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Evaluation of Airport Projects (B.O.T.) in Egypt

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2011

To My fiancé,

Mom And Dad

For all your Support

And

Unconditional love

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First and foremost I thank God for everything and for enabling me to go through this path and allowing me to do this research.

I am really indebted to many people who have, directly and indirectly, influenced and inspired me throughout the different stages of this research. I highly value their guidance, enthusiasm and continuous support which pushed forward this work to be successfully accomplished.

Summary

Through the last twenty years, Globalization has been the main issue of international arguments of economical issues and its effect on the third world countries. There are a lot of researches that analysis the globalization issue and its effect on developed countries, it is not possible to understand what is happening successive developments without reference to the phenomenon of globalization, which has now become a frame of reference for all humanities and social and political studies.

The end of twentieth century witnessed the change of governmental role in infrastructure projects; it changed its role to supervisor on infrastructure projects implemented by private sector through different methodologies of privatization in infrastructure projects. The economy of Egypt faced a lot of challenges that led to increase of private sector participation in infrastructure projects. Privatization system in infrastructure projects was first initiated in the middle of 1980's. It aimed to improve quality of services provided to users, improvement of economical efficiency of services and reduction of financial burdens on government budget and development of local financial markets. Build Operate Transfer (BOT) system is considered one of the main manifestations of privatization systems as a result of globalization in construction industry. It is accompanied by the increase of private contribution in the infrastructure projects; consequently the role of the government has changed to a supervisor committee. Large Projects all over the world is managed by the BOT system since the middle of the twentieth century, since the government now supervises the management of large projects, which the investors are responsible of founding and managing these projects.

Airports facilities are considered one of the most important facilities that privatization system was applied on especially BOT system; because airports are one of the most features that reflect the development of countries. Airports had become one of the main features they compete to show their power and development achievements; in order to introduce better and more entertaining services to customers. Airport planning, design and operation systems had changed a lot through the past decade as a result of privatization of airport that was first initiated in USA and then spread all over the world. Egyptian aviation industry has 20 airports, divided in 5 categories; international, domestic-international,

domestic, training & BOT airports. BOT airports are only two of these airports (Marsa Alam airport & Al Alamein airport) are privately operated under the supervision of Egyptian government represented in the Egyptian Airport Company_ EAC. Marsa Alam Airport and Al Alamein Airport were contracted to private entities under BOT contract in 1998, as a part of council of ministries development plan for Egyptian cities.

Chapter I examines the historical background of the infrastructure projects in the world and the evolution of economy system in different ages and the impact on infrastructure project, in addition to the methods of financing these projects at various ages and the impact of globalization in infrastructure projects over the last decade of the twentieth century and emergence of the concept of privatization.

Chapter II deals with the historical background to BOT system and its evolution through the ages and methods of participation and types of contracts in used, then it discusses the privatization program in Egypt, explaining the problems faced by infrastructure projects and economic systems change and then addresses the BOT projects implemented in Egypt

Chapter III discusses privatization of airports, explaining its beginning in the world and its development over the last decade of the twentieth century, its impact on the movement of the development of aviation in the world and design elements of the airports and their development until the advent of the concept of "Airport City"; turning the airport into the center to attract investments and focus for development. It addresses the characteristics associated with the privatization of airports and the strategic plans of airport BOT projects

Chapter IV deals with presentation of the case study of the airports (Marsa Alam, El Alamein, Hurghada, Borg El Arab and Marsa Matruh) through three different studies. First study presented a comparison between BOT airports in Egypt, reviewing the possibilities of the airport and its ability to achieve the expectations of the project feasibility study. Second study presented an architectural display of airports, taking into account the evolution of architecture in the design of airports. While third study concerned with statistical overview of the most important elements operating in different airports.

This thesis aims to evaluate BOT airports constructed in Egypt within two main aspects; first it evaluate these BOT airports according to their achievement with respect to their primary expectations in the feasibility study stage; second it evaluates these BOT airports according to their performance with respect to number of governmental airports located near them and almost have the same circumstances. This thesis aims to identify changes of airport industry and its impact on airport planning, design and operation systems. It also aims to identify points of strength and weakness for the airport industry in Egypt, differing from BOT airports and governmental airports and help to improve both airports performance in the future.

Abstract

This thesis aims to evaluate BOT airports constructed in Egypt within two main aspects; first it evaluate these BOT airports according to their achievement with respect to their primary expectations in the feasibility study stage; second it evaluates these BOT airports according to their performance with respect to number of governmental airports located near them and almost have the same circumstances. This thesis aims to identify changes of airport industry and its impact on airport planning, design and operation systems. It also aims to identify points of strength and weakness for the airport industry in Egypt, differing from BOT airports and governmental airports and help to improve both airports performance in the future.

The thesis concluded that BOT airports in Egypt are not necessary more effective than governmental airports; if they were badly handled they will be worse than any governmental airports. Private operated airports are more efficient than governmental airports if they are right oriented towards the world standard of airport operational aspects; because private sector have the ability to direct the airport towards profitability & application of latest technology with financial resources can't be afforded by governmental entities.

Keywords

Build Operate Transfer

BOT

Evaluation

Airport

Egypt

Privatization

Airport City

Infrastructure projects

Al Alamein airport

Marsa Alam airport

Hurghada airport

Borg El Arab airport

Marsa Matruh

Research problem

The Egyptian government offered number of BOT airport projects to private sector and investors in order to construct new BOT airport projects in several developing cities in Egypt. They aimed to achieve integrated development for these cities. Since government could not afford financial cost of these projects, the government offered these airport projects to private investors in addition to other projects under supervision of Egyptian government. Only two airports were provided to private sector at the beginning of last decade (Marsa Alam Airport, El Alamein Airport).

The private investor in airport projects was the responsible for feasibility studies of the airport showing future forecast for the operation process of the airport. Marsa Alam Airport was inaugurated in 2001 while El Alamein Airport was inaugurated in 2005 and so far there is no record about achievement of BOT airport projects with respect to the forecast expected at the beginning of the studies, evaluation of airport BOT experiment in Egypt with respect to governmental airports, Further studies lack the comparison between BOT airports and governmental operated airports.

Research Goal

The research aims to evaluate BOT airport experiment in Egypt with respect to governmental operated airport; to clarify points of strength and weakness for BOT airports in Egypt to benefit from this study in the future; and also clarify points of difference between governmental operated airports and private operated airports in order to benefit from points of strength for both systems in the development of these systems in the future.

Research scope and limitations

The study focuses on architectural process concerning the main items of airport & accomplishment of airport to world design standards. It also focuses on operation process of airport (rate of flights, rate of passengers, expansion strategy of airport and mutual impact between airport and surrounding area & revenues….etc.

Cases studied projects was chosen by certain criteria; Marsa Alam Airport and El Alamein Airport was chosen as BOT airports because they are the only BOT airport projects implemented in Egypt; Hurghada airport and Borg El Arab Airport was chosen for several reasons that can vary as follows; the airport is located near BOT airport; it has same circumstances; the capacity of air traffic is nearly similar to BOT airport.

Research objectives

The research has several objectives that helped in shaping the structure of the research; they can be mentioned as follows:

1. Evaluation of BOT airports operational achievements with respect to expectations during study stage.

2. Evaluation of BOT airports and governmental operated airports architectural aspects achievements with respect to world standard design

3. Evaluation of BOT airports and governmental operated airports operation process.

Research hypothesis

The research hypothesis that BOT airports in Egypt are more effective than governmental operated airports during the operation process

Research methodology

The research followed two main methodologies.

- **Theoretical Methodology:**
    The research followed the theoretical methodology in reviewing the first three chapters; it reviewed the history of infrastructure projects, characteristics of BOT system, and characteristics of airports privatization movement.

1. Review background of infrastructure projects showing historical stages passed by projects during the 20th century.

2. Review of BOT system showing main characteristics of such system, contributors, their goals and risks & historical background of BOT projects in Egypt.

3. Benchmarking study for airport privatization movement, showing its main features and influence on airport planning & airport privatization in Egypt.

- **Comparative Analytical Methodology:**
    The research followed Analytical to show points of strength and weakness for BOT airports and governmental operated airports in Egypt.

1. Operational achievements with respect to expectations for BOT airports

2. Architectural aspects for BOT airports and governmental operated airports in Egypt.

3. Operation aspects for BOT airports and governmental operated airports in Egypt.

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Infrastructure Projects

1. Chapter 1: Infrastructure projects

1.1 Introduction:

With the emergence of the concept of globalization in the middle of the 20th century& the massive increase of population all over the world, governments faced a great problem in financing the infrastructure projects needed for the expansions of societies, with the suitable quality and distribution to serve the largest part of society. Governments was lacking to financial supports provided by international institutions that used to provide financial loans to governments but they faced a lot of difficulties in supporting large number of governments, due to the increase of societies that fund can not cover. These circumstances forced the international financial society to search for a solution to finance infrastructure projects, and finally recommended the participation of private sector accompanied by the supervision of governmental authorities, to guarantee the interests of all parties, customers, private sector entities & governments' entities.

The developing world needs for more financed infrastructure than can be provided by domestic public finances alone. Around the middle 1980s a new strategy based in the use of public-private agreements. Over the past two decades, the capacity of government to provide public services on their own in an effective and efficient way is being questioned at different levels. Public services are seen as ineffective in resource allocation and poor in management. Public sector is incapable of acting quickly to change, because of bureaucratic procedures that constrict change trials to improve management and quality of services. It has recognized that conventional support to public sector through loans for capital investment has not reached the desired results in reducing poverty.[1]

Developing countries found a strategy for solving the problem of infrastructure, is to expand the use of public-private agreements in infrastructure. This new strategy relies on public-private partnerships as a policy instrument to

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[1]Franceys R, Weitz A. 2003. Public-Private Community Partnership in infrastructure for the poor, Journal of International Development 15: 1083-1098. DOI: 10.1002/jid.1052.

attain multiple purposes such as adequate infrastructure, improving welfare, enhancing efficiency.[1]

The developing countries need more financing for infrastructure projects that cannot be provided by governmental finances. The cost of maintaining existing infrastructure and implementing necessary extensions for its coverage is estimated by OECD[2] at 7 % of developing GNP, equivalent to about 600 billion US Dollar per year. However, public spending on infrastructure in developing countries is around 3 % only.

1.2 Globalization& change of Government role

The term refer specifically to economic globalization: the integration of national economies into the international economy through trade, foreign direct investment[3]. Globalization is usually recognized as being driven by a combination of economic, technological, socio-cultural, political, and biological factors.[4]

The United Nations ESCWA (Economical and Social Commission for Western Asia) [5] has written that globalization "is a widely-used term that can be defined in a number of different ways.. Globalization is not a new phenomenon; it began in the late nineteenth century, but it slowed down during the period from the start of the First World War until the third quarter of the twentieth century. This slowdown can be attributed to the inward looking policies pursued by a number of countries in order to protect their respective industries. However, the pace of globalization picked up rapidly during the fourth quarter of the twentieth century..."[6]

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[1]United Nation 2002, Report of the International Conference on Financing for Development, Monterrey, Mexico, 18-22 March 2002.
[2] Investment for African development: making it happen. Background information in support of session 5 of the Roundtable: Encouraging Public Private Partnership in the Utilities sector: The Role of Development, 25-27 May 2005, NEPAD/OECD Initiative.
[3]Bhagwati, Jagdish (2004). In Defense of Globalization. Oxford, New York: Oxford University Press.
[4]Sheila L. Croucher. Globalization and Belonging: The Politics of Identity in a Changing World. Rowman& Littlefield. (2004). p.10
[5] United Nations (ESCWA), ESCWA Study on Air transport in the Arab world, New York, 2007
[6]Summary of the Annual Review of Developments in Globalization and Regional Integration in the Countries of the ESCWA Region by the United Nations Economic and Social Commission for Western Asia

Globalization caused that the role of national state changed and decreased its functions; in most cases the government should intervene effectively in the national economic in order to protect it through unity of national market.[1] The international experience in globalization shows that globalization trend has created new demands from the ment as a sult of ing global competitive-ness.
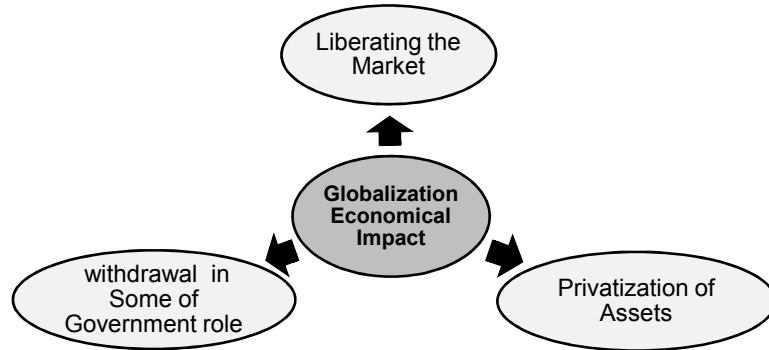
Figure 1-1: Globalization economical impact [2]

Figure 1-1 shows the economical impact of globalization upon the eco-nomical system; it participated in liberating of Markets all over the world, de-pending on demand and supply. It also helped in the change of governmental role from total control upon produc-tive units into a super-visory role as shown in Figure 1-2.
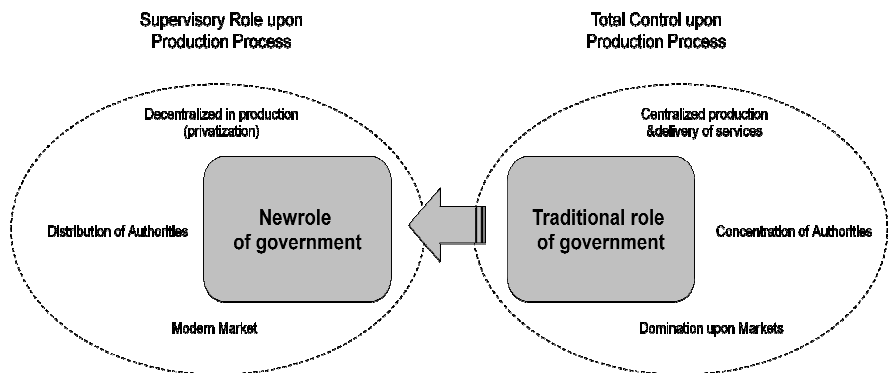
Figure 1-2: Change of Government role[3]

United Nations development program for year 1999 stated that globaliza-tion is tightly connected to contraction of time, place and disappearance of bor-ders by linking people's lives on a deeper and faster that what was happening

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[1]Galal Amin, Globalization, Dar Al Maaraf, Cairo 1988.
احمد السيد سماحة، نحو إدارة حضرية فعالة في مصر – الخصخصة في إطار مشروعات البنية التحتية، رسالة دكتوراه[2]
[3] ibid

any time ago, and it is a process that don't integrate economics only but also integrate culture and technology. Globalization can allow great opportunities through refreshing trade, using new technology and expansion of foreign investments and growth of international markets.[1]

The activation of private sector to share governments in infrastructure projects doesn't mean that governments will abandon its economical role, but it is a way to change this role to be supervising production process instead of producing by itself. There are a lot of services that private sector can't afford such services that are related to the government authorities such as police forces, army & etc…

Globalization has a lot of economical, informatics, media, and technological, social, cultural, and political features as shown in Figure 1-3.

Globalization Economical Features

- Spread of multinational companies
- Change of government role through programs of restructure
- Increase of international , technological between different countries
- Increase of investment rate through borders
- Internationalize of investment, production & services
- Increasing the influence of international economical organizations
- Increase of private sector participation

Figure 1-3: Globalization Economical Features [2]

1.3 Economic Systems Development

It become obvious through the recent economical conditions in different countries the dependence on achieving development through markets mechanism, after the changes in balance of economic forces that faced the world due to

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[1] United nation development program, human resources report, 1999.
[2] Gamal Nassar. Infra-structure projects execution by BOT system. FIDIC. Sliver book, 1998, page 1

the change of concepts to count on market mechanism because of globalization system that has been created. This forced a lot of developed countries to count on privatization system as a part of markets mechanism, and then followed by developing countries to apply privatization systems in infrastructure projects.
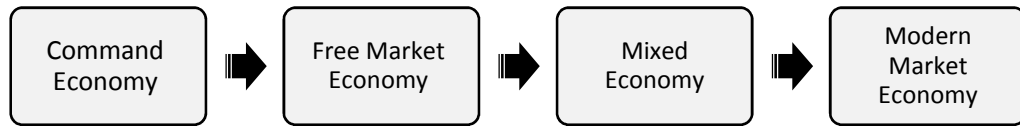
Figure 1-4: Economic System Development [1]

Privatization systems revealed an important issue, concerning the role of public and private sector in different economic systems. Privatization systems require a free economy in order to achieve its goals, different economic systems differ in their social, financial and regulations that regulates countries of different social and political circumstances.[2]

1.3.1 Command Economy

It can be called centralized planning economy. It is defined as the system where public interest overcomes private interest through government's entities; it increases the monopoly systems for government entities in the society and disappearance of competitive between productive entities.

Figure 1-5: Command economic system[3]

[1] احمد السيد سماحة، نحو إدارة حضرية فعالة فى مصر — الخصخصة فى إطار مشروعات البنية التحتية، رسالة دكتوراه، 2003 ، جامعة القاهرة
[2] ibid.
[3] ibid.

Figure 1-5 shows the process of command economic system performed by the government, which shows government total control of production process, prices and quality of products. It has a lot of problems as the presence of black markets, restrictions of personal freedom and difficulty of access of database used for economic decisions.

1.3.2 Free Market Economy

It is defined as the depends on the concept that governmental entity is responsible for organizing economic affairs of society. Free market economy relies on the free market, where productive firms and consumer are responsible for directing supply and demand, without the interference of government to direct the market.
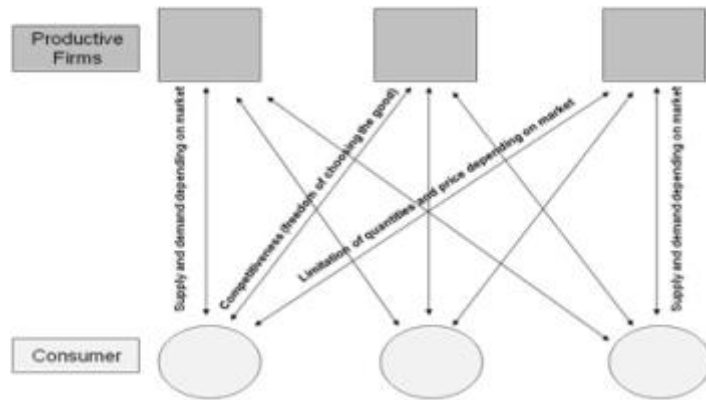
Figure 1-6: Free Market Economy [1]

Figure 1-6 shows the process of free market economy preformed through productive firms and consumer firms. It represents trends in supply and demand, determination of productive quantities, price, and consumed quantities by consumers without the interference of government.

1.3.3 Mixed Economy:

The mixed economy system is considered a system to compromise a middle solution between centralized system and free system. Government is identified as general authority that is considered the source of decision making to achieve general and political goals, & has the right to exercise some productive and marketing economic activities.

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[1] احمد السيد سماحة، نحو إدارة حضرية فعالة فى مصر – الخصخصة فى إطار مشروعات البنية التحتية، رسالة دكتوراه، 2003 ، جامعة القاهرة

In mixed economy system as shown in Figure 1-7, government out of its traditional activity and shares the private sector in operation of economic activities. public sector activity that is responsible of execution of national economic activities, and private sector activity that is responsible of execution of private economic activities.
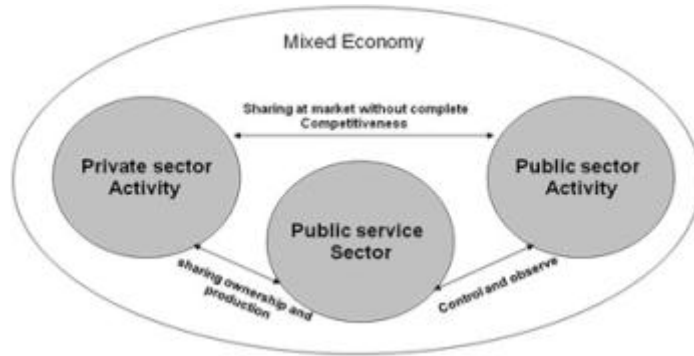
Figure 1-7: Mixed Economy System [1]

1.3.4 Modern Market Economy:

Modern Market Economy is the system that aims to correction of national economic trend and transfer national economy to system that depends on the market to achieve correction of national economic from economic recession.[2] It aims to expand the base of private sector and rehabilitation of national economic through privatization system.
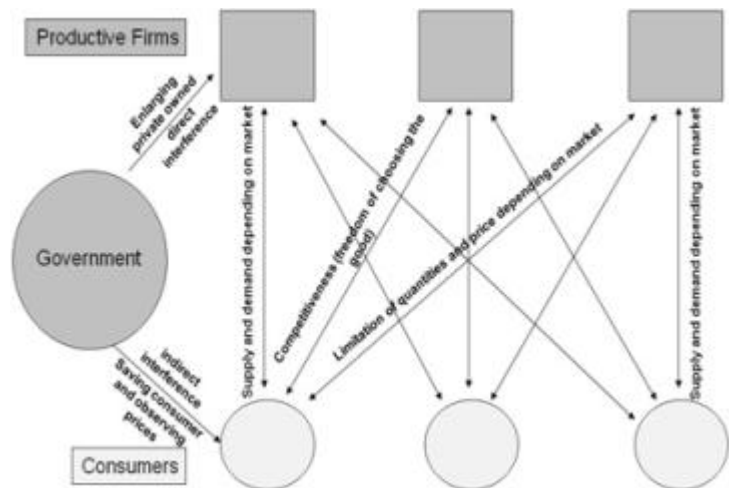
Figure 1-8: Modern Market Economy [3]

[1] احمد السيد سماحة، نحو إدارة حضرية فعالة في مصر – الخصخصة في إطار مشروعات البنية التحتية، رسالة دكتوراه، 2003 ، جامعة القاهرة

[2] Paul A. Samuelson, William D. Nordhaus Economics, Fifth Edition, McGraw-Hill Inc, USA, 1995.

[3] احمد السيد سماحة، نحو إدارة حضرية فعالة في مصر – الخصخصة في إطار مشروعات البنية التحتية، رسالة دكتوراه، 2003 ، جامعة القاهرة

Figure 1-8 shows the process of modern market economic system, it shows the participation of private sector in infrastructure projects and the role of government in supervising over the market activities.

1.4 Infrastructure:

Infrastructure is defined by the basic physical and organizational structures needed for the operation of a society or enterprise,[1] or the services and facilities necessary for an economy to function.[2] The term typically refers to the technical structures that support a society, such as roads, water supply, sewers, power grids, telecommunications. In some contexts, the term may also include basic social services such as schools and hospitals.[3]

It also defined by "...both specific functional modes - highways, streets, roads, bridges; mass transit; airports and airways; solid-waste treatment and disposal; electric power generation and transmission; telecommunications."[4] Infrastructure projects are defined by group of buildings, networks & services found in cities & civilized regions, social & economical and it is represented in products and services characterized by monopolization.[5]

Infrastructure global definition includes all services& buildings, the government usually take responsibility of affording such services & construction those buildings & operating those services. World bank report for year 1994[6] stated that developed countries invest at present 200 billion dollar per year in infrastructure projects; this represent 4% of total GNP and fifth its total investments. Through last two decades, large accomplishments are achieved in construction field in different countries.

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[1] Infrastructure, Online Compact Oxford English Dictionary, http://www.askoxford.com/concise_oed/infrastructure (accessed January 17 2009)
[2] Sullivan, Arthur; Steven M. Sheffrin (2003). Economics: Principles in action. Upper Saddle River, New Jersey 07458: Pearson Prentice Hall. p. 474. ISBN 0-13-063085-3
[3] Infrastructure, American Heritage Dictionary of the English Language, http://education.yahoo.com/reference/dictionary/entry/infrastructure (accessed January 17 2009)
[4] Infrastructure for the 21st Century, Washington, D.C.: National Academy Press, 1987
[5] Gamal Nassar. Infra-structure projects execution by BOT system. FIDIC. Sliver book, 1998
[6] البنك الدولى، تقرير عن التنمية فى العالم: البنية الأساسية من أجل ألتنمية، ترجمة الأهرام للترجمة و النشر، مطابع الأهرام التجارية، القاهرة 1994.

By the early 1980's, large numbers of developing countries were having trouble financing their foreign debt; because the 2nd half of 20th century witnessed population grew even faster than ever before reaching 6 billion in 2000[1]. In addition, the International Funding Monetary stated that for 1981 the total balance of payments deficit of the non-oil-producing developing countries will rise to $ 97 million, from $ 86 million in 1980.

According to Amex, the London unit of the American Express International Banking Cooperation, lending by Arab banks in the first seven months of 1981 jumped by 78 percent over 1980 levels.[2] In 1984, many of the world's developing nations continued to grapple with problem of repayment of staggering foreign debts; due to rise of oil prices all over the world, strong relation between dollar and world economy, high increase of inflation rates.[3]

1.4.1 Types of infrastructure projects

Infrastructure projects can be divided into several categories according to its targets & goals as shown in Figure 1-9.

Economical infrastructure includes are the ideal infrastructure that privatization system can be applied on.
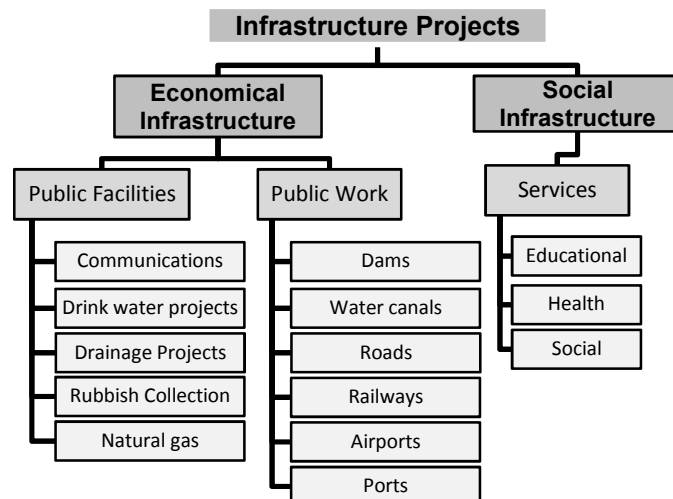
Figure 1-9: Types of Infrastructure Projects [45]

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[1] Lester Brown, The Population Challenge article, Encarta yearbook, 2000
[2] International Banking and Finance Article for year 1981, Encarta Encyclopedia, 2009
[3] ibid.
[4] البنك الدولي – تقرير عن التنمية في العالم: البنية الأساسية من أجل التنمية – ترجمة الأهرام للترجمة و النشر، مطابع الأهرام التجارية، القاهرة 1994.
[5] Baffes, John, and Anwar Salah. Productivity of Public Spending, sectoral Allocation choices, and Economic growth. policy Research working paper 1178. World Bank. 1993

1.4.2 History of Financing Infrastructure Projects

The appearance of contemporary infrastructure projects is related to the appearance of industrial revolution at the beginning of nineteenth century, this period witnessed the usage of technology provided by industrial revolution in construction of infrastructure projects.

Financing infrastructure projects have gone through different regular stages in most world countries under the influence of economical theories, we can summarize stages of financing infrastructure projects to four main stages as shown in Figure 1-10.

Complete freedom of economic 1800 - 1850	→	Organization & regulation of infrastructure 1850 -1945	→	Nationalizing infrastructure 1945- 1980' s	→	Private participation 1980's - present
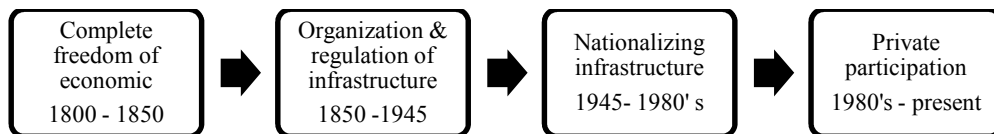
Figure 1-10: Development stages of fiancing infrastrucuture projects[1]

1.4.2.1 Complete freedom of economic stage

This stage started at the beginning of nineteenth century until the middle of nineteenth century, since it started by individual initiatives and evolution of small projects financed by personnel and families, infrastructure projects & providing countries by power using gas and coals through small institutions.

This stage is characterized by complete economics and total financial for infrastructure by private sector, especially in UK where the industrial revolution started.[2]

1.4.2.2 Organization and regulation of infrastructure stage

This stage started in the middle of nineteenth century until World War II. Government of most countries realized the importance of infrastructure and its relation to economical revolution and welfare of society, they also realized the transfer of infrastructure providers into monopolists, and their dominance of services provided to public and control of service price at the expense of public.

Governments of different countries at this stage aimed to regulate and organize infrastructure projects, in order to direct infrastructure projects to guaran-

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[1] Gamal Nassar. Infra-structure projects execution by BOT system. FIDIC. Sliver book, 1998
[2] ibid.

tee the benefit of all society consumers. Some of governments started to facilitate proceedings for investors in order to construct more infrastructure projects in different regions.[1]

In Egypt, before 1952 the private sector was dominating a lot of economical activities besides foreign investments in different fields, private sector was dominating financially and administratively on most public facilities.[2]

1.4.2.3 Nationalizing infrastructure Stage

This stage started at the end of World War II and ended in the middle of 1970's. In Europe where the war destroyed large sector of its infrastructure, and government was responsible for the reconstruction of infrastructure system to rebuild the country infrastructure all over again.

In the third world like Egypt, this period witnessed the nationalizing of private sector investments in Egypt after 1952 revolution. Egypt started to minimize the role of private sector in Egypt especially the foreign investments, such as nationalizing Suez Canal. Egyptian government was directed towards the construction of national projects; such as high dam, iron and steel companies, sugar companies, etc…

All facilities and companies were operated by public sector between years1961 to 1973. They were characterized by mismanagement and inefficient management systems causing the loss of most companies and inappropriate usage of these infrastructure projects.[3]

1.4.2.4 Private participation stage

This stage started by increasing private participation in infrastructure projects at the middle of seventeenth, as privatization was first used in the united states of America where they started restructuring infrastructure then followed by privatization in Great Britain, Chile, New Zealand, and turkey at the beginning of eighteenth.

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1 Brigham, Egugene F. and Louis C. Gapenski, Financial Management, Theory and Practice, New York, the Dryden Press 1977.
[2] El Salmi, Ali, Private Sector Management: An analysis of decision-making and employment policies and practices in Egypt, UNSP, 1980
[3] ibid.

In Egypt and after war of 1973, government started liberalization of the economy and take legal actions necessary for such policy. Privatization system started to be used at the middle of eighteenth by selling public sector companies that faced obstacles and problems in operation.[1]

Egyptian government declared in the middle of 1991 its commitment towards economical and financial reform program after it reached an agreement with International Monetary Fund about privatization program in Egypt.[2]

1.4.3 Types of Infrastructure Finance

Infrastructure projects are characterized by being large complicated projects with large cost, these forced governments to finance these projects for two reasons; firstly financial capital required to construct infrastructure projects; secondly ways to cover these costs. Types of infrastructure finance system can be classified as shown in Figure 1-11.
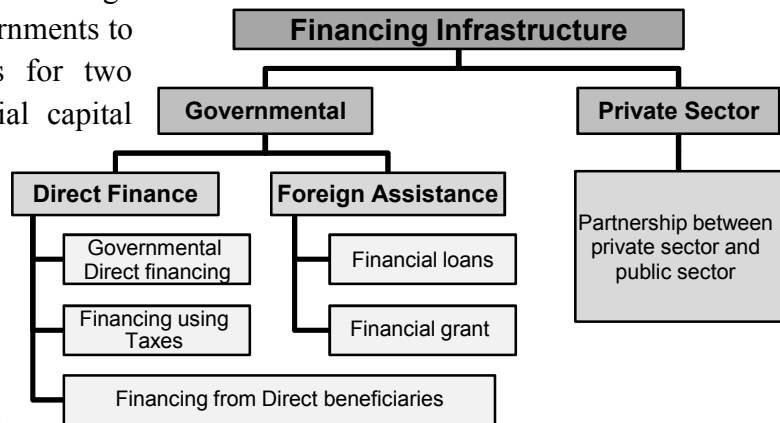
Figure 1-11: Types of Infrastrycture Finance [3]

1.4.3.1 Government's direct financing:

Governments are responsible for financing infrastructure projects directly from the government general budget. Governments impose taxes on citizens related to infrastructure projects.

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[1] احمد السيد سماحة، نحو إدارة حضرية فعالة في مصر – الخصخصة في إطار مشروعات البنية التحتية، رسالة دكتوراه، 2003 ، جامعة القاهرة

[2] أماني قنديل، محمود عبد الفضيل، كمال المنوفي. 1989. القطاع الخاص و السياسات العامة في مصر. ندوة "السياسات العامة و القطاع الخاص في مصر". كلية الاقتصاد. مصر.

[3]Heggie, Ian, and Micheal Quick; A frame work for analyzing Financial performance of the Transport sector working paper, World Bank, Washington, 1990

1.4.3.2 Government financing through foreign assistance:

Governmental financing through loans from other countries or international organizations or local financial bodies due to increase of cost of infrastructure projects that exceed the ability of the government general budget.

1.4.3.3 Financing by private sector:

This system is characterized by providing governments to the private sector different types of partnership contracts between public & private sectors; in order to provide infrastructure projects to citizens by guaranteeing outcomes of such projects over the public sector from quality and cost of service provided.

1.4.4 Infrastructure financial problems

Despite achievements accomplished through last decades in infrastructure projects, that infrastructure projects face great problems now a day as shown in Figure 1-12.[1]Infrastructure projects also need large budget for new investments specially to match ogical development of implementation ways and to overcome the increase of inflation rate. Developed countries also suffer from infrastructure problems as well because of great pressures on budgets and lack of possibility of imposing new taxes.
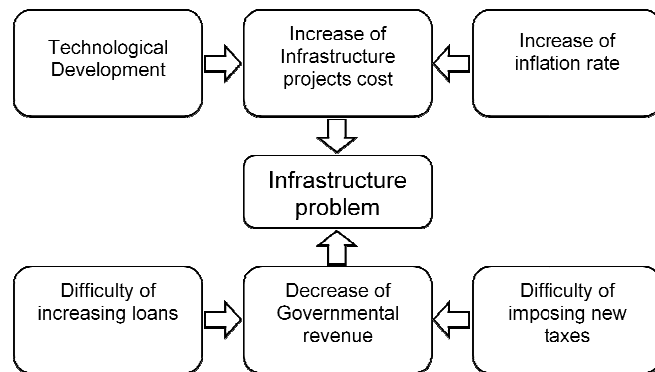
Figure 1-12: Problems Infrastructure Projects[2]

World Bank report for year 1994[3], entitled by "infrastructure for development" discussed the problem of infrastructure projects especially in developing countries. This report summarized the problems facing infrastructure projects as

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[1] البنك الدولى – تقرير عن التنمية فى العالم: البنية الأساسية من أجل التنمية – ترجمة الأهرام للترجمة و النشر، مطابع الأهرام التجارية، القاهرة 1994

[2]Gamal Nassar. Infra-structure projects execution by BOT system. FIDIC. Sliver book, 1998

[3] البنك الدولي، تقرير عن التنمية في العالم: البنية الأساسية من أجل التنمية، ترجمة الأهرام للترجمة و النشر، مطابع الأهرام التجارية، القاهرة 1994.

Low efficiency of operation represented in shortage of production, and ineffective use of workers; Negligence of maintenance: represented in insufficient fund required for such purpose; Low financial efficiency represented in inefficiently financial management; Failure to respond to public demands represented in repetitive mistakes of services, Negligence of incapable public sector & Ignorance of harmful influences on environment.

1.5 Privatization

Privatization definition is considered one of the most confusing definitions despite world wide spread usage of it. Privatization is just like other large definitions, it may contain content in more than one definition, and there is no agreed definition for privatization. It is defined as the transfer of enterprise ownership – in whole or in part – from the state to private hands.[1] While there is a general agreement that stated the sale of government represents privatization. It is also defined as the act of reducing the role of government or increasing the role of the private institutions of society in satisfying people's needs; it means relying more on the private sector and less government.[2]

Developed countries faced large stresses at the middle of 1980 because of debts crisis, followed by decreasing the external funding for these countries, so that they are obligated to apply a developing program in order to change economical policies followed at these days, they followed a system of decreasing expenses and increasing of revenues, this where privatization system took place to minimize financial burdens[3]

1.5.1 Privatization objectives:

There are a lot of objectives that government and private sector aim when they started to use privatization system, these objectives must be achieved in order to guarantee the success of privatization system as shown in Figure 1-13.

