such as colourful artificial lighting and colorful materials. Colors are used to express the design concept. They can be also achieved more positive aspects as a guiding or safety tool, for example by emphasizing railings or elevators by special color. (Holgate, 1992)

8- Composition: Composition have many advantages in the architectural design. It provides balance, unity, and harmony. Balance in built forms provides and great comprehensive equilibrium between all visual forces. Unity is equaled with beauty of built shape and form. Harmony is related to the unity, which means that all architecture elements must be not only fit to each other but also to their context, wider surrounding, etc. (Ching, 2007)

9- Movement and rhythm: The movement and rhythm determine the movement shape and help to direct flow of passengers. At the subway stations, rhythm of some facades can make focusing on the entrance and the main station halls and distinguish them from other areas. (Ghyka & Valéry, 2016)

10- Image-based elements: Image illustrates and determine the architectural design idea. Built shapes express their relation with certain location. They might express the landmark of the city. (Holgate, 1992)

11- Outstanding elements – landmarks: Most stations are perceived as landmarks, cultural, historical, and social context. Historically, most subway stations in Europe were landmarks, distinguished by their elaborated large forms and by prominent location. (Holgate, 1992)

2- VALUE STRATEGIES PROCESS

The Value strategy process was followed using the SAVE International Value Methodology job plan. It was structured into the three basic phases which are: pre-workshop phase, workshop phase and post-workshop phase. The first phase is pre-workshop stage which focusing of the preparatory activities such as developing models and data gathering. The leader worked to define the team members for the study. They can include design staff, Architects, and other domain experts as deemed suitable based on the study's specific needs. All study team members were provided by project information with the formal session to become familiar with the study track. The second phase is workshop stage which followed the classic value strategy curriculum in a sequenced approach.

- Information/Investigation: This step aims to present the value strategy team to enhance their understanding of the data and information under study. The presentations were made by team leader and others as the study needed. The leader usually used a brainstorming method to provide consensus on the study expectations, sensitivities and study goals.
- Function Analysis: This step present a vital millstone in the value studies. The function analysis activity uses many recognized value engineering techniques to define the study targets.
- Creativity/Speculation: The team members participated in the interactive creativity session to generate several creative ideas related to the identified targets. Many techniques could be generated during this session such as Brainstorming techniques and additive/subtractive strategies.
- Evaluation Phase: The team create a shortlist of the new ideas followed by the speculation step. It is devolved using many evaluate and assessment criteria, to reach the ideas which have more value index.
- Development: A key component is the preparation of a compelling argument supporting the implementation of each value strategies proposal.
- Presentation/Implementation: The final step focuses on the implementation and presentation of the developed ideas. The team should identified only the valuable ideas.

The main aim of this step to present the most defensible ideas, provide the value benefits and consistently confirm the direction needed for the recommended changes.

The final phase is post workshop phase, it's main aim is preparing the value study report and documented the final findings. (LAURIE DENNIS, 2017)

II. RESULTS AND DISCUSSIONS

3- VALIDATION THE VALUE STRATEGIES PROCESS

The validation of the study process which evaluate using value strategies depend on two terms as follows:

The first term is the questionnaire process. It was selected from the primary stakeholders that will

affect the realization more accurate results. The stakeholders such as subway station end user, the employees, Top management, consultant architects in the National Authority of tunnels in Egypt, Architects and sample random from the decision makers at the Ministry of Transportation.

The Second one consist of five stages; meeting preparation; pilot meeting; interviewees selection; meeting experts and the meeting outcomes.

1- The meeting preparation stage: This stage aims to design the meeting protocol. The structure started by an introduction which aims to introduce the study aims and the model generation. Then, literature summary to present the previous assessment for different types of projects using value methodology. After that, Model generation process will explain the value strategies approach to evaluate the subway station.

2- A pilot meeting: It is started with value experts in order to test the meeting process before embarking an actual meeting. The pilot interview aims to modify the interview process. It was necessary to pilot the meeting process to ensure the paths are clear and comprehensive.

3- The selection interviewees: After applying the modifications, The Interviewees were selected from the domain experts that will affect the realization of accurate results. The category for interviewees consists of three categories of experts. These categories present the key players in study filed. The first one, university professor in the architecture department. The second, Value members who's certified from the SAVE international origination. The third category, Consultants in the National Authority of tunnels in Egypt.

4- Meeting experts: in this stage the study will present the discussion with the whole expert categories as the outlines which are drawn by the validation process.

5- The meeting outcomes: in this stage the study will analysis their discussion based on the value strategies. It will be showed the items which does not provide quality level and the other which had unnecessary cost.

