

Research Paper

On Bi–Level Tourism Strategic Plan Problem in Egypt

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Abstract: *Tourism is a major industry in Egypt and considers the backbone of the Egyptian economic as one of every 6 Egyptians citizens employed in the tourism. So in another words there are more than 16 million Egyptians are benefiting from the tourism business moreover tourism business is representing around (6 %) of the country's gross domestic product (GDP). Needless to say that the tourism sector has been extremely suffered and occupancy rate has been dropped by almost by 60 % since year 2011 till date due to the political unrest and the frequent waves of violence across Egypt during the last 3 years. Bi-level programming, a tool for modeling decentralized decisions, consists of the objectives of the leader at its first level and that of the follower at the second level. Numerous algorithms have been developed so far for solving bi-level programming problem. Finally, an illustrative numerical example, of the application problem, is given to demonstrate the obtained results.*

Keywords: Bi–level, tourism business, strategic plan, Pareto optimal solution, Stackelberg game.

1. Introduction

Egypt have a huge potential to be one the best venue destination and easy achieving the optimistic targeted number that the Egyptian Government of (25 ML tourists) estimated at the end of 2019. Why Egypt could take its fair market share from the international tourism business it's simply because of its geographical location as it's almost 3-4 hours flying from the Euro-zone. Meanwhile, Egypt has outstanding location as its overlooking on Mediterranean and Red Sea. As well as 1/3 of the world monuments plus nice beaches, safari, diving and wind surfing spots ... etc.

The tourism industry has shown a slight growth in Egypt for the last 6 years especially in the Red Sea and Sinai region the growth of the tourism business in Egypt has encouraged some of the multinational and local firms to invest in the tourism segment by adding more rooms to the market supply. The number of rooms in Egypt is expected to be ¼ million rooms by 2013. Due to the instable political and social situation in Egypt during the last 3 years.

Re-position Egypt as one of the best historical and leisure destination in terms of environment, safety, events organization and resorts, to gain a better market share by positioning Egypt in a new potential markets especially Far East markets while deeming the urgency to elevate the value of the offered services.

A bi-level programming problem is formulated for a problem in which two decision-maker make decisions successively. For example, in a decentralized firm, top management, an executive board, or headquarters makes a decision such as a budget of the firm, and then each division determines a production plane in the full knowledge of the budgeted.

Bi-level programming (BLP) is a subset of the multi-level programming problem which identified as a mathematical programming problem that solves decentralized planning problems with two decision makers (DMs) in a two-level or hierarchical organization ([3], [4], [5], [6], [7], [9]). An algorithm for the interactive multi-level non-linear multi-objective decision-making problem is presented in many searches (Osman et al. [7] and Shi and Xia [10]).

The interactive algorithm uses the concepts of satisfactoriness to multi-objective optimization at every level until a preferred solution is reach. Based on (Shi and Xia [10]) satisfactory solution concepts, the proposed solution method proceed from the first-level decision-maker (FLDM) to the second-level decision-maker (SLDM). The FLDM gets the preferred or satisfactory solutions that are acceptable in rank order to the SLDM.

The SLDM will search for the preferred solution of the FLDM until the preferred solution is reached. Integer multi-objective programming has attracted the attention of many researchers in the past. The main reason for interest in linear or nonlinear programming stems from the fact that programming models could better fit the real problems if we consider optimization of economic quantities ([1], [8]).