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[1] E.S. Savas, Privatization and public-private partnerships, New York: CQ Press, 2000.
[2] ibid
[3] المنظمة العربية للتنمية الادارية، إصلاح و تطوير مؤسسات المنافع العامة، القاهرة، 1999
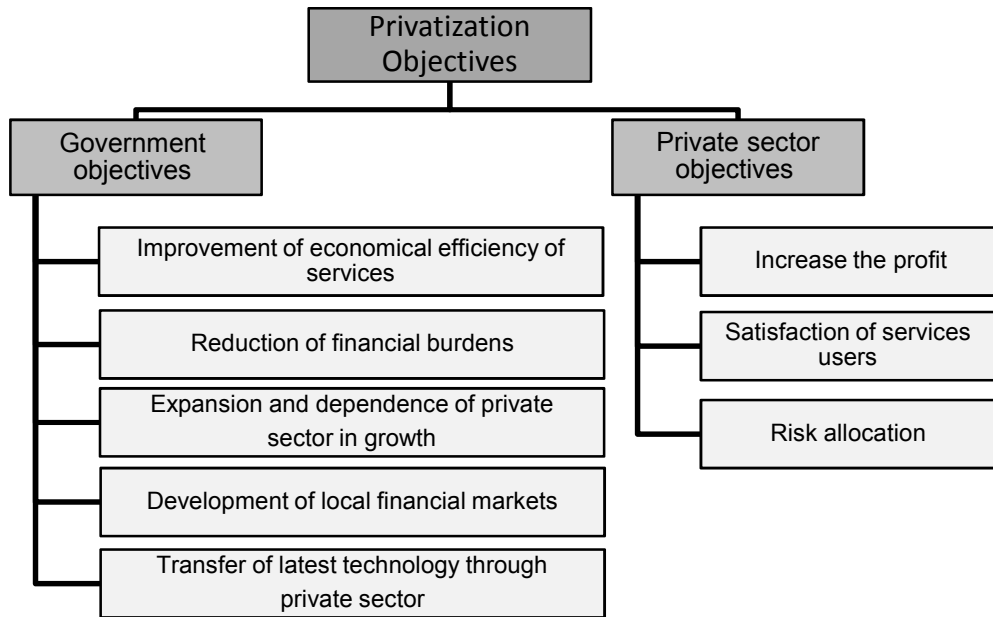
Figure 1-13: Privatization System Objectives[1]

There are a lot of principles that must be achieved to guarantee the success of partnership between government and private sector, [2] as shown in Figure 1-14. These principles determine the main aspects need to be achieved in Public Private Partnership that leads to the enrichment of relation between government and private sector. These principles guarantee the efficiency of services pro-vided to customers and protect the investments spent in such projects.
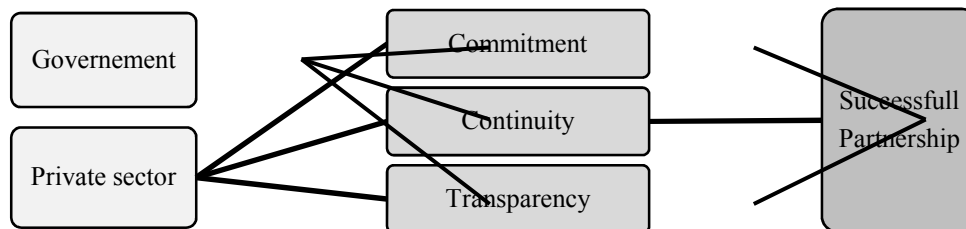
Figure 1-14: Principles of Partnership between Public private sectors[3]

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[1] SH & E, International air transport consultancy, Airport Privatization, KMPG PPP Transport international conference, October 2007.

[2] احمد السيد سماحة، نحو إدارة حضرية فعالة في مصر – الخصخصة في إطار مشروعات البنية التحتية، رسالة دكتوراه، 2003 ، جامعة القاهرة

[3] ibid.

1.6 Privatization System

Privatization systems in different countries are classified into different classifications according to the role of government in privatization system and according to the types of agreements between parties of private sector and public sector.

1.6.1 According to the role of government

Government participation in society and economy in various forms is necessary. It aims to establish rules for an increasingly interactive urbanized nation; and to regulate natural monopolies. There are three main systems of privatization classified according to the role of government in privatization systems[1].
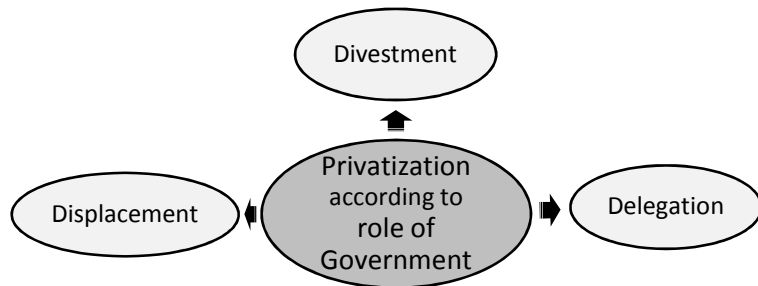
1-15 Types of Privatiz a-tion system according to role of government[2]

1.6.1.1 Delegation

This system is recognized that government has the responsibility and oversight but uses private sector for service delivery. It requires a contining active role for government.
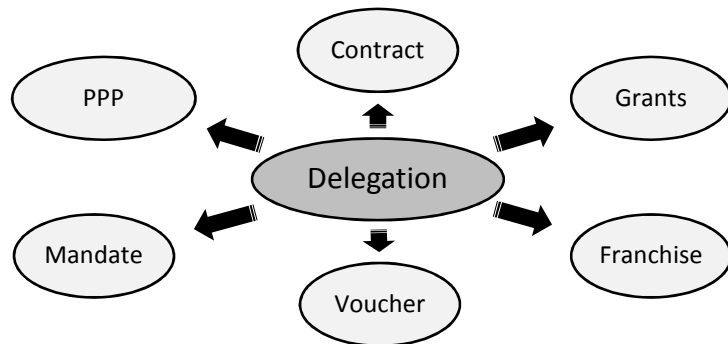
Figure 1-16: Delegation Privatization system [1]

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[1] E.S. Savas, A taxonomy of Privatization Strategies, Policy Studies journal 18 (2): 343-55 (1990)
[2] E.S. Savas, Privatization and public-private partnerships, New York: CQ Press, 2000

1.6.1.2 Divestment

Divestment can be identified that government abandons its responsibilities of infrastructure projects to the private sector. It requires a direct act by government but it is a one-time event. The asset is either sold or given away. Divestment system is divided into three categories as shown in Figure 1-17.
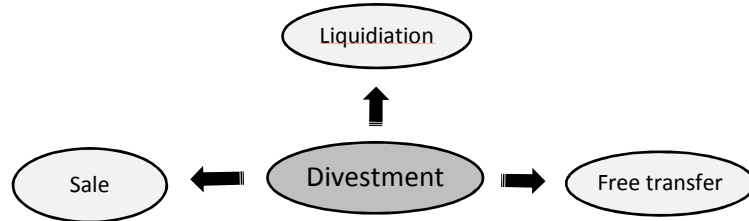
Figure 1-17: Divestment Privatization system [1]

1.6.1.3 Displacement:

Displacement is identified that private sector grows and displaces a government activity. Displacement is a more passive or indirect process that leads to government ing displaced more or less gradually by the private sector[2]. Displacement can be classified as shown in Figure 1-17.
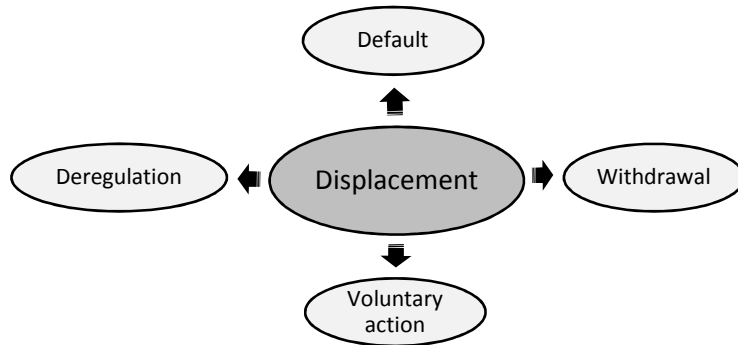
Figure 1-18: Displacement Privatization system [3]

1.6.2 According to type of agreement:

The provision of infrastructures and public utilities has under gone major changes through last two decades with many developing countries choosing to

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[1] E.S. Savas, A taxonomy of Privatization Strategies, Policy Studies journal 18 (2): 343-55 (1990)
[2] Paul Starr, "The Meaning of Privatization"; in Sheila B Karerman and Alfred J. Khan, eds, Privatization and the Welfare State, Princeton U. Press, 1989, 24.
[3] E.S. Savas, A taxonomy of Privatization Strategies, Policy Studies journal 18 (2): 343-55 (1990)

move away from the traditional public sector model of service and to introduce private sector participation. As the role of public sector decreases and role of private sector increases, the role of public sector changes into a provision in an agreement between public & private sectors, in order to provide services to customers. Privatization systems differ according the type of agreements between public & private sector. The agreements between public-private sectors can be classified into six forms.[1]
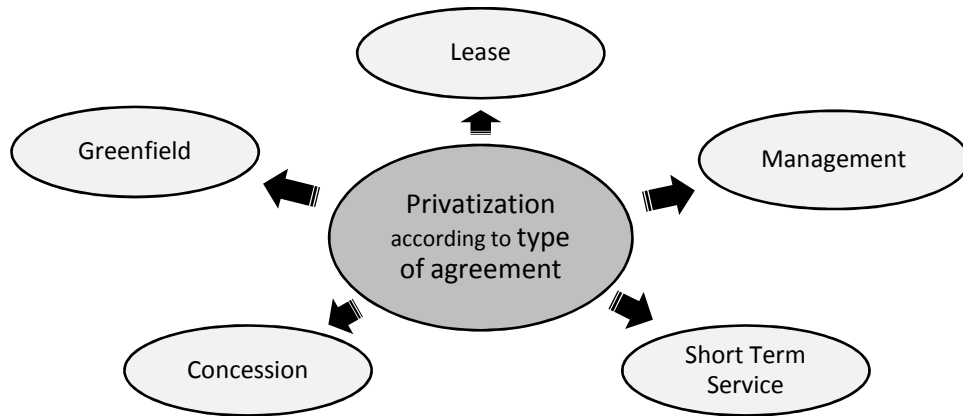
Figure 1-19: Privatization systems according to type of agreement [2]

1.6.2.1 Short term service contracts:

It has atypical duration from 6 months to 2 years;[3] specific tasks are contracted to private sector. Service contracts are characterized by providing the opportunity to benefit from private sector.[4]

1.6.2.2 Management contract:

This contract has a typical duration from 3 to 5 years. Management contract is an arrangement by which a private company is authorized with various types of tasks.

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[1]Franceys R, Weitz A. 2003. Public-Private Community Partnership in infrastructure for the poor, Journal of International Development 15: 1083-1098. DOI: 10.1002/jid.1052.
[2] E.S. Savas, Privatization and public-private partnerships, New York: CQ Press, 2000
[3]Argentino Pessoa, Public-private sector partnerships in developing countries, FEP Working Papers, N.266, Feb. 2008, p 9.
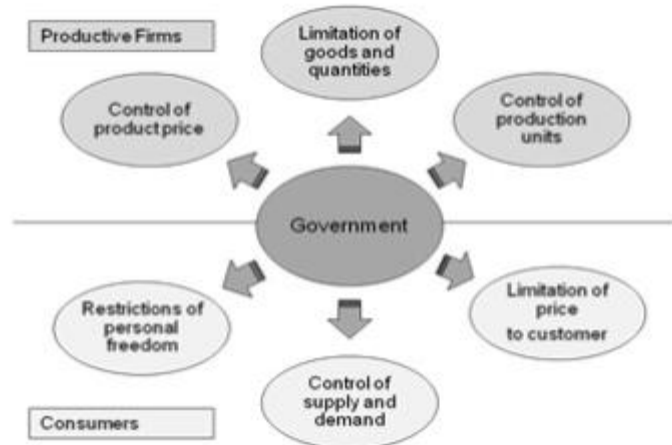[4] احمد السيد سماحة، نحو إدارة حضرية فعالة في مصر – الخصخصة في إطار مشروعات البنية التحتية، رسالة دكتوراه، 2003 ، جامعة القاهرة

1.6.2.3 Lease contract:

This contract has a typical duration from 10 to 15 years; private company can lease the asset of a utility, and maintains and operate them, in return for the right of revenues.

1.6.2.4 Greenfield projects:

This contract has a typical duration from 15 to 30 years and varies according to the agreement between parties, depending on the satisfying period of payback period of the private sector, who takes on the commercial risks.[1].

1.6.2.5 Concession:

This contract has a typical duration from 25 to 30 years.[2] Public sector owns the assets, but it contracts with private sector for operations, maintenance and investment. it is considered an older form of BOT idea where the private sector contracts with host government to build and operate an infrastructure project for an agreed period could be called Concession period where Private sector is responsible for full commercial risks.[3]

Table 1-1shows different responsibilities aspects of government and private sector in different privatization contracts.

Table 1-1: Responsibility in Different Privatization Contracts[4]

| Responsibility	Owner-ship	Investment financing	Revenue risk	Execution investment	Operation &maintenance
Service	Public	Public	Public	Public	Private
Management	Public	Public	Public	Private	Private
Lease	Public	Public	Private	Private	Private
Concession	Public	Private	Private	Private	Private
Greenfield	Private	Private	Private	Private	Private
Sale	Private	Private	Private	Private	Private

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[1]Argentino Pessoa, Public-private sector partnerships in developing countries, FEP Working Papers, N.266, Feb. 2008, p 10

[2]Argentino Pessoa, Public-private sector partnerships in developing countries, FEP Working Papers, N.266, Feb. 2008, p 11

[3] Ahmed A. Abbasi – Prof. Moheeb El Said, Private infrastructure approach: BOT projects in Egypt, 3rd international conference for building and construction, Cairo University, 1996, Cairo.

[4] احمد عبد الوارث، بدائل الخصخصة في مشروعات مياه الشرب، مؤتمر "أفاق التعمير في عصر مبارك، أكتوبر 1997، القاهرة

Chapter 2
BOT Projects in Egypt

2. Chapter 2: BOT Projects in Egypt

2.1 Introduction

BOT refers to; Build - a private company or consortium agrees with government to invest in infrastructure projects; Operate - the private sector owns, maintains and manages the facility for an agreed concession period; transfer - after concession period the company transfers ownership and operation of facility to the government.[1]

Build Operate Transfer projects involve a private sector company usually a consortium led by an international construction company that finances, builds and operates an infrastructure system for a fixed time during which the government has a regulatory and oversight role, BOT projects generates enough revenues to cover the project company's investment and operating costs plus an acceptable rate of return on capital usually ranges between 15% - 20%. BOT project were originally conceived to transfer commercial risks to the private sector and thus free government funds for other uses.

This system is considered a form of financing projects given by the government (donor) to one of private sector entities for certain time which is called the project company the right to design, build and operate certain project suggested by government, besides that the commercial exploitation for several agreed years, that are sufficient enough for project company to recover the cost of construction besides achieving acceptable profit from the income of the project. The project's property is transferred according to terms of contract to the donor without any charges.[2]

2.1.1 History of BOT System

The roots of BOT projects returns to what is known as concession contracts or agreement, which were spread at the end of 19th century and beginning of 20th century in France and other countries, where France government used

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[1]Khan, Ammad Hassan-jamil, Misbah and Sattar, Mudassar. The trend of Build Operate Transfer (BOT) Projects in Pakistan. First international conference on construction in developing countries. August 4-5 2008. Pakistan.

[2]محمد سمير زكى- نظام التشييد و الإدارة و التحول BOT- المركز الاستشاري الدولي للبحوث – القاهرة - 1999

these contracts to construct railway projects, electricity power stations, and water supply projects. At the middle of 1980's and especially in 1984, it received two important developments in the application of this system.

BOT system was applied through implementation of the Channel Tunnel that connects between England and France, this agreement was between both British & French governments on one hand and Eurotunnel Company on the other hand. Second, the invitation of prime minister of Turkey then Turgat Ozal to use this system in implementation of infrastructure projects in Turkey, credited to him the first of use the term "BOT" to refer to this type of projects.

Governments started to use BOT system in financing and operating infrastructure projects as a result of the world change of economic theories, and especially after the collapse of central planning theory in the Soviet Union and east Europe, and after the financial crisis that faces different countries in most industrial communities. BOT system usually is used as a part of economical process aiming to liberate economics & transfer to market economy through program for privatizing public sector.[1]

Egypt started to know and use Concession system in the middle of 1940's where suburb of Heliopolis was supplied by electricity and water and tram lines according to concession system. Suez Canal is considered one of the most famous examples of concession system in the end of 19th century. This system disappeared from Egypt after 1930's of 20th century and specially in infrastructure projects, applying this system was confined to different agreement in the field of exploration of natural resources specially oil.[2]

BOT system is a solution for financing infrastructure projects, under which the government get an established projects without the need to borrow or to increase the government spending and increase of loads over general budget.[3]

[1] احمد محمد محرز – الخصخصة، النظام القانوني لتحول القطاع العام إلى القطاع الخاص – كتاب الأهرام الاقتصادي 99 – ابريل 1996 – مؤسسة الأهرام – القاهرة.

[2] احمد السيد سماحة، نحو إدارة حضرية فعالة في مصر – الخصخصة في إطار مشروعات البنية التحتية، رسالة دكتوراه، 2003 ، جامعة القاهرة

[3] محمد غازى الجلالى – نحو بناء نظام متكامل لاستخدام نظم عقود البناء و التشغيل و النقل – رسالة دكتوراه – كلية الهندسة – جامعة عين شمس - 2000

2.1.2 Types of BOT systems:

BOT projects used in the construction of mega projects of infrastructure such as transportation projects appears clearly where governments would not afford financial fund of such projects since the private sector is responsible for the financial fund. The project is transferred to the government at the end of agreement period without any charges as shown in Table 2-1.

Table 2-1: Institutional Arrangement for BOT system [1]

	Term Abr.	Term Definition
Transfer immediately	BT	Build and Transfer
	BTO	Build, Transfer and Operate
Transfer After Concession period	BOT	Build, Operate and Transfer
	BOT	Build, Own and Transfer
	BOOT	Build, Own, Operate and Transfer
	BLT	Build, Lease and Transfer
	BRT	Build, Rent and Transfer
	ROT	Rehabilitate, Own and Transfer
No transfer	DCMF	Design, Construct, Manage and Finance
	BOR	Build, Operate and Renewal of concession
	DBFO	Design, Build, Finance and Operate
	BOO	Build, Own and Operate
	ROO	Rehabilitate, Own and Operate
	MOO	Modernize, Own and Operate

Table 2-1show the abbreviations for different types of BOT system. BOT system is considered an alternative system in financing and construction of infrastructure projects instead of ordinary system applied in most countries.

2.1.3 Contributor in BOT Projects:

Although BOT projects differ from each other clear difference, they are connected in different points and shares different faces, Figure 2-1shows the contributors in BOT projects and the contractual agreements that bonds contributors together. The partnership between contributors through contractual agreements is based on commercial basis that guarantees specific and accurate reviews for the project aims and feasibility. The contributors in BOT projects are listed as follows:

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[1]Gamal Nassar. Infra-structure projects execution by BOT system. FIDIC. Sliver book, 1998
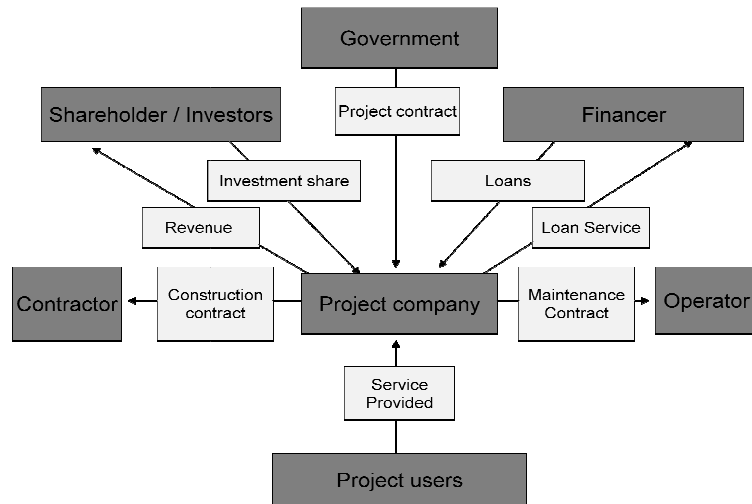
Figure 2-1: Contributors in BOT projects[1]

2.1.3.1 Host government:

Government's role is responsible for supervision of private sector through and after implementation of infrastructure projects. Government must ensure the presence of stable political legal to encourage the private sector investments at the long run of projects.[2]

2.1.3.2 Project Company:

Project company is called for the entity that formed by private sector to implement the project.[3] The consortium may consist of group of investor, contractors, and operators, financing entities, resources and equipment suppliers.

2.1.3.3 Financier:

It is required from private sector to do great effort at international and local financing agencies in order to get the needed finance required for implementation of the project. Project Company pays the loan from the revenues of the project through providing products and services to customers.[4]

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[1] محمد غازي الجلالى. نحو نظام متكامل لاستخدام نظم عقود البناء و التشغيل و النقل (في تشييد مشروعات البنية الأساسية في الدول النامية). رسالة دكتوراه. كلية الهندسة . جامعة عين شمس

[2] ibid.

[3] ibid

[4] Augenblick Mark, - Custer B. Scott Jr. - 1990- the Build, Operate and Transfer (BOT) Approach to infrastructure projects in developing Countries – Policy Research And External Affairs Working Papers 498 – The World Bank – Washington.

2.1.3.4 Construction Contractor:

The construction contractor may be a part of project consortium. It takes construction and completion risks on time within budget and to specifications. Project Company entrusts private company (contractor) to implement construction works.[1]

2.1.3.5 Operation and maintenance contractor

Operator is expected to sign a long term contract with the project company for safe operation and scheduled maintenance of the project. Operator may also share equity into project but usually they tend to accept little risk in the form of capital or expenditure.[2]

2.1.3.6 Investors

Investors may be company, partnership, a limited partnership, a unit trust, joint venture & combination of one or more. It is always necessary to ensure that proposed investors in infrastructure projects have sufficient powers to enter into relevant contracts and perform their obligations under those contracts.

Table 2-2: Responsibilities of BOT Contributors[3]

Project Contributor	Responsibility
Host Government	Initiate, approve, monitor and control the project directly to safe guard the public funds and interest.
Project Company	Design, Construct, Operate, handle project risks, provide service to users.
Financer	provide financial loans to project company in order to implement the project
Construction Contractor	Construct project within fixed time construction contract.
Operation & maintenance contractor	Operation and maintenance Administration of infrastructure projects.
Investors	Participation in investment of infrastructure project.

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[1] محمد غازي الجلالى. نحو نظام متكامل لاستخدام نظم عقود البناء و التشغيل و النقل (في تشييد مشروعات البنية الأساسية في الدول النامية). رسالة دكتوراه. كلية الهندسة . جامعة عين شمس.

[2] S. Mubin& A. Ghaffar, BOT Contracts: Applicability in Pakistan for infrastructure development, Pak. J. Engg& Appl. Sci. Vol. 3, Jul 2008, P33-46

[3] محمد غازي الجلالى. نحو نظام متكامل لاستخدام نظم عقود البناء و التشغيل و النقل (في تشييد مشروعات البنية الأساسية في الدول النامية). رسالة دكتوراه. كلية الهندسة . جامعة عين شمس

2.1.4 Contracts in BOT system:

BOT systems contain different types of contracts and agreements between different contributors of BOT project. Contracts and agreements used in BOT system is the same traditional agreements used in the implementation of infra-structure projects. These agreements should be well prepared by experts in order to achieve BOT system goals

2.1.4.1 Project Agreement:

The host government is responsible for the development of terms of this agreement and posed for investors at the tender stage, then signed after a company wins the tender. The project agreement contains commitments and rights for both parties as shown in Figure 2-2.
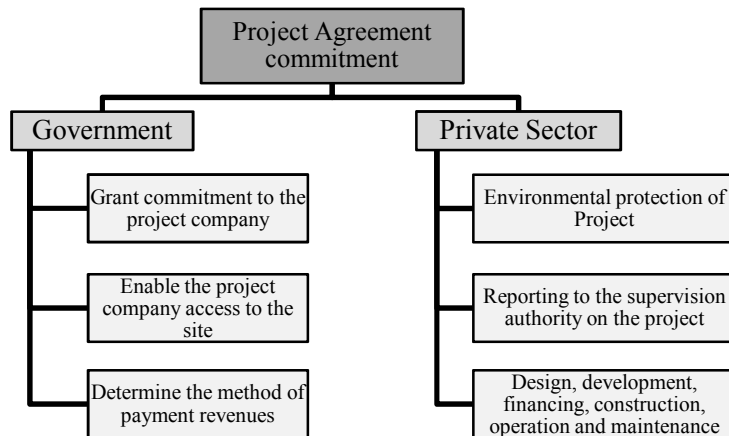
Figure 2-2: Project Agreement Commitment [1]

2.1.4.2 Consortium agreement:

BOT projects are usually large projects with different specialties that a single company faces a lot of difficulties to take responsibility of such large project, so group of companies are united in a consortium that is defined as the project company in BOT system.

2.1.4.3 Finance Agreement:

Finance agreement is signed between the Project Company and different finance sources, which are probably commercial banks. It is difficult to get this type of finance because the government is not a part of this agreement, commer-

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[1]Gamal Nassar. Infra-structure projects execution by BOT system. FIDIC. Sliver book, 1998

cial banks finance infrastructure projects with a guarantee of revenues of the project.

2.1.4.4 Construction contract:

Construction contract is signed between Project Company and contractor, who may be a part of the consortium that represents the project company itself, the project company is responsible for choosing the suitable type of construction contract to be used in the project according to concession requirements and conditions.

2.1.4.5 Other contracts:

BOT systems contains other contracts signed by the project company in order to fulfill its commitment towards the implementation of the project according to the project agreement, these contracts are same traditional contracts used in construction field, these contracts may increase or decrease according to the project nature:

- operation & maintenance contracts
- insurance contracts
- guarantees

2.2 Risk transfer:

Project risks include all factors that cannot be definitively predicted and incorporated in the project costing. In large-scale infrastructure projects, typical risks include unpredicted engineering problems as shown in Table 2-3.

Table 2-3: types of risks in BOT projects[1]

Risk	Description
Construction risk	Related to design problems, cost overrun & project delays
Financial risk	Related to variability in interest rates, exchanges rate and other financial factors
Availability risk	Related to continuity and quality of service provided and in turn depend of "availability" of an asset
Demand risk	Related to ongoing need for the service
Residual value risk	Related to future market price of assets

[1] project finance and risk management course, public private partnership, Cambridge, march 2007

Private sector has stayed away from infrastructure projects due to high risks involved in these projects. Recently, when BOT system appeared the private sector started to have the will to participate in those projects if the governments or international financial institutions assume significant portion of project risks. Governments in BOT system is required to carry out most of risks as shown in Figure 2-3.

Public			Private
Design/ Build	D/ B/ Finance	D/ B/ F/ Operate Maintain	Build-Operate-Trans./ Concession
Regulatory	Regulatory	Regulatory	Regulatory
Approvals	Approvals	Approvals	Approvals
Environment	Environment	Environment	Environment
Customer Acceptance	Customer Acceptance	Customer Acceptance	Customer Acceptance
Design	Design	Design	Design
Traffic/Rev.	Traffic/Rev.	Traffic/Rev.	Traffic/Rev.
Technology	Technology	Technology	Technology
R-O-W	R-O-W	R-O-W	R-O-W
Construction	Construction	Construction	Construction
O & M	O & M	O & M	O & M

Figure 2-3: Shared Risk Allocation in BOT projects[1]

The World Bank and other international financial institutions are developing a mechanism where their funds are used to guarantee private sector projects. The host government should also provide private sector guarantees and share the project risks as shown in Table 2-4.

Table 2-4: Risks in BOT projects[2]

Risk	Public	Private
Legislative (existing & future)	Major Responsibility	Sharing with defined parameters
Acquisition & Environmental	Major Responsibility	Sharing with public assistance
Permitting & Planning	Major Responsibility	Sharing with defined parameters
Design & Construction		Major Responsibility
Operation &Maintenance	Sharing with defined parameters	Major Responsibility
Financing		Major Responsibility
Termination		Major Responsibility
Insurance	Sharing with defined parameters	Major Responsibility
Force Majeure	Sharing with defined parameters	Sharing with defined parameters

Figure 2-4 shows relation between models of privatization systems and degree of private sector risk. It ranges from government infrastructure projects to full privatization projects, passing through different models of private sector involvement.

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[1] Victor P. Poteat PPP in Transportation. National practice Management
[2] Manju Chandraseker, Cruise terminal financing public-private partnerships, Cruise Seminar, San Francisco, Feb. 7, 2008
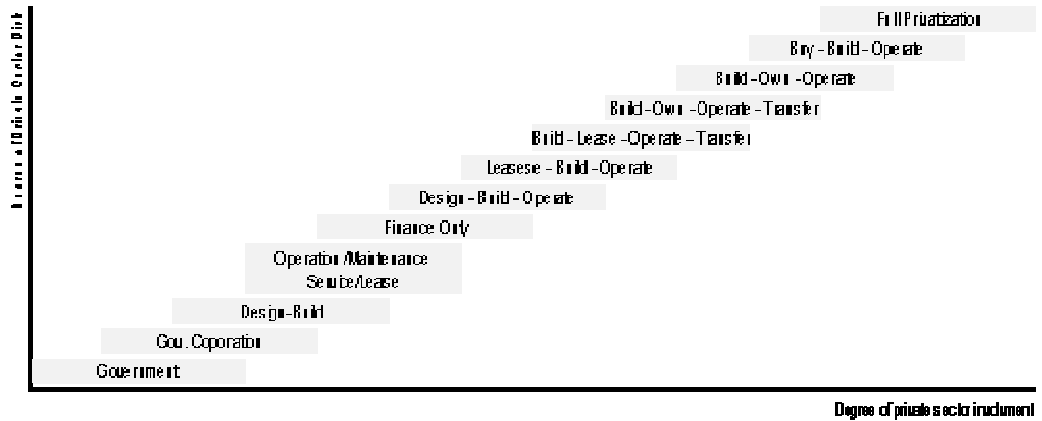
Figure 2-4: Models of privatization & risk allocation[1]

2.2.1 Advantages & disadvantages of BOT system:

BOT system brings many benefits for governments, customer and private sector. It is a must that government pursues a policy to deal with infrastructure projects using BOT system through maximizing of its advantages and minimizing of its disadvantages as BOT system has different advantages and disadvantages.

Main advantages of BOT system is that BOT system reduce of risk for public sector, reduce burdens on public sector, it also increase of efficiency of construction and operation process of infrastructure projects. Participation of private sector in implementation of projects leads to innovation; reduce waste, decrease of cost and increase of work efficiency as shown in Figure 2-5.
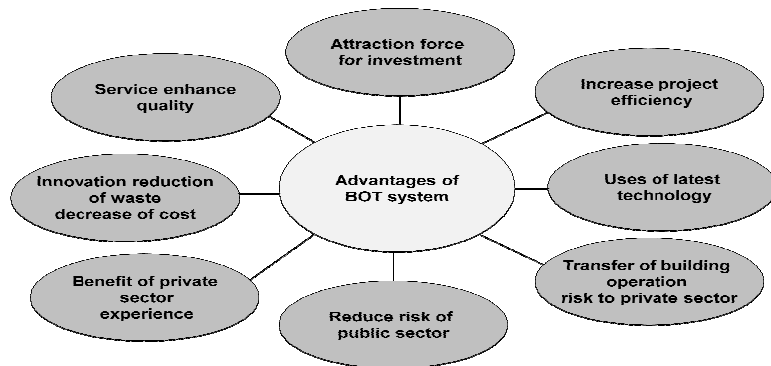
Figure 2-5: Advantages of BOT system[1]

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[1] John Walker, Private financing of infrastructure assets (the Virtuous Cycle), Asia-Pacific Ministerial Conference on Public-Private Partnerships for infrastructure projects development, 2007

Figure 2-6 shows main disadvantages of BOT system, it decrease governmental control over the different stages of the project. On the long run, the spending of customers in exchange of service provided by the project could exceed savings of customer
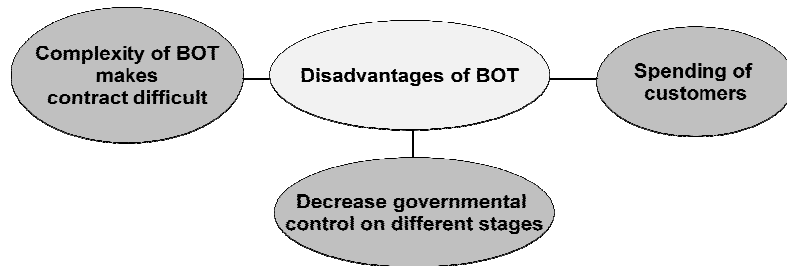
Figure 2-6: Disadvantages of BOT system [2]

2.2.2 BOT project Stages:

The stages of BOT projects are similar in different stages, the spread of this system all over the world lead to adoption of specific policies and stages to implement BOT projects. Figure 2-7 shows the different stages of BOT projects and contributors, stages of implementing BOT project.
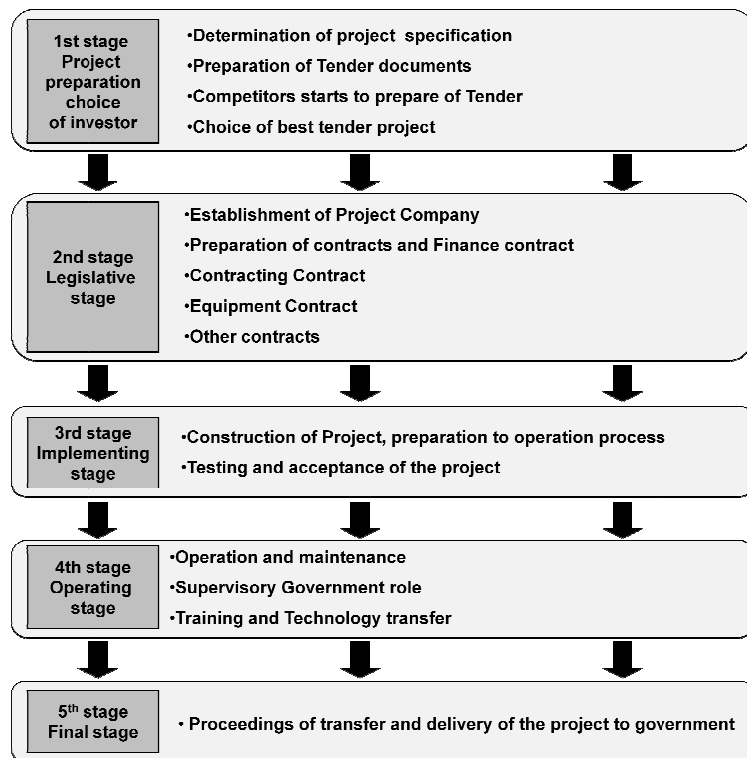
Figure 2-7: Stages of BOT project [1]

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[1] Gamal Nassar. Infra-structure projects execution by BOT system. FIDIC. Sliver book, 1998
[2] ibid

2.2.3 BOT Governmental strategies:

Government should plan for its own strategy to use BOT concept as shown in Figure 2-8, it is based on its needs and privacy, investors prefers participation in BOT projects in developing countries than in industrial developed, that is characterized with relative high national income and has stable inflation rates within stable legal environment. It is demanded that the political and government system must be stable enough to ensure the return/payback of the investors to minimize their financial risks.[2]
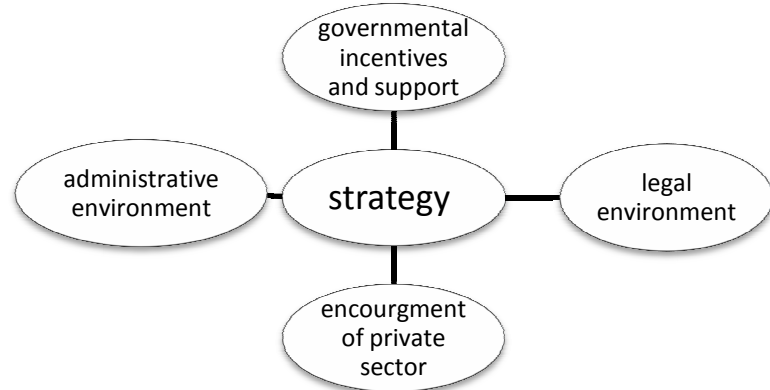
Figure 2-8: BOT Governmental Strategy[1]

2.2.3.1 Encouragement of private sector participation:

Government needs to work on strategy to encourage private sector participation in infrastructure projects using BOT system through working on political agreement to accept this participation. Government should convince private sector investors and their creditor with total commitment to national BOT projects, government need to achieve local support especially those who are used to service provided by public sector with no charge or low rate charges, government need to get support from all departments in the country such as public administrative and unions.