4- APPLY THE VALUE STRATEGIES PROCESS

The study will analysis the pilot case study by following the 6 phases of SAVE value strategies methodology to evaluate subway station. The six stages according to SAVE International origination are Information, Function Analysis, Creative, Evaluation, Development and Presentation.

- Information Stage:

This study will use the Bill of Quantities to generate the first stage of value strategies plan for the Cairo fair station as shown in table 1. All data are citied from National Authority for Tunnels.

Table 1. Bill of quantities

Section no	Items	Total price EGP
01	Masonary	4,581,098.01
02	Damp and Waterproofing	598,159.80
03	Thermal Insulation	311,480.00
04	Aluminium Windows , doors and Partitions	125,774.00
05	Steel doors and windows	5,208,325.14
06	Floors and Skirting	10,937,048.70
07	Plaster	4,230,596.80
08	Walls and stairs lining	16,629,097.30
09	Painting	3,054,708.50
10	Railing and Metal Fabrications	11,701,270.89
11	Suspended ceiling	47,058.00

12	Signs	3,067,808.60
13	Concrete for arrangement works	3,293,612.00
14	Miscellaneous(furntature, ticket offices façade saftyglass, partitions and wast basket)	4,374,020.90
		68,160,058.64

• Function Analysis Stage:

This stage is considered the most important stages in value strategies. It is divided into two phases. During First phase, it aims to define the needs for end-user of the station. During Second one, the study will analyse the relationship between function as a needs and cost; to determine and calculate the function cost. After that, the study will allocate the unnecessary cost.

(1) First phase: Function (Needs) Identification. These needs have been summarized from the research theoretical part. A questionnaire was performed upon random end-users in order to identify their function weights as shown table 2.

Table 2. Function Identification and its Weight (Questionnaire Results).

Function (Needs)			Weight %
Function	Transportation	Accessibility	22.0%
		Information	11.0%
		Station building quality	6.0%
		station entrance quality	4.0%
		station hall and concourse quality	3.0%
		stations platform quality	4.0%
	Commercial	Shops	3.0%
		Advertisements	2.0%
	Cultural		3.0%
Form	Aesthetics criteria	Size and scale	6.0%
		Proportion:	3.0%
		Space	7.0%
		Visual weight	2.0%
		Light	4.0%
		Texture	2.0%
		Color	2.0%
		Composition	2.0%
		Movement and rhythm	8.0%
		Image-based elements	3.0%
		Outstanding elements landmarks	3.0%

(2) Second phase: Function cost

The study will generate the relationship between function and cost. This analysis will provide the function impact for different section for the case study and calculate the function cost as shown tables 3. Different disciplines of value team generated the relationships impact using brainstorming methodology

Table 3. Function Impact FI and Function Cost.

		Accessibility		Information		Quality of station building		Quality of station entrance	
No.	Items	FI %	Cost EGP.	FI %	Cost EGP.	FI %	Cost EGP.	FI %	Cost EGP.
01	Masonary	25	1145274.5	0	0.0	0	0.0	0	0.0
02	Damp and Waterproofing	0	0.0	0	0.0	25	149540.0	25	149540.0
03	Thermal Insulation	0	0.0	0	0.0	25	77870.0	25	77870.0
04	Aluminium Win. doors and Partitions	25	31443.5	0	0.0	0	0.0	0	0.0
05	Steel doors and windows	70	3645827.6	0	0.0	0	0.0	0	0.0
06	Floors , Skirting	10	1093704.9	0	0.0	0	0.0	0	0.0
07	Plaster	0	0.0	0	0.0	20	846119.4	20	846119.4
08	Walls and stairs lining	25	4157274.3	0	0.0	0	0.0	0	0.0
09	Painting	0	0.0	5	152735.4	0	0.0	0	0.0
10	Railing and Metal Fabrications	15	1755190.6	5	585063.5	0	0.0	0	0.0
11	Suspended ceiling	0	0.0	0	0.0	0	0.0	0	0.0
12	Signs	15	460171.3	30	920342.6	0	0.0	0	0.0
13	Concrete for arrangement works	10	329361.2	0	0.0	10	329361.2	10	329361.2
14	Miscellaneous	25	1093505.2	15	656103.1	0	0.0	0	0.0
Function Cost		13,711,753.14		2,314,244.68		1,402,890.51		1,402,890.51	
Function Cost Ratio		20.4%		3.4%		2.1%		2.1%	