2. Tourism Overview in Egypt

Tourism sector is important to Egypt because of the following:

1. Tourism is a strategic asset, and it has not received the attention it deserves recently .Egypt is a tourist destination and it will be able to attract tourists in all seasons, not only in winter, and not only on the Mediterranean coast in the country's north or on the Red Sea coast to in its east or South territories.
2. 1.8 Million Egyptians are working directly in tourism Sector ,
3. 2 Million Egyptians are indirect workers
4. 1 out of every 6 of the Egyptian labor force works in tourism.
5. 14,800.000 Tourists arrived in Egypt in 2010
6. 12.50 Billion Dollars total revenue generated in 2010
7. 20% of foreign currency generated by tourism business
8. 11.5% of the GDP 'Direct & Indirect 'achieved by tourism sector
9. 200 Billion Egyptian pounds investment (on process)
10. 225 thousand hotel rooms available
11. 209 thousand hotel rooms under construction
12. 2000 tourism companies
13. 4500 restaurants
14. 14,000 shops for tourism goods

15. 4500 diving centers
16. 302 floating hotels
17. In 2010, tourism accounted for \$12.5bn in income, and comprised 11.3% of GDP which Indicates that Egypt tourism industry is one of the major sectors of Egypt economy.
18. Egypt is one of the most popular tourist destinations in the Middle-East region. It received 14.8 Million international tourists in 2010, an increase of around 17.6%
19. Over the previous year. Russia, UK, Germany, France and Italy are the most important destinations for visitors.
20. Since January 25th revolution, this industry has suffered dramatically due to the political instability dropping the number if tourist inflows to 9.4 Million deeming the enforced shift to Far East and East European markets that concluded a tremendous
21. Decline of revenues generated due to their very limited budgets with inflation widening and EGP continuous devaluation, profitability became too minor, in other Words a business for striving.

3. The Main Perspective from the Tourism Sector.

Our perspectives from Tourism sector are:

- Having a clear vision for the tourism future
- Protect and Rescue the tourism Industry from the collapsing
- Creating job opportunities for thousands of young generation
- To meet the expansion of market supply Upgrading the level of graduates of tourism faculties and institutes to enable them to work in the tourism sector
- Egypt's budget deficit reached 7.1 percent of its gross domestic product (GDP) in the first nine months of the current fiscal year, compared to 10 percent recorded in the same Period in FY2012/2013, according to the finance ministry's monthly report for April.
- The deficit totaled some LE145 billion (\$20.7 billion) for the period of July 2013 to March 2014, compared to around LE176 billion (\$25.1 billion) in the same months of the Preceding fiscal year.
- "This decrease comes on the back of aid from the Gulf, rather than any restructuring of the economy".
- Egypt received \$12 billion (LE83.7 billion) in financial aid from neighboring Gulf nations from July 2013 until January 2014, of which \$4 billion was in petroleum aid and \$2 billion in grants.
- The present interim government has said it is aiming to contain the deficit to between 11 and 12 percent by the end of the current fiscal year in June.
- Revenues amounted to some LE283 billion (\$40.4 billion), compared to approximately LE208 billion (\$29.7 billion) in the first nine months of the previous year, with taxes contributing LE169 billion (\$24.1 billion) of the total, or 60 percent, compared to LE156 billion (\$22.3 billion), or 75 percent.

An overview about tourism sector evolution from 2003 -2013 can be described in the following table

Years	Number of tourists
2003	6,044,160
2004	8,103,609
2005	8,607,807
2006	9,082,777
2007	11,090,863
2008	12,835,351
2009	12,535,885

2010	14,730,813
2011	8,432,346
2012	11,667,253
2013	9,464,349

4. Egypt Political Situation & Road Map

After the announcement of the results of Egypt's 2014 constitutional referendum, Egyptians should have just finished the presidential elections accordingly there is official and elected present in Egypt and last step of the political road map will be parliamentary elections.

After completing the parliamentary elections there's no doubt the at Egypt will somehow normal political relationship with main key players in world as everybody believes now especially after the results often presidential elections that June 30th was strong wants from the majority of the Egyptians and not Military coup as the oppositions try to sell for the west and USA .

Despite the above fact Egypt have to also to consider absorbing the minority of the opposition –then human rights as well the extra power of the new elected parliament who are having more power that the president as per the new constitution of Egypt .