2.2.3.2 Legal environment for BOT system:

Legal environment for BOT project is considered one of the most factors that guarantee the success of such projects; investor and his creditors depend on this legal environment to identify risk factors of the project related to the host country. Government should put suitable regulations and laws that specify the

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[1] Gamal Nassar. Infra-structure projects execution by BOT system. FIDIC. Sliver book, 1998

محمد غازي الجلالى. نحو نظام متكامل لاستخدام نظم عقود البناء و التشغيل و النقل (في تشييد مشروعات البنية الأساسية [2]
في الدول النامية). رسالة دكتوراه. كلية الهندسة . جامعة عين شمس

responsibility of authorized entity to sign the BOT project agreement and sets the commitments and powers of this entity.

2.2.3.3 BOT project administrative environment:

Government should provide effective administrative environment to guarantee the success of its BOT strategy, where complicated bureaucratic methods and lack of power of departments to take decision are considered main obstacles that faces perfect application of BOT system.

2.2.3.4 Governmental incentives and support:

Government sometimes should provide investors with incentives to contribute implementation of BOT projects. Type and scale of incentives concerned with risk of host country, feasibility study of project, and country's need for project.

2.3 Privatization in Egypt

Egypt witnessed a large social change due to the massive increase of population in Egyptian cities as other cities in the world, lead to the change of Egypt from agricultural country – where rural citizens represent 90% of Egyptian population – to civilized country where the population represent more than 45 % of Egyptian population and expected to raise to 55 % by the year 2020. This continuous urban growth poses large challenges the most important challenge is the need for effective advanced methods to operate the development in Egypt, and implementing infrastructure projects to face the major increase in population in civilized cities.[1]At the entry of twenty-first century and the accompanying change in global and political, economic and the emergence of new ideas such as globalization, the Egyptian government paid attention to the role of private sector in development through privatization program.

The local administrative system faced failure in its hierarchy to supervise services implemented within the range of local units, it faced group of shortcomings mentioned as follows: the control of central government over local administrative system, the inability of local units to adjust investments of infrastructure

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[1] مجلس الشعب – تحديث مصر الباب السادس "الإسكان و المرافق العامة" – مجلس الشعب المصري - 2002

projects dedicated to the local unit according to its need, it is required to review the central government to take decisions concerning infrastructure projects.

2.3.1 Problems of infrastructure projects in Egypt

Local administration in Egypt faced a lot of problems in administration process of infrastructure projects represented in lack of efficiency and effectiveness of local administration process of infrastructure projects due to centralization of decision making process in Egypt. Efficiency is defined as the ability to achieve established targets in specified time within required method, effectiveness of performance of infrastructure projects is defined as providing high level service to all users with same quality and with least price possible, and achieving high level of satisfaction for users.[1] Infrastructure projects in Egypt facing two types of problems at the local level, institutional and technical frame works, and financing, it can be mentioned as shown in Figure 2-9.
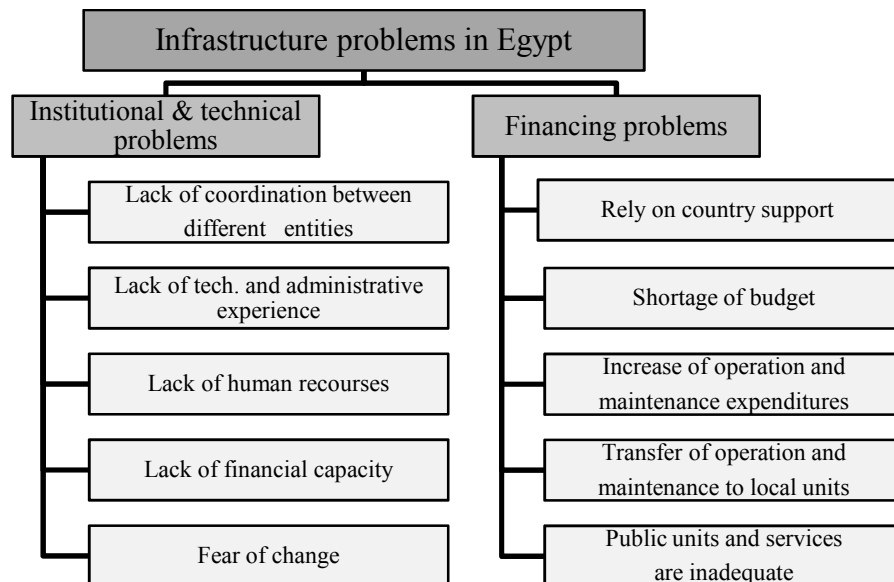
Figure 2-9: Problems of infrastructure in Egypt [2]

[1]Bahl; Roy W. & Linn; Johnannes F.- Urban Public Finance in developing countries – Oxford Uni.-1993

احمد السيد سماحة، نحو إدارة حضرية فعالة في مصر – الخصخصة في إطار مشروعات البنية التحتية، رسالة دكتوراه، [2] 2003 ، جامعة القاهرة

2.3.2 Economic & structure reform program

The economic & structure reform program has gone through different stages since the political decision to decrease the control of government and public sector at the beginning of 1970's, privatization process accelerated due to the increase of the trends calling to increase the participation of private sector and using privatization program as a main basis for economic reform program adopted by the International Monetary Fund (IMF).[1] The Egyptian government started since 1987 to prepare and implement economic & structure reform program with the help of World Bank and IMF[2] as shown in Figure 2-10.
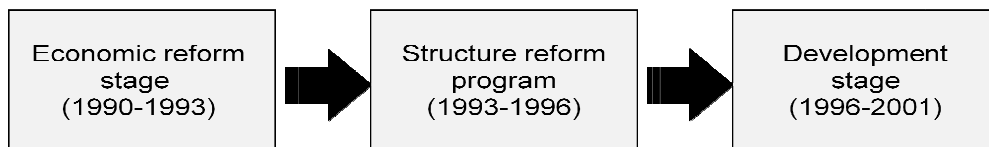
Figure 2-10: stages of Economic reform program in Egypt [3]

2.3.2.1 Economic reform stage (1990-1993)

The aim of the first stage for the reform program was to create macro-economic environment that is capable of achieving economic stability, through controlling the increase of inflation rate and decreasing it from 40% to 5%.

2.3.2.2 Structure reform program (1993-1996)

This stage aims to achieve structure reform in productive base of the national economy to benefit from the economic environment achieved in the first stage. The mechanism used in this stage is liberating prices of products and services according to supply -demand rule.

2.3.2.3 Development Stage (1996-2001)

This stage is known as the stage of increasing investments in country, it aims to increase the foreign and local investments in the development program of infrastructure projects. The mechanism used in this stage is to implement national privatization program.

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[1] على عبد العزيز – برنامج الخصخصة:قضايا التحول الاقتصادي لاقتصاد السوق في مصر- مركز الدراسات السياسية و الإستراتيجية – الأهرام 1977.

[2] البنك الدولي – تنمية القطاع الخاص في مصر: الأوضاع و التحديات – القاهرة 1994

[3] احمد السيد سماحة، نحو إدارة حضرية فعالة في مصر – الخصخصة في إطار مشروعات البنية التحتية، رسالة دكتوراه، 2003 ، جامعة القاهرة

2.4 BOT System in Egypt

The participation between government and private sector witnessed several stages, where the financing system appeared as a phase of Build, Operate & Transfer (BOT) Contract or as concession contract. The Egyptian government contracted with the international company of Suez Canal in year 1853 and government signed concession contract with this company in order to excavate and operate Suez Canal for 99 years, the government provided the company the land of project with no charge.

Concession projects appeared in Egypt at early stage in different phases, either in concession agreements to operate public facilities or concession agreements in excavating natural resources. These projects were recessed in Egypt from fifties accompanied with nationalization trend applied by Egyptian government. Egyptian economy witnessed increase of the private sector investment _ foreign and local investment_ at the beginning of nineties using BOT system to implement infrastructure projects in Egypt, achieving the development program of Egyptian government.[1]

According to the Egyptian law, project agreement is considered a concession contract for public infrastructure, which is defined as:" administrative contract where the committed _ individual or company_ is responsible for operating public infrastructure project and use it for a fee paid by the users, this contract is applied according to the general rule for operating infrastructure projects besides the conditions mentioned in the concession contract".[2]

Recently, group of laws[3] was issued to regulate the private sector participation in infrastructure projects using BOT system in different sectors of development; law no.100 for year 1966 to edit some regulation of law no. 12 for year 1976 to create the Egyptian electricity authority, law no. 229 for year 1996 to edit some terms of law no. 84 for year 1968 concerning public roads, law no. 3

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[1] محمد أبو العنين- انتشار الاتجاه إلى إقامة مشروعات البنية الأساسية في الدول النامية عن طريق نظام البوت- مؤتمر مشروعات البناء و التشغيل و إعادة الملكية – شرم الشيخ – 1998

[2] سليمان محمد الطماوي – الأسس العامة للعقود الإدارية دراسة مقارنة – مطبعة جامعة عين شمس – الطبعة الخامسة – 1991 القاهرة.

[3] احمد السيد سماحة، نحو إدارة حضرية فعالة في مصر: الخصخصة في إطار مشروعات البنية التحتية، رسالة دكتوراه، جامعة القاهرة.

for year 1997 concerning offering public facilities concession to build, operate and use airports.

2.4.1 Egyptian experience in BOT system

By following up the Egyptian experience in application of BOT infrastructure projects, with contribution of private sector, characteristics of Egyptian experience can be summarized in several points:

2.4.1.1 Economic environment

Egyptian government started to use BOT system within integrated program for economic reform; it aims to liberate the economic from regulations and restrictions; increase of private sector participation in economic activities; privatization of public sector.

2.4.1.2 Investment environment

Egypt is characterized with good investment environment, and several conditions to attract the foreign investment such as; freedom to deal with foreign exchange; expansion of the size of Egyptian market; exchange rate stability and political stability. The investment environment is considered suitable for application of BOT projects.[1]

2.4.1.3 Egyptian constitution

The Egyptian constitution says that Egypt is a country where its economy is developed through integrated development plan. There are some terms in constitutions concerning the private commitment towards the public infrastructure projects, so there are no direct constitutional obstacles towards the BOT system, but the constitution need to be more specific and clear concerning regulation of BOT system.[2]

2.4.1.4 The awarding authority

It is clear from the laws enhanced to implement BOT system that these laws stresses on validity of concession and modifying its terms through the council of ministers based on the suggestion from the competent minister.

[1] احمد على جبر – المناخ الاستثماري في مصر (دراسة لقياس الرأي العام) – كتاب الأهرام الاقتصادي رقم 116 – سبتمبر 1997- مؤسسة الأهرام - القاهرة

[2] حسين توفيق إبراهيم – الاقتصاد السياسي للإصلاح الاقتصادي – مركز الدراسات السياسية و الإستراتيجية بالأهرام – القاهرة - 1999

2.4.1.5 Guarantees

The Egyptian government provided several guarantees to investors in BOT projects and their creditors such as; different agreements between investor and governmental entities; World Bank guarantees for the Egyptian government commitments.[1]

2.4.1.6 Special legislation for BOT projects

Laws concerning concession of public infrastructure were modified, such as laws that regulate the percentage of profit does not exceed 10%, or period of concession does not exceed 99 years. The percentage of profit was no longer used in the law all over the world, the period of concession become 30 years instead of 99 years. Limiting the profit for infrastructure projects can be used in different countries because of the monopolistic nature of infrastructure projects, such as system used in the United States of America.[2]

2.4.1.7 Project agreement (concession contract)

The Egyptian government has not worked for a typical agreement to use in application of BOT projects in Egypt. Egyptian government has used international consultants in most of its BOT projects. This strategy leads to the inability to build professional cadres and local advisory to contribute in enhancing BOT agreements and evaluating its bids according to recommendations of professional consultancy agencies in Egypt.[3]

2.4.1.8 Tendering BOT projects

Different laws issued to apply BOT system in Egypt states that project company should be chosen according to factors of competitive and publicly, but it did not specify these rules that the method should be used to choose the contractor. These laws did not specify different standards that should be taken in consideration to evaluate bids. In Egypt the administrative authorities or the consultant are responsible for the specification of these standards.

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[1] معتز كامل مرسى – تجربة هيئة كهرباء مصر في عقود الإنشاءات و التشغيل و التحويل – أبحاث مؤتمر التحكيم الدولي و الوسائل السلمية الأخرى لحل المنازعات في الفترة من 8الى14 ابريل 1997 – المركز الإقليمي للتحكيم التجاري الدولي - القاهرة

[2] Alexander, Ian, Mayer, Colin and Weeds Helen – regulatory structure and risk and infrastructure firms – an international comparison policy research working paper 1698 -1996 – the world Bank.

[3] شهيرة الرافعي – الأولوية للمستثمر المصري في مشروعات البوت – الأهرام الاقتصادي – العدد 1502 – أكتوبر 1997 - القاهرة

2.4.2 BOT projects in Egypt

Egypt confirms continuing BOT projects; Egyptian ministry of finance stressed the importance of using BOT system in implementation of infrastructure projects in Egypt that allows the country to execute its development plan with the aid of private sector to construct high cost infrastructure projects including roads, airports, ports, power plants, drinking water projects and sanitary projects.

General authority for investment specified number of infrastructure projects to be constructed and operated by the private sector, these projects are concerned with activities in different ministries.

2.4.2.1 Drinking water and sanitation field

Ministry of Housing and Urban Community proposed 20 projects to extend drinking water and sanitation pipelines to new communities in Egypt as shown Table 2-5 as follows:

Table 2-5: Drinking Water and Sanitaion BOT projects[1]

	Project Description	Project Stage	Financing method
Drinking water Projects	Drinking water pipeline project (Marsa Alam -Edfo)	study	BOT
	Extension of Drinking water plant (Korymat)	study	BOT
	Drinking water pipeline project (Isamlia - hasana)	study	BOT
	Drinking water pipeline project (Nafak – AboRedes)	study	BOT
	Drinking water pipeline project (Al shat – Ras El Nakb)	study	BOT
	Drinking water project (New Menia)	study	BOT
	Drinking water project (Tiba)	study	BOT
	Drinking water project (6 of October)	study	BOT
	Drinking water projects in different Provinces	study	BOT
Sanitation projects	Sanitary drainage plant (New Cairo)	study	BOT
	Sewage treatment plant (East of Alexandria)	study	BOT
	Sanitation project (6 of October)	study	BOT
	Sanitation project (Dekhila, Agami)	study	BOT
	Extension of sanitation plant (sherouk)	study	BOT
	Extension of sanitation plant (Damietta)	study	BOT
	Extension of sanitation plant (Abo Rawash)	study	BOT
	Extension of sanitation plant (El Gabl El Asfar)	study	BOT
	Extension of sanitation plant (Helwan)	study	BOT
	Improvement of water properties project (El Gabl El Asfar)	study	BOT
	Reuse of treated water in agriculture (Alexandria)	study	BOT

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[1]General authority of investment, Annual report, 2002

2.4.2.2 Electrical and Energy field

Ministry of Electricity and Energy is first ministry tended to finance power plants in new communities using investment with Build Own Operate Transfer (BOOT) as shown in Table 2-6. First project was constructed using this system was Sedi Krir power plant in year 1998. There are 5 projects put up for investment in the Egyptian experience stated as follow:

Table 2-6: Electrical and Energy BOT projects[1]

	Project Description	Project Stage	Financing method
Electricity projects	Sidi Karir Power plant	Contracted	BOOT
	Suez Power Plant	Contracted	BOOT
	East Port Said Power plant	Contracted	BOOT
	Safaga Power plant	Study	BOOT
	North Cairo Power plant	Study	BOOT

2.4.2.3 Communication Field

Ministry of Communication and information technology raised 4 projects for investments using Build Operate Transfer (BOT) by private sector as shown in Table 2-7. Two private sector companies (Menatel, Nile telecom) was formed to provide and operate public service cabins all over Egypt, mobile phone service was privatized by three companies (Mobinil, Vodaphone & Etisalat).

Table 2-7: Communication BOT projects[2]

	Project Description	Project Stage	Financing method
Communication project	Mobile Phone service	Contracted	N/A
	Public service cabin	Contracted	N/A
	Quick info network	Study	BOT
	Electronic government	Study	BOT
	Electronic trade	Study	BOT
	Participation with Telecom Egypt company	Study	BOT

2.4.2.4 Transportation field (Roads)

Ministry of transportation offered 10 roads for investment using Build, Own, Operate, & transfer (BOOT) by private sector as shown in Table 2-8.

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[1] General authority of investment, Annual report, 2002
[2] Telecom Egypt Company 2002Telecom Egypt Company, 2002

Table 2-8: Transportation (Roads) BOT projects[1]

	Project Description	Project Stage	Financing method
Transportation Roads	Cairo – Ain Sokhna Road	Constructed	BOOT
	Helwan – Korimat Road	Study	BOOT
	Alexandria – Fayoum Road	Study	BOOT
	Cairo – Alexandria – Matrouh Road	Study	BOOT
	Cairo – Ismalia – Port Said Road	Study	BOOT
	Cairo – Alexandria Road	Study	BOOT
	Fayoum – Assuit Road	Study	BOOT
	AinSokhna – Marsa Alam Road	Study	BOOT
	Dirout – Farafra Road	Study	BOOT
	Cairo – Suez Road	Study	BOOT

2.4.2.5 Aviation field (airports)

Ministry of Aviation offered number of airports for investment using Build, Own, Operate & Transfer (BOOT) or Build, Operate & Transfer (BOT) to cover the airports all over Egypt as shown in Table 2-9.

Table 2-9: Airports BOT projects [2]

	Project Description	Project Stage	Financing method
Aviation Airport	Ain Sokhna Airport	Study	BOT/BOOT
	Assuit Airport	Study	BOT/BOOT
	East Ewainat Airport	Study	BOT/BOOT
	Taba Airport	Study	BOT/BOOT
	Sharm El-Shiekh Airport	Study	BOT
	Abo Semble Airport	Study	BOT
	Borg Al Arab Airport	Study	BOT/BOOT
	Al Wahat El Bahrya	Study	N/A
	El Farafra Airport	Study	N/A
	Marsa Alam Airport	Contracted	BOT
	Dahab Airport	Study	N/A
	Al Alamin Airport	Contracted	BOT
	RasSedr Airport	Contracted	BOT
	Cairo Airport (Terminal 3)	Constructed	N/A

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[1] General authority of investment, Annual report, 2002
[2] ibid

2.4.2.6 Transportation Field (railways)

Ministry of transportation offered number of projects for Railways and underground metro as shown in Table 2-10 in order to improve performance of transportation inside the cities and linking between new communities, all projects are implemented using (BOT) system by private sector.

Table 2-10: Transportation (Railways) BOT projects [1]

	Project Description	Project Stage	Financing method
Metro	Underground Metro in Cairo(third Stage)	Construction	BOT
	Underground Metro in Alexandria	Study	BOT
	Underground Metro in 6th of October	Study	BOT

2.4.2.7 Transportation Field (Ports)

Ministry of Transportation offered 4 Ports projects as shown in Table 2-11 in order to be implemented using Build, Operate & Transfer (BOT) system by private sector to improve performance of traffic in Suez Canal or to serve new industrial free zones constructed along Suez Canal.

Table 2-11: Transportation (Ports) BOT projects [2]

	Project Description	Project Stage	Financing method
Ports	East Suez Port	Study	BOT
	North-Ain El Sokhna Port	Study	BOT
	Rehabilitation of channel lake	Study	BOT
	River Transport	Study	BOT

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[1] General authority of investment, Annual report, 2002
[2] ibid

Chapter 3
Airport Privatization

3. Chapter 3: Airport Privatization

3.1 Introduction:

The patterns of ownership and regulation of airports and airlines have differed between the United States and the rest of the world, so their evolution and conclusion in privatizations has been different.

Most nations have judged that they can no longer afford the scale of subsidies associated to airports programs, the resulting drive for economic efficiency and the elimination of subsidies has led to the privatization of national airports. Airport authorities that have to raise money in the private sector are replacing governmental bodies that could afford to disregard interest payments.

3.2 Airports and Airlines before privatization and deregulation

Privatization refers to the transfer of the ownership from a government agency to private investors, while deregulation refers to elimination of government process that review business decisions, it also refers to economic deregulation, which removes the need for companies to get permission to raise or lower prices, enter and exit markets, and innovate in the range of services they offer. Generally privatization has been the trend for airports and deregulation the trend for airlines.[1] The change in airlines industry has affected airports so the operators of airports need to take in consideration both privatization and airlines deregulations.

3.2.1 Airports:

Governments owned and operated all commercial airports in the world, with few exceptions until the British Airports Authorities (BAA) was changed to a private company. It was understood that airports were governmental authorities. Governmental ownership has two phases; the first phase was represented in the United States, while the second was represented in the rest of the world.

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[1] Richard de Neufville, Amedeo Odoni. Airport systems (Planning, Design and Management).McGraw Hill Companies. 2003

In the United States, state governments have established special governmental units called authorities in order to operate airports and other infrastructure projects related to their state such as ports, bridges. State governors and legislators control these authorities through their political control. Authorities have special identities and finance themselves independently through bonds sold to the private investors.

In the rest of the world, national governments typically controlled the country's airports. A national department or ministry under the power of the government is responsible to design, build and operate airports with governmental employees. These governmental airports organizations have relatively large staff of professionals, which could be justified for their national mission. Airports operated by national departments did not have control on their finances..

3.2.2 Airlines:

Airlines in the United States were independent businesses that were economically regulated by governmental agency, the Civil Aeronautics Board (CAB). Airlines had to have CAB permission to carry passengers between any two cities, new licenses became difficult to obtain because the market would naturally oppose added competitions. The CAB also controlled the service provided by airlines in detail. This regulatory system made it difficult for airlines to provide innovative services.[1]

National governments owned the major airlines in their countries. Until the last years of the twentieth century, Air Canada, Air France, British Airways, Japan Airlines and Lufthansa were national firms regulated by their government. They also regulated any other airlines that competed against them such as Air Inter in France, British Caledonian in Britain and ANA in Japan, which was not fair enough for these airlines. Many arguments was represented that competition between airlines was neither appropriate nor practical.[2]

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[1]Jordon, W. Airline Regulation in America-Effects and Imperfections, the John Hopkins Press, 1970, Baltimore, MD.
[2]Pavaux, J. l'économie du transport Aérien – La Concurrence Impraticable, 1984, Economica, Paris.

3.3 Privatization of airports

Airport privatization is no longer a novelty, it is a global trend followed by most worldwide countries. Privatization of airports has been an ongoing and accelerating global trend over the past two decades. It was initiated in United Kingdom, processing across Europe and Australia region, airport privatization then started to be applied in Asia and Middle East countries.

Privatization of airports started as a result of commercialization and globalization in airport market. Government was directed to privatization of airports as shown in Figure 3-1.
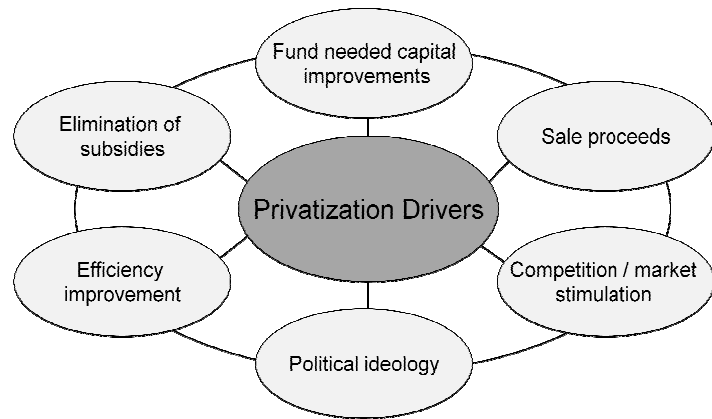
Figure 3-1: Keys of Drivers of airport privatization[1]

3.3.1 Airports privatization

The privatization of airports and deregulation of airlines went through three phases at the end of twentieth century as shown in

Figure 3-2: Stages of Airport Privatization [2]

Airports and airlines in the United States and the rest of the world were differently affected according to the difference between airline/airport industry operation methodology in United States and rest of the world.

[1]Tom Wlash. Jacob Consultancy. Privatizing Airports in Asia: Lessons learned from around the world
[2]Richard de Neufville, Amedeo Odoni. Airport systems (Planning, Design and Management).McGraw Hill Companies. 2003

3.3.1.1 Deregulation of Airlines in the United States

The pubic desire for effective competition and lower prices was the principal motivation for the economic deregulation of airlines. The country has an experience with airlines operating flights internally in the states of Texas and California; these airlines were not regulated by CAB and offered low prices. All these factors, led to deregulation of airlines in 1978, the end of CAB authority, and the removal of interference in airlines agreements.[1]

Airlines in the United States as a result of deregulation movement started new competitive regime, represented in a burst of economic innovative, reduction of prices and new services provided. U.S. Airlines succeeded to improve their performance in different aspects.

3.3.1.2 Worldwide Airline privatization

Innovation resulted from U.S. deregulation stimulated the worldwide airlines privatization. The principal motivation for worldwide airline privatization was the need to deregulated airlines. Canada, for example, Canadian airlines faced a problem as it could not tolerate to face the United States low fares airlines when traveled inside United States, or between the two countries. Canadian airlines could not compete with United States airlines which were characterized with low fares, this forced Canadian government to deregulate airlines. In major intercontinental markets, the airlines in the United States could undercut the foreign airlines by offering connections within United States through their frequent flyer programs. In order to compete with deregulated United States airlines, regulated airlines had to deregulate.

Privatization was the means to deregulate the nationalized airlines industry. Canada and Britain – the closest partners to United States – were the first countries to start privatization of their national airlines. By year 2000, about half of the Western European airlines were privatized. privatization process was very painful process because competition means the elimination of insufficient companies that fails to compete with other companies, this led to the disappear of many major airlines such as Pan America in the United States and also the disappearance of Swissair and Sabena, that were symbol for their countries.

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[1] Khan, A. E. 'Interview with PBS', http://www.pbs.org/fmc/interviews/khan.htm

3.3.1.3 Privatization of airports

After the success of the privatization of airlines and appearance of new ideas such as globalization and liberalization, governments found several benefits in privatization as it made them a lot of money, increase service efficiency and ease financial burden of infrastructure projects. By privatizing assets, they got immediate and future payments from the new owners and avoided the need to finance improvements.

There are several motivations that Stimulates movement of airport privatization in the world, it drives the government to pursue this direction in dealing with airports infrastructure problems, it also encourages private sector to participate in airport infrastructure. Motivations that drive government to use this systemcan be mentioned as shown in Figure 3-3.
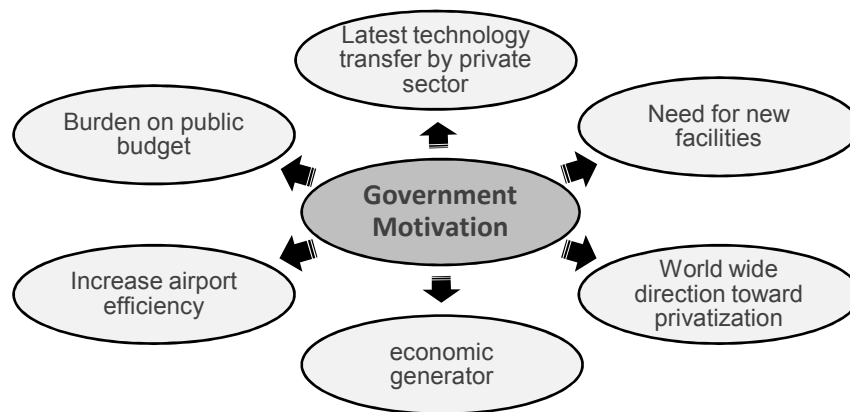
Figure 3-3: Motivation of Government towards Airport Privatization [1]

Motivations for private sector differ from those of Government as private sector mainly aims to increase its profit and investments in his projects, these motivations can be mentioned as shown in Figure 3-4.

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[1]Tom Walsh, Global Experience in privatizing airports, Feature Asian airlines and Aerospace, July 2007
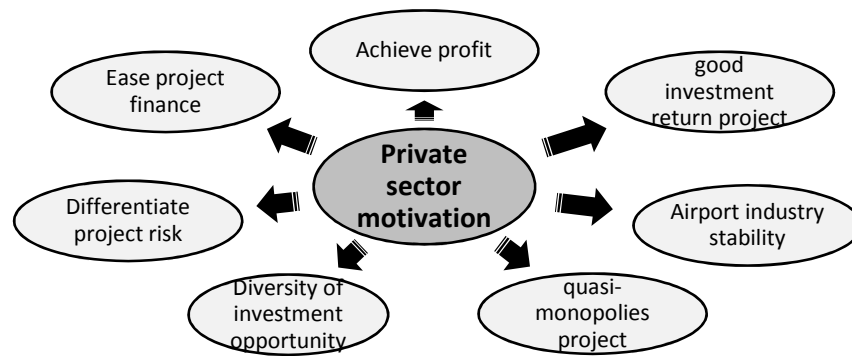
Figure 3-4: Motivation of Private sector towards Airport Privatization[1]

3.3.2 Concept of airport privatization

Privatization refers to the change of ownership from government agency to private investor. The typical airport privatization involves a long-term concession in return of certain rights that guarantee the cost return of airport investments The practical definition of airport privatization involves the transfer of some ownership rights. The rights associated with the ownership can be classified into two main items as follows:

3.3.2.1 Rights to residual income

Residual income is the difference between the revenues and costs. The right to residual income is one of the standard benefits of ownership. When the governments privatize airports, they offer investors the rights to keep any residual income for a particular period. The rights to residual income are the main reason that encourage private sector to invest in airports. The owner of the rights to residual income should be able to make a good profit that covers cost of the airport.

3.3.2.2 Management control

The other item for ownership of airports is the control of the property, the ability to run and develop the airport. Management control achieves many different aspects of the operations [2]Private investors require management control

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[1] Tom Walsh, Global Experience in privatizing airports, Feature Asian airlines and Aerospace, July 2007
[2] Richard de Neufville, Amedeo Odoni. Airport systems (Planning, Design and Management).McGraw Hill Companies. 2003

over the airport to have the flexibility to organize facilities and operations, these lead to increase of private groups to participate in all management aspects of airports as shown in Figure 3-5.

Consultants	• Do most of Airport planning – under the governmental direction
Engineers and Architects	• Do all the design process
Major banks and Investors	• responsible for organizing the financing of major projects
Private companies, Airlines	• Responsible for major operation of airports
Long-term contracts	• Set many prices for airport services
Governments	• Control development and airport price and quality of services provided

Figure 3-5: Private Sector Participation in Airport Management [1]

3.3.3 Airport privatization systems

There are three main types of airport privatization system applied in worldwide privatization trend as shown in Table 3-1; they differ according to the degree of participation of private sector and the role of government in privatization system. The participation of private sector varies between full, partial and limited participation in airport construction and operation processes, the role of government may varies between full or partial control on airport industry process. The main types of airport privatization systems could be summarized as shown in Table 3-1.

Table3-1: Types of airport privatization system[2]

	Full	Partial	Limited
Privatization System	Asset Sale System	Concession System	Service system
Policy Options	Trade Sale Initial public stock offering (IPO)	BOT, BOOT, BTO, etc. Long term lease Master concessions	Service / management contract
Ownership	Private sector	Government private sector	Government
Investment	Private sector	Private sector	Government
Management/ Operation	Private sector	Private sector	Government

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[1] Richard de Neufville, Amedeo Odoni. Airport systems (Planning, Design and Management).McGraw Hill Companies. 2003
[2] Tom Wlash. Jacob Consultancy. Privatizing Airports in Asia: Lessons learned from around the world, Asia Airport Summit. Singapore. April 23, 2007

3.3.3.1 Asset sale system (Full Privatization):

Assets of airport are transferred to Private Sector Company and the company shares could be sold to employees or customers, such as BAA plc, Fraport and ADP, or trade sale of airports such as Brussels and Düsseldorf.

3.3.3.2 Concession system (Partial privatization)

Concession system refers to the transfer of operation right to private sector, while airport assets stay under the government control. There are different types of concession system vary from BOT system to BD system as discussed in previous chapter. Concession contract system length ranges from 25 to 30 years, but the extremesvary from 5 to 99 years.

3.3.3.3 Service/Management system (limited privatization)

In limited privatization, government owns and operates the airport while private sectors participate in airport through service contracts or management contracts. Private sector may provide different service to airport operator such as cargo service, maintenance service, etc. government sometimes may provide private sector management contract to operate the airport facility.

Table 3-2: Difficulties in Privatization Systems [1]

Full Privatization	Partial Privatization	Limited Privatization
Airport Charges need to be controlled due to monopoly characteristics of Airport	Concession contracts need to be significantly flexible to respond to the unforeseen events	Operation process is lied under the total responsibility of government
Economic regulation needs to reflect on an appropriate level of intervention	facility and service quality at end of concession period should be clearly defined	

3.3.4 Worldwide experience in airport privatization

Airport privatization started at 1987 by the privatization of British Airports Authority (BAA), and then followed by number of airports privatized in France and England. Privatization movement started to be a worldwide trend that increased in different countries during the last decade of twentieth century. The beginning of the twentieth century witnessed slight decrease in airport pri-

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[1]Tom Wlash. Jacob Consultancy. Privatizing Airports in Asia: Lessons learned from around the world, Asia Airport Summit. Singapore. April 23, 2007

vatization
movement
that did not
last long and
started to in-
crease again
in the last
decade. Figure
3-6 shows air-
port privatiza-
tion move-
ment through
its development over years.

BAA	Vienna	Liverpool Prestwick southampton	Athens Belfast Bournemouth Cardiff Cochin Copenhagen E.Midlands	Dusseldorf Istanbul Kent Melbourne Naples Perth Rome	Birmingham Bolivia Brisbane Bristo ASUR (Mexico) Adelaide Argentina Auckland Australian Reg Canberra Costa Rica Eindhoven Hanover Hobart Luton Malaysia Skavska South Africa	GAP (Mexico) Jakarta OMA Stewart	Bangalore Hyderabad Narita Fairport Lima Malta Sydney Zurich	firenze Larnaca Copenhagen Brussels Bratislva Budapest Delhi Mumbai	Dublin Pisa St. Petersburg Dusseldorf Hamburg French Reg Athens Ecuador Chubu Hong Kong India (non-Metro) Kolkata Chennai Navi Mumbai Parque Midway Schiphol ADP
1987	1990-1992	1993-1996		1997	1998	1999	2000-2003	2004-2006	2007-recent

Figure 3-6: Increase of privatized airports[1]

3.3.5 Future of Airport industry

The future trends in airports and air transportation change the context, objectives and criteria of excellence for airport planning, management and design long-term growth. Increase of privatization trends in airport industry calls to the appreciation of economic and financial aspects for the operation of airports from the owner's point of view.

In the contrast to previous, airport planning need to focus on costs, revenues, traffic, risks, operations and management methodology. Airports professionals are required to develop dynamic strategic plans that allow the operators to manage their risk with flexible and effective solutions. There are five trends that dominated airport/airline industry at the start of twenty-first century as shown in Figure 3-7.

