STUDYING ECONOMIC IMPACT OF INVESTMENT IN CAIRO METRO TERMINAL STATIONS

By

Mahmoud Abd El Rahman Farag Abd El Kareem

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
In

STRUCTURAL ENGINEERING

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Title of Thesis:

Studying Economic Impact of Investment in Cairo Metro Terminal Stations

Key Words:
Investing impact in metro stations; Stations design; Artificial neural network (ANN); Life cycle cost analysis (LCCA); Cairo metro terminals stations.

Summary:

Metro transportation systems play a pivotal role in enhancing the productivity and quality of life in Egypt. It is considered the back bone of transportation in Cairo. However, although large numbers of passengers whose uses it daily, it has not the adequate attention specially stations. The current situation for Cairo metro stations, especially terminal stations and its surrounding areas have a bad effect on environment and bad financial revenue to the Metro. Thus this research proposed a methodology that helps to apply multilateral investments in metro terminal stations to gain extra profits and also decrease the bad environmental effect in terminal stations and its surrounding areas. Hence, Helwan-Metro station has been considered as a case study to show the possibility of applying various investments in the stations. Using of Artificial Neural Network technique (ANN) using Just NN software to calculate the initial cost and the Net Present Value (NPV) to achieve the investment feasibility for the project. Also, applying BOT as a method to fund the project.

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Abstract

Metro transportation systems play a pivotal role in enhancing the productivity and quality of life in Egypt. It is considered the back bone of transportation in Cairo. However, although large number of passengers who use it daily. Cairo metro has not had the adequate attention specially stations which considered the way to success of the metro network. The current situation for Cairo metro stations, especially terminal stations and its surrounding areas have a bad financial revenue and bad effect on environment where it is a major factor in increase of noise, traffic jam and air pollution in addition to spread of street vendors. Also, collecting of random parking around these terminal stations. Thus, this research proposes a methodology that helps to apply multilateral investments in metro terminal stations to gain extra profits and decrease the bad environmental effect in terminal stations and its surrounding areas. Hence, Helwan-Metro station in line 1 has been considered as a case study. The plan of this research is set by considering the history of the station's area and number of passengers through last ten years. In addition, the detailing number of passengers at peak time, their ages, and their destinations have been considered by making a field survey and questionnaire. After collecting data and finishing the survey questionnaire, the primary studies were done to modify and introduce a new proposal for Helwan-Metro station. The initial cost of the proposed project is predicted using Artificial Neural Network technique using Just NN software through six steps namely: 1) Determining Output Variables ; 2) Identifying input Variables; 3) Data Collection and Encoding ; 4) ANN Structure Design ; 5) Training & Validation Using ANN and 6) Cost Calculation. The investment feasibility achieved by consideration of Life Cycle Cost analysis and calculation of Net Present Value (NPV) of the proposed project. The funding method is determined by applying the Build Operate Transfer (BOT) for construction of the project which shown that BOT is acceptable for both public and private authorities.

The findings of this research reveal that investment in Cairo Metro stations must be improved to gain extra profits for metro and contributes in improvement the services for passengers. Also, it helps in decreasing the bad environmental impacts. Thus, increase the positive environmental effects in metro stations and its surrounding areas. It also encourages the investors to invest in Metro stations because of the high revenues of this kind of investment as explained in the case study which shows that the NPV and funding method of the proposed project is profitable.

CHAPTER 1

INTRODUCTION

1.1. General

Cairo metro is considered one of the most important transportation facilities for its speed, safety and comfort. Also, the metro helps in solving the problem of crowding in cities. It has a positive environmental and economic impacts. For the environmental aspect, it reduces the oil consumption, reduces the emissions that result from the fuel consumption, and decreases the negative environmental impacts. For the economic aspect, it is considered to be the cheapest facility. Thus, Cairo metro becomes the back bone of transportation in Cairo. While it limits on transporting the passengers only. This current situation leads to decreasing the margin profit for the metro company. Where, the price of the ticket does not represent any profit nowadays, especially with inability of raising the ticket price due to the bad economic conditions. This produces a significant difficulty in providing appropriate services for passengers. All these problems require to develop new ways to get extra revenues by multiple investments, which commensurate with the metro. Investment in metro stations is considered to be an optimal way to gain extra profit especially with sloping down of stations level. Phenomenon of spreading the street vendors around most of metro stations leads to spreading of chaos and insecurity of passengers. Therefore, investments in metro stations should be implemented to increase the revenue of metro and decrease the negative environmental effect.

1.2. Problem Statement

Financial revenue from operation of Greater Cairo Metro Network decreased in the recent years and Cairo Metro does not cover its operation cost. This resulting from the authority which cannot increase the ticket price due to social considerations and high cost of components, which requires for maintenance. Thus, it must be thought for other ways to increase the revenue. One of the most important ways is re-planning of terminal stations, where they have been designed a long time ago according to special circumstances. As the population was not as it is nowadays and there were not any overcrowdings and the phenomenon of street vendors hadn't been spread yet. While, nowadays there is an increase in population and unemployment, which leads to increasing the private facilities transportations as microbuses. These facilities perform a random terminal stations to collect people in all places around stations and the surrounding streets that lead to traffic jam, also closing many streets, which founded from several decades and uncorrectable. Also, unemployment leads to presence of a lot numbers of vendors inside metro cars and around metro stations. Because of their huge numbers, most areas around station have been closed as shown in figure (1-1). All of this also lead to bad environmental effect like noise pollution that reach to 85 dB at rush hours and air pollution emissions such CO_2, NO_2, and SO_2 [1]. This problem must be resolved with technical solutions. There are no studies or researches that take this