		Quality of station hall and concourse		Quality of stations platform		Shops		Advertisements	
No.	Items	FI %	Cost EGP.	FI %	Cost EGP.	FI %	Cost EGP.	FI %	Cost EGP.
01	Masonary	0%	0.0	0%	0.0	0%	0.0	5%	229054.9
02	Damp and Waterproofing	25%	149540.0	25%	149540.0	0%	0.0	0%	0.0
03	Thermal Insulation	25%	77870.0	25%	77870.0	0%	0.0	0%	0.0
04	Aluminium Win. doors and Partitions	0%	0.0	0%	0.0	5%	6288.7	10%	12577.4
05	Steel doors and windows	0%	0.0	0%	0.0	5%	260416.3	0%	0.0
06	Floors , Skirting	0%	0.0	0%	0.0	5%	546852.4	5%	546852.4
07	Plaster	20%	846119.4	20%	0.0	0%	0.0	0%	0.0
08	Walls and stairs lining	0%	0.0	0%	0.0	0%	0.0	5%	831454.9
09	Painting	0%	0.0	0%	0.0	10%	305470.9	15%	458206.3
10	Railing and Metal Fabrications	0%	0.0	0%	0.0	10%	1170127.1	10%	1170127.1
11	Suspended ceiling	0%	0.0	0%	0.0	5%	2352.9	5%	2352.9
12	Signs	0%	0.0	0%	0.0	20%	613561.7	20%	613561.7
13	Concrete for arrangement works	10%	329361.2	10%	329361.2	0%	0.0	0%	0.0
14	Miscellaneous	0%	0.0	0%	0.0	5%	218701.0	5%	218701.0
Function Cost		1,402,890.51		556,771.15		3,123,771.00		4,082,888.63	
Function Cost Ratio		2.1%		0.8%		4.6%		6.1%	

		Cultural		Size and scale		Proportion		Space	
No.	Items	FI %	Cost EGP.	FI %	Cost EGP.	FI %	Cost EGP.	FI %	Cost EGP.
01	Masonary	0%	0.0	15%	687164.7	10%	458109.8	20%	916219.6
02	Damp and Waterproofing	0%	0.0	0%	0.0	0%	0.0	0%	0.0
03	Thermal Insulation	0%	0.0	0%	0.0	0%	0.0	0%	0.0
04	Aluminium Win. doors and Partitions	5%	6288.7	10%	12577.4	0%	0.0	10%	12577.4
05	Steel doors and windows	0%	0.0	0%	0.0	0%	0.0	15%	781248.8
06	Floors , Skirting	10%	1093704.9	0%	0.0	0%	0.0	5%	546852.4
07	Plaster	0%	0.0	0%	0.0	0%	0.0	0%	0.0
08	Walls and stairs lining	0%	0.0	10%	1662909.7	10%	1662909.7	10%	1662909.7
09	Painting	10%	305470.9	0%	0.0	5%	152735.4	5%	152735.4
10	Railing and Metal Fabrications	0%	0.0	0%	0.0	5%	585063.5	20%	2340254.2
11	Suspended ceiling	0%	0.0	20%	9411.6	20%	9411.6	20%	9411.6
12	Signs	0%	0.0	0%	0.0	0%	0.0	0%	0.0
13	Concrete for arrangement works	0%	0.0	5%	164680.6	5%	164680.6	5%	164680.6
14	Miscellaneous	5%	218701.0	0%	0.0	0%	0.0	0%	0.0
Function Cost		1,624,165.47		2,536,744.03		3,032,910.70		6,586,889.74	
Function Cost Ratio		2.4%		3.8%		4.5%		9.8%	

		Visual weight		Light		Texture		Color	
No.	Items	FI %	Cost EGP.	FI %	Cost EGP.	FI %	Cost EGP.	FI %	Cost EGP.
01	Masonary	5%	229054.9	0%	0.0	0%	0.0	0%	0.0
02	Damp and Waterproofing	0%	0.0	0%	0.0	0%	0.0	0%	0.0

03	Thermal Insulation	0%	0.0	0%	0.0	0%	0.0	0%	0.0
04	Aluminium Win. doors and Partitions	0%	0.0	5%	6288.7	0%	0.0	0%	0.0
05	Steel doors and windows	0%	0.0	0%	0.0	0%	0.0	0%	0.0
06	Floors , Skirting	5%	546852.4	10%	1093704.9	10%	1093704.9	20%	2187409.7
07	Plaster	0%	0.0	0%	0.0	10%	423059.7	10%	423059.7
08	Walls and stairs lining	0%	0.0	0%	0.0	0%	0.0	0%	0.0
09	Painting	5%	152735.4	5%	152735.4	15%	458206.3	25%	763677.1
10	Railing and Metal Fabrications	0%	0.0	0%	0.0	0%	0.0	0%	0.0
11	Suspended ceiling	10%	4705.8	15%	7058.7	0%	0.0	0%	0.0
12	Signs	10%	306780.9	0%	0.0	0%	0.0	0%	0.0
13	Concrete for arrangement works	0%	0.0	0%	0.0	0%	0.0	0%	0.0
14	Miscellaneous	5%	218701.0	0%	0.0	10%	437402.1	0%	0.0
Function Cost		1,458,830.47		1,259,787.70		2,412,372.92		3,374,146.55	
Function Cost Ratio		2.2%		1.9%		3.6%		5.0%	