[1]Tom Wlash. Jacob Consultancy. Privatizing Airports in Asia: Lessons learned from around the world, Asia Airport Summit. Singapore. April 23, 2007
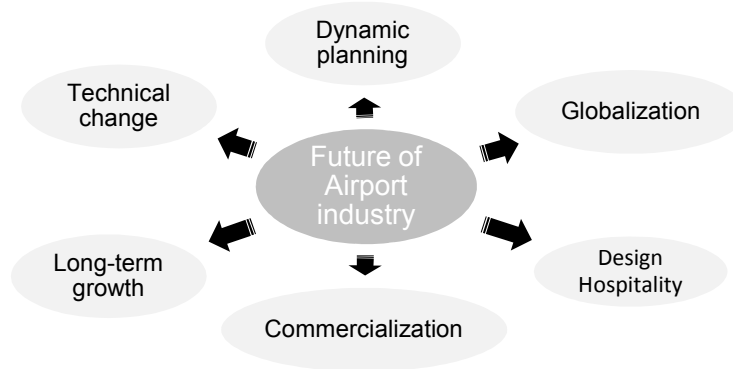
Figure 3-7: Future of Airport industry [1]

3.3.5.1 Long-term growth

Airport industry changed under the increase of population and tendency of members of younger generation to fly cumulate to enormous differences in consequences within 25 years. This leads to the continual demand for expansion facilities and development of airport operation methodology. Airport planners should be prepared for long-term growth of airport forecast of traffic rate.

3.3.5.2 Commercialization

Management in airport industry replaced the government ownership with private ownership in a regulated environment, accompanied by the increase the orientation of profits and economic efficiency is overtaking political considerations. It also enhances criteria excellence to focus on cost effectiveness, value for money, efficiency both technical and economic and profitability.

3.3.5.3 Globalization

Globalization concept appeared at the end of twentieth century, led to the formation of international airlines alliances and airport companies. In 2002, the star and own world alliances were formed. Large-scale airport companies were formed to operate airports in different regions based on long-term management contracts. This led to the implementation of worldwide practice in provision of airport services.

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[1]Richard de Neufville, Amedeo Odoni. Airport systems (Planning, Design and Management).McGraw Hill Companies. 2003

3.3.5.4 Technical change

The future of airport industry witnessed great change in technical facilities, especially electronic commerce, which both propels the rapid rise of integrated cargo carriers and through electronic ticketing, rearranges passenger handling inside airport buildings. This led to increase of productivity, reduce demand for facilities and increase of operation efficiency of airport industry.

3.3.5.5 Dynamic strategic planning

Dynamic strategic planning is the new approach recommended for the future of airport development. It identifies future uncertainties and seeks for fixable development strategy that leads airports to minimize its risks and take advantages of future opportunities and avoid threats.[1]

3.3.5.6 Design Hospitality

Design of airports nowadays depends on airport project is a part of integrated project that contains all means of entertainment, comfort, luxury and hospitality. This integrated project must contain all means of comfort for passengers using the airport can be mentioned as follows; airport terminal building, international standard hotel, and free duty.

The airport is considered the first place for the tourist to see in the country, it must be at international standard since the world changed to a small village and the passengers can simply compare between airports all over the world. Airport project are changed to be a commercial hub for passengers waiting for their flights or waiting in transit, and also can be an entertainment hub for passengers.

3.4 Airport City Concept

Airports were defined by the place where aircrafts operate and passengers and cargo transmit; due to globalization; airport facilities changed to be a vital quality of life, business & culture experience. Airports became one of the most important economic engines for growth & prosperity through what is called "the airport city".

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[1] Richard de Neufville, AmedeoOdoni. Airport systems (Planning, Design and Management). McGraw Hill Companies. 2003

Airport City concept is defined as airport is incorporated a wide variety of non-aeronautical facilities and services. Retail mall concepts have been merged into passenger terminals Airport property beyond the terminal is being developed with hotel and entertainment facilities, conference and exhibition complexes, shopping centers, office buildings, and logistics and free trade zones. Airports also frequently offer complementary sets of facilities for airport.[1]

Airport City started in 1999 in People's Republic of China, due to the importance of airport to attract different investment & activities such as Head Quarters, Distribution, Large International Enterprises, Hotels, Financial Services & Technology institutes as shown in Figure 3-8.
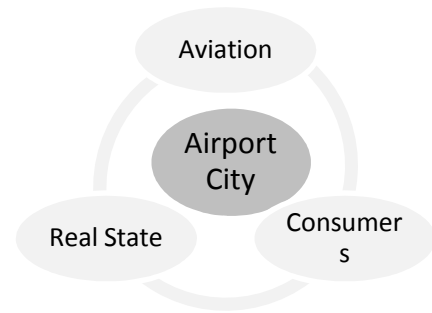
Figure 3-8: Airport City Strategy[2]

Airport facilities & services provided defines the category of airport & its economical impact upon the surrounding area, different types of airport has different networks and economic impact for their region as shown in Figure 3-9.

Characteristics	Airport Typology	Economic Impact
Major network operator Large # ICA Destination (>50) High share Transfer (>30%)	Hub Airports	Connecting Global City Regions Driving national economy
Diverse cameras Medium # ICA Destination (<50) Medium Share Transfer Fair Amount of LCC	O/D Airports	Serving national and Regional O/D market
No Hub Carrier Mainly Point-to-point traffic High Share LCC/ charter	Destination airports	Driving local Economy (tourism)
No Hub carrier Mainly Point-to-Point traffic High Share ICC	Originating Airports	Serving the regional O market
Regional National carrier Mainly Capital Connections No LCC	Public Service Airports	Opening up the region

Figure 3-9: Airport typology & economical impact[3]

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[1] dr. John d. Kasarda, Airport Cities & the Aerotropolis: New planning Models article, Airport innovation, April 2007.
[2] ibid
[3] ibid

With the airport area serving as a region wide multimodal transportation and commercial nexus, strings and clusters of airport-linked shopping centers, business parks, information and communications technology complexes, hotel and entertainment centers, industrial parks, logistics parks, wholesale merchandise marts, and mixed-use developments along airport corridors[1], as shown in Figure 3-10 how aviation-oriented businesses span up to 20 miles (32 km) outward along airport expressway corridors (aero-planes) and airport-linked passenger rail lines (aero-trains).

Airport cities work to improve economics of regional area through being an attraction business center, improve regional access to the world, and improve better living conditions of residences, increase tourism development & employment enrichment.
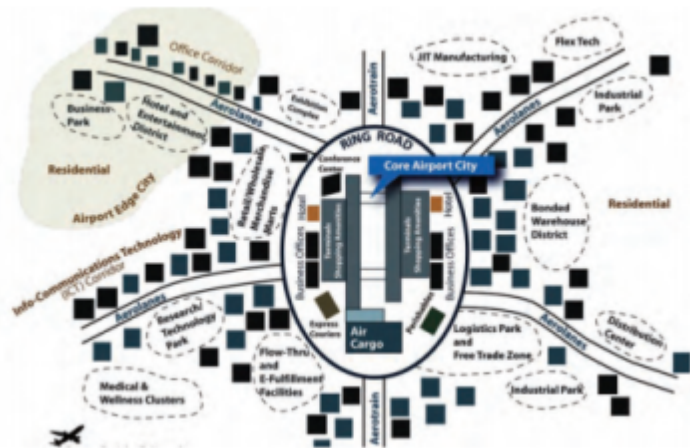
Figure 3-10 A composite schematic of the aerotropolis, an airport -integrated urban economic region[2]

Airports projects along the world witnessed the enrichment of airport city concept, varying from construction of new airport cities & upgrading old airports to accommodate with the concept, such as Hong Kong sky city shown in Figure 3-11.

Figure 3-11: Hong Kong sky city phase 1

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[1] dr. John d. Kasarda, Airport cities,urban land, April 2009
[2] dr. John d. Kasarda, Airport Cities & the Aerotropolis: New planning Models article, Airport innovation, April 2007.

3.5 Characteristics of airport privatization

According to the airport council international (2003), privatization in air transport industry enabled the airport operators to build market power by raising additional capital, improve efficiency, reduce costs, seek new revenue stream, engage in market-oriented investments, become accountable to public and enhance competition among airlines. It witnessed increase of non-aviation commercial activities in airport.[1]

Trend of privatizing airports/airlines had shaped the air transportation industry very effectively; it had changed the air transportation systems in different aspects, it had introduced new concepts in planning, operation and management to accompany the new objectives of the airport owner. These changed can be mentioned as follows:

3.5.1 Ownership & Management of Airport

There are several models of airports ownership and management as shown Figure 3-12 that are currently used around the world and some are working better than others[2]. Most privatization of commercial airports has not involved the actual sale of the airport property.
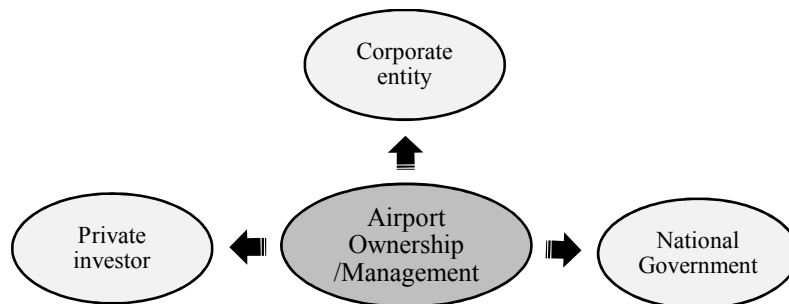
Figure 3-12: Airport Ownership/ Management [3]

The responsibilities for airport planning, management and design should be shared between governmental and private groups; there are four basic possibilities as shown in Table 3-3[1].

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[1] Dorothea Zakrewski, airlines magazine, e-zine edition, issue 34
[2] Doganis, R. European Airports: Privatization Ahead, Deutche Bank, London, UK.
[3] ibid

Table 3-3: Posibilities for allocating control of airport planning, management and design between governmental and pricte setor [2]

Management Control	Rights to residual income or profits	
	Government	Private
Government	Fully government: complete control by civil service and politics	Regulated control: unilateral, Centralized control by government of rates and access
Private	Partnership Control: government sets policy as owner, private parties implement	Full private: Complete control by private interests

Total control of airports by government or private sector appears to be inappropriate model. Airports need to be operated with kind of customer's responsiveness that cannot be provided through governmental organization, it also needs to be supervised by government to prevent airport monopolies.

Regulated approach involves that the government is responsible for operation of airport while the private sector can participate in operation of some activities under regulation of government.

Partnership approach involves government participation which is responsible for setting policies while the private sector is responsible for implementing these policies. It seems to permit effective business operations, encourage local direction and provide balance between public and private interests.[3]

3.5.2 Airport industry evaluation

Airport industry is complicated industry that includes different aspects ranging from construction, operation and financial aspects. It is an industry that had a great influence in the investment market, and characterized by its large capital requirements. Planning for airport industry is very complicated process; it can be easily affected by world major events (e.g. Terrorist event in Septem-

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[1] De Neufille, R. and Barber, J. 'Deregulation induced Volatility of Airport Traffic', Transportation Planning and Technology, pp. 117-128
[2] Richard de Neufville, Amedeo Odoni. Airport systems (Planning, Design and Management). McGraw Hill Companies. 2003
[3] Beatty, S. and lispon, W. 'Preparation is the key', Airport Finance and Development, Spring1999, pp. 24-46

ber 11 2001), but also it is characterized by speed performance recovery process.

There are different factors that affect airport industry evaluation process; there are two main factors that mainly evaluate airports. First, capital structure of airports, it is the financial aspects of airports and capital distribution among participants. Second, operational structure, it is the ability to enhance operating margins by increasing revenues and decreasing of airport expenses.

The other aspects that affect airport industry evaluation include different aspects; first, capital expenditure requirements, the need to spend on construction of new facilities and rehabilitating existing facilities. Second, the regulatory environment, it related to the extent to which the local regulator has the right to control airports charges. Third, current environment of infrastructure projects, the demand of investors to airport projects and level of competition for such assets. Fourth, the shareholders structure, the level of control the operator has in airport operation process.[1]

Rivas V. in his term paper that studied the role of credit rating agencies in large US airport stated that there are significant factors that summarize the criteria of airport's economic prospects as shown in Table 3-4.

Table 3-4: Criteria of airport's economic prospects[2]

Criteria	Description
Market Strength	geographic location; regional economic characteristics, such as demographic, disposable income, etc.
Air traffic Characteristics	air traffic forecast, strength and commitment of these airlines to the airport
Physical Infrastructure	utilization of existing facilities; need for new facilities; control of the gates by airport operator
Management and Operations	utilization of existing facilities; need for new facilities; control of the gates by airport operator
Financing	existing debt burden; share of debt secured by general revenues, airlines, cash reserves
General Context	political climate; environmental concerns and disputes

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[1] Tom Walsh, Global Experience in privatizing airports, Feature Asian airlines and Aerospace, July 2007
[2] Rivas, V. (2001) "Credit Rating Agencies: their role in the Capital Programs of Large US Commercial Airports", term paper, Massachusetts Institute of Technology, Cambridge, MA

3.5.3 Airport privatization life cycle

Figure 3-13shows airport privatization life cycle, which passes through two main phases; start-up phase and growth phase. It also shows the role of Airport Company (consortium) through the airport life cycle till the end of airport project it varies from airport planning and designing passing through operation process till end of concession period. It shows the development of investment phase of privatized airport through different project stages, and it also illustrates the stages of airport financing process in airport privatization life time.

	START- UP PHASE			GROWTH PHASE	
Airport Company Activity (Concessionaire)	Airport concept Air transport market potential analysis	Company formation (SPV) Airport development concept/masterplan Operations concept Route development and airport marketing concept	Start of operation	Traffic growth	Facility and process improvement Exploitation of market potential New route development
PROFIT / LOSS					
Investment Phases	Seed Start-up Capital (for Feasibility Studies, Market Testing, business formation)	Start-up Validation of Concept Market Confirmation	Growth Revenue Generation	Expansion Free Cash-Flow generation Positive Income (fuel growth)	Maturity Full Operations Revenue Growth Capital Sourcing for Expansion
Sources of Financing	Private Funds Angels Micro-financing	Government Suppliers Strategic Partners Early Stage Equity Funds Mezzanine Finance	Customers Trade Lease Mezzanine Finance	Banks / Loans Financial Institutions ABLs	Institutional Investors Public Market Securitization

Figure 3-13: Airport Privatization Life Cycle[1]

3.6 Airport industry in Egypt

This industry is a big moneymaker and an important revenue earner for the country. Passengers using Egyptian airports are commercially considered customers that needed to satisfy them and provide international services in order to encourage them to return back again. Airports should seek to attract tourists through modern, attractive and efficient airport facilities. Other airports features to attract passengers should include entertainment offerings, world-class duty-free shops, clean well-run restaurants and coffee shops to serve passengers when they waiting to depart.

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[1] Dr. Raphael Von Heereman (Lufthansa Executive director), PPP Models to build Airport Infrastructure matching the demand in central Europe, 8th CEI Summit economic forum, Jan 2010.

The first impression for a country received by passenger/tourist is vitally very important, and the first impression is received in the airport. Also the airport is where the passenger/tourist receives his last impression for a country. That's why airport is very important feature of tourism industry; it is a principal corner basic for country economic development and one of main initiator to increase the country development plan.

The Egyptian government represented in the President Mohamed Hosni Mubarak is very keen to develop the aviation in Egypt to reach international standards and to compete in the worldwide aviation market, President Hosni Mubarak issued in 2002 new presidential decrees for developing the organizational structure of ministry of civil aviation. This move is expected to enhance the importance of aviation as one of the principal contributors to the growth of the national economy.

There was a critical need to make changes in the aviation sector in order to contribute toward relieving the state's budgetary burden and to ensure future success in sector management, operations, maintenance and future development. Government is bearing the maintenance cost of thirteen airports that do not generate profit; only six airports currently realize profits. In term of private sector involvement, Egypt prefers commercialization rather than privatization.

3.6.1 Ministry of aviation in Egypt

A presidential decree no. 71/2001 was issued for the reorganization and restructuring of Egyptian Civil Aviation Authority and the Civil Aviation Sector, accordingly the name of the authority was changed to "Egyptian Civil Aviation Monitoring Authority". Another presidential decree no. 72/2001 was issued for the establishment of "Egyptian Civil Aviation Holding Company" (later to be named Egyptian Holding Company for Airports and Air Navigation EH-CAAN) which possesses two subsidiaries: "Egyptian Airports Company, National Air Navigation Services".

On March 11, 2002 the presidential decree no. 56/2002 was issued for the organization of the Ministry of Civil Aviation and the separation of civil aviation authorities from the Ministry of Transportation.[1]

Ministry of aviation has a very large plan to upgrade and improve the civil aviation sector in Egypt and seek to reach the international standards. It is the highest priority to ensure flight safety and security, create and upgrade facilities; and to train and prepare a professional workforce. It also seeks to guarantee increased efficiency and productivity within the sector and carry out in accordance with country's social and economic development plan that is aligned with international standards which ensures safety and security of Egyptian aviation in the service of local and international communities.

3.6.2 Future strategy for aviation Development

Ministry of civil aviation has held a workshop in 2002 represented in the Egyptian Aviation Holding Company (EAHC) with the participation of the privatization coordination and support unit (PCSU/CARANA), in association of United States Agency for International Development (USAID). The workshop was entitled Airport Infrastructure: Public-Private Partnership. The workshop was attended by the senior managers and staff of the EAHC, representatives of other relevant ministries, officials of USAID, Egypt and member of public and private sector organization related to the sector.[2]

The workshop aimed to focus on the importance of aviation sector to the growth of Egypt's economy linking this sector to sustaining the tourism sector. Aviation experts all over the world provided a global perspective to the assembled group and related experiences and lessons learned in various developing countries regarding airport planning, operation and development. It also showed that the government was taking important steps towards development of Egypt's airports which would achieve high international standards over the coming years.

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[1] Egyptian Holding Company for Airports and Air Navigation website,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010)
[2] Privatization coordination support unit, privatization in Egypt, January – March 2002 report.

Massive investment is required for infrastructure projects in order to sustain growth rates, support increasing urbanization and promote higher levels of trade. Much of this investment is directed towards transportation industry, especially aviation industry. The government is unable to meet this demand alone; a significant amount of private sector participation is required to help government to meet its target in provision of more efficient service to customers.

Various methods, such as management contracts, BOT system, and leases have been applied in airports all over the world. Development of airport industry must utilize proven methods that create competitive markets, establish regulatory networks, and provide for transparent contracting of technically qualified firms.

The workshop held in 2002 under the title "Airport Infrastructure: Public-Private Partnership" succeeded to reach a group recommendations for aviation development strategy in the future; it summarized this strategy in three main points as follows:
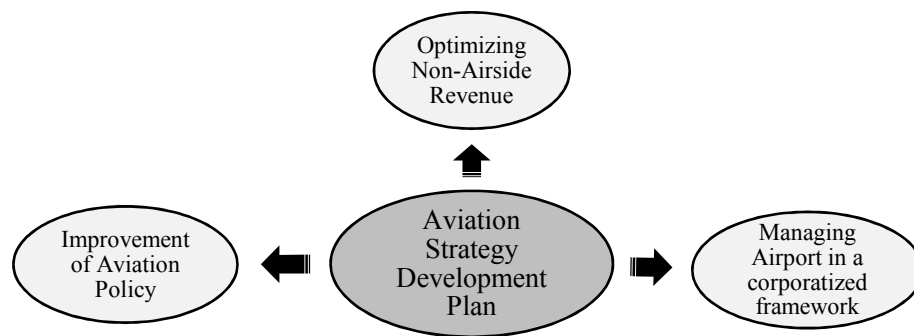
Figure 3-14: Aviation Strategy Development Plan [1]

3.6.2.1 Managing airports in a corporatized framework

The role of government in airports is changing in worldwide basis; the governments need to learn to guide airport industry than to perform this industry by them. Governments are moving from the role of operator to the role of participants in public-private partnership through airport cooperation. This transition involves the creation of airport companies, regulation for airport companies. This results in airports being more efficiently managed, being more customer-

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[1] Privatization coordination support unit, privatization in Egypt, January – March 2002 report.

focused, and mean that airports can gain direct access to financial markets for their expansion and development programs. Airports are more profit-focused and succeed in developing aeronautical and non-aeronautical revenues. New revenues should result from retail sales, advertising, car parks and commercial consultancies. Increased revenues have derived from higher passenger volume, increased non-aeronautical sales and the airport now has access to private financial markets.

3.6.2.2 Optimizing non-airside revenues

Passenger traffic through airport council international (ACI) airports will increase from 3.6 to 4.8 billion by year 2020. From commercial point of view airports represent large customer base. The role of airports is changing. Instead of focusing on passenger flight from airport terminal door to the aircraft door and vice versa, it started to focus on the time spent by transit passenger waiting in the airport.

Airport operators started use this time effectively by providing international high standard services and goods to waiting passengers. It also extended to the surrounding community, members of which become repeat customers by airport shops, outlets, service centers and entertainment facilities. Passenger using Egyptian airports spent on average $4 per visit. At the Middle East airports spending runs $12 and $16 per visit.

The design of new airports or the expansion of existing airports should take advantage of this fact and plan for customer outlets in these areas. Airport retailers should be world class, as travelers having experience with other airports are likely to avoid poor quality provided. in order to offer competitive commercial contracts to attract best retail operators – ones who can maintain high standards of management and customer support; and who offers a wide range of local and international quality products and services.

3.6.2.3 Aviation policy and regulation

There must be well managed aviation policy that include as best as possible all national interests, including those of the tourist industry, airports, and the national airline. Aviation policy must promote open aviation in a manner that makes the greatest contribution to national interest, and to the economy. An open skies policy has served well in many countries to promote increased growth in tourism and can do so here as long as ways are found to resolve the

natural conflicts that would arise in the wake of such competition. The regulations and enforcement measures of any new aviation policy should be clearly and uniformly applied in the aviation sector.

3.6.3 Developments in BOT Projects

Since the beginning of President Hosni Mubarak mandate, policy of Egyptian government has adopted on scientific planning and developing the national economy in an integrated development policy in all fields; agriculture, industrial, urban and service fields.

In 1994, the officials in civil aviation field started to draw attention to subject of airport economics and operation process, the Egyptian airports incurred the budget of government a lot of money every year; investments in Egyptian airports increased year after year in airports' modernization or in services' development or in construction of new airports to serve new communities. It also lacked coverage of operation costs for airports that exceeds the income of these airports.

In 1995 & 1996, the Egyptian Civil Aviation Authority studied – under the fund of The Academy of Scientific Research – economics of six Egyptian airports (Cairo, Hurghada, Luxor, Abo Simbel, Port Said, and Assuit). They depended in their studies on standards of ICAO (International Civil Aviation Organization), it also studied control over revenue and cost of airports, they defined basis of cost and charging. They studied rules and decisions concerning the Egyptian aviation system. This study reached a set of recommendations that can be mentioned as follows:[1]

- Classification of airports in two main groups: commercial airports that should be operated upon economical basis that could be delivered to private sector and airports that serve national security purposes.
- the need to authorize the private sector to construct and operate new commercial airports in new communities in order to achieve integrated development for these communities in different fields; touristic, industrial, commercial, etc…

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[1]Marsa Alam Airport Brochure, EMAK Marsa Alam for Management and operation of airports, October 2005

- Exempting the private sector from paying the government any charges for certain period.
- Providing suitable flexibility to private sector in determining charges that are suitable to achieve acceptable revenue.

The concept of private sector participation in Egyptian airports was initiated in 1998, after law was promulgated in 1997 in the support of it. Strategic investors (BOT operators) are carefully selected and closely monitored. Egypt has offered a strategic plan for construction of 11 new airports and upgrading existing airports under BOT system as shown in Table 3-5.

The main concept of construction of new airports is to achieve integrated development for these new communities, as airports are considered a center of development according to the new concept of airport planning which states that airport is considered a small community of different projects that complete the system of integrated development for site of the airport.

Table 3-5: BOT Airport projects in Egypt – 2002 [1]

Airport Project Name	Concession Period	Invest-ment Cost	Project Stage	Name of contractor
Marsa Alam Airport	40	$ 40m	Inaugurated in 2001	EMAK (Elkharafi group
Hurghada Terminal	5	$ 15m	Completed 1999	JV Artoc Suisse for airport services & investment
Sharm El Sheikh (ext.)	25	$ 170m	Awarded 2001, contract under negotiation	ABB Equity Swiss SESAM
Luxor Airport	25	$ 70m	Under negotiation	JV Aeroport De Parie
Al Alamein	50	LE 200m	Under construction	Inernational Company for airports
Bahareya & Farafra Oasis Airport (2 airports)	50	DM200m	Awarded	ABB-Manhiem Germany
Assuit	Bidding underway			
Ras Sedr	Bid under negotiation and will be re-offered as joint venture			
Borg El Arab	Offers accepted till Mar. 2002			
East Owinat	To be announced			
Sohag	To be announced			

When the ministry of civil aviation was structured in 2002, it postponed the BOT projects of the airports were under study indefinitely. The ministry of aviation has a strategy that airports are profitable projects that the government

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[1] Privatization coordination support unit, privatization in Egypt, January – March 2002 report.

needs to benefit from these projects in order to improve the performance of GNP, and that airports are vital projects that need to be controlled by Ministry of aviation.

Table 3-6 shows BOT projects status in Egypt nowadays; 11 new airports was offered to be constructed in new communities to achieve integrated development for these regions, only airports was implemented according to BOT system and the rest airports were canceled for contractual, security & other issues.

Table 3-6: Airport BOT Projects in Egypt - Update 2009

Airport Project Name	Concession period	Investment cost	Project stage	Name of contractor
Marsa Alam	40	$ 40 m	Inaugurated in 2001	EMAK (EL Kahrafi Group)
Al Alamein	50	LE 600 m	Inaugurated in 2005	International company for airports
Ras Seder	Canceled			
Sohag	Canceled			
Assuit	Canceled			
Dahab	Canceled			
El Farafra	Canceled			
El Baharia	Canceled			
Quesna	Canceled			
KomOsheim	Canceled			
East Owinat	Canceled			

Chapter 4
Case Studied Analysis

4. Chapter 4: Cases studied

4.1 Introduction

In this chapter, the study follows the comparative analytical method for BOT airport projects in Egypt. The comparison is applied between BOT airport and governmental airports, the airports applied for the study are located in the same region in Egypt and characterized by the same surrounding environment. This study clarifies the difference between private and governmental operated airports in Egypt during the operation phase, showing the impact of new trend in airport planning methodology. It also shows the benefits and defects generated for following trend of private sector participation in airports projects in Egypt, maximizing the benefits and minimizing of defects of this system in airport projects. This study aims to evaluate BOT airports projects constructed in Egypt with the respect to governmental airports in order to determine the efficiency of BOT system applied in airport projects.

4.1.1 Airports in Egypt

Egypt has 20 airports distributed all over the Egypt in different regions as shown in Figure 4-1, and they serve almost 17 million passengers in 2006/2007. They are classified into different categories according to the importance of region served by the airports and traffic of passengers for this region. They are classified as shown in Table 4-1into international airports, domestic international airports, domestic airports, air show & training airport and BOT airports

Figure 4-1: Airports in Egypt

Table 4-1: Classification of Egyptian Airports [1]

International Airports	Domestic Airports
Sharm El Sheikh	Port Said
Hurghada	El Tor
Aswan	El Dakhla
Borg El Arab	El Kharga
Alexandria	Domestic-International Airports
Assuit	Areesh
Taba	Shark El Owainat
Marsa Matruh	Saint Catherine
BOT Airport	Abo Simbel
Marsa Alam	Air Show & Training Airport
Al Alamein	6th October

4.1.2 Scope of Studies:

These studies focuses on 5 airports classified into 2 BOT airports (Marsa Alam, Al Alamein) and 3 Governmental operated airports (Hurghada, Borg El Arab, Marsa Matruh). These studies are divided into three different studies as follows

- Comparison between BOT Airports constructed in Egypt. It compares legal and contractual aspects of both airports, it also compares between expectations during feasibility studies and actual performed for different aspects of both airports.

- Comparison between BOT and governmental operated airports through architectural aspects of different airports. It compares between different components of airports.

- Comparison between BOT airports and governmental operated airports during the operation process showing different aspects of success and points of strength in different systems.

The main criteria for choosing airports of the cases studied can be mentioned as follows:

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[1]http://www.eac-airports.com/, Accessing (2/5/2010)

- BOT airports (Marsa Alam Airport and Al Alamein Airport) was chosen for being the only BOT airports implemented in Egypt.

- The governmental airports (Hurghada Airport, Borg El Arab, Marsa Matruh Airport) were chosen under the following criteria:
1. Capacity of governmental operated airport is nearly similar to BOT airport.
2. Located in same governorate of BOT airport.
3. Same surrounding circumstances.
4. Located near BOT airport.
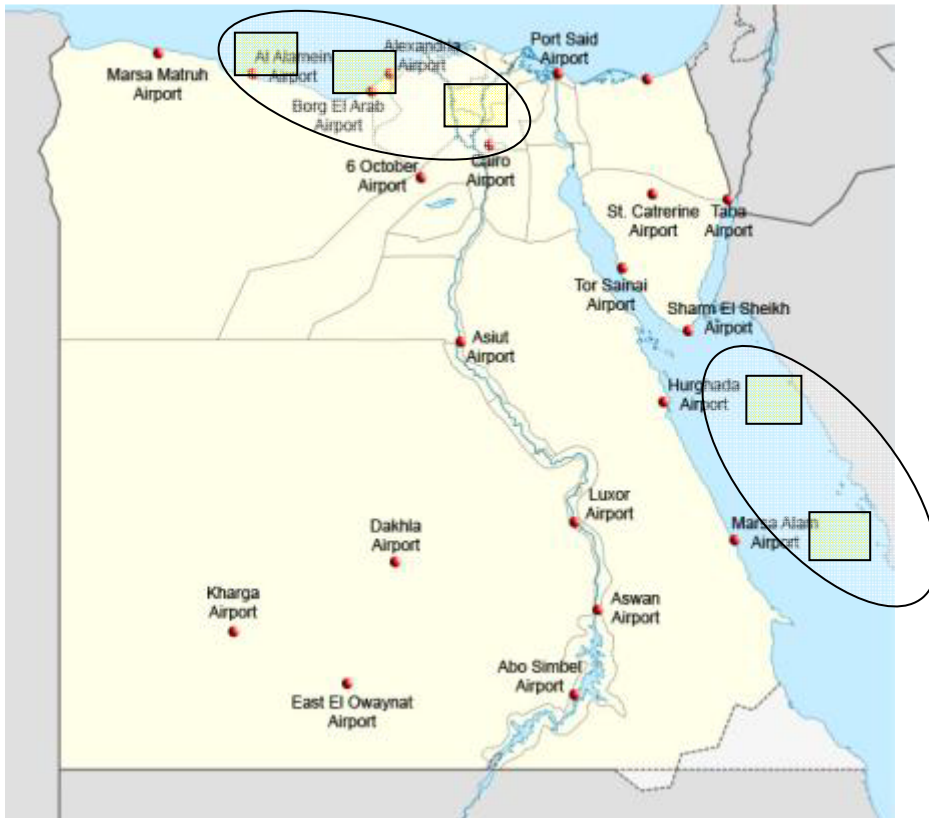
Figure 4-2: Scope Map of Cases studied Airport Location

Two airports are chosen from Red Sea province, one of them is constructed under BOT system which is Marsa Alam Airport, while the other airport is governmental operated airport which is Hurghada Airport.

The other two airports are chosen from Alexandria region, one of them is constructed under BOT system which is Al Alamien airport, while the second airport is governmental operated airport which is Borg El Arab airport and Marsa Matruh Airport.

4.1.3 Structure of Cases Studied

The structure of Case study is classified into three studies as mentioned before illustrated as follows:

4.1.3.1 Comparison study of BOT Airport Evaluation:

This study aims to compare between BOT Airports constructed in Egypt. It compares legal and contractual aspects of both airports, it also compares between expectations during feasibility studies and actual performed for different aspects of both airports.

1. Airport Participants
    a. Investor
    b. Designer
    c. Contractor
2. Airport Contract
    a. BOT Duration
    b. Time Schedule Estimated and Performed
    c. Construction Cost Estimated and Performed
3. Financial Study
    a. Project Finance
    b. Fiscal Revenue
4. Hotel Capacity
    a. Hotel Capacity Estimated and Performed
5. Air traffic
    a. Air traffic Estimated and Performed
    b. Passenger traffic Estimated and Performed

4.1.3.2 Comparison Study of Airport Architectural Evaluation:

This study aims to compare between BOT airports and governmental operated airports through architectural aspects & its impacts upon operation performance showing different aspects of success and points of strength in different systems.

1. General Data
   a. Airport Location
   b. Governorate of City
   c. Main Activity of City
2. Airport General Data
   a. Airport Area
   b. Airport Capacity
   c. Airport Location
   d. Airport Type
   e. Airport History
   f. Airport Mission
3. Airport Design
4. Airport Architectural Data
   a. Airport Layout
   b. Runway
   c. Parallel Taxi
   d. Terminal Building
5. Expansion Development
   a. Expansion Time Schedule (Estimated and Performed)
   b. Airport Expansion Cost
   c. Terminal Building Capacity
6. Hotel Capacity

4.1.3.3 Statistical Comparison of Airport Operational Analysis

This study aims to compare statistically between BOT airports and governmental operated airports during the operation process showing different aspects of statistical indicators that evaluate the performance of different airports.

1. Airport Share Rate
   a. Total Flight share rate
   b. International Flights share rate
   c. Domestic Flights share rate
   d. Total Passengers share rate
   e. International Passengers share rate
   f. Domestic Passengers share rate
2. Airport Share / Floor Area rate
   a. Total Flights per floor area rate
   b. International Flights per floor area rate
   c. Domestic Flights per floor area rate
   d. Total Passengers per floor area rate
   e. International Passengers per floor area rate
   f. Domestic Passengers per floor area rate
3. Cumulative Frequency Distribution
   a. Flights cumulative frequency distribution
   b. Passengers cumulative frequency distribution
4. Frequency Distribution Bar Chart
   a. Hurghada Airport frequency distribution
   b. Borg El Arab Airport frequency distribution
   c. Marsa Matruh Airport frequency distribution
   d. Marsa Alam Airport frequency distribution
   e. Al Alamein airport frequency distribution
5. Mean Passengers per Month & floor area
6. Airport Revenue Analysis

Comparison study of BOT Airport Evaluation

4.2 Comparison study of BOT Airport Evaluation

This study aims to compare between BOT Airports constructed in Egypt. It compares legal and contractual aspects of both airports, it also compares between expectations during feasibility studies and actual performed for different aspects of both airports.

4.2.1 Marsa Alam Airport

4.2.1.1 Marsa Alam Airport Parties

Table 4-2 shows the parties in construction of Marsa Alam Airport project in different construction phases.

Table 4-2: Marsa Alam Airport Project Parties [1]

Project Investor	EMAK Marsa Alam for Management and Operation of Airports
	Subsidiary of El Kharafi Group for development was established to bid for the tender of Marsa Alam international Airport. It got the tender with 40 years BOT concession, it is a part of EMAk Marsa Alam Group which is responsible for development in Marsa Alam in different aspects (Airport Operation, Construction, Tourism and Real Estate Development)
Designer	Netherlands Airports Consultants (NACO)
Main Contractor	Egyptian Consultants Group (ECG)
Roads/ runways	Nile Company for Contracting and Roads
Interior Contractor	Arab Contractors

4.2.1.2 Airport Contract

Table 4-3 shows Marsa Alam Airport Contract duration that was stated in the contract of Marsa Alam Airport, it is classified into three main durations; construction period that states the construction period estimated for construction of the airport; free tax period that states the period allowed for the investor to pay the agreed tax to the government; concession period that states the period

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[1]P.M.P. Services, Marsa Alam Airport Feasibility study, 1996

granted to investor to use the airport facilities before the transfer to the government at the end of the concession period.

Table 4-3: Marsa Alam Airport Contract duration[1]

4 years	Construction Period
11 years	Period after which the project can start to profit and benefit from the Egyptian government revenue
25 years	Concession Period
40 Years	Total BOT Contract

Table 4-4 shows Estimated/Performed time schedule for Marsa Alam Airport, it shows that Marsa Alam airport succeeded to start the operation of the airport in first phase few months earlier than scheduled. It also succeeded to start the second phase 4 years before the time scheduled for this phase.

