

The role of value engineering in reducing the costs of constructing governmental housing.

Dr. AMR AHMED MOHAMAD ALI ZEINA

Assistant Professor at Architecture Engineering Department, Faculty of Engineering, Horus University,
New Damietta, azeina@horus.edu.eg

Paper History:

Paper received 14th May 2021, Accepted 17th July 2021, Published 1st of September 2021

Abstract:

The research reviews the concept of governmental housing in Egypt, its types and development, and the most important challenges facing the state to provide housing units of high quality at reasonable prices that meet the needs and aspirations of users, and identify the most important design requirements for the housing unit by reviewing the design standards according to the unified Egyptian building law to ensure that housing projects meet the needs of users.

Identify the value engineering methodology and the importance of its application to various government housing projects, due to its significant impacts on the level of performance, cost and quality, and the importance of the architect and decision-makers familiarizing themselves with its steps to follow this approach and its application to control quality and reduce the costs of establishing governmental housing projects from the beginning of the initial idea of the project to the implementation and maintenance.

The use of computer applications to provide a tool in the form of a computer program that helps architects and those concerned to apply the value engineering approach, with the aim of reducing the costs of establishing government housing projects, taking into account the design standards and quality required for those projects.

Applying the computer program to one of the designs of the governmental housing project by analyzing and evaluating the architectural design of the housing units in terms of the total area in order to reduce the wasted spaces inside the unit and its impact on reducing construction costs without compromising quality standards and then drawing conclusions and recommendations.

Rapid urban growth in many developing countries has led to many problems (economic, social, health, security,...) in the absence of governments to meet the needs of citizens for housing, so slums appeared that lack the necessary services such as electricity, clean drinking water and sewage networks, Crime rates have also increased and environmental health has deteriorated in these areas.

In April 2002, the United Nations Program on Housing Rights emerged as a joint initiative between UN-Habitat and the Office of the United Nations High Commissioner for Human Rights, which focused on governments' focus on taking appropriate measures to promote, protect and guarantee the right to adequate housing.

In 2008, UN-Habitat declared that the development objective of the United Nations Program on Housing Rights is the right to adequate housing by trying to consider the affordability and accessibility of housing, and to support and enable housing reform and sustainability.

Therefore, governments faced great challenges in how to provide adequate low-cost housing to meet the needs of users of all categories, the Egyptian government worked to provide a huge number of housing units to meet the increasing of population, it represented a huge burden on the state budget due to the increase in prices of building and construction materials.

The value engineering methodology appeared nearly twenty years ago, and during this relatively small period, this technology was able to achieve impressive success in achieving great financial savings, which encouraged researchers and specialists in the field of construction management to study this technology and study how to apply it to various projects, the United States of America occupied the first place in the application of value engineering, while Japan occupied the second place, followed directly by the Kingdom of Saudi Arabia.

Dr. Jacqueline Fahmy, Head of the Eastern Mediterranean and Africa Regional Branch for Safe International, the American Society for Value Engineering, confirmed on the sidelines of the third value engineering conference that applies the value engineering methodology in Egypt, if the value engineering especially used in Egypt, will reduce the costs of real estate projects by up to 30% without compromising the quality and reducing the price per m² of projects, the application of the methodology will lead to savings in the costs of governmental housing projects .

The problem: We find that many of those concerned with providing housing, including architects, stakeholders and decision makers, lack the importance of applying the value engineering methodology in the field of governmental housing, which works to reduce the cost of constructing housing units in a way that does not

affect the design standards, quality and needs of users of all categories, and helps the state to provide the largest possible number of sustainable housing units to meet the needs of citizens.

Objectives: Providing a mechanism that helps architects and decision-makers in the field of housing by applying the value engineering methodology with the aim of reducing the costs of establishing governmental housing projects without compromising architectural design standards and quality, and thus helping the state to provide the largest number of housing units for eligible groups.

Methodology: To achieve this goal, the research followed the deductive methodology to present the value engineering methodology, its concepts and definitions, the concepts of costs and their relationship to the different stages of the project, and how to benefit from this approach in governmental housing projects, and a review of the Egyptian building law that defines the design standards for housing units.