		Composition		Movement and rhythm		Image-based elements		Outstanding elements – landmarks	
No.	Items	FI %	Cost EGP.	FI %	Cost EGP.	FI %	Cost EGP.	FI %	Cost EGP.
01	Masonary	10%	458109.8	5%	229054.9	0%	0.0	5%	229054.9
02	Damp and Waterproofing	0%	0.0	0%	0.0	0%	0.0	0%	0.0
03	Thermal Insulation	0%	0.0	0%	0.0	0%	0.0	0%	0.0
04	Aluminium Win. doors and Partitions	10%	12577.4	15%	18866.1	0%	0.0	5%	6288.7

05	Steel doors and windows	0%	0.0	10%	520832.5	0%	0.0	0%	0.0
06	Floors , Skirting	5%	546852.4	10%	1093704.9	5%	546852.4	0%	0.0
07	Plaster	0%	0.0	0%	0.0	0%	0.0	0%	0.0
08	Walls and stairs lining	10%	1662909.7	10%	1662909.7	15%	2494364.6	5%	831454.9
09	Painting	0%	0.0	0%	0.0	0%	0.0	0%	0.0
10	Railing and Metal Fabrications	5%	585063.5	20%	2340254.2	0%	0.0	10%	1170127.1
11	Suspended ceiling	5%	2352.9	0%	0.0	0%	0.0	0%	0.0
12	Signs	0%	0.0	5%	153390.4	0%	0.0	0%	0.0
13	Concrete for arrangement works	10%	329361.2	15%	494041.8	5%	164680.6	5%	164680.6
14	Miscellaneous	0%	0.0	10%	437402.1	10%	437402.1	10%	437402.1
Function Cost		3,597,227.01		6,950,456.61		3,643,299.72		2,839,008.24	
Function Cost Ratio		5.3%		10.3%		5.4%		4.2%	

At end of function analysis stage, variance between results of phase1and phase 2 is calculated. The ideal value index for this variance is to be zero (0) which means that the end-users functions are suitably allocated as cost impact for the project. On the other hand, when the variance value is negative value (-) it means that there is unnecessary cost that needs reallocation, while the positive value (+) for variance means that the function does not provide the suitable quality level. As shown in Table 4.

Table 4. Variance between end-user results and team value analysis.

Function		Phase 1 Results	Phase 2 Results	Variance between Results	Un-necessary Cost	Does Not Provide Quality Level
		End-users Questionnaire Results	Value team analysis			
1	Accessibility	22.0%	20.4%	1.6%		√
2	Information	11.0%	3.4%	**7.6%**		√
3	Quality of station building	6.0%	2.1%	3.9%		√
4	Quality of station entrance	4.0%	2.1%	1.9%		√
5	Quality of station hall and concourse	3.0%	2.1%	0.9%		√
6	Quality of stations platform	4.0%	0.8%	3.2%		√
7	Shops	3.0%	4.6%	-1.6%	√	
8	Advertisements	2.0%	6.1%	**-4.1%**	√	
9	Cultural	3.0%	2.4%	0.6%		√
10	Size and scale	6.0%	3.8%	2.2%		√
11	Proportion	3.0%	4.5%	-1.5%	√	
12	Space	7.0%	9.8%	-2.8%	√	
13	Visual weight	2.0%	2.2%	-0.2%	√	
14	Light	4.0%	1.9%	2.1%		√
15	Texture	2.0%	3.6%	-1.6%	√	
16	Color	2.0%	5.0%	**-3.0%**	√	

17	Composition	2.0%	5.3%	**-3.3%**	√	
18	Movement and rhythm	8.0%	10.3%	-2.3%	√	
19	Image-based elements	3.0%	5.4%	-2.4%	√	
20	Outstanding elements – landmarks	3.0%	4.2%	-1.2%	√	
Total		100	100			

5-VALUE STRATEGIES RESULTS

According to PARETO theory analysis, the variance for Advertisements (CF11), Composition (CF10) and Colors (CF09) shows largest negative values. This means that these functions have the largest impact for unnecessary cost. As shown in Fig 1. On the other hand, the Information (QF9), Quality of station building (QF8) and Quality of stations platform (QF7) have not provided the quality level as shown in tables 5 and 6.