Table 4-4: Estimated/Performed Phases Time Schedule - Marsa Alam Airport [23]

Time schedule	construction	1st phase	2nd phase	3rd phase
Estimated	1998	2002	2013	2026
performed	1998	2001	2009	NA

Graph 4-1shows a graphical diagram of construction phase update in Marsa Alam airport as estimated and performed.
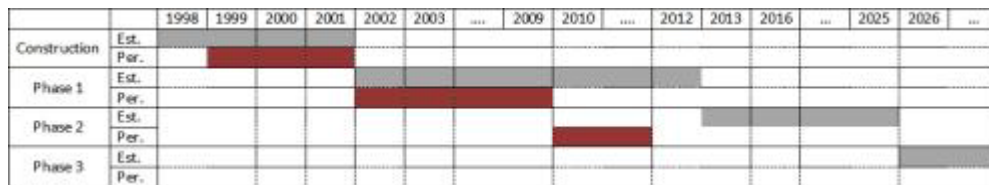
Graph 4-1: Estimated/Performed Phases time schedule – Marsa Alam airport

Graph 4-2 shows the Airport estimated/performed cost in Marsa Alam Airport, it stated that Initial Cost of the airport was significantly small. The estimated cost of project increased due to the additional development projects related to the airport project. Performed cost was increased by 20 million LE and was before schedule by 4 months.

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[1] ، ملحق الوقائع المصرية، عدد 264 لعام 1998 (BOT) عقد منح التزام و إنشاء و تشغيل مطار مرسى علم الدولي بنظام
و عدد 53 لعام 1999.
[2] ibid.
[3]Meeting with Eng. Abd El Aal El Zarie, Deputy Manager of Marsa Alam Airport, April 2010
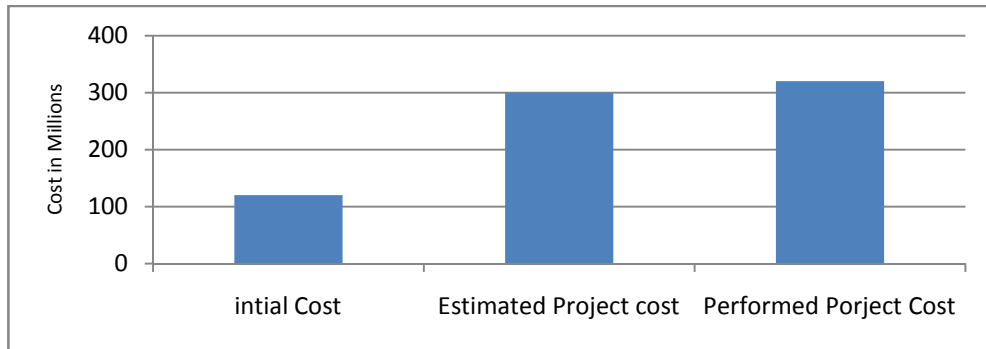
Graph 4-2: Airport Estimated/Performed Cost – Marsa Alam Airport [12]

4.2.1.3 Airport Financial Study

The investor financed the airport through 40% direct finance by investor and parties, in addition to 60% indirect finance through loans from local banks.[3]The feasibility study stated different facial revenues generated by the airport during the operation phase as shown in Table 4-5.

Table 4-5: Facial Revenue for Marsa Alam Airport [4]

Arrival & Departure Halls	Flight Revenues	Parking Projects	Related projects
Advertisements	Airlines Companies	Parking spots	Local Integrated Market
Free Duty Market	Traveling Agencies	Advertisement	Cargo Village
VIP Center	Passengers		Gas Station
Exchange House			Cafeteria

4.2.1.4 Hotel Capacity

Table 4-6 show estimated/performed hotel capacity in Marsa Alam.

Table 4-6: Estimated/Performed Hotel Capacity - Marsa Alam [56]

Year	2005	2010	2015
Hotel capacity (by room) Est.	9363	17428	31041
Hotel capacity (by room) Per.	10156	27946	NA

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[1]P.M.P. Services, Marsa Alam Airport Feasibility study, 1996
[2]Meeting with Eng. Abd El Aal El Zarie, Deputy Manager of Marsa Alam Airport, April 2010
[3]P.M.P. Services, Marsa Alam Airport Feasibility study, 1996
[4]ibid.
[5]Tourism Development Authorities, Ministry of Tourism, Report on Tourism in Red Sea, December 2009
[6]EMAK Marsa Alam Airport Company, International Marsa Alam Airport Brochure, October 2005

Graph 4-2shows the estimated/performed hotel capacity in Marsa Alam. It shows that hotel capacity in Marsa Alam performed is almost doubled as estimated in feasibility study.
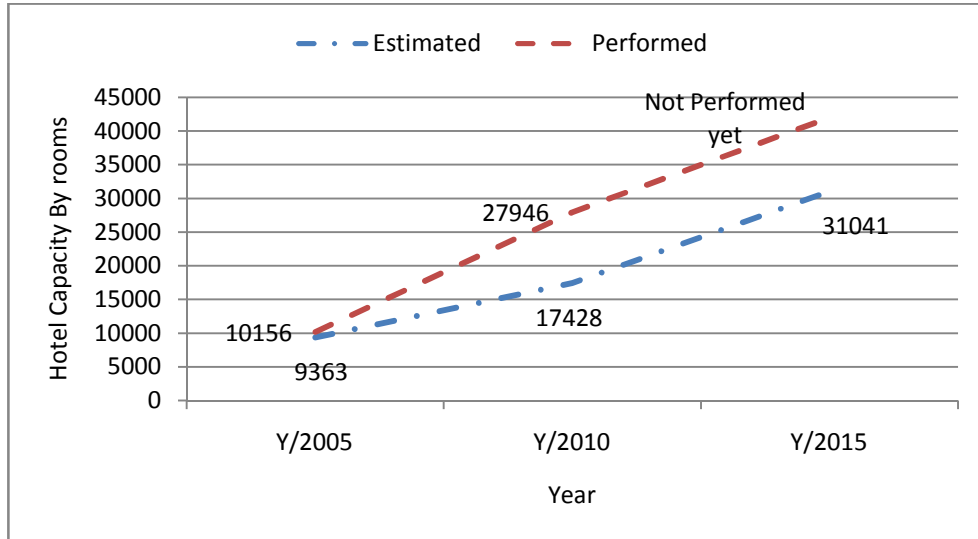
Graph 4-3: Estimated/Performed Hotel Capacity - Marsa Ala Airport

4.2.1.5 Air traffic

Table 4-7 shows the estimated/performed annual flight rate in Marsa Alam Airport, it shows that airport rate in Marsa Alam airport has increased above the estimated rates as illustrated in Graph 4-4.

Table 4-7: Estimated/Performed annual Flight rate- Marsa Alam Airport[12]

Year	Flights Estimated	Flights Performed	Status
2002	840	1235	+ 395
2007	3750	4891	+ 1141
2010	9370	11054	+ 1684

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[1]Meeting with Eng. Abd El Aal El Zarie, Deputy Manager of Marsa Alam Airport, April 2010
[2]EMAK MarsaAlam Airport Company, International Marsa Alam Airport Brochure, October 2005
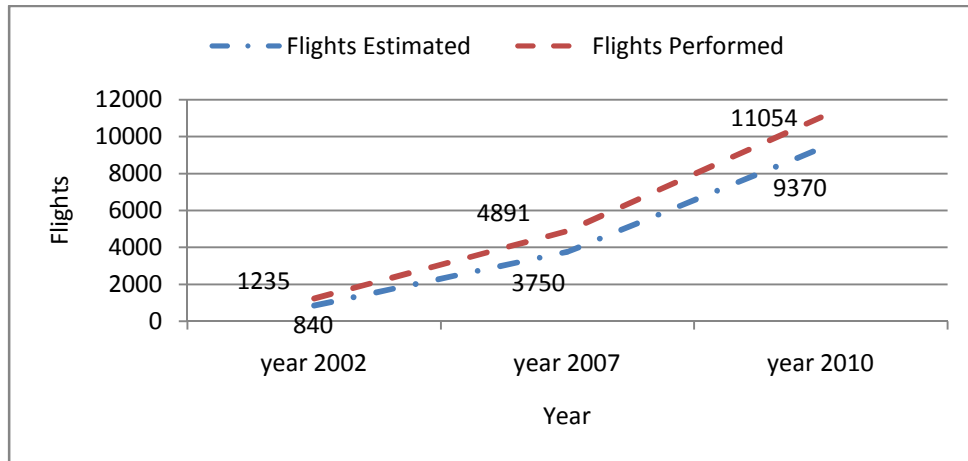
Graph 4-4: Estimated/Performed Flight Rate - Marsa Ala airport

Table 4-8 shows the estimated/performed annual passenger rate in Marsa Alam Airport, it shows that airport rate in Marsa Alam airport has increased above the estimated rates as illustrated in Graph 4-5.

Table 4-8: Estimated/Performed Passenger Rate – Marsa Alam Airport[12]

Year	Pax. Estimated	Pax. Performed	Status
2002	94200	169600	75400
2007	200400	642807	442407
2010	403200	938858	535658

Graph 4-5: Estimated/Performed Passenger Rate - Marsa Alam Airport

4.2.1.6 Related projects to Airport

When the airport was awarded to the investor; additional projects related to airport was granted to the investor in order to increase investment around the airport and encourage airport operation process as shown in Table 4-9, it shows the status of related projects and its description. Marsa Alam related projects achieved significant progress according to estimated time.

Table 4-9: Related Projects to Marsa Alam Airport [12]

Related project	Project Description	Status
Port Ghalib Marina	30,000 sq. m contains 3 hotels with total cost 200 million	2nd Phase Constructed
Diving Training Center	Training diving center equipped with latesttech.	2nd Phase Constructed
Harbor Yacht Club	it accommodate 1000 yachts with different scales	2nd Phase Constructed
International Conference Center	Conference Center opposite to Port Ghalib	under construction
Service Facilities	Water desalination, Sewage treatment plant, central, medical center, stores, sporting club for residents of region	constructed

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[1]EMAK Marsa Alam Airport Company, International Marsa Alam Airport Brochure, October 2005
[2]P.M.P. Services, Marsa Alam Airport Feasibility study, 1996

4.2.2 Al Alamein Airport

4.2.2.1 Al Alamein Airport Parties

Table 4-10 shows the parties in construction of Al Alamein Airport project in different construction phases.

Table 4-10: Al Alamein Airport Project Parties [1]

Project Investor	International Airport Company (IAC)
	Subsidiary of Kato Group was established to bid for the tender of Al Alamein international airport. It got the tender with a 50 year BOT concession
Designer	A.C.C
Main Contractor	Kato Group for Contracting
Roads/ runways	Nile Company for Contracting and Roads

4.2.2.2 Airport Contract

Table 4-11 shows Al Alamein Airport Contract duration that was stated in the contract of Al Alamein Airport, it is classified into three main durations; construction period that states the construction period estimated for construction of the airport; free tax period that states the period allowed for the investor to pay the agreed tax to the government; concession period that states the period granted to investor to use the airport facilities before the transfer to the government at the end of the concession period.

Table 4-11: Al Alamein Airport Contract duration [2]

4 years	Construction Period
15 years	Period after which the project can start to profit and benefit from the Egyptian government revenue
31 years	Concession Period
50 Years	Total BOT Contract

Table 4-12 shows Estimated/Performed time schedule for Al Alamein Airport, it shows that Al Alamein Airport was delayed in start of construction phase due to problems concerning land acquisition with ECAA. It was ended in 2001 and started to construct the airport.

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[1]Dr. Ahmed Abd El-Warith Consultants, Al Alamein airport feasibility study, 1998
[2] ibid.

Table 4-12: Estimated/Performed Phases Time Schedule - Al Alamein Airport[12]

Time schedule	construction	1st phase	2nd phase	3rd phase
Estimated	1998	2002	2015	2028
performed	2001	2005	NA	NA

Graph 4-6 shows a graphical diagram of construction phase update in Al Alamein airport as estimated and performed.
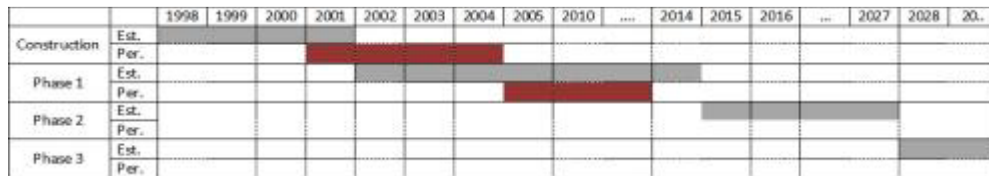
Graph 4-6: Estimated/Performed Phases time schedule – Al Alamein airport

Graph 4-7 shows the Airport estimated/performed cost in Al Alamein Airport, it stated that Al Alamein Airport was delayed in start of construction phase due to problems concerning land acquisition with ECAA. It was ended in 2001 and started to construct the airport
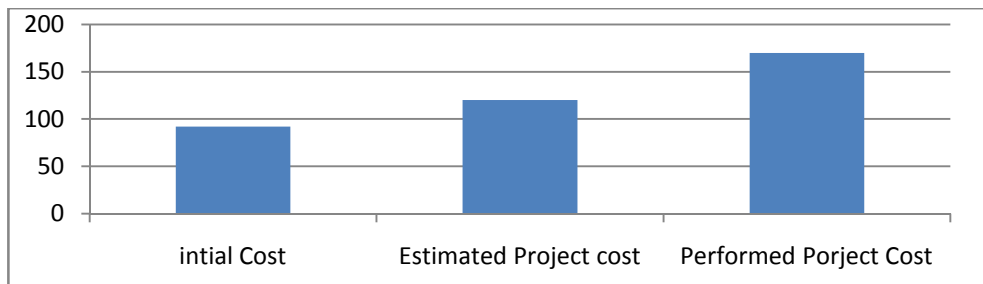
Graph 4-7: Airport Estimated/Performed Cost – Al Alamein Airport [3] [4]

4.2.2.3 Airport Financial Study

The investor financed the airport through 40% direct finance by investor and parties, in addition to 60% indirect finance through loans from local banks. The feasibility study stated different facial revenues generated by the airport during the operation phase as shown in Table 4-13.

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[1]Meeting with Eng. HamdiAbd El Azim, General Manager of Al Alamein Airport, April 2010
[2] Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998
[3]Meeting with Eng. HamdiAbd El Azim, General Manager of Al Alamein Airport, April 2010
[4]Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998

Table 4-13: Facial Revenue for Al Alamein Airport [1]

Arrival & Departure Halls	Flight Revenues	Parking Projects	Related projects
Advertisements	Airlines Companies	Parking spots	Cargo Village
Free Duty Market	Traveling Agencies	Advertisement	Cafeteria
VIP Center	Passengers		Agriculture land
Exchange House			industrial & commercial park

4.2.2.4 Hotel Capacity

Table 4-14 show estimated/performed hotel capacity in Al Alamein.

Table 4-14: Estimated/Performed Hotel Capacity – Al Alamein [23]

Year	2005	2010	2015
Hotel capacity (by room) Est.	2500	25000	50000
Hotel capacity (by room) Per.	250	2000	NA

Graph 4-8 shows the estimated/performed hotel capacity in Al Alamein. It shows that hotels and resorts in Al Alamein are extremely under estimated hotel capacity. Hotel capacity in Al Alamein depends on local tourism spread along the north coast; it neglected large tourism potentials due to World War II.[4]
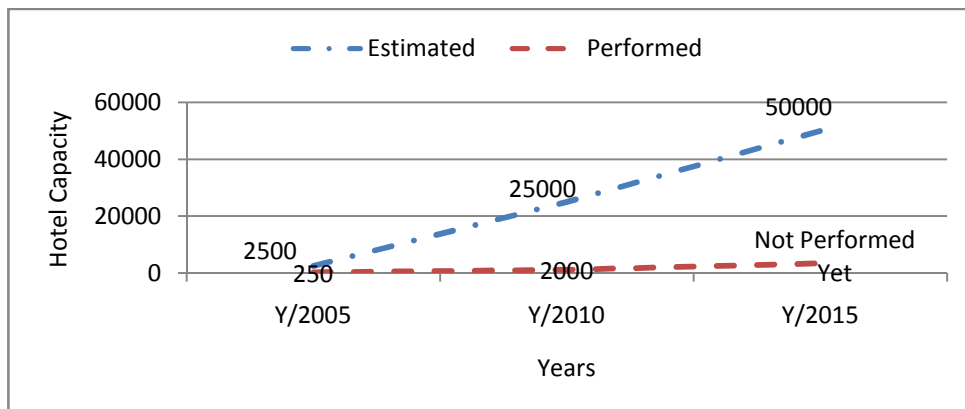
Graph 4-8: Estimated/Performed Hotel Capacity - Al Alamein

[1]Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998
[2]Meeting with Eng. HamdiAbd El Azim, General Manager of Al Alamein Airport, April 2010
[3]Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998
[4]Al Alamein City Official website, http://www.el-alamein.world-guides.com/el_alamein_landmarks.htm. accessing 5-5-2010

4.2.2.5 Air traffic

Table 4-15shows the estimated/performed annual flight rate in Al Alamein Airport, it shows that Al Alamein Airport could not afford Estimated Flights due to the delay in construction project and Lack of hotels around the airport as illustrated in Graph 4-9.

Table 4-15: Estimated/Performed annual Flight rate- Al Alamein Airport [12]

Year	Flights Estimated	Flights Performed	Status
2002	195	0	-195
2007	474	277	-197
2010	975	NA	NA
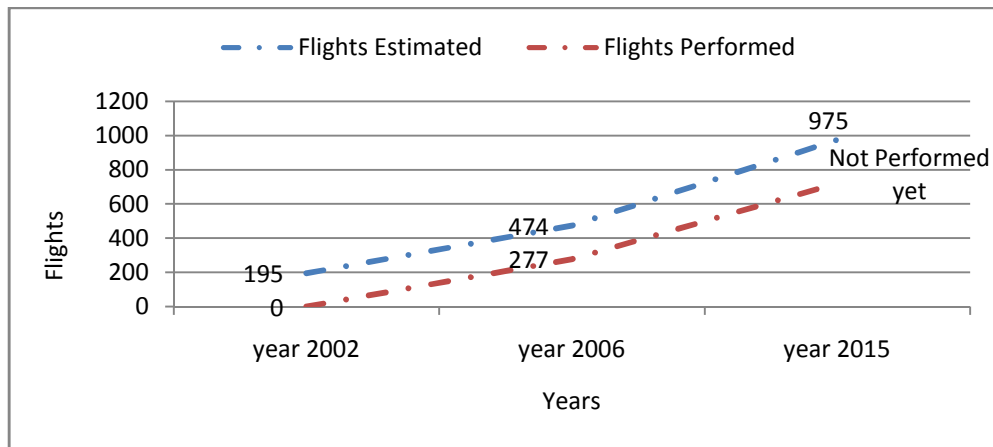
Graph 4-9: Estimated/Performed annual Flight rate- Al Alamein Airport

Table 4-16 shows the estimated/performed annual passenger rate in Al Alamein Airport, it shows that Al Alamein airport Passenger Performed witnessed remarkable retard behind estimated Passenger due to Late in implementation of airport and lack of tourism attraction potentials around airport as illustrated in Graph 4-10.

Table 4-16: Estimated/Performed Passenger Rate – Al Alamein Airport [1 2]

Year	Pax. Estimated	Pax. Performed	Status
2002	62,400	0	-62400
2007	151,704	17723	-133981
2010	312,226	NA	NA
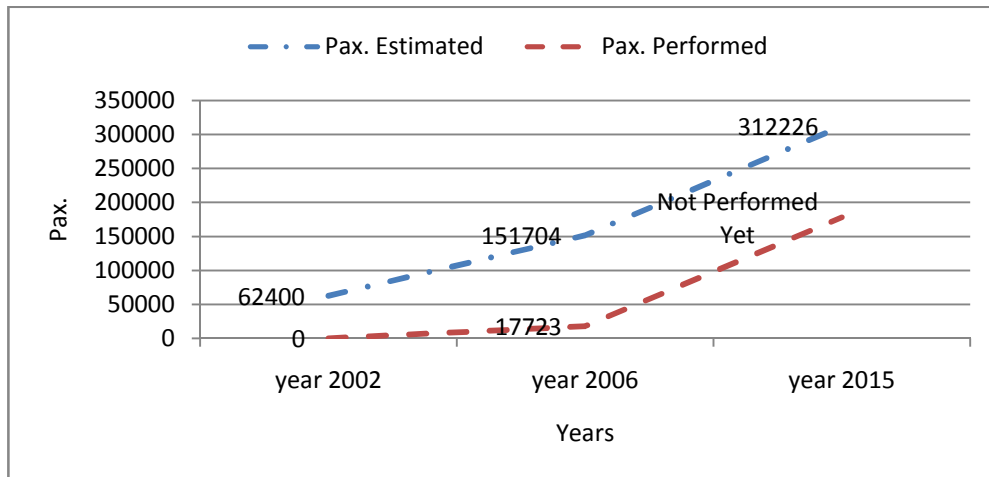
Graph 4-10: Estimated/Performed annual Passenger rate- Al Alamein Airport

4.2.2.6 Related projects to Airport

When the airport was awarded to the investor; additional projects related to airport was granted to the investor in order to increase investment around the airport and encourage airport operation process as shown in Table 4-9, it shows the status of related projects and its description. Al Alamein related projects achieved significant progress according to estimated time.

Table 4-17: Related Projects to Al Alamein Airport [12]

Related project	Project Description	Status
Ghazala Bay Resort	1st Move pick on North Coast, 19 km from airport with 2500 room	1st Phase Constructed
Cargo Village	include storage, refrigeration, warehousing center	Postponed
Industrial & Commercial park	total area 25km2 geared towards export to western markets	Postponed
Organic agriculture land area	16 km2, perform additional export to European markets	Postponed
Hotels And resort	4 hotels and resort located near the airport	Canceled due to location in range of Dabaa Plant

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[1] Meeting with Eng. Hamdi Abd El Azim, General Manager of Al Alamein Airport, April 2010
[2] Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998

Comparison Study of Architectural Airport Evaluation

4.3 Comparison of Architectural Airport Evaluation

This study aims to compare between BOT airports and governmental operated airports during the operation process showing different aspects of success and points of strength in different systems.

4.3.1 Borg El Arab Airport

4.3.1.1 Borg El Arab City[12]

Borg EL Arab city is located 60 kilometers to the south west of Alexandria, 7 kilometers from the shore of Mediterranean sea as shown in Figure 4-3. Borg El Arab city is located in Alexandria Governorate; it is considered one of the new communities the government began to build during the last decade. The main Activities of Borg El Arab city inhabitants are touristic, industrial and residential investments.

Figure 4-3: Borg El Arab City Location

4.3.1.2 Airport General Data [3]

The airport is located 43 Km south west of Alexandria, East of New Borg El Arab City as shown Figure 4-4. The area of Borg El Arab Airport is 43.69 Kilometers square. Borg El Arab is considered one of the international airports in Egypt with 600 Pax. /Hour capacity. The Egyptian civil authority started in 1998 to study the possibility of establishing another international airport at Borg

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[1]Ministry of Trade & Industry, Alexandria international trade point website, Overview, http://www.alextp.gov.eg/borgloc.html, Accessing (28-04-2010)
[2]Ministry of Trade & Industry, Alexandria international trade point website, City Plane, http://www.alextp.gov.eg/borgplane.html, Accessing (28-04-2010
[3] Egyptian Holding Company For Airports And Air Navigation (Ehcaan) Official Site, Http://Www.Ehcaan.Com/About_Comp.Aspx 12/4/2010

El Arab city on part of Borg El Arab Military air base land. It is established in order to ease the traffic congestion at Alexandria Airport as it will be the replacement of El Nozha international Airport in Alexandria.

Figure 4-4: Borg El Arab Airport Location

4.3.1.3 Airport Design

Figure 4-5: Borg El Arab Airport Perspective

4.3.1.4 Airport Architectural Data

Table 4-18: Borg El Arab Airport Architectural Data [1]

Runway	Runway Width	Runway Length
	45 meters	3400 meters
Parallel Taxi	Width	Length
	30 meters	3000 meters
Terminal Building	TB Facilities	TB Area
	Arrival Hall	1376.25 meters square
	Departure Hall	TB Capacity
	Free Duty zone	600 Pax. / Hour
	Cargo Export	Service Provided
		Electronic Check-In Counters
		Visa Counters
		computerized counters

4.3.1.5 Airport Expansion Development

Expansion Time schedule

Table 4-19: Planned/Performed Expansion plan – Borg El Arab Airport[2]

No. of Phase	Planned Delivery of Phase	Performed Delivery of Phase	Status
1st Phase (Current)	2009	current	Behind 1 years
2nd Phase	2014	NA	NA
3rd Phase	2024	NA	NA
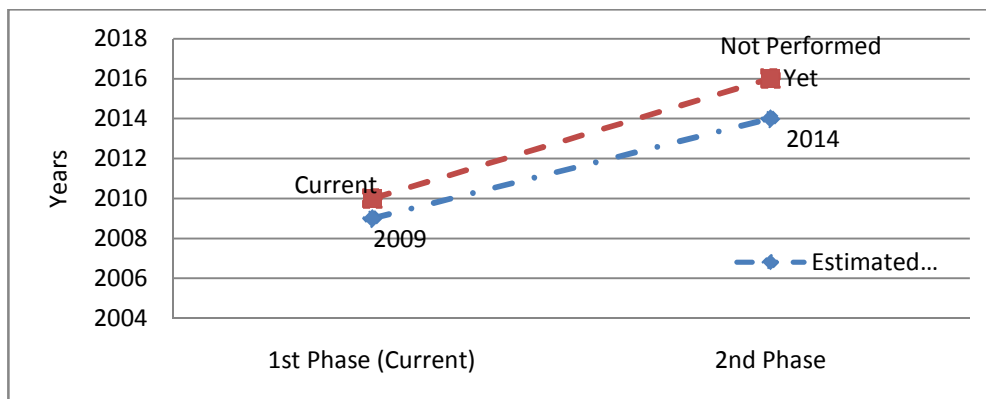
Graph 4-11: Planned/Performed Expansion plan – Borg El Arab Airport

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[1] Egyptian Holding Company For Airports And Air Navigation (Ehcaan) Official Site, Http://Www.Ehcaan.Com/Main_Airports.Aspx, Accessing 12/4/2010
[2] ibid

Expansion Cost

Table 4-20: Planned/Performed Expansion Cost - Borg El Arab Airport [1]

No. of Phase	Planned Cost of Phase	Performed Cost of Phase	Status
1st Phase	52 Million USD	NA	NA

Hotel Capacity

Hotel capacity in Borg El Arab city was increased by 60 % during the period from year 2007 till nowadays. Borg el Arab city has a remarkable tourism development rate during last few years.

Table 4-21: Hotel Capacity - Borg El Arab city [2]

	2007	2010	2015
Hotel Capacity (by rooms)	4127	6804	NA
Investment	NA	NA	NA
No. of projects	72 project	80 project	NA

4.3.2 Marsa Matruh Airport

4.3.2.1 Marsa Matruh City

Marsa Matruh is located 240 kilometers west of Alexandria, 22 kilometers from Sallum as shown in   Figure 4-7. Marsa Matruh city is capital of Matruh governorate. The main Activities of Marsa Matruh city inhabitants are touristic investment through diving, wind surfing sports and beach resorts. [3]

Figure 4-7: Marsa Alam City Location

4.3.2.2 Marsa Matruh Airport General Data

The airport is located 1.1 sea miles to the south west of the city as shown in Figure 4-8. The area of Mars Matruh Airport is 15.54 Kilometers square.

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[1]Egyptian Airport Company Official Website, http://www.eac-airports.com/OurAirports_BorgElarab.aspx, Accessing 12/5/2010

[2]Ministry of Tourism, Report on Tourism in Egypt, 2007

[3] Official site for Marsa Matruh Governorate, http://www.matrouh.gov.eg/matrouhsite/egypt.htm/, Accessing 29-5-2010

Marsa Matruh is considered one of Local airport which opened international flights in 2006 with 300 Pax. /Hour capacity. It is considered one of the airports that were delivered to the tian civil company from the English army in 1945.[1]

Figure 4-8: Marsa Matruh Airport Location

4.3.2.3 Airport perspective

Figure 4-9: Marsa Matruh Airport Perspective [2]

4.3.2.4 Airport Architectural Data

Table 4-22 : Marsa Matruh Architectural data [3]

Runway	Runway Width	Runway Length
	45 meters	3000 meters
Parallel Taxi	Width	Length
	45 meters	3000 meters
Terminal Building	TB Facilities	TB Area
	Arrival Hall	1570 meters square
	Departure Hall	TB Capacity
	Free Duty zone	300 Pax. / Hour
	VIP Hall	Service Provided
		Electronic Check-In Counters

4.3.2.5 Hotel capacity

Marsa Matruh has large potentials in tourism, it witnessed remarkable rise in hotel capacity. It was increased by 300 % through last three years.

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[1]Egyptian Holding Company For Airports And Air Navigation (Ehcaan) Official Site, Http://Www.Ehcaan.Com/About_Comp.Aspx 12/4/2010
[2] ibid
[3] ibid

Table 4-23: Hotel Capacity - Marsa Matruh City[1]

	2007	2010	2015
Hotel Capacity (by rooms)	4881	14811	NA
Investment	NA	NA	NA
No. of projects	47 project	83 project	NA

4.3.3 Hurghada Airport

4.3.3.1 Hurghada City

Hurghada city is located 600 kilometers from Cairo, 82 kilometers along the Red Sea shore[2] as shown in Figure 4-10. Hurghada city is considered the capital of Red Sea Governorate. The main Activities of Hurghada city are touristic investments, it is considered a worldwide aquatic sport center along the Red Sea.[3]

Figure 4-10: Hurghada city Location

4.3.3.2 Hurghada Airport General Data

The airport is located 5 km to the south west of Hurghada Downtown as shown in Figure 4-11. The area of Hurghada Airport is 40.3 km^2. Hurghada is considered one of international airport with 2500 Pax. /Hour capacity. In May 1966, Egypt located 102 thousand LE to prepare Hurghada Airport to receive jet aircrafts carrying tourists arriving directly from Europe. [4]

Figure 4-11: Hurghada Airport Location

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[1] Ministry of Tourism, Report on Tourism in Egypt, 2007

[2] Official Site for Hurghada City, Site, http://www.hurghada-tourism.com/index-ar.php?menu=1, Accessing 29-5-2010.

[3] Official Site for Hurghada City, Touristic Features, http://www.hurghada.com/index.aspx, Accessing 8/5/2010

[4] Egyptian Holding Company For Airports And Air Navigation (Ehcaan) Official Site, Http://Www.Ehcaan.Com/About_Comp.Aspx 12/4/2010

4.3.3.3 Airport Design

Figure 4-12: Hurghada Airport Perspective [1]

4.3.3.4 Hurghada Airport Architectural Data

Table 4-24: Hurghada Airport Architectural Data [2]

Runway	Runway Width	Runway Length
	45 meters	4000 meters
Parallel Taxi	Width	Length
	45 meters	4000 meters
Terminal Building	TB Facilities	TB Area
	Arrival and Departure Halls	15534 meters square
	Free Duty zone	TB Capacity
	Public Lounge	2500 Pax. / Hour
	Airlines Facilities	Service Provided
	Departure Lounge	Electronic Check-In Counters
		Visa Counters

[1] Egyptian Holding Company For Airports And Air Navigation (Ehcaan) Official Site, Http://Www.Ehcaan.Com/About_Comp.Aspx 12/4/2010
[2] ibid

4.3.3.5 Airport Expansion Development

Expansion Time schedule

Table 4-25: Planned/Performed Expansion plan – Borg El Arab Airport [1]

No. of Phase	Planned Delivery of Phase	Performed Delivery of Phase	Status
1st Phase	2005	2007	Behind 2 years
2nd Phase (Current)	2015	NA	NA
3rd Phase	NA	NA	NA
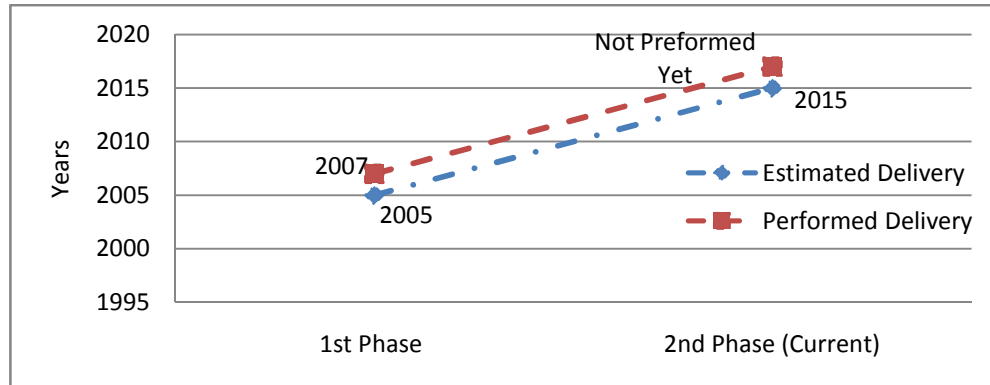
Graph 4-12: Planned/Performed Expansion Plan – Hurghada Airport [2]

The expansion phase of airport was two years behind the schedule estimated for this expansion development.

Expansion Cost

The expansion cost of phase was almost double the estimated cost for such development.

Table 4-26:Planned/Performed Expansion Cost - Borg El Arab Airport [3]

No. of Phase	Planned Cost of Phase	Performed Cost of Phase	Status
1st Phase	60 Million USD	115 Million USD	Almost Doubled

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[1] Egyptian Holding Company For Airports And Air Navigation (Ehcaan) Official Site, Http://Www.Ehcaan.Com/Main_Airports.Aspx, Accessing 12/4/2010
[2] ibid
[3] Egyptian Airport Company Official Website, http://www.eac-airports.com/OurAirports_BorgElarab.aspx, Accessing 12/5/2010

4.3.3.6 Hotel Capacity

Hurghada witnessed remarkable development in tourism movement that exceeded expectations for this area.

Table 4-27: Hotel Capacity - Hurghada city [1]

	2007	2010	2015
Hotel Capacity (by rooms)	35027	28935	51185
Investment	NA	5663 million LE	8360 million LE
No. of projects	NA	86 Project	149 project

4.3.4 Al Alamein Airport

4.3.4.1 Al Alamein City

Al Alamein city is located 106 kilometers west of Alexandria, 240 Kilometers North West of Cairo[2] as shown in Figure 4-13. Al Alamein city is one a part of Matruh Governorate; it is considered one of the most famous Historical cities in Egypt. That witnessed a famous battle during World War II[3]. The main Activities of Al Alamein city is touristic and Historical investments.