4.1 Egypt Latest Economic Situation

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Investments encouragement and inflows are the bedrock to rapidly improve the nation economic and social status, the incremental increase of unemployment rates is the main threat that upcoming cabinet should tackle as a priority to ensure tranquility and stability for vastly rebuilding the economy billion (\$22.3 billion), or 75 percent.

5. Grand Egyptian Museum

The Grand Egyptian Museum (GEM) is currently one of the largest museum development projects in the world. Given the global interest in the pharaonic history, Egypt and in anticipating the arrival of this new cultural destination. The implementation of the GEM project started in May 2005 and included three main phases.

The Construction consists of the following main elements: Museum, Conference center, restaurants and coach parking; exhibition works and an extensive External Works package.

The area of the land is 470.974 m². The Grand Egyptian Museum complex is extremely flexible and suitable for permanent and temporary exhibitions with an attendance up to 15,000 visitors per day.

The (GEM) will represent an incredible opportunity to increase the demand to the pyramids area from either leisure or business guests where hotel supply generally in pyramids area will be extremely low to accommodate to the huge expected demand.

Considering that, the Egyptian Government is endeavored to review the area infrastructure, from roads, streamlined accessibilities along with entire design lift up to reshape the area as a pure touristic site

5.1 Recommendation for Tourism to Development:

- Apply the usufruct system in different regions to create further investments in conjunction with joint infrastructure development with Government.
- Enhance the awareness of the tourism business to the Egyptians,
- Installing camera in all the tourism spots to secure guests.
- New touristic T.V channel to promote and market Egypt touristic destinations
- Create diversity of hotel categories, preferably branded ones to meet with all tourist segments especially economy hotels with 3 and 4 stars as in Europe.
- Create a benchmark of pricing strategy to all hotel categories to avoid revenue dilution.
- Structuring new restrictive policy with new legalization to protect tourists especially from street vendors, beggars and hagglers with severe legal actions.
- Protecting touristic areas from any sort of harassment toward guests with severe legal actions.
- Improving the infrastructure in coordination with Tourism companies' owners and businessmen.
- Unify granted prices to tourists and domestic market without any sort of privileges.
- Developing all touristic sites according to the international standards.
- Reviewing all issues organizing the relationship between owners, labors and syndicates to ensure stability in sector.
- Emphasis on green hotels project in terms of saving natural resources and consumptions, like prevailing LED, solar sheets and accredited wastage recycle
- Taxi service tariff should be fixed and mandatory to avoid manipulation to tourists.
- Remove all violations on the Nile banks with all signs of dirt and random like buildings, cruises..etc,
- Eliminate the seen of garbage in all streets which affects negatively the beauty of the country.
- Controlling the parking problem in country that leads into a jam traffic.
- Increase the sign boards in Cairo streets & roads will solve narrowly the traffic problem.
- Undergrounds supply to be extended and prevail; it will solve acutely the traffic issue.
- Eliminate all sides of pollution, air, soil and water, having restrictive actions toward this will encourage tourist to visit Egypt
- Planting trees and caring about national parks will enhance the beauty of the country.

6. Forecast of the Tourism Business Environment

The political instability will take place throughout the last quarter of 2014, many events will occur from Presidential elections, Parliament elections, new cabinet and new policies will ensure more stability in the country.

Business flow is projected to improve as of the 4th quarter of 2014 however not expected to return fast to normal business rating, The Grand Egyptian Museum official opening announcement is September 1st, 2015 which probably might be delayed 3-6 months based on their pace of acceleration to meet with their targeted date.

Competition development was monitored throughout the past few years, some rooms were renovated and transformed to an elegant modern styles, new rooms with several category were built, a new modern facilities and services were added to the market, this product discrepancy with the current professor hotel is the main obstacle against our ambitious to lead the market when the prospected market evolution occurs and business revive.

Based on this data we will study the project of new hotel nominated as Professor Hotel.