Table 5. Descending functions which have un-necessary cost

Un-necessary Cost	CF1	Visual weight	-0.041	-0.2
	CF2	Outstanding elements – landmarks	-0.033	-1.2
	CF3	Proportion	-0.03	-1.5
	CF4	Texture	-0.028	-1.6
	CF5	Shops	-0.024	-1.6
	CF6	Movement and rhythm	-0.023	-2.3
	CF7	Image-based elements	-0.016	-2.4
	CF8	Space	-0.016	-2.8
	CF9	Color	-0.015	-3
	CF10	Composition	-0.012	-3.3
	CF11	Advertisements	-0.002	-4.1

Table 6. Descending functions which do not provide the quality level

Does Not Provide Quality Level	QF9	Information	0.076	7.6
	QF8	Quality of station building	0.039	3.9
	QF7	Quality of stations platform	0.032	3.2
	QF6	Size and scale	0.022	2.2
	QF5	Light	0.021	2.1
	QF4	Quality of station entrance	0.019	1.9
	QF3	Accessibility	0.016	1.6
	QF2	Quality of station hall and concourse	0.009	0.9
	QF1	Cultural	0.006	0.6

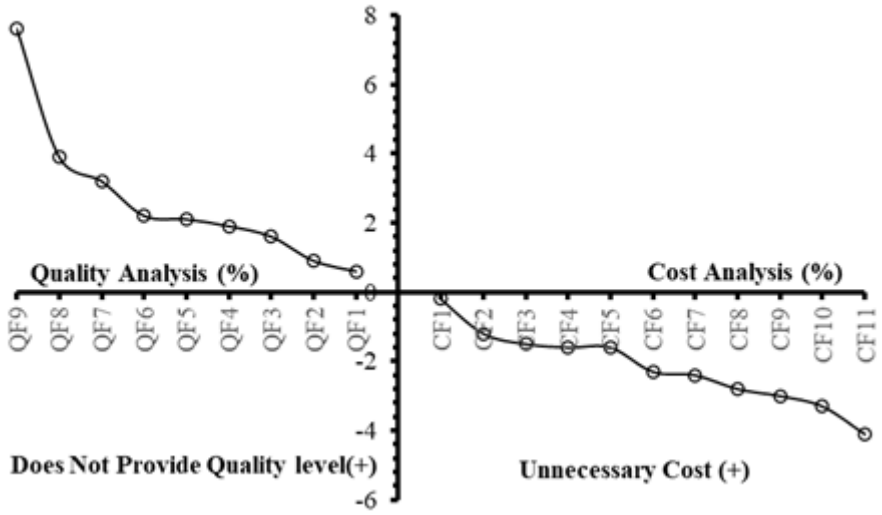

Fig 1.Value Strategies Results.Source: Author Analysis

III. CONCLUSION

The research is built upon the theoretical part shows in materials and methods and the applied part shows in final results. The developed new strategies need more effective tools to be able to achieve the Subway Stations project goals and their needs. The upcoming Stations are more complex in all architecture dimensions as a real result for the new strategies and our life developments. The research believes if we cannot plan a new road map for top management will not be able to face many problems in the construction filed. It also believes that the value methodologies and strategies have shown great methods for our life developments.

The study has concluded that the evaluation using value strategies affect many levels. These levels are summarized as follow:

• At the Government Polices level:

The national authority of tunnels responsible should make a new legislation to obligate all the technical committees use and consider the value methodology to add values for all Subway Stations. It will guarantee for the government more scientific rational analysis to achieve the goals as end- user need.

• At the Consultants level:

The research urges the consultants to apply the value analysis and strategies in the subway stations evaluation to get a concentrated value and certain value index. This direction guarantees for all sides fair rational evaluation (without any favour) of what it achieves not only the end – project goals but also improve all technical aspects in the projects. Applying the value strategies as a new direction in the subway stations will mitigate the many problems which linked by cost variation and the quality levels. They will achieve the core goals of their subway stations projects according to the project management triangle. First side of triangle is the cost, it will within the budget without any un-necessary cost. Second side of triangle is the time, it will within the project duration by focusing at the specific scope . Third side of triangle is the quality, it will achieve as the end user requirements and get more indexes to allocate the functions that are not provide the required level.

assessment process from outside authority.

• At the Researchers level

The research recommends for applying the value strategies process as a new direction by a clear scientific framework on all types of construction projects.

Applying core value strategies methodology will earn more and more quality aspects in the construction industry researches.

The other discipline in the construction field should apply the value strategies to get more value indexes.

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