Figure 4-13: Al Alamein city Location

4.3.4.2 Al Alamein Airport General Data

The airport is located near the coastal road and the road connecting Cairo / Alexandria desert road as shown in Figure 4-14. The area of Al Alamein Airport is 64 kilometers square. Al Alamein airport is considered one of international-Cargo airport with 600 Pax. /Hour capacity[4]. International Airport Company

[1]Tourism Development Authorities, Ministry of Tourism, Report on Tourism in Red Sea, December 2009
[2] Official Site for El Alamein City, Maps, http://www.el-alamein.world-guides.com/el_alamein_maps.html, 5/5/2010
[3] Official Site for El Alamein City, Historical Visits, http://www.el-alamein.world-guides.com/el_alamein_landmarks.html, Accessing (5/5/2010)
[4]Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998

won the tender to construct Al Alamein airport in 1998 under BOT system with the supervision of ECAA. It witnessed difficulties in land acquisition; it was inaugurated in 2005 - 4 years behind the schedule. Al Alamein Airport was established in order to serve the Western shores of Mediterranean Sea for Egypt. It is considered the west gate for Egypt.[1]

Figure 4-14: Al Alamein Airport Location

4.3.4.3 Al Alamein airport Perspective

Figure 4-15: Al Alamein Airport Perspective [2]
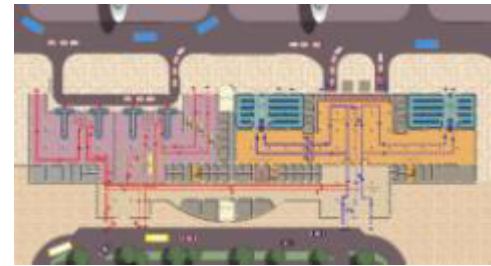
Figure 4-16 Al Alamein Airport Plan [1]

4.3.4.4 Al Alamein Architectural data

Table 4-28: Al Alamein Architectural Data [1]

Runway	Runway Width	Runway Length
	45 meters	3500 meters
Parallel Taxi	Width	Length
	30 meters	3500 meters
Terminal Building	Service Provided	TB Area
	Electronic Check-In Counters	13019 meters square
		TB Capacity
	Visa Counters	600 Pax. / Hour

[1]Kato Group Official Website, http://www.katoinvestment.com/divisions/Logistics.htm, Accesing 2/5/2010
[2]Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998

TB Facilities	
Arrival Halls	Departure halls
cargo facilities	VIP Facilities
Free Duty zone	First Aid Center
Public Lounge	Tour Agents
Airlines Facilities	Banking
Departure Lounge	inspection points
Food and Beverage	gov. facilities
information center	

4.3.4.5 Airport Expansion Development

Expansion Time schedule

Table 4-29: Planned/Performed Expansion plan – Al Alamein Airport [12]

No. of Phase	Planned Delivery of Phase	Performed Delivery of Phase	Status
1st Phase	2002	2005	Behind 4 years
2nd Phase	2015	NA	NA
3rd Phase	2028	NA	NA

Al Alamein Airport construction was delayed 4 years behind the scheduled plan, due to the land acquisition problem that faced the investor of the airport.
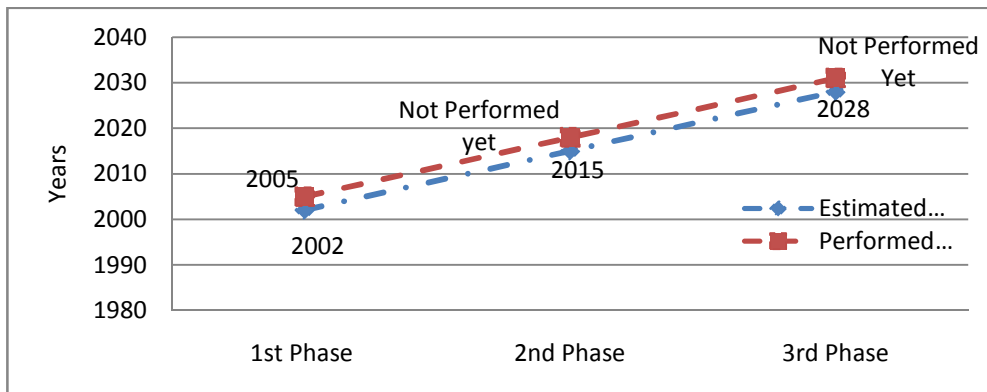
Graph 4-13: Planned/Performed Expansion Plan - Al Alamein Airport

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[1]Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998
[2]Meeting with Eng. HamdiAbd El Azim, General Manager of Al Alamein Airport, April 2010

Expansion Cost

The airport construction cost was increased by 42 % than estimated cost for the project.

Table 4-30: Planned/Performed Expansion Cost - Al Alamein Airport [12]

No. of Phase	Planned Cost of Phase	Performed Cost of Phase	Status
1st Phase	120 Million LE	170 million LE	Increased by 42 %

4.3.4.6 Hotel Capacity

4 projects were postponed due to the location of these hotels is near El Dabaa necular plant in Egypt, this led to delay of these projects that affected tourism in Al Alamein. Tourism in North Coast depends on local tourism in resorts and hotels that are focused in summer.

Table 4-31: Hotel Capacity - Al Alamein city [3]

	2007	2010	2015
Hotel Capacity (by rooms)	206	206	2500
Investment	NA	NA	NA
No. of projects	1 project	1 project	NA

4.3.5 Marsa Alam Airport

4.3.5.1 Marsa Alam City

Marsa Alam city is located 280 South of Hurghada City, 65 kilometers along Red Sea Shore as shown in Figure 4-17. Marsa Alam city is one a part of Red Sea Governorate; it is considered one of the most famous touristic cities in Egypt along Red Sea.[4]

Figure 4-17: Marsa Alam City Location

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[1]Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998
[2]Meeting with Eng. HamdiAbd El Azim, General Manager of Al Alamein Airport, April 2010
[3] ibid
[4]Marsa Alam Official site, www.marsaalam.co.uk/, Accessing (10/5/2010)

4.3.5.2 Marsa Alam Airport General Data

The airport is located 60 Km North of Marsa Alam city as shown in Figure 4-18. The area of Marsa Alam Airport is 21 km square. Marsa Alam airport is considered one of al airport with 600 Pax. /Hour capacity[1].EMAk Marsa Alam got the tender in 1998 to construct international airport in Marsa Alam under BOT system with the supervision of ECAA. It was first inaugurated in 2001 for international aviation. Marsa Alam Airport was established in order to serve touristic flow directly from Europe to Red Sea Touristic sites.[2]

Figure 4-18: Marsa Alam Airport Location

4.3.5.3 Airport Perspective

Figure 4-19: Marsa Alam Airport Perspective [3]

Figure 4-20: Marsa Alam Airport Plan [4]

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[1] ملحق الوقائع المصرية، عدد 264 لعام 1998 (BOT) عقد منح الالتزام و إنشاء و تشغيل مطار مرسى علم الدولي بنظام
و عدد 53 لعام 1999.
[2] EMAK Marsa Alam Airport Company, International Marsa Alam Airport Brochure, October 2005
[3] ibid
[4] EMAK Marsa Alam, ECAA – Marsa Alam Airport Presentation, 2001

4.3.5.4 Marsa Alam Airport Architectural Data

Table 4-32: Marsa Alam Airport Architectural data [1]

Runway	Runway Width	Runway Length
	45 meters	3000 meters
Parallel Taxi	Width	Length
	30 meters	3000 meters
Terminal Building	Service Provided	TB Area
	Electronic Check-In Counters	2500 meters square
		TB Capacity
	Visa Counters	600 Pax. / Hour
	TB Facilities	
	Arrival and Departure Halls	VIP Facilities
	Free Duty zone	First Aid Center
	Public Lounge	Tour Agents
	Airlines Facilities	Banking
	Departure Lounge	inspection points
	Food and Beverage	gov. facilities
	information center	

4.3.5.5 Airport Expansion Development

Expansion Time schedule

Table 4-33: Planned/Performed Expansion Plan - Mars Alam airprot [2,3]

No. of Phase	Planned Delivery of Phase	Performed Delivery of Phase	Status
1st Phase	2002	2001	Advanced 4 Months
2nd Phase	2013	2009	Advanced 4 Years
3rd Phase	2026	NA	NA

Marsa Alam airport succeeded to construct the airport 1 year before scheduled plan. It also succeeded to start the 2nd phase 4 years before schedule.

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[1]P.M.P. Services, Marsa Alam Airport Feasibility study, 1996
[2]P.M.P. Services, MarsaAlam Airport Feasibility study, 1996
[3]Meeting with Eng. Abd El Aal El Zarie, Debuty Manager of MarsaAlam Airport, April 2010
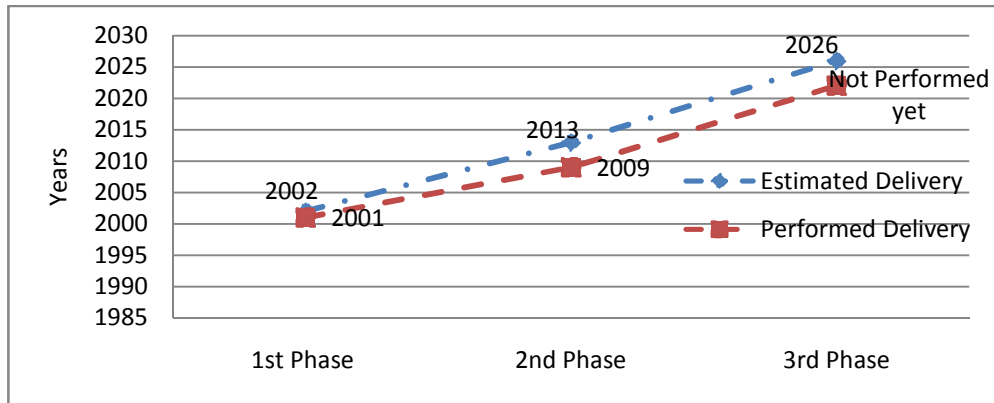
Expansion Cost

Marsa Alam Airport cost was increased by 6.6 % with respect to estimated cost in the airport in the feasibility study.

Table 4-34: Planned/Performed Expansion Cost – Marsa Alam Airport

No. of Phase	Planned Cost of Phase	Performed Cost of Phase	Status
1st Phase	300 Million LE	320 Million LE	Increase by 6.6 %

4.3.5.6 Hotel Capacity

Marsa Alam witnessed remarkable development in tourism movement that exceeded expectations for this area. Marsa Alam Airport and Tourism Development in Marsa Alam has large mutual influence on each other that enriched both

Table 4-35: Hotel capacity - Marsa Alam City [1]

	2007	2010	2015
Hotel Capacity (by rooms)	4746	5337	36528
Investment	840 million LE	2319 million LE	NA
No. of projects	NA	56 Project	123 project

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[1]Tourism Development Authorities, Ministry of Tourism, Report on Tourism in Red Sea, December 2009

Statistical Comparison of Airport operation study

4.4 Statistical Comparison of Airport Operational Study:

This study aims to compare statistically between BOT airports and governmental operated airports during the operation process showing different aspects of statistical indicators that evaluates the performance of different airports.[1]

Statistical analysis of airport operational performance of different airports in this thesis follows frequency statistical analysis as defined 'it is the study that deals with repentance of certain items'. The frequency study is evaluated with respect to 100% or 1; where the scoring system depends on the normalization performance of the frequency of studies. Normalization of performance results a single line; airport evaluation depends on evaluation of linear equation for normalization line with respect to single line slope & constant as follows:

Linear equation: $y = ax + b$

Where 'a' is the slope or gradient of single line
'b' is the equation constant term

Table 4-36: Evaluation of single line equation

Lines	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Line 1	$y = ax + b$	a	a'	b	b'	(a' + b')/2
Line 2	$y = cx + d$	c	c'	d	d'	(c' + d')/2
Line 3	$y = ex + f$	e	e'	f	f'	(f' + d')/2
Line 4	$y = gx + h$	g	g'	h	h'	(g' + h')/2
Line 5	$y = ix + j$	j	i'	i	j'	(i' + j')/2

Where (a', c', e', g' & i') coefficient of linear slope with respect to 1
(b', d', f', h' & j') coefficient of linear constant with respect to 1

Evaluation points is average sum of slope coefficient & constant coefficient

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[1] Lind, Douglas. A; Marchel, William A. Wathen, Samuel A., Statistical Techniques in business and economics with global data sets. McGraw Hill

4.4.1 Airport share rate:

This study shows the rate of annual share of each airport with the respect to the total annual rates in Egypt along the study duration (from 2005 to 2009). It is calculated as ratio between airport flights / passengers share rate in Egyptian aviation industry to maximum share flights / passenger's rate along the study duration period (2005-2009). This graph implies rate of development of airport share along the study duration period as a part of Egyptian aviation industry.

Equation 4-1: airport share rate equation

$$airport\ share\ rate = \frac{annual\ airport\ share\ rate\ in\ egyptian\ aviation\ industry}{maximum\ airport\ share\ rate\ in\ egyptian\ aviatin\ industry}$$

4.4.1.1 Total flights Share rate

This study shows rate of annual flight share rate of each airport with respect to total annual airport flights of the Egyptian aviation industry, it aims to study the annual number of flights share rate of case study airports with respect to total flights in Egypt as a percentage rate. Table 4-37 shows airport flight rate percentage of different airports with respect to Egyptian aviation industry.

Table 4-37: Airport flight share Percentage[1]

	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	14.35%	14.15%	14.49%	14.79%	14.63%
Borg El Arab	0.65%	1.04%	0.85%	0.48%	1.11%
Marsa Matruh	0.26%	0.27%	0.23%	0.20%	0.26%
Marsa Alam	1.63%	1.74%	1.77%	1.97%	2.34%
Al Alamein	0.01%	0.12%	0.12%	0.16%	0.19%

Table 4-38 shows annual frequency share for cases studied airports showed in Table 4-37 by usage of Equation 4-2, it shows the frequency of airport share rate with respect to 1 as illustrated in Figure 4-21, Figure 4-22, Figure 4-23, Figure 4-24, & Figure 4-25.

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[1] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)

Equation 4-2: airport share rate

$$airport\ share\ rate = \frac{annual\ total\ flight\ share\ rate\ in\ egyptian\ aviation\ industry}{maximum\ flight\ share\ rate\ in\ egyptian\ aviatin\ industry}$$

Table 4-38: Airport Flight Share rate[1]

Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.97	0.96	0.98	1.00	0.99
Borg El Arab	0.59	0.94	0.77	0.43	1.00
Marsa Matruh	0.96	1.00	0.87	0.74	0.97
Marsa Alam	0.70	0.74	0.76	0.84	1.00
Al Alamein	0.03	0.60	0.65	0.84	1.00

Table 4-39: airport flight share evaluation

Airport	evaluation
Hurghada	0.46
Borg El Arab	0.40
Marsa Matruh	0.45
Marsa Alam	0.55
Al Alamein	0.49

Table 4-39 shows airports flight share rate evaluation points for normalization of Figure 4-21, Figure 4-22, Figure 4-23, Figure 4-24, & Figure 4-25, as shown in table A.1-4; appendix A.1
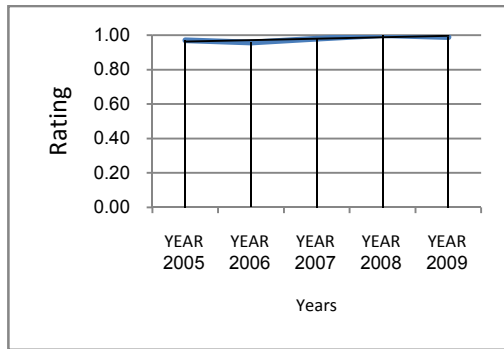
Figure 4-21: Hurghada Flight Share Rate[2]
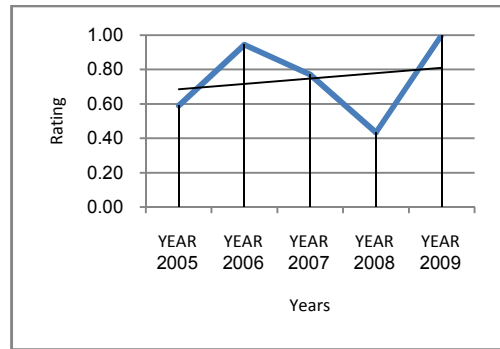
Figure 4-22: Borg EL Arab Flight Share rate[2]

[1] Prepared by the researcher
[2] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)
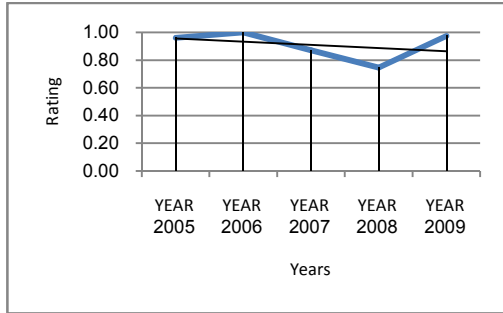
Figure 4-23: Marsa Matruh Flight Share rate[2]
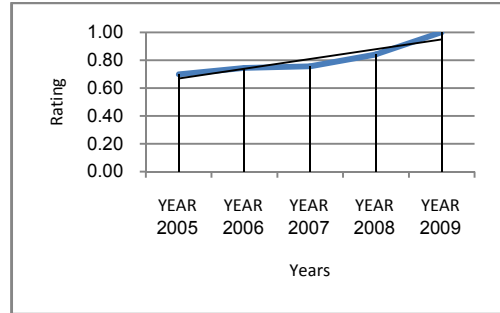
Figure 4-24: Marsa Alam Flight share rate[2]
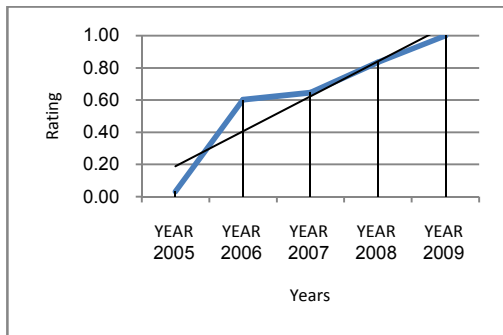
Figure 4-25: Al Alamein Flight Share rate[1]

Hurghada airport shows slight rise and fall during the study period; due to the slight development of tourism in Hurghada.

Borg el Arab airport shows large rise and fall during year 2008 because of the stoppage of airport for maintenance.

Marsa Matruh airport flight share shows medium rise and fall during 2008 and then rise again in 2009; the dependency of tourism in Marsa Matruh on road transportation due to the high rate of aviation price.

Marsa Alam airport shows regular rise during the study period, it shows regular development of the airport performance and improvement along the past period.

Al Alamein airport flight share large study as the airport started in 2005; it shows improvement of airport but it doesn't accompany the expected rates for the development of airport in preliminary study.

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[1] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010), prepared by researcher

4.4.1.2 International Flight share rate

This study shows rate of annual international flight share rate of each airport with respect to total annual international flights of the Egyptian aviation industry, it aims to study the annual number of international flights share rate of case study airports with respect to total international flights in Egypt as a percentage rate. Table 4-40 shows airport international flights share rate percentage of different airports with respect to Egyptian aviation industry.

Table 4-40: Airport International share percentage[1]

Intl. Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	18.62%	18.00%	18.52%	18.51%	17.90%
Borg El Arab	0.90%	1.53%	1.27%	0.71%	1.62%
Marsa Matruh	0.00%	0.10%	0.12%	0.08%	0.19%
Marsa Alam	2.25%	2.42%	2.53%	2.73%	3.03%
Al Alamein	0.00%	0.10%	0.16%	0.16%	0.20%

Table 4-41 shows annual frequency share for cases studied airports showed in Table 4-40 by usage of Equation 4-3, it shows the frequency of airport international share rate with respect to "1" as illustrated in Figure 4-26, Figure 4-27, Figure 4-28, Figure 4-29, & Figure 4-30.

Equation 4-3: Airport International share

$$airport\ share\ rate = \frac{annual\ Intl\ flight\ share\ rate\ in\ egyptian\ aviation\ industry}{maximum\ intl\ flight\ share\ rate\ in\ egyptian\ aviatin\ industry}$$

Table 4-41: Airport International Flights share rate[2]

Intl. Flights rate	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	1.00	0.97	0.99	0.99	0.96
Borg El Arab	0.56	0.95	0.78	0.44	1.00
Marsa Matruh	0.00	0.52	0.62	0.44	1.00
Marsa Alam	0.74	0.80	0.84	0.90	1.00
Al Alamein	0.02	0.53	0.82	0.81	1.00

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[1] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)
[2] Prepared by the researcher

Table 4-42: airport international flight share evaluation

Airport	evaluation
Hurghada	0.49
Borg El Arab	0.40
Marsa Matruh	0.40
Marsa Alam	0.47
Al Alamein	0.48

Table 4-42 shows airports flight share rate evaluation points for normalization of Figure 4-26, Figure 4-27, Figure 4-28, Figure 4-29, & Figure 4-30, as shown in table A.2-4 appendix A.2
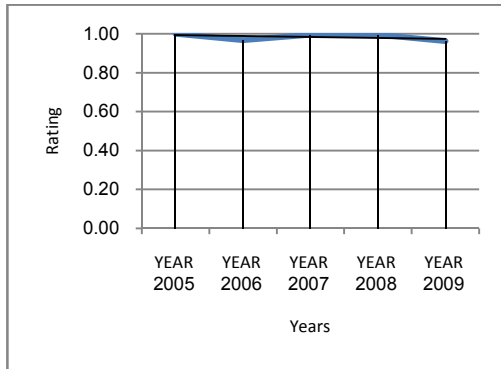
Figure 4-26: Hurghada Intl. Flight Share Rate[1]
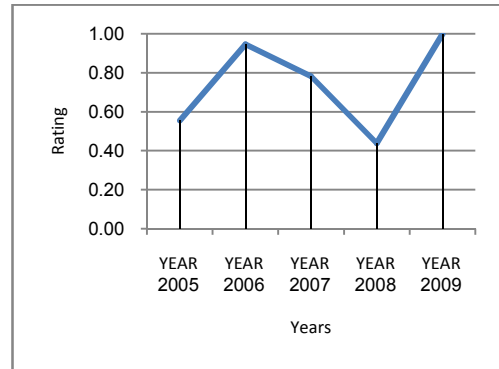
Figure 4-27: Borg elArab Intl. Flight Share rate[3]
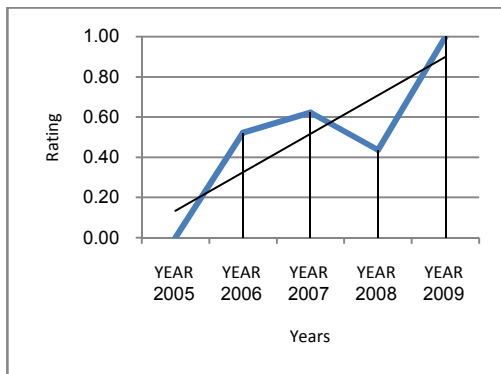
Figure 4-28:MarsaMatruh Intl. flight share rate[2]
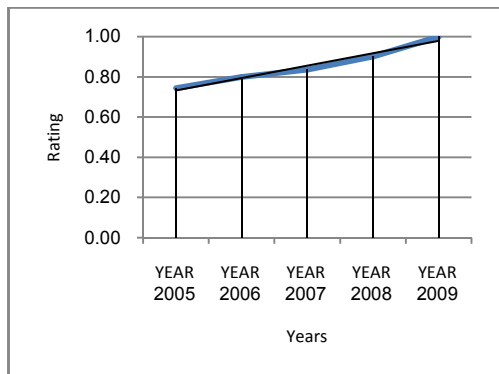
Figure 4-29: Marsa Alam Inlt. Flight share rate[1]

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[1] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010), prepared by researcher
[2] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010), prepared by researcher
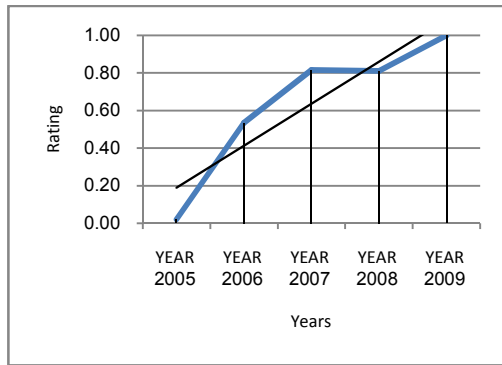
Figure 4-30: Al Alamein Flight Share rate[1]

Hurghada airport international flights rate shows slight decrease respectively during the study period as Hurghada witnessed decrease of international tourism rate.

Borg el Arab airport international flights rate shows rise and fall vacillation because the stoppage period of the airport for maintenance. Marsa Matruh airport international flights rate shows regular rise except for year 2008, which witnessed remarkable fall and then started to rise again.

Marsa Alam Airport international flights rate shows remarkable rise along the study period; this show the development of Marsa Alam airport performance and increase tourism rate in Marsa Alam.

Al Alamein airport international rate shows remarkable rise along the study period; this show the development of Al Alamin airport performance.

4.4.1.3 Domestic Flight share rate:

This study shows increase of annual domestic flight rate of each airport with respect to annual domestic airport flights of the Egyptian aviation industry, it aims to study the annual number of domestic flights share rate of case study airports with respect to total domestic flights in Egypt as a percentage rate. Table 4-43 shows airport domestic flights rate percentage of different airports with respect to Egyptian aviation industry.

Table 4-43: Airport Domestic Flight percentage[1]

Dom. Flight	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	6.32%	6.51%	6.81%	8.04%	8.18%
Borg El Arab	0.19%	0.07%	0.06%	0.06%	0.09%
Marsa Matruh	0.74%	0.59%	0.44%	0.40%	0.39%
Marsa Alam	0.38%	0.38%	0.30%	0.58%	0.97%
Al Alamein	0.01%	0.14%	0.06%	0.16%	0.19%

Table 4-44 shows annual frequency share for cases studied airports showed in Table 4-43 by usage of Equation 4-4, it shows the frequency of airport share rate with respect to "1" as illustrated in Figure 4-31, Figure 4-32, Figure 4-33, Figure 4-34 & Figure 4-35.

Equation 4-4: Airport domestic share rate

$$airport\ share\ rate = \frac{annual\ dom.\ flight\ share\ rate\ in\ egyptian\ aviation\ industry}{maximum\ dom\ flight\ share\ rate\ in\ egyptian\ aviatin\ industry}$$

Table 4-44: Airport Domestic Flight rate[2]

Dom Flights rate	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.77	0.80	0.83	0.98	1.00
Borg El Arab	1.00	0.37	0.32	0.32	0.47
Marsa Matruh	1.00	0.81	0.60	0.55	0.53
Marsa Alam	0.39	0.40	0.31	0.60	1.00
Al Alamein	0.05	0.74	0.31	0.88	1.00

Table 4-45: airport domestic Flight share evaluation

Airport	evaluation
Hurghada	0.43
Borg El Arab	0.12
Marsa Matruh	0.20
Marsa Alam	0.40
Al Alamein	0.49

Table 4-45 shows airports flight share rate evaluation points for normalization of Figure 4-31, Figure 4-32, Figure 4-33, Figure 4-34 & Figure 4-35, as shown in table A.3-4, appendix A.3

[1] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)
[2] Prepared by the researcher
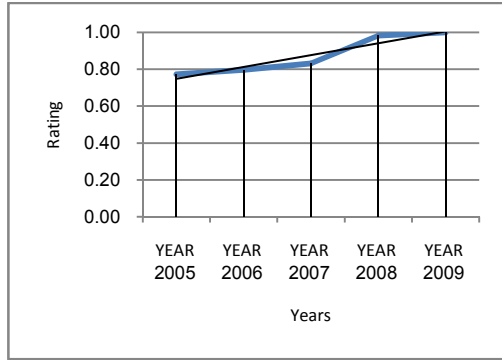
Figure 4-31: Hurghada dom. Flight Share Rate[1]
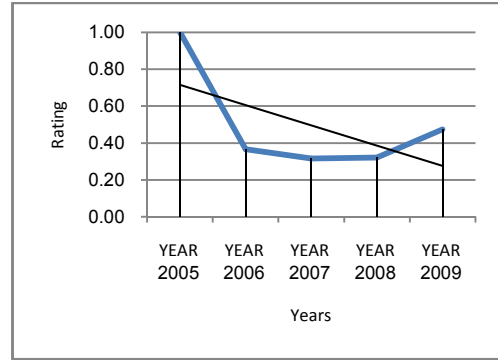
Figure 4-32: Borg elArab dom. flight Share rate[1]
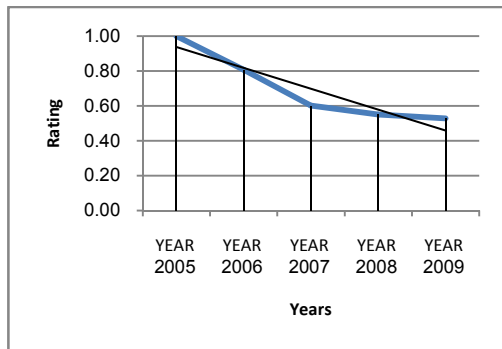
Figure 4-33:MarsaMatruh Intl. flight share rate[1]
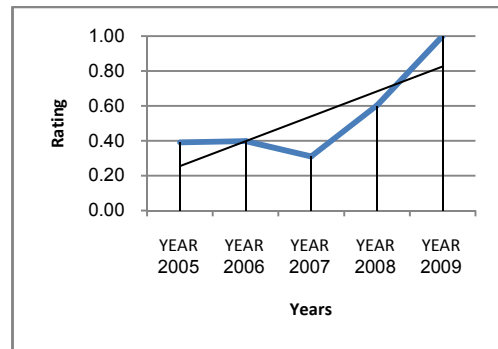
Figure 4-34: Marsa Alam dom. Flight share rate[1]
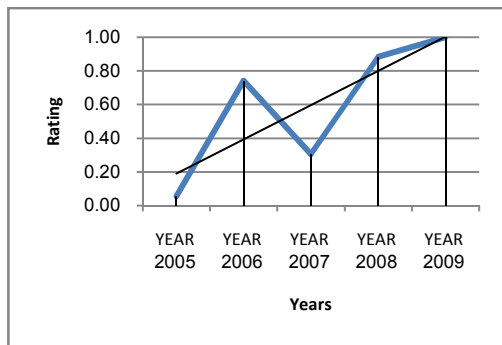
Figure 4-35: Al Alamein Flight Share rate [1]

Hurghada airport domestic flight rate shows slight rise during study period; it reflects the improvement of domestic tourism in Hurghada from 2005 to 2009 & it continues to rise accordingly.

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[1] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)

Borg El Arab airport domestic flight rate shows steep fall during the study period & it starts to rise in 2009; it reflects the decline of domestic tourism in Borg El Arab due to the maintenance works in airport then the rise again due to the change of aviation load in Alexandria to Borg El Arab airport.

Marsa Matruh airport domestic flight rate shows steep fall during the study period; it reflects the decline of domestic aviation tourism due to high rates of aviation transportation for domestic tourism.

Marsa Alam airport domestic flight rate shows steady rates during 2005 & 2006 then steep rise till 2009. It reflects the domestic tourism development in Marsa Alam as it is considered one of the promising cities in tourism in Egypt.

Al Alamin airport domestic flight rate shows vacillation during study period until it shows rise in 2009; it reflects the vacillation performance of Al Alamein airport.

4.4.1.4 Total Passengers share rate:

This study shows increase of annual total passenger rate of each airport with respect to total annual airport passengers of the Egyptian aviation industry, it aims to study the annual number of passengers share rate of case study airports with respect to total passengers in Egypt as a percentage rate. shows airport passengers rate percentage of different airports with respect to the Egyptian aviation industry.

Table 4-46 shows airport passengers rate percentage of different airports with respect to the Egyptian aviation industry.

Table 4-46: Airport Passengers share percentage[1]

Passengers	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	18.33%	18.73%	19.42%	18.85%	19.31%
Borg El Arab	0.49%	0.89%	0.76%	0.52%	1.07%
Marsa Matruh	0.08%	0.16%	0.16%	0.12%	0.21%
Marsa Alam	1.76%	1.94%	2.10%	2.29%	2.70%
Al Alamein	0.00%	0.07%	0.09%	0.11%	0.09%

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[1] [1] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)

Table 4-47 shows annual frequency share for cases studied airports showed inn Table 4-46 by usage of Equation 4-5, it shows the frequency of airport share rate with respect to "1" as illustrated in Figure 4-36, Figure 4-37, Figure 4-38, Figure 4-39 & Figure 4-40.

Equation 4-5: airport passengers share rate

$$Airport\ share\ rate = \frac{annual\ total\ Pax\ share\ rate\ in\ egyptian\ aviation\ industry}{maximum\ Pax\ share\ rate\ in\ egyptian\ aviatin\ industry}$$

Table 4-47: Airport Passengers share rate[1]

Passengers	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.94	0.96	1.00	0.97	0.99
Borg El Arab	0.46	0.84	0.72	0.49	1.00
Marsa Matruh	0.41	0.79	0.80	0.58	1.00
Marsa Alam	0.65	0.72	0.78	0.85	1.00
Al Alamein	0.01	0.63	0.86	1.00	0.81

Table 4-48: airport passengers share evaluation

Airport	evaluation
Hurghada	0.53
Borg El Arab	0.46
Marsa Matruh	0.47
Marsa Alam	0.54
Al Alamein	0.53

Table 4-48 shows airports flight share rate evaluation points for normalization of Figure 4-36, Figure 4-37, Figure 4-38, Figure 4-39 & Figure 4-40, as shown in table A.4-4; appendix A.4

Figure 4-36: Hurghada passenger Share Rate[2]
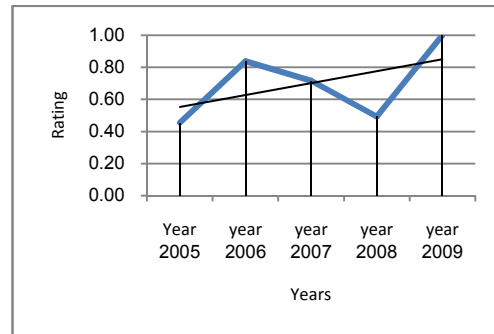
Figure 4-37: Borg el Arab passenger Share rate[1]

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[1] prepared by the researcher
[2] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010), prepared by researcher
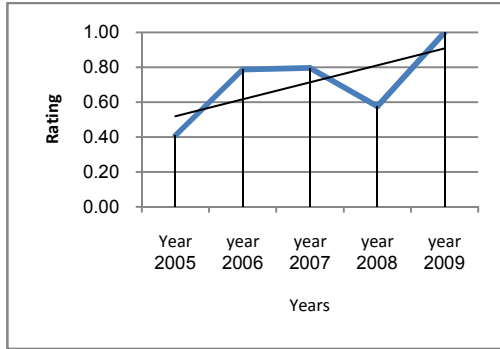
Figure 4-38:Marsa Matruh passenger share rate[1]
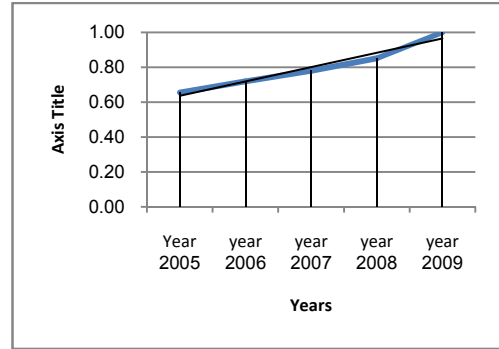
Figure 4-39: Marsa Alam passenger share rate[1]
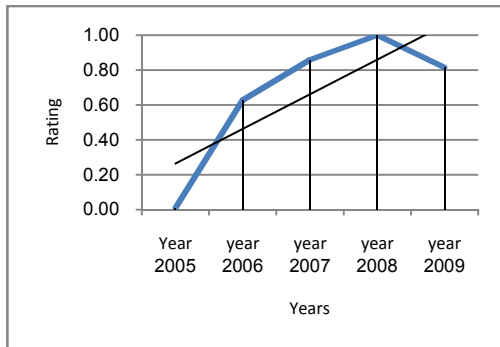
Figure 4-40: Al Alamein passenger Share rate[1]

Hurghada airport passenger share rate shows the slight rise of passengers during the study period; it reflects slight development of tourism in Hurghada.

Borg El Arab airport passengers share rate shows vacillation rise of passengers during the study period; it reflects the instability of passengers' number in Borg El Arab airport due to the stoppage period of maintenance.

Marsa Matruh airport passenger share rate shows vacillation rise of passengers during the study period; it reflects the instability of passengers' number due to the instability of tourism field in Marsa Matruh.

Marsa Alam airport passenger share rate shows the steady rise of passengers during the study period; it reflects the steady development of Marsa Alam airport performance.

Al Alamein airport passenger share rate shows steady rise then witnessed steep fall in 2009; it reflects vacillation performance of Al Alamein airport.

4.4.1.5 International passengers share rate:

This study shows increase of annual international passenger rate of each airport with respect to annual international passengers of the Egyptian aviation industry, it aims to study the annual number of international passengers share rate of case study airports with respect to total international passengers in Egypt as a percentage rate. Table 4-49 shows airport international passengers rate percentage of different airports with respect to Egyptian aviation industry.

Table 4-49: Airport international Passengers share percentage[1]

Intl Passengers	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	21.98%	21.80%	22.58%	21.88%	22.00%
Borg El Arab	0.62%	1.11%	0.96%	0.66%	1.30%
Marsa Matruh	0.00%	0.09%	0.13%	0.08%	0.19%
Marsa Alam	2.24%	2.37%	2.60%	2.78%	3.17%
Al Alamein	0.00%	0.08%	0.12%	0.13%	0.11%

Table 4-50 shows annual frequency share for cases studied airports showed in Table 4-49 by usage of Equation 4-6, it shows the frequency of airport share rate with respect to "1" as illustrated in Figure 4-41, Figure 4-42, Figure 4-43, Figure 4-44 & Figure 4-45.