7. Bi-Level Problem Formulation and Solution Concept

Let $x_i \in R^{n_i}$, ($i = 1, 2$) be a vector variables indicating the first decision level's choice and the second decision level's choice, $n_i \geq 1$, ($i = 1, 2$).

Let $F_i: R^{n_i} \rightarrow R^{N_i}$, ($i = 1, 2$) be the first level objective function, and the second level objective function, respectively. Let the HLDM and LLDM have N_1 and N_2 objective function, respectively.

Therefore, the BL –NLP problem may be formulated as follows:

[Upper Level]

$$\underset{x_1}{\text{Max}} F_1(x_1, x_2), \quad (1)$$

where x_2 solves

[Lower Level]

$$\text{Max} F_2(x_1, x_2), \quad (2)$$

Subject to

$$G = \left\{ (x_1, x_2) \mid \begin{array}{l} g_i(x_1, x_2) \leq 0, i = 1, 2, \dots, m, \\ x_1, x_2 \geq 0. \end{array} \right\} \quad (3)$$

Where G is the bi-level non-convex constraint set. F_1 and F_2 are non-linear functions. The decision mechanism of BLNLP problem is that the HLDM and LLDM adopt the leader-follower Stackelberg game. According to the two-planner Stackelberg game and mathematical programming [1], the definitions of solution for the of BLNLP model are:

Definition 1: For any $x_1 (x_1 \in G_1 = \{x_1 \mid (x_1, x_2) \in G\})$ given by HLDM, if the decision-making variable $x_2 (x_2 \in G_2 = \{x_2 \mid (x_1, x_2) \in G\})$ is the Pareto optimal solution of the LLDM, then (x_1, x_2) is a feasible solution of BLNLP problem.

Definition 2: If (x_1^*, x_2^*) is a feasible solution of the BLNLP problem; no other feasible solution $(x_1, x_2) \in G$ exists, such that $F_1(x_1^*, x_2^*) \leq F_1(x_1, x_2)$; so (x_1^*, x_2^*) is the Pareto optimal solution of the BLNLP problem.

8. Numerical Example for BLNLP Problem

To demonstrate the solution method for BLNLP problem, let us consider the following example which describe the profit of Professor Hotel:

[Upper Level]

$$\text{Max}_{x_1} F_1(x_1, x_2) = \text{Max}_{x_1} [5x_1 + x_2^2]$$

where x_2 solves

[Lower Level]

$$\text{Max} F_2(x_1, x_2) = \text{Max} [(x_1 - 2)^2 + x_2^2]$$

subject to

$$(x_1, x_2) \in G = \{(x_1, x_2) \mid 2x_1 + x_2 \leq 8, \\ x_1 + 2x_2 \leq 6, \\ x_1, x_2 \geq 0, \text{ and integers}\}$$

First, the HLDM solves his / her problem as follows:

1- Find individual optimal solution by solving (1) – (3), the owner solution is

$$(x_1^L, x_2^L) = (2, 2), F_2 = 5, \text{ and } \beta^L = 0.49999. \quad (x_1^H, x_2^H) = (4, 0), F_1^H = 16, \text{ and } \lambda^H = 1.$$

Then solve

$$\text{Max } \delta,$$

subject to

$$(x_1, x_2) \in G, \\ x_1 - \delta \geq 3, \\ x_1 + \delta \leq 5, \\ x_1^2 + x_2^2 - 12\delta \geq 4, \\ (x_1 - 1)^2 + x_2^2 + 4\delta \geq 9, \\ \delta \in [0, 1].$$

Whose optimal solution is

$(x_1^0, x_2^0) = (3, 1), (F_1^0, F_2^0) = (15, 11), \text{ and } \delta = 1$, (overall satisfaction for both decision - maker's).

9. Summary and Concluding Remarks

The previous Strategic Marketing study there's no doubt that Professor hotel has a huge potential to gain its market share among the competition in the Area along with high profitability for owners and shareholders.

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