Then the research used the inductive methodology in order to take advantage of computer applications in providing a suggested mechanism that helps architects to apply the value engineering methodology in order to reduce wasted spaces within the housing unit. Then the research followed the experimental method by applying the proposed computer program to one of the horizontal planes of a governmental housing model to evaluate the proposed mechanism by studying the spaces of the architectural spaces of the housing unit, and how to help the proposed mechanism to reduce wasted spaces and thus reduce construction costs and optimal utilization of resources. **Results:** that the proposed mechanism processed the entered data, whereby the unit area was reduced by 15%, equivalent to 21.27 m², so that the total area of the housing unit became 118.73 m² instead of 140 m² after deleting unnecessary spaces, while maintaining the design standards of the housing unit. - the mechanism made the most recent modifications in the dimensions of the architectural spaces of the unit, and thus it was modified in the architectural design. -By entering the cost of constructing a flat meter = 3200 EGP, as well as entering the number of units in each floor, and the number of floors of the residential architecture, the program calculated the value of savings by creating housing units in the unit architecture, meaning that the unneeded costs were deleted. -Where the amount of 68,071.16 pounds was removed from the cost of constructing the housing unit, which represents unnecessary costs, and the total savings in the construction of one residential building became about 1,633,707.94 pounds. -Thus, the value engineering methodology was applied by eliminating unnecessary costs without affecting the required design and quality standards. - Reducing the area of the housing unit respected the design requirements of the Egyptian Building Law, and thus took into account the fulfillment of users' requirements. - the use of the proposed mechanism will help the architectural designer to reduce wasted and unnecessary spaces, and thus the optimal use of building lands through the application of the value engineering approach. - Reducing the wasted space in the housing unit will reduce construction costs and consumption of building materials, thus reducing the rate of environmental pollution and achieving the concept of sustainability. - By applying the value engineering approach from the beginning of the design idea, it will help reduce the costs of establishing housing projects by eliminating unnecessary costs, and thus will help the state to establish the largest number of housing units to meet the needs of citizens and help solve the housing problem. - The state must adopt the application of the value engineering methodology in all projects, especially housing projects, with the aim of reducing unnecessary costs and improving resource utilization.

Keywords :

value engineering methodology - governmental housing - Egyptian building law - cost - computer applications.

References :

1. Al-Yousifi, A.A.S., 2004. The concept and method of value management. King Fahd National Library fourth edition.
2. Babiker, QA, 2016. *Introduction to Computer Applications*.
3. Shawky, AM, 2019. *Principles of sustainability as an economic approach to solving the problem of low-cost housing in Egypt*.
4. Sobhy, M.N., 2007. *Value engineering systems as confirmation of the effectiveness of architectural and urban preservation. Master's thesis, Faculty of Engineering, Cairo University*.
5. Abdel-Fattah, H.A., 2012. *A critical study of luxury housing in Egypt: the role of the main parties to participate in formulating the problem of design foundations and determinants*.
6. Moselhi, MS, 2012. *Value engineering towards a consensual value approach to government housing projects in Egypt*.
7. Matar, MH, 2008. *Value Engineering - Engineering Management between Quality and Cost*.
8. Afifi, A.M., 2002. *Towards Activating an Integrated Strategy for Developing Housing Provision and Facilitation Policies in the Arab World*.
9. Cook, H.E., 2010. *Value Driven Product Planning and Systems Engineering*.
10. Hubbard, D.W., 2010. *How to Measure Anything: Finding the Value of Intangibles in Business*.

11. Mukhopadhyaya, A.K., 2009. *Value Engineering Mastermind: From Concept to Value Engineering Certification*.
12. Sexton, D.E., 2008. *Value Above cost. Ph.D, The Library of Garrick Lee*.
13. Studies, S.C.a., 2013. *a working paper directed at non-governmental organizations to pressure housing policy-makers directed to marginalized groups*.
14. UN-Habitat, 2002. *Agenda 21 for Sustainable Construction in Developing Countries*. Pretoria: CIB & UNEPIETC.
15. UN-Habitat, 2012. *Sustainable Housing for sustainable cities: A policy framework for Developing countries*.
16. UN-Habitat, U.a., 2008. *Housing the Poor in Asian Cities. Quick Guide 5: Housing Finance: Ways to Help the Poor to Pay for Housing*. Nairobi: United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) and United Nations Human Settlements Programme (UN-Habitat).
17. Venkataraman, R.R., 2008. *Cost and Value Management*.
18. Younker, D.L., 2003. *Value Engineering: Analysis And Methodology (Cost Engineering)*.
19. Websites:
20. <https://www.cabinet.gov.eg/Arabic/Pages/default.aspx>. (Accessed 01 May 2021).
21. <https://www.value-eng.org/>. (Accessed 10 May 2021).
22. <http://www.mhuc.gov.eg/Media/Services> . A (Accessed 22 May 2021).
23. <http://www.mhuc.gov.eg/programs/programs/2> . B (Accessed 01 June 2021).