Equation 4-6: airport international share rate

$$airport\ share\ rate = \frac{annual\ Intl\ Pax\ share\ rate\ in\ egyptian\ aviation\ industry}{maximum\ Intl\ Pax\ share\ rate\ in\ egyptian\ aviatin\ industry}$$

Table 4-50: Airport international passengers share rate[2]

Passengers	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.97	0.97	1.00	0.97	0.97
Borg El Arab	0.47	0.85	0.73	0.50	1.00
Marsa Matruh	0.00	0.48	0.68	0.44	1.00
Marsa Alam	0.71	0.75	0.82	0.88	1.00
Al Alamein	0.01	0.61	0.86	1.00	0.79

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[1] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010) prepared by researcher
[2] prepared by researcher

Table 4-51: airport international passengers share rate

Airport	evaluation
Hurghada	0.50
Borg El Arab	0.44
Marsa Matruh	0.47
Marsa Alam	0.54
Al Alamein	0.53

Table 4-51 shows airports flight share rate evaluation points for normalization of in Figure 4-41, Figure 4-42, Figure 4-43, Figure 4-44 & Figure 4-45, as shown in table A.5-1; appendix A.5
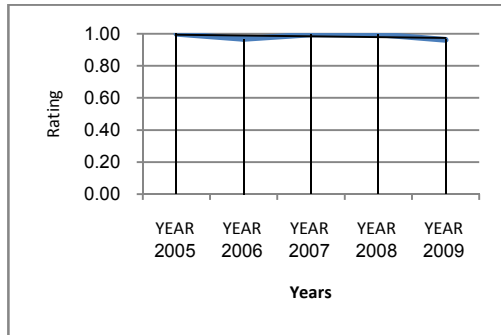
Figure 4-41: Hurghada intl. pass. Share Rate[1]
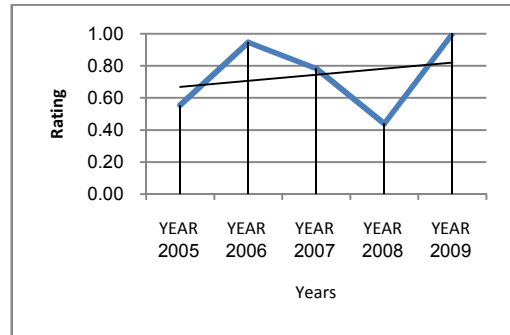
Figure 4-42: Borg el Arab intl. pass. Share rate[3]
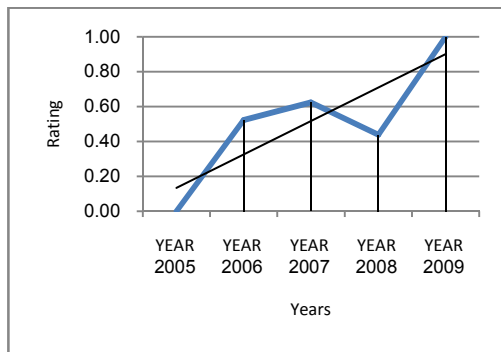
Figure 4-43:Marsa Matruh Intl. pass. share rate[1]
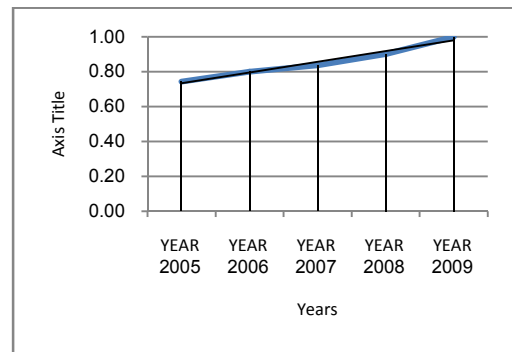
Figure 4-44: Marsa Alam Inlt. pass. share rate[1]

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[1] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010) prepared by researcher
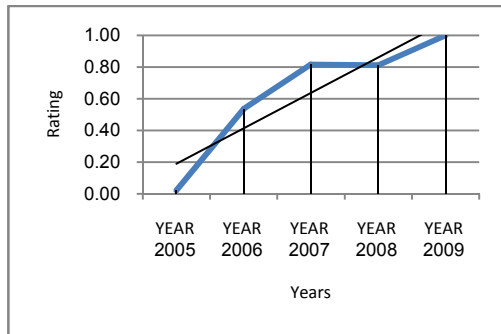
Figure 4-45: Al Alamein Inlt. pass. Share rate[1]

Hurghada airport international passenger share rate shows the slight decline during the study period; it reflects the slight decrease rates of international tourism in Hurghada.

Borg El Arab airport international passenger share rate shows the vacillation rise & fall during the study period; it reflects the vacillation of airport performance due to the stoppage of airport during the maintenance period.

Marsa Matruh airport international passenger share rate shows vacillation rise and fall during the study period; it reflects vacillation performance of Marsa Matruh airport performance and vacillation international tourism rates in city.

Marsa Alam airport international passenger share rate shows steady rise of passengers during the study period; it reflects the steady increase of performance of Marsa Alam airport.

Al Alamein airport international passenger share rate shows steady rise of passengers during the study period, except for 2007-2008 witnessed slight rise; it reflects the steady performance of Al Alamein airport although it doesn't imply with the expected rates.

4.4.1.6 Domestic passenger share rate:

This study shows increase of annual domestic passenger rate of each airport with respect to annual domestic passengers of the Egyptian aviation industry, it aims to study the annual number of domestic flights share rate of cases studied airports with respect to total domestic flights in Egypt as a percentage rate. Table 4-52 shows airport domestic passenger rate percentage with respect to Egyptian aviation industry.

Table 4-52: Airport domestic passenger share percentange[1]

Dom. pass.	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	5.84%	6.16%	6.96%	6.96%	7.49%
Borg El Arab	0.03%	0.02%	0.01%	0.01%	0.02%
Marsa Matruh	0.37%	0.45%	0.31%	0.26%	0.28%
Marsa Alam	0.13%	0.16%	0.12%	0.37%	0.63%
Al Alamein	0.00%	0.01%	0.01%	0.01%	0.01%

Table 4-53 shows annual frequency rate for cases studied airports showed in Table 4-52 by usage of Equation 4-7, it shows frequency of airport domestic passengers share rate with respect to "1" as illustrated in Figure 4-46, Figure 4-47, Figure 4-48, Figure 4-49 & Figure 4-50

Equation 4-7: airport domestic passengers rate

$$airport\ share\ rate = \frac{annual\ Dom.Pax\ share\ rate\ in\ egyptian\ aviation\ industry}{maximum\ Dom,Pax\ share\ rate\ in\ egyptian\ aviatin\ industry}$$

Table 4-53: Airport Domestic Passenger share rate[2]

Dom. Pass. rate	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.78	0.82	0.93	0.93	1.00
Borg El Arab	1.00	0.48	0.29	0.32	0.69
Marsa Matruh	0.81	1.00	0.68	0.58	0.63
Marsa Alam	0.20	0.25	0.20	0.59	1.00
Al Alamein	0.02	0.79	0.48	0.82	1.00

Table 4-54: airport domestic passengers share rate

Airport	evaluation
Hurghada	0.46
Borg El Arab	0.21
Marsa Matruh	0.30
Marsa Alam	0.55
Al Alamein	0.51

Table 4-54 shows airports flight share rate evaluation points for normalization of Figure 4-46, Figure 4-47, Figure 4-48, Figure 4-49 & Figure 4-50, as shown in table A.6-1; appendix A.6

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[1] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)
[2] prepared by researcher
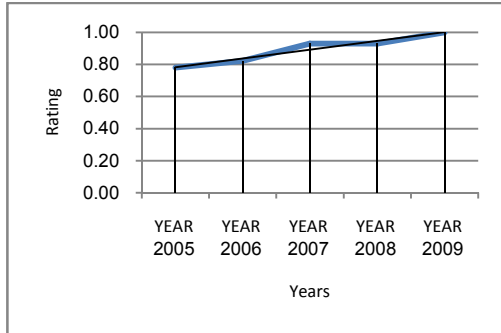
Figure 4-46: Hurghada dom. pass. Share Rate[1]
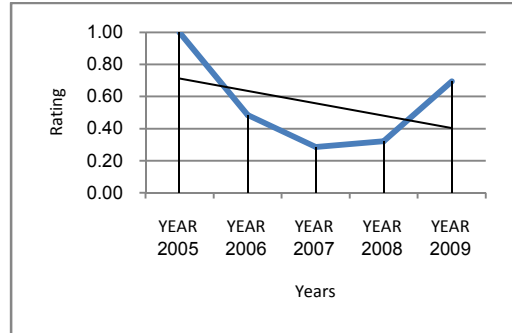
Figure 4-47: Borg el Arab dom. pass. Share rate[1]
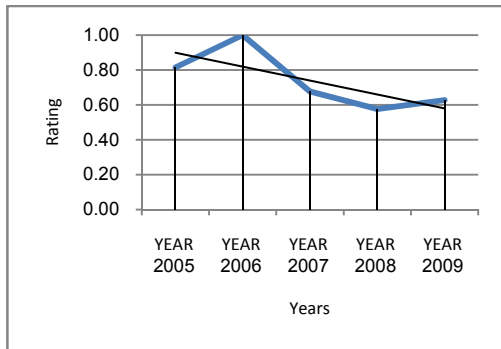
Figure 4-48:Marsa Matruh dom. pass. share rate[1]
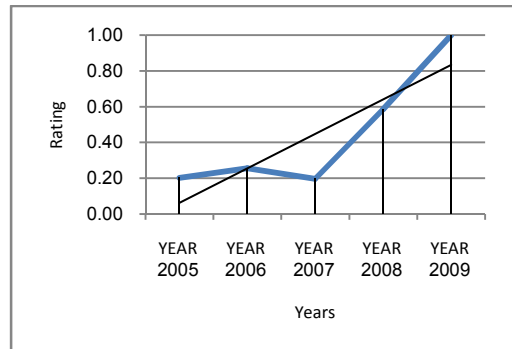
Figure 4-49: Marsa Alam dom. pass. share rate[1]
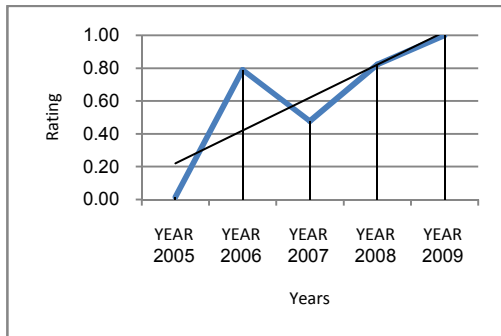
Figure 4-50: Al Alamein dom. pass. Share rate[1]

Hurghada airport domestic passenger share rate shows slight rise during the study period; it reflects the increase of domestic tourism due to the encouragement programs of the government to enrich domestic tourism in Hurghada.

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[1] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)

Borg El Arab airport domestic passenger share rate shows steep decrease during the study period except for 2008-2009 it begins to rise; this reflects the stoppage period of the airport due maintenance.

Marsa Matruh airport domestic passenger share rate shows rise in 2006 then witnessed steep fall till 2008, till it starts to rise again in 2009; it reflects the instability of domestic tourism through aviation due to high aviation rates with respect to other transportation.

Marsa Alam airport domestic passenger share rate shows vacillation till 2007 then it witnessed a steady rise till the end of the study period; it reflects the increase of the airport performance & direction of domestic tourism towards Marsa Alam as a new pole for tourism along the red sea.

Al Alamein airport domestic share rate shows vacillation till 2007 then it witnessed a steady rise till the end of the study period; it reflects the increase of airport performance although this didn't imply with expected performance.

4.4.2 Airport Share per floor area rate:

This study shows the rate of annual share of each airport with the respect to theunit floor area of the airport along the study duration (from 2005 to 2009).

It is calculated as share rate for number of flights or passengers with respect to floor area along the study duration period (2005-2009); in order to show the participation of flights/passengers from floor area of the airport. This graph implies rate of efficiency of floor area in airport along the study duration period.

Table 4-55: Total floor area of Airports[1]

Airport	Total Floor area (m^2)
Hurghada	90,000 m^2
Borg El Arab	34,000 m^2
Marsa Matruh	3,290 m^2
Marsa Alam	10,000 m^2
Al Alamein	8,600 m^2

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[1] Egyptian Holding Company for Airports and Air Navigation website, http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010).

Equation 4-8: Airport share per unit area rate

$$airport\ share\ rate/unit\ area\ = \frac{annual\ airport\ rate}{Area\ of\ airport\ terminal\ building}$$

4.4.2.1 Total flights per floor area rate:

This study shows the rate of total annual total flights share of each airport with the respect to the total floor area of the airport along the study duration (from 2005 to 2009), it aims to study the annual total flights share rate of case study airports with respect to unit floor area as a percentage rate. Table 4-56 shows rate of efficiency of floor area in airport along the study duration period with respect to number of total flights in Egyptian aviation industry.

Table 4-56: Airport Total flights per floor area[1]

Flight-Area	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.36	0.37	0.44	0.53	0.52
Borg El Arab	0.04	0.07	0.07	0.05	0.10
Marsa Matruh	0.18	0.19	0.19	0.19	0.25
Marsa Alam	0.37	0.41	0.49	0.64	0.75
Al Alamein	0.00	0.03	0.04	0.06	0.07

Table 4-57 shows annual frequency total flights per unit area for cases studied airports showed in Table 4-56 by usage of

Equation 4-9, it shows the frequency with respect to "1" as shown in Figure 4-51.

Equation 4-9: total flight share per unit area rate

$$total\ flight\ airport\ share\ rate/unit\ area\ = \frac{annual\ total\ flight\ airport\ share\ rate}{Area\ of\ airport\ terminal\ building}$$

Table 4-57: Total Airport flight share rate / unit area[2]

Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.69	0.70	0.84	1.00	0.98
Borg El Arab	0.42	0.69	0.66	0.44	1.00
Marsa Matruh	0.70	0.75	0.77	0.77	1.00
Marsa Alam	0.49	0.55	0.65	0.85	1.00
Al Alamein	0.02	0.44	0.56	0.84	1.00

[1] Egyptian Holding Company for Airports and Air Navigation website ,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010), prepared by researcher.
[2] prepared by researcher

Table 4-58: total flight share per unit area evaluation

Airport	evaluation
Hurghada	0.65
Borg El Arab	0.11
Marsa Matruh	0.63
Marsa Alam	0.53
Al Alamein	0.39

Table 4-58 shows airports flight share rate evaluation points for normalization of Figure 4-51 , as shown in table A.7-3 appendix A.7
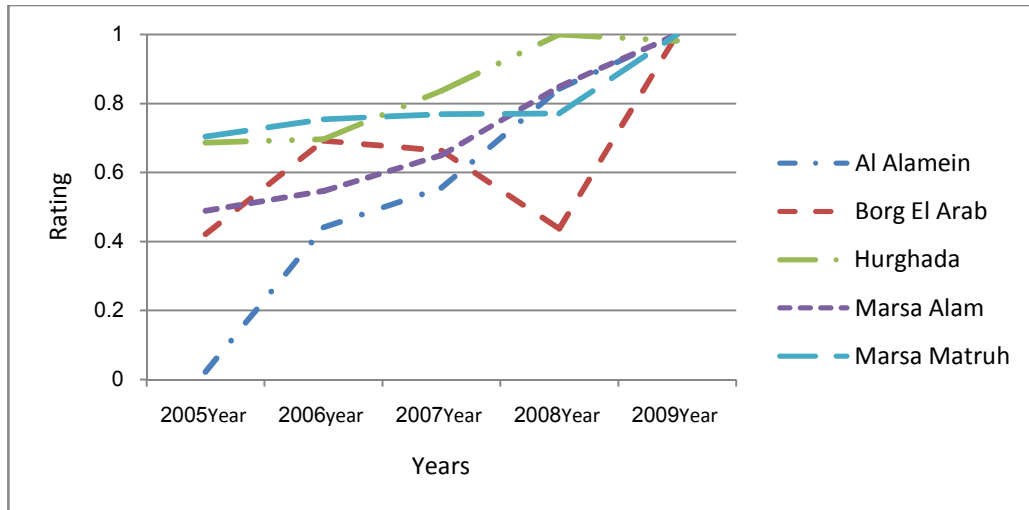
Figure 4-51: Airport Total flights per floor area[1]

Hurghada airport shows Maximum share for flights per floor area, while Al Alamein airport shows minimum share for flights per floor area & other airports lies in between. Hurghada airport shows the nearest rates compared to Marsa Alam airport although it is much older than Marsa Alam airport.

This implies that Hurghada airport shows more efficiency than other governmental airports, while Al Alamein airport shows less efficiency than other governmental airports. Hurghada shows the best efficiency for governmental airports studied.

4.4.2.2 International flights per floor area rate:

This study shows the rate of total annual international flights share of each airport with the respect to the total floor area of the airport along the study dura-

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[1] Egyptian Holding Company for Airports and Air Navigation website ,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010), prepared by researcher

tion (from 2005 to 2009), it aims to study the annual international flights share rate of case study airports with respect to unit floor area as a percentage rate. Table 4-59 shows rate of efficiency of floor area in airport along the study duration period with respect to number of international flights in Egyptian aviation industry.

Table 4-59: International flights per floor area[1]

Intl Flight-Area	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.31	0.31	0.37	0.43	0.42
Borg El Arab	0.04	0.07	0.07	0.04	0.10
Marsa Matruh	0.00	0.05	0.07	0.05	0.12
Marsa Alam	0.34	0.38	0.46	0.57	0.64
Al Alamein	0.00	0.02	0.03	0.04	0.05

Table 4-50 shows annual international flights per unit area frequency rate for cases studied showed in Table 4-59 by usage of Equation 4-10, it shows the frequency with respect to "1" as shown in Figure 4-52, Figure 4-53, Figure 4-54, Figure 4-55 & Figure 4-56.

Equation 4-10 international flight share per unit area rate

$$International\ flight\ share\ rate/unit\ area\ = \frac{annual\ Intl\ flight\ airport\ share\ rate}{Area\ of\ airport\ terminal\ building}$$

Table 4-60: International Airport Share rate per unit floor area[2]

Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.72	0.73	0.87	1.00	0.99
Borg El Arab	0.39	0.70	0.67	0.43	1.00
Marsa Matruh	0.00	0.38	0.53	0.43	1.00
Marsa Alam	0.52	0.59	0.71	0.88	1.00
Al Alamein	0.01	0.39	0.69	0.79	1.00

Table 4-61: international flights share per unit area evaluation

Airport	evaluation
Hurghada	0.67
Borg El Arab	0.48
Marsa Matruh	0.31
Marsa Alam	0.56
Al Alamein	0.39

Table 4-61 shows airports flight share rate evaluation points for normalization of Figure 4-52, Figure 4-53, Figure 4-54, Figure 4-55 & Figure 4-56, as shown in table A.8-3; appendix A.8

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[1] Egyptian Holding Company for Airports and Air Navigation website ,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010), prepared by researcher
[2] Prepared by the researcher
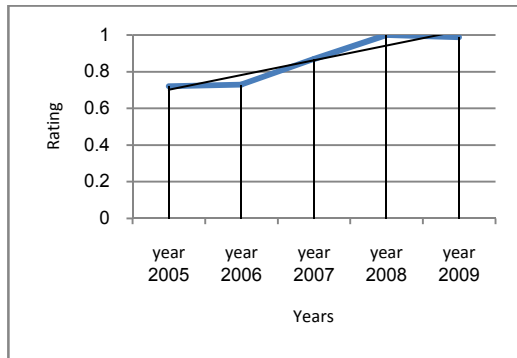
Figure 4-52:Hurghada Intl flight Share rate/ area[1]
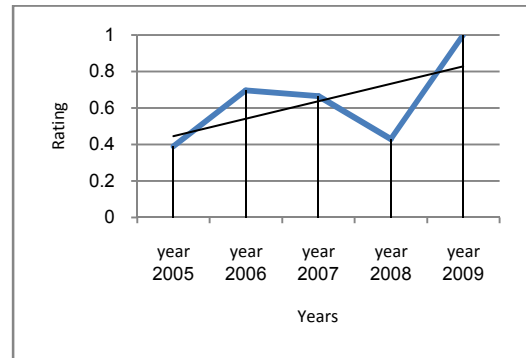
Figure 4-53:BorgelArab Intl flight share rate/area[1]
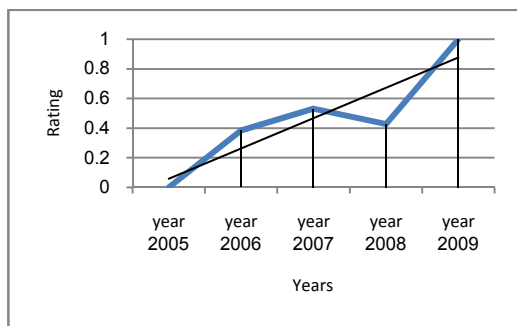
Figure 4-54 Marsa Matruh Intl flight Share rate/ area[1]
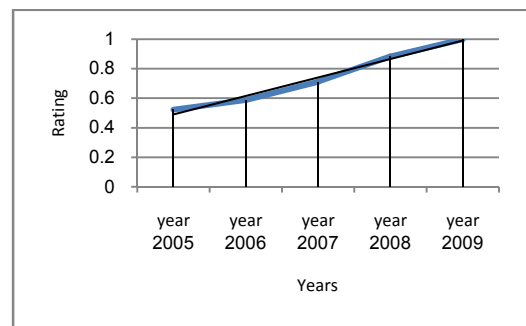
Figure 4-55: Marsa Alam Intl flight share rate/area [1]
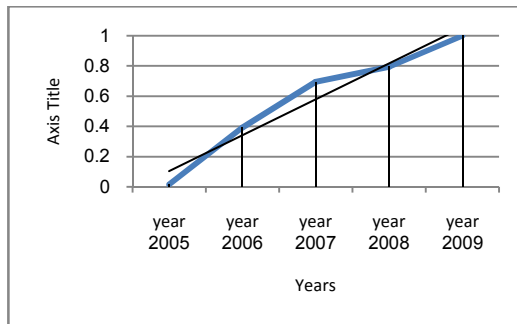
Figure 4-56:Al Alamein Intl flight Share rate/ area[1]

Marsa Alam airport shows maximum share for international flights per floor area, while Al Alamein airport shows minimum share for flights per floor

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[1] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)

area. Hurghada airport shows the nearest rates compared to Marsa Alam, despite it is much older than Marsa Alam.

This shows that Marsa Alam airport shows more efficiency than other governmental airports, while Al Alamein airport shows less efficiency than other governmental airports. Hurghada shows the best efficiency for governmental airports studied. All airports international flights per floor area shows rise along the study period.

4.4.2.3 Domestic flights per floor area rate:

This study shows the rate of total annual domestic flights share of each airport with the respect to the total floor area of the airport along the study duration (from 2005 to 2009), it aims to study the annual domestic flights share rate of case study airports with respect to unit floor area as a percentage rate. Table 4-62 shows rate of efficiency of floor area in airport along the study duration period with respect to number of domestic flights in Egyptian aviation industry.

Table 4-62: Airport domestic flight per floor area rate[1]

Dom Flight-Area	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.06	0.06	0.07	0.10	0.10
Borg El Arab	0.00	0.00	0.00	0.00	0.00
Marsa Matruh	0.18	0.14	0.13	0.14	0.13
Marsa Alam	0.03	0.03	0.03	0.07	0.10
Al Alamein	0.00	0.01	0.01	0.02	0.02

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[1] Egyptian Holding Company for Airports and Air Navigation website ,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010), prepared by researcher

Table 4-63 shows annual domestic flights per unit area frequency share for cases studied airports showed in Table 4-62 by usage of Equation 4-11, it shows the frequency rate with respect to "1" as shown Figure 4-57, Figure 4-58, Figure 4-59, Figure 4-60 & Figure 4-61.

Equation 4-11 domestic flight share per unit area

$$Domestic\ flight\ share\ rate/unit area = \frac{annual\ domestic\ flight\ airport\ share\ rate}{Area\ of\ airport\ terminal\ building}$$

Table 4-63: Airport domestic flight share per unit area[1]

Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.54	0.56	0.70	1.00	0.96
Borg El Arab	1.00	0.36	0.38	0.46	0.64
Marsa Matruh	1.00	0.80	0.72	0.79	0.72
Marsa Alam	0.29	0.29	0.27	0.64	1.00
Al Alamein	0.04	0.54	0.27	0.94	1.00

Table 4-64: domestic flight share per unit area evaluation

Airport	evaluation
Hurghada	0.44
Borg El Arab	0.25
Marsa Matruh	0.38
Marsa Alam	0.40
Al Alamein	0.43

Table 4-64 shows airports flight share rate evaluation points for normalization of Figure 4-57, Figure 4-58, Figure 4-59, Figure 4-60 & Figure 4-61, as shown in table A.9-3; appendix A.9
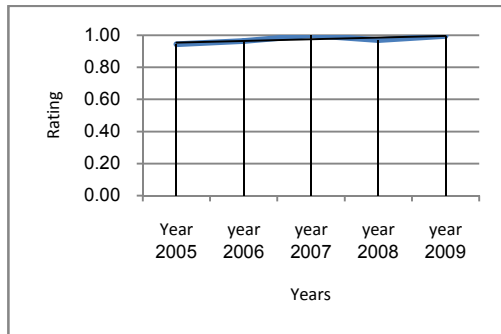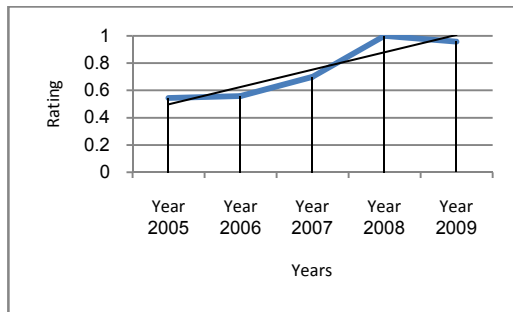

Figure 4-57Hurghada dom. flight Share rate/ area[2]
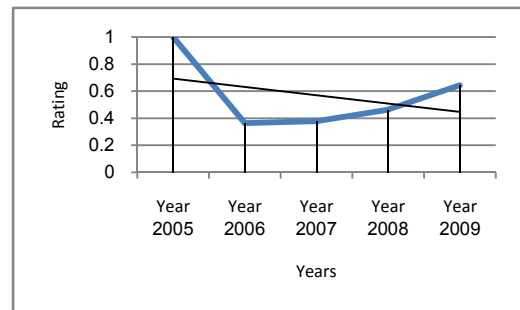
Figure 4-58: Borg el Arab dom flight rate/area

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[1] prepared by the researcher
[2] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)
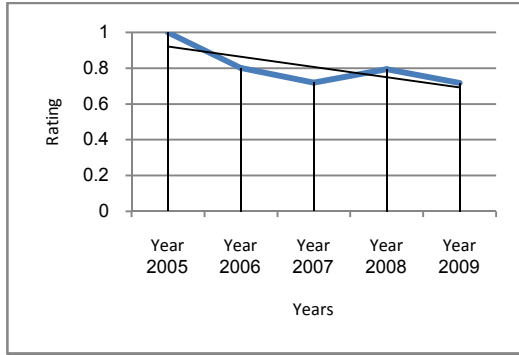
Figure 4-59:Marsa Matruh dom. flight Share rate/ area[1]
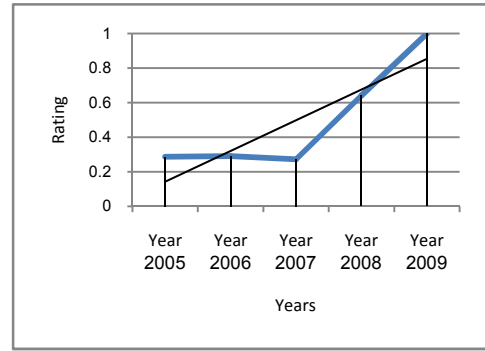
Figure 4-60: Marsa Alam dom. flight share/area[1]
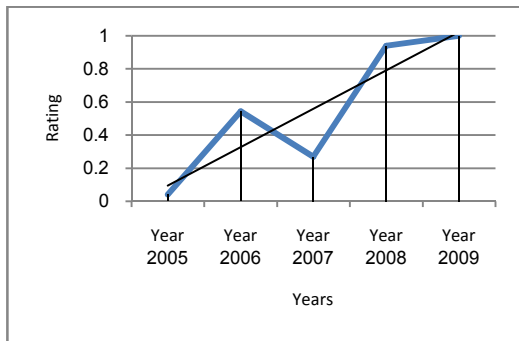
Figure 4-61:Al Alamein dom. flight Share rate/ area[1]

Hurghada airport shows maximum domestic flights share per floor area, while Borg El Arab airport shows minimum domestic flights share per floor area. Marsa Matruh domestic flight share witnessed fall along the study period, while Hurghada, Marsa Alam & Al Alamein domestic shares witnessed rise along the study period with different values; Marsa Alam rate is considered the maximum rise rate for domestic flights per floor area.

Marsa Alam domestic flight rates per floor area is not the maximum for the study but it shows rise during the study period, while Hurghada rate shows decline through 2009, Al Alamein & Borg El Arab domestic flights rates show slight rise for past period While Marsa Matruh domestic flight rate shows steep fall.

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[1] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)

This implies that Hurghada airport efficiency development rate is considered the best rate between other airports, while Marsa Matruh airport is considered the worst for the studied airports.

4.4.2.4 Total passengers per floor area:

This study shows the rate of total annual total passengers share of each airport with the respect to the total floor area of the airport along the study duration (from 2005 to 2009), it aims to study the annual total passengers share rate of case study airports with respect to unit floor area as a percentage rate. Table 4-65 shows rate of efficiency of floor area in airport along the study duration period with respect to number of total passengers in Egyptian aviation industry.

Table 4-65: Airport total passengers per floor area rate[1]

Pass/Area	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	50.27	53.69	66.06	74.90	74.76
Borg El Arab	3.52	6.77	6.88	5.52	10.92
Marsa Matruh	6.28	12.64	15.20	12.86	21.73
Marsa Alam	43.53	50.02	64.28	81.99	93.89
Al Alamein	0.03	2.06	3.35	4.56	3.62

Table 4-66 shows total passengers per unit area frequency share for cases studied airports showed in Table 4-65 by usage of Equation 4-12, it shows the frequency with respect to "1" as shown in Figure 4-62.

Equation 4-12 total passengers share per unit area rate

$$total\ pax\ airport\ share\ rate/unit\ area\ = \frac{annual\ total\ pax\ airport\ share\ rate}{Area\ of\ airport\ terminal\ building}$$

Table 4-66: Total Airport passengers share rate / unit area[2]

Passengers	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.94	0.96	1.00	0.97	0.99
Borg El Arab	0.46	0.84	0.72	0.49	1.00
Marsa Matruh	0.41	0.79	0.80	0.58	1.00
Marsa Alam	0.65	0.72	0.78	0.85	1.00
Al Alamein	0.01	0.63	0.86	1.00	0.81

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[1] Egyptian Holding Company for Airports and Air Navigation website ,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010), prepared by researcher
[2] prepared by researcher

Table 4-67: total passengers share per unit area

Airport	evaluation
Hurghada	0.72
Borg El Arab	0.51
Marsa Matruh	0.51
Marsa Alam	0.67
Al Alamein	0.47

Table 4-67 shows airports flight share rate evaluation points for normalization of Figure 4-62, as shown in table A.10-3; appendix A.10
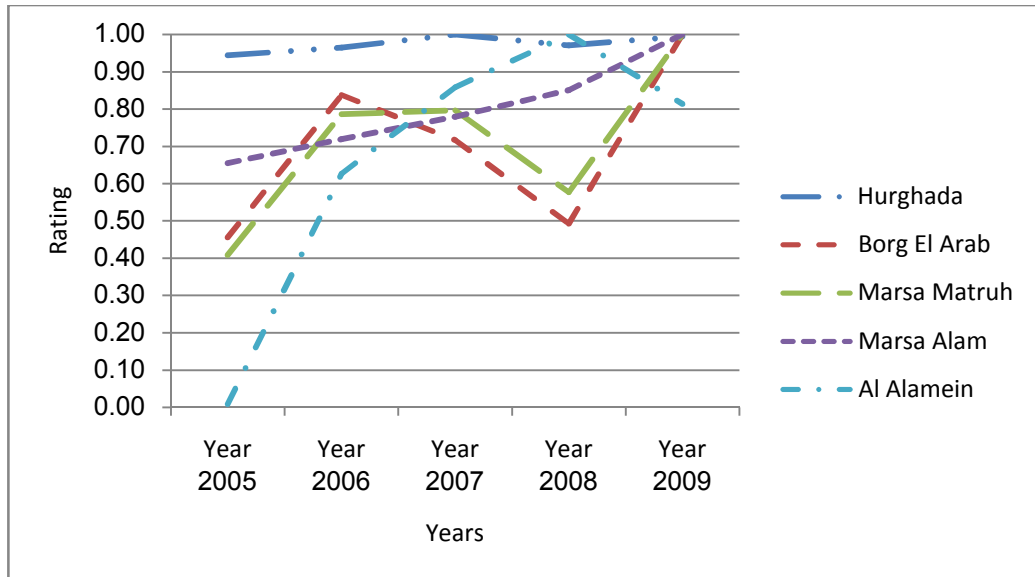
Figure 4-62: Airport total passengers per floor area rate [1]

Hurghada airport passenger per floor area share shows maximum rates while Borg El Arab airport rate shows minimum rate. Hurghada passenger per floor area rate witnessed almost steady rates, Marsa Alam airport rates shows the maximum increase rates, while Marsa Matruh & Borg El Arab shows vacillation rates during the study period. Al Alamein airport rate witnessed rise during the first four years of study and then witnessed steep fall in 2009.

This implies that Hurghada passenger per floor area rates show the best rates; it shows the most efficient performance, while Al Alamein airport rates show worst rates with respect to the study airports.

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[1] Egyptian Holding Company for Airports and Air Navigation website ,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010), prepared by researcher

4.4.2.5 International passenger per floor area rate:

This study shows the rate of total annual international passengers share of each airport with the respect to the total floor area of the airport along the study duration (from 2005 to 2009), it aims to study the annual international passengers share rate of case study airports with respect to unit floor area as a percentage rate. Table 4-68 shows rate of efficiency of floor area in airport along the study duration period with respect to number of international passengers in Egyptian aviation industry.

Table 4-68: International passengers per floor area rate[1]

Intl Pass/Area	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	46.65	50.23	61.27	69.28	69.39
Borg El Arab	3.47	6.75	6.86	5.49	10.87
Marsa Matruh	0.00	5.65	9.42	7.07	16.14
Marsa Alam	42.83	49.21	63.52	79.32	89.84
Al Alamein	0.02	2.00	3.30	4.47	3.51

Table 4-69 shows annual international passengers per unit area frequency share for cases studied airports showed in Table 4-68 by usage of Equation 4-13, it shows the frequency with respect to "1" as shown Figure 4-63, Figure 4-64, Figure 4-65, Figure 4-66 & Figure 4-67.

Equation 4-13 international passengers share per unit area

$$International\ pax\ share\ rate/unit\ area = \frac{annual\ Intl\ pax\ airport\ share\ rate}{Area\ of\ airport\ terminal\ building}$$

Table 4-69: Airport International share rate / unit area[2]

Passengers	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.97	0.97	1.00	0.97	0.97
Borg El Arab	0.47	0.85	0.73	0.50	1.00
Marsa Matruh	0.00	0.48	0.68	0.44	1.00
Marsa Alam	0.71	0.75	0.82	0.88	1.00
Al Alamein	0.01	0.61	0.86	1.00	0.79

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[1] Egyptian Holding Company for Airports and Air Navigation website ,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010), prepared by researcher
[2] prepared by researcher

Table 4-70: international passengers share per unit area evaluation

Airport	evaluation
Hurghada	0.72
Borg El Arab	0.51
Marsa Matruh	0.37
Marsa Alam	0.60
Al Alamein	0.38

Table 4-70 shows airports flight share rate evaluation points for normalization of Figure 4-63, Figure 4-64, Figure 4-65, Figure 4-66 & Figure 4-67, as shown in table A.11-3; appendix A.11
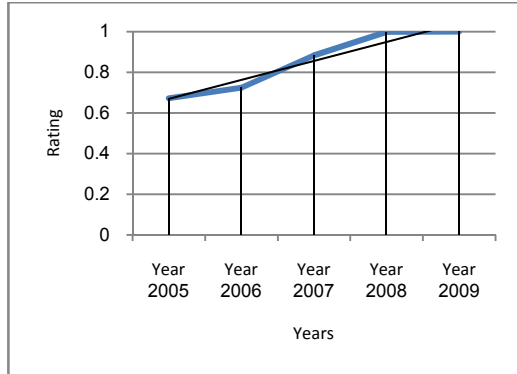
Figure 4-63:Hurghada Intl pax Share rate/ area[1]
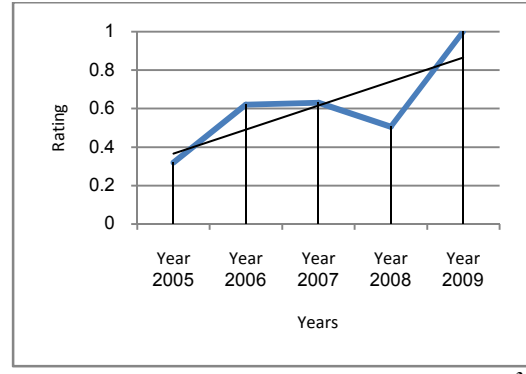
Figure 4-64: Borg elArab Intl pax share rate/area[3]
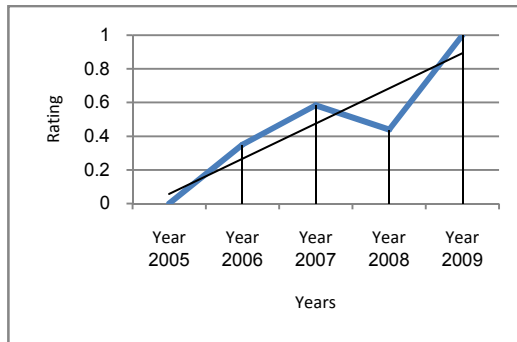
Figure 4-65 Marsa Matruh Intl pax Share rate/ area[2]
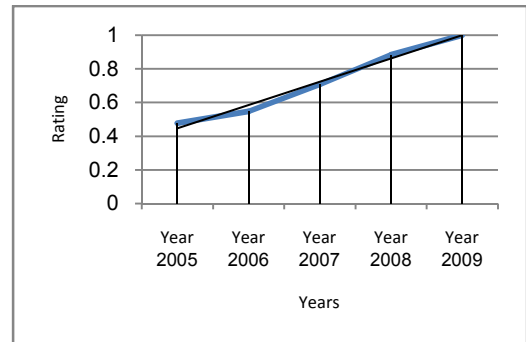
Figure 4-66: Marsa Alam Intl pax share rate/area[1]

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[1] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)
[2] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)
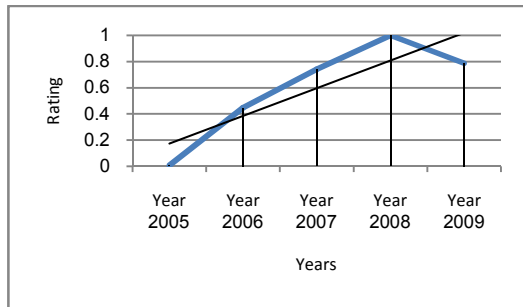
Figure 4-67:Al Alamein Intl pax Share rate/ area[1]

Marsa Alam international passengers per floor rates show as the maximum, while Al Alamein international passengers per floor rates show as the minimum rates. Hurghada international passengers per floor rates was exceeding that of Marsa Alam at the beginning of study period but it decreases below that of Marsa Alam along the study period till 2009. Al Alamein, Marsa Matruh & Borg El Arab airports rates are almost similar.

This implies that Hurghada international passengers per floor area rates show the best rates; it shows the more efficiency of Marsa Alam airport, Al Alamein international passengers per floor area rates shows the worst rates with respect to the studied airports.

4.4.2.6 Domestic passengers per floor area:

This study shows the rate of total annual domestic flights share of each airport with the respect to the total floor area of the airport along the study duration (from 2005 to 2009), it aims to study the annual domestic flights share rate of case study airports with respect to unit floor area as a percentage rate. Table 4-71 shows rate of efficiency of floor area in airport along the study duration period with respect to number of domestic flights in Egyptian aviation industry.

Table 4-71: Airport domestic passengers per floor area rate[1]

Dom Pass/Area	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	3.62	3.46	4.79	5.62	5.37
Borg El Arab	0.06	0.02	0.02	0.02	0.04
Marsa Matruh	6.28	6.99	5.79	5.78	5.59
Marsa Alam	0.70	0.81	0.76	2.67	4.05
Al Alamein	0.00	0.06	0.05	0.09	0.10

[1] Egyptian Holding Company for Airports and Air Navigation website ,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010), prepared by researcher

Table 4-72 shows annual domestic passengers per unit area share for cases studied airports showed in Table 4-71 by usage ofEquation 4-14, it shows the frequency with respect to "1" as shown Figure 4-68, Figure 4-69, Figure 4-70,Figure 4-71 & Figure 4-72.

Equation 4-14 domestic pass engers share per unit area

$$Domestic\ pax\ share\ rate/unit area = \frac{annual\ domestic\ pax\ airport\ share\ rate}{Area\ of\ airport\ terminal\ building}$$

Table 4-72: Airport domestic passengers share rate / unit area[1]

Passengers	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.78	0.82	0.93	0.93	1.00
Borg El Arab	1.00	0.48	0.29	0.32	0.69
Marsa Matruh	0.81	1.00	0.68	0.58	0.63
Marsa Alam	0.20	0.25	0.20	0.59	1.00
Al Alamein	0.02	0.79	0.48	0.82	1.00

Table 4-73: domestic passengers share per unit area evaluation

Airport	evaluation
Hurghada	0.48
Borg El Arab	0.28
Marsa Matruh	0.42
Marsa Alam	0.56
Al Alamein	0.46

Table 4-70 shows airports flight share rate evaluation points for normalization of Figure 4-63, Figure 4-64, Figure 4-65, Figure 4-66 & Figure 4-67, as shown in table A.9-3; appendix A.9
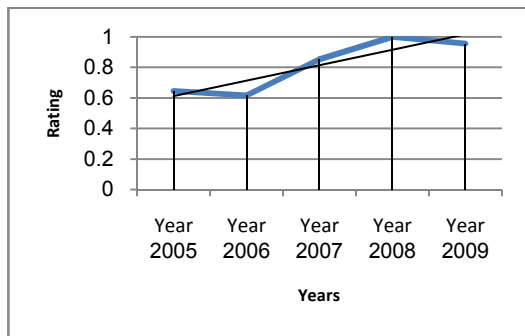
Figure 4-68:Hurghada dom. pax Share rate/ area[2]
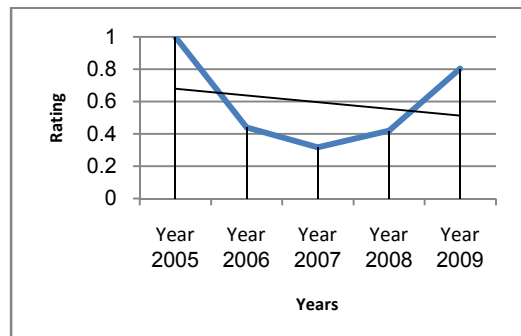
Figure 4-69 Borg elArab dom. pax share rate /area[1]

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[1] prepared by researcher
[2] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)
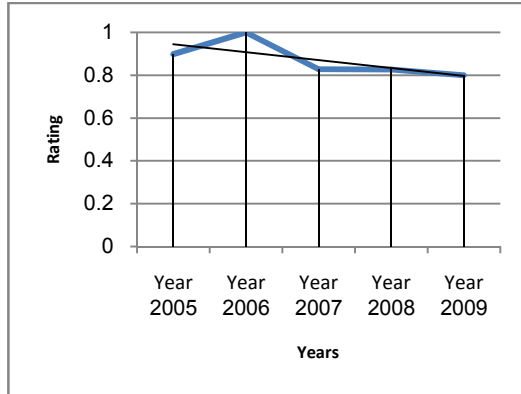
Figure 4-70: Marsa Matruh dom. pax Share rate/ area[1]
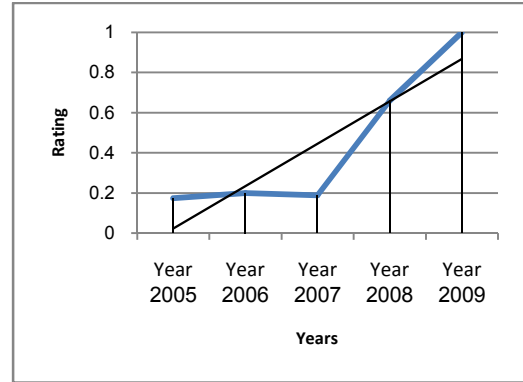
Figure 4-71 Marsa Alam dom. pax share rate /area[1]
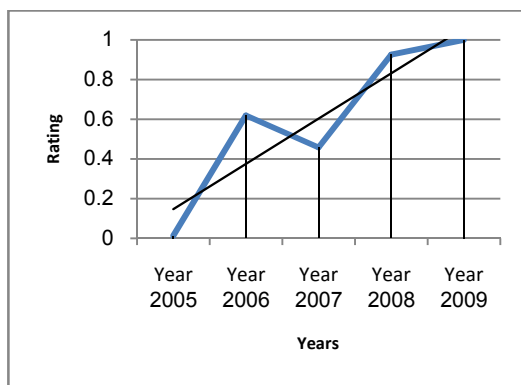
Figure 4-72:Al Alamein dom pax Share rate/ area[1]

Al Alamein & Borg El Arab passengers per floor area rates are considered the lowest rates, while Marsa Matruh passengers per floor area rates are considered the highest rates with respect to the studied airports. Marsa Alam passenger per floor rates shows remarkable increase from 2007, Hurghada passenger's rates shows rise during the study except in 2009 the rate witnessed steep fall.

This implies that Marsa Alam passenger per floor area rates show the best rate of increase; it shows the most efficient performance, Al Alamein & Borg El Arab passengers per floor rates show the worst rates with respect to the studied airports.

4.4.3 Cumulative frequency distribution:

It shows grouping of monthly number of flights/passengers into 7 mutually exclusive classes showing number of observation in each classes through cu-

mulative frequency. It is calculated as cumulative frequency along different frequency ranges; it implies curve of performance of airport monthly flights/passengers rates along the study period (Jan 2005 – June 2010).

4.4.3.1 Flights cumulative frequency distribution:

It shows grouping of monthly number of flights into 7 mutually exclusive classes showing number of observation in each classes through cumulative frequency. It is calculated as cumulative frequency along different frequency ranges as shown in Table 4-74.

Table 4-74: Flights cumulative frequency distribution[1]

Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
range 1	4.55 %	9.09 %	1.52 %	4.55 %	3.03 %
range 2	15.15 %	15.15 %	7.58 %	13.64 %	4.55 %
range 3	27.27 %	30.30 %	10.61 %	25.76 %	4.55 %
range 4	45.45 %	37.88 %	25.76 %	42.42 %	6.06 %
range 5	62.12 %	66.67 %	36.36 %	63.64 %	16.67 %
range 6	84.85 %	92.42 %	50.00 %	87.88 %	48.48 %
range 7	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %

Flights range is divided into 7 equal ranges between maximum monthly flights & minimum monthly flights. Figure 4-73 implies curve of performance of airport monthly flights rates along the study period (Jan 2005 – June 2010); it shows the performance of cases studied flights frequency with respect to 100%.

Table 4-75: flights cumulative frequency evaluation

Airport	evaluation
Hurghada	0.95
Borg El Arab	0.99
Marsa Matruh	0.75
Marsa Alam	0.92
Al Alamein	0.82

Table 4-75 shows airports flight share rate evaluation points for normalization of Figure 4-73, as shown in table A.14-2; appendix A.14

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[1] Egyptian Holding Company for Airports and Air Navigation website ,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010), prepared by researcher
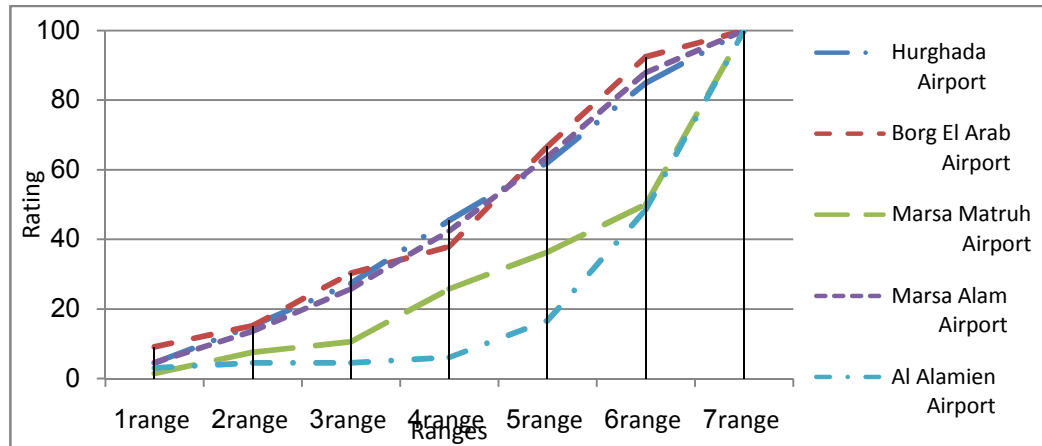
Figure 4-73: Flights Cumulative Frequency distribution [1]

Borg El Arab cumulative frequency distribution shows the best frequency distribution as it reaches the maximum first, while Al Alamein cumulative frequency is considered the worst frequency distribution with respect to the studied airports. Borg El Arab, Hurghada & Marsa Alam cumulative frequency distribution for flights are nearly the same, they have slight differences. There are large gap between Marsa Matruh & Al Alamein frequency rates.

This implies that the performance of Borg El Arab, Hurghada & Marsa Alam airports is considered the best, while Al Alamein airport performance is considered the worst with respect to the studied airport.

4.4.3.2 Passengers cumulative frequency distribution

It shows grouping of monthly number of passengers into 7 mutually exclusive classes showing number of observation in each classes through cumulative frequency. It is calculated as cumulative frequency along different frequency ranges as shown in Table 4-76.

Passengers range is divided into 7 equal ranges between maximum monthly flights & minimum monthly flights. Figure 4-74 implies curve of performance of airport monthly flights rates along the study period (Jan 2005 – June 2010); it shows the performance of cases studied passengers frequency with respect to 100%.

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[1] Egyptian Holding Company for Airports and Air Navigation website ,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010), prepared by researcher

Table 4-76: Cumulative Passengers frequency distribution[1]

Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
range 1	4.55	12.12	1.52	6.06	1.52
range 2	13.64	16.67	3.03	12.12	4.55
range 3	25.76	24.24	7.58	27.27	6.06
range 4	42.42	30.30	12.12	42.42	15.15
range 5	62.12	43.94	27.27	60.61	27.27
range 6	83.33	86.36	37.88	86.36	48.48
range 7	100.00	100.00	100.00	100.00	100.00

Figure 4-74: Cumulative passengers frequency distribution[1]

Table 4-77: cumulative passengers frequency evaluation

Airport	evaluation
Hurghada	0.93
Borg El Arab	0.96
Marsa Matruh	0.70
Marsa Alam	0.93
Al Alamein	0.71

Table 4-77 shows airports flight share rate evaluation points for normalization of Figure 4-74, as shown in table A.18-2; appendix A.18

Borg El Arab Airport cumulative passengers frequency distribution shows best frequency distribution as it reaches the maximum first, while Marsa Matruh cumulative frequency is considered the worst frequency distribution with respect to the studied airports. Marsa Alam & Hurghada cumulative frequency distribu-

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[1] Egyptian Holding Company for Airports and Air Navigation website ,http://www.ehcaan.com/about_comp.aspx, Accessing (12/4/2010), prepared by researcher

tion is almost similar; it has slight difference in advance for Marsa Alam. Al Alamein & Marsa Matruh frequency distribution is almost similar; it has slight differences in advance for Al Alamein airport.

This implies that Borg El Arab airport performance is considered the best for cumulative passengers frequency distribution, while Marsa Matruh airport performance is considered the worst with respect to the studied airports.

4.4.4 Frequency distribution bar chart:

It shows number of flights/passengers achieves different ranges of distribution frequency. It also shows the mean (average value of different values), median (midpoint of values after they are ordered from smallest to largest or largest to smallest) & mode (the value of observation that appears most). It implies the distribution range of values and allocation of mean, median & mode along the graph & illustrating distribution of values along the ranges as follows:

1. Mean:

It is the sum of all monthly flight/passenger values divided by the number of monthly flight/passenger values

2. Median:

It is the midpoint of monthly flight/passenger values after they have been ordered from the smallest to the largest or from larges to smallest.

3. Mode:

It is the value of the observation that appears most frequently.

4.4.4.1 Flight frequency distribution bar chart:

It shows number of flights/passengers achieves different ranges of distribution frequency. It also shows the mean, median & mode as shown in Figure 4-75, Figure 4-76, Figure 4-77, Figure 4-78, Figure 4-79.

Table 4-78: Flight frequency distribution [1]

Hurghada Airport Frequency Distribution		Borg El Arab Airport Frequency Distribution		Marsa Matruh Airport Frequency Distribution	
No. Flights / Month	Frequency	No. Flights / Month	Frequency	Flights Range	Frequency
R (5210-4800)	3	R (600-514)	6	R (164-144)	1
R (4800-4390)	7	R (514-428)	4	R (144-124)	4
R (4390-3980)	8	R (428-342)	10	R (124-104)	2
R (3980-3570)	12	R (342-256)	5	R (104-84)	10
R (3570-3160)	11	R (256-170)	19	R (84-64)	7
R (3160-2750)	15	R (170-84)	17	R (64-44)	9
R (2750-2340)	10	R (84 - 0)	5	R (44-24)	33
Mean	3,557	Mean	253	Mean	59
Mode	2,955	Mode	213	Mode	34
Median	3,410	Median	198	Median	42

Marsa Alam Airport Frequency Distribution		Al Alamein Airport Frequency Distribution	
No. Flights / Month	Frequency	No. Flights / Month	Frequency
R (870-774)	3	R (175-150)	2
R (774-678)	6	R (150-125)	1
R (678-582)	8	R (125-100)	0
R (582-486)	11	R (100-75)	1
R (482-390)	14	R (75-50)	7
R (390-294)	16	R (50-25)	21
R (294-198)	8	R (25-0)	34
Mean	469	Mean	31
Mode	342	Mode	13
Median	433	Median	20

Table 4-79: flight frequency distribution evaluation

Airport	evaluation
Hurghada	0.52
Borg El Arab	0.61
Marsa Matruh	-0.27
Marsa Alam	0.51
Al Alamein	-0.63

Table 4-79 shows airports flight share rate evaluation points for normalization of Figure 4-75, Figure 4-76, Figure 4-77, Figure 4-78, Figure 4-79, as shown in table A.21-2; appendix A.21

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[1] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010), prepared by researcher.
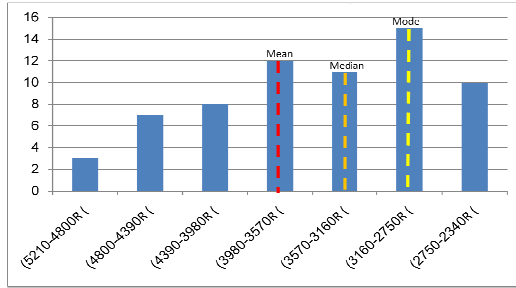
Figure 4-75: Hurghada flight freq. dis.[1]
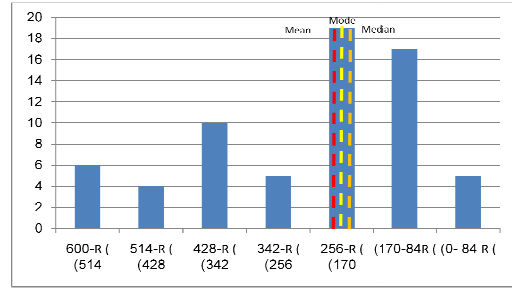
Figure 4-76: Borg el Arab flight freq. dis.[1]
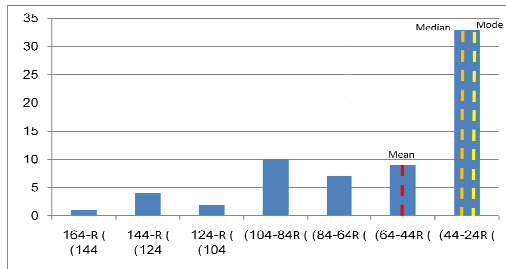
Figure 4-77:Marsa Matruh flight freq. dis.[1]
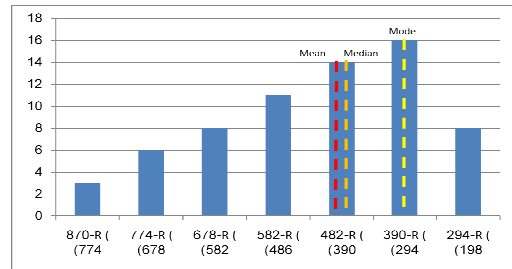
Figure 4-78: Marsa Alam flight freq. dis. [1]
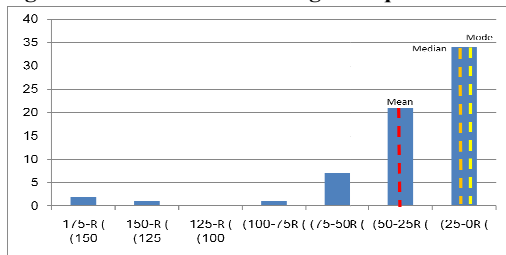
Figure 4-79: Al Alamein flight freq. dis.[1]

4.4.4.2 Passengers frequency distribution bar chart:

It shows number of flights/passengers achieves different ranges of distribution frequency. It also shows the mean, median & mode as shown in Figure 4-80, Figure 4-81, Figure 4-82, Figure 4-83, Figure 4-84 & Table 4-80.

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[1] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010), prepared by researcher.

Table 4-80: Passengers frequency distribution bar chart[1]

Hurghada Airport		Borg El Arab Airport		Marsa Matruh Airport	
No. pax / Month	Frequency	No. pax / Month	Frequency	No. pax / Month	Frequency
R (760K-696K)	3	R (59K-50K)	8	R (19K-16K)	1
R (696K-632K)	6	R (50K-42K)	3	R (16K-13K)	1
R (632K-568K)	8	R (42K-33K)	5	R (13K-11K)	3
R (568K-504K)	11	R (33K-25K)	4	R (11K-8K)	3
R (504K-440K)	13	R (25K-16K)	9	R (8K-6K)	10
R (440K-376K)	14	R (16K-8K)	28	R (6K-3K)	7
R (376K-312K)	11	R (8K - 0)	9	R (3K-940)	41
Mean	493,365	Mean	22,171	Mean	4,067
Mode	408,000	Mode	12,675	Mode	2,230
Median	489,298	Median	14,833	Median	1,937

Marsa Alam Airport		Al Alamein Airport	
No. pax / Month	Frequency	No. pax / Month	Frequency
R (115K-102K)	4	R (9K-8K)	1
R (102K-88K)	4	R (8K-6K)	2
R (88K-74K)	10	R (6K-5K)	1
R (74K-60K)	10	R (5K-4K)	6
R (60K-46K)	12	R (4K-2K)	8
R (46K-32K)	17	R (2K-1K)	14
R (32K-19K)	9	R (1K-0)	34
Mean	58,674	Mean	1,931
Mode	39,775	Mode	685
Median	55,549	Median	1,199

Table 4-81: passengers frequency distribution evaluation

Airport	evaluation
Hurghada	0.50
Borg El Arab	0.40
Marsa Matruh	-1.09
Marsa Alam	0.67
Al Alamein	-0.92

Table 4-81 shows airports flight share rate evaluation points for normalization of Figure 4-80, Figure 4-81, Figure 4-82, Figure 4-83, Figure 4-84, as shown in table A.22-2; appendix A.22

[1] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010), prepared by researcher.
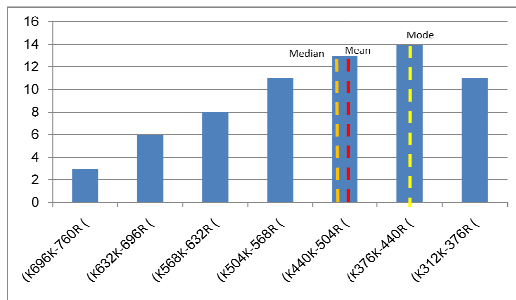
Figure 4-80: Hurghada pass. freq. dis.[1]
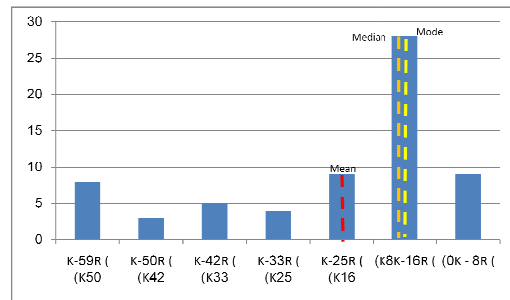
Figure 4-81: Borg el Arab **pass. freq. dis.**[1]
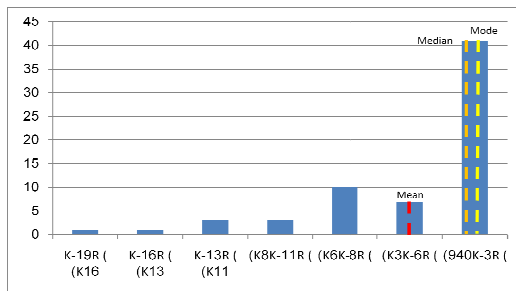
Figure 4-82:Marsa Matruh pass. freq. dis.[1]
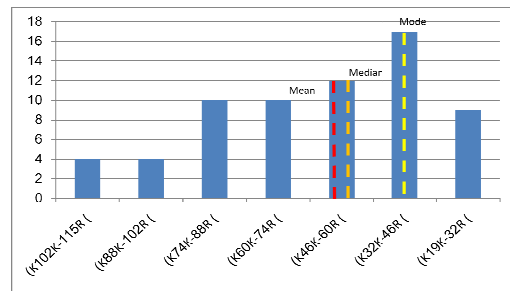
Figure 4-83: Marsa Alam pass. freq. dis. [1]
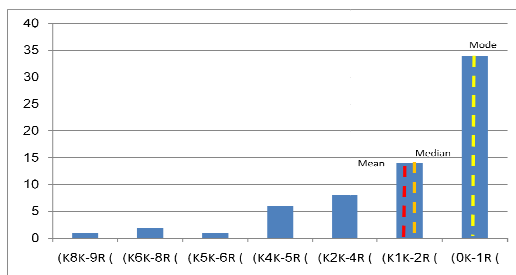
Figure 4-84: Al Alamein pass. freq. dis.[1]

Marsa Alam & Hurghada flights frequency distribution shows regular distribution for positive skewed type of distribution; this implies on the more efficient of such airports than others. Borg El Arab airport shows vacillation distribution for flights frequency, while Marsa Matruh & Al Alamein shows irregular distribution for frequencies that are concentrated in the large frequency rather than other frequencies.

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[1] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010)

4.4.5 Mean monthly passengers per floor area:

It shows rate of participation of mean passengers along different months (Jan 2005 – June 2010) with respect to month time and floor area. It is calculated as monthly mean passengers per unit floor area. It implies efficiency of terminal building floor area per month for different airports.
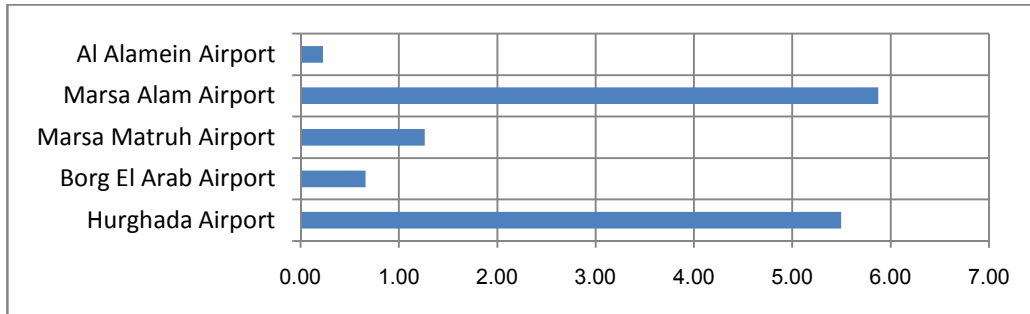
Figure 4-85: Mean monthly passengers per floor area[1]

Marsa Alam airport shows largest mean monthly passengers per floor area while Al Alamein airport shows the lowest mean monthly passengers per floor area. Hurghada airport mean monthly passengers per floor area are almost near that of Marsa Alam airport, although there is a large gap between them in construction and total floor area.

Table 4-82: mean monthly passengers per unit area

Airport	evaluation
Hurghada	0.68
Borg El Arab	0.90
Marsa Matruh	0.57
Marsa Alam	0.74
Al Alamein	0.61

Table 4-81 shows airports flight share rate evaluation points for normalization of Figure 4-85, as shown in table A.23-2; appendix A.23

This implies that Marsa Alam is considered the most efficient airport; it shows the maximum monthly mean passengers per floor area, while Al Alamien airport is considered the least efficient with respect to the airports studied.

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[1] Egyptian Holding Company for Airports and Air Navigation statics,
http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010), prepared by the researched.

4.4.6 Aiport revenue analysis:

It is considered one of the indicators for airport efficiency performance during the operation process of the airport. The researcher faced a lot of difficulties to achieve the data concerning the revenues of governmental airports; passenger rates is considered an indicator of airport revenues by assuming international/ domestic passengers rates to indicate the revenues of airport. Other aspects of airport revenues such as (commercial services, airlines facilities revenues, cargo services, etc...).

Assume that: Revenue / international passenger = 5000 LE/ intl. Pass.
Revenue / domestic passenger = 1000 LE/ dom. Pass.

Table 4-83: Annual airport international passengers[1]

Airport	2005	2006	2007	2008	2009
Hurghada	4,198,056	4,520,977	5,513,855	6,235,120	6,244,651
Borg El Arab	117,878	229,393	233,162	186,804	369,631
Marsa Matruh	0	18,584	30,984	23,272	53,090
Marsa Alam	428,255	492,078	635,223	793,207	898,404
Al Alamein	214	17,179	28,397	38,415	30,213

Table 4-84: Annual airport domestic passengers[1]

Airport	2005	2006	2007	2008	2009
Hurghada	325,966	311,553	431,399	505,897	483,640
Borg El Arab	1,895	832	600	794	1,523
Marsa Matruh	20,661	23,008	19,035	19,022	18,389
Marsa Alam	7,045	8,077	7,584	26,678	40,454
Al Alamein	12	544	403	813	879

Table 4-83 shows annual airport international passengers while Table 4-84 shows annual airport domestic passengers along the study period (2005 – 2009); by assuming that revenue rate of international passenger is 5000 LE/ intl. Pass & revenue rate of domestic passengers is 1000 LE/ dom. Pass.; We can use Equation 4-15 to calculate annual airport revenues as shown in Table 4-85.

Equation 4-15 airport annual revenues

$$Annual\ Airport\ revenues$$
$$= annual\ intl\ passenger \times Intl\ revenue\ rate$$
$$+ annual\ domestic\ passrengers \times domestic\ revenue\ rate$$

[1] Egyptian Holding Company for Airports and Air Navigation statics, http://www.ehcaan.com/statistics.aspx Accessing (12/4/2010), prepared by the researched

Table 4-85: Airport revenues[1]

Airport	2005	2006	2007	2008	2009
Hurghada	21,316,246,000	22,916,438,000	28,000,674,000	31,681,497,000	31,706,895,000
Borg El Arab	591,285,000	1,147,797,000	1,166,410,000	934,814,000	1,849,678,000
Marsa Matruh	20,661,000	115,928,000	173,955,000	135,382,000	283,839,000
Marsa Alam	2,148,320,000	2,468,467,000	3,183,699,000	3,992,713,000	4,532,474,000
Al Alamein	1,082,000	86,439,000	142,388,000	192,888,000	151,944,000

Table 4-86 shows annual airport revenues frequency share for cases studied airports showed in Table 4-85. It shows the frequency with respect to "1" as shown in Figure 4-86.

Table 4-86: Airport revenues rate [1]

Airport	2005	2006	2007	2008	2009
Hurghada	0.67	0.72	0.88	1.00	1.00
Borg El Arab	0.32	0.62	0.63	0.51	1.00
Marsa Matruh	0.07	0.41	0.61	0.48	1.00
Marsa Alam	0.47	0.54	0.70	0.88	1.00
Al Alamein	0.01	0.45	0.74	1.00	0.79

Table 4-87: airport annual revenues evaluation

Airport	evaluation
Hurghada	0.72
Borg El Arab	0.50
Marsa Matruh	0.40
Marsa Alam	0.76
Al Alamein	0.47

Table 4-87 shows airports flight share rate evaluation points for normalization of Figure 4-86, as shown in table A.24-2; appendix A.24

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[1] prepared by researcher
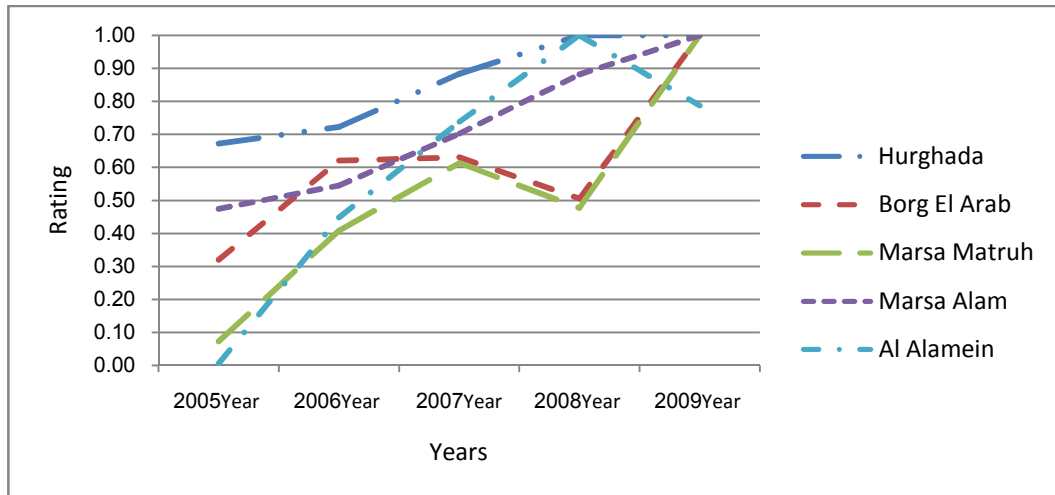
Figure 4-86: Airport Revenues [1]

Marsa Alam airport shows the highest revenues rate of increase with respect to other airports, it shows steady increase in revenues along the study period; it reflects the development of airport facilities & accompany of airport to world class specification & standards.

Al Alamein airport shows least revenues rate of development in all airports due to the lack of different aspects in airport facilities & weakness of surrounding area that supports the airport.

Hurghada, Al Alamien & Marsa Matruh airports revenues lies in between Marsa Alam airport & Al Alamein airport, it varies gradually with respect to accomplishment of airports to world standard in two aspects; design & operation aspects.

4.5 Airport Evaluation rates:

It shows the evaluation rates of the studied points through the thesis. It shows the evaluation of BOT airports comparison illustrated in a comparison for main issues for BOT airports evaluation of points discussed. It also showed the evaluation of Architectural airports comparison illustrated in a comparison for main architectural aspects of BOT and governmental airports. It also showed the

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[1] Prepared by researcher

evaluation of statistical comparison for operational aspects of BOT and governmental airports.

4.5.1 BOT airport Comparison:

It studies the evaluation comparison of BOT airport projects constructed in Egypt, taking in consideration evaluation of airports performance with respect to feasibility studies for cases studied planned at the early stages of the projects as shown in Table 4-88.

Table 4-88: BOT airport comparison evaluation

Comparison points	Marsa Alam airport	Al Alamien
Development schedule	Marsa Alam airport succeeded to cope with planned development expectations schedule at early studies of the project.	Al Alamein airport failed to cope with planned development expectations schedule at early studies of the project.
Airport Cost	Planned cost 300 million LE Performed cost 320 million LE Margin tolerance 20/300	Planned cost 120 million LE Performed cost 170 million LE Margin tolerance 50/120
Construction time schedule	4 months in advance to planned schedule	4 years behind planned schedule
Finance system	40 % self finance 60% loans	40 % self finance 60% loans
Related projects	Related projects performed are constructed 100% as planned in early studies of airport	Related projects preformed are constructed 25% as planned in early studies of airport

Marsa Alam airport succeeded to achieve the expected planned development of airport concerning time frame & airport construction cost, it also succeeded to construct related projects as planned in early studies of airport.

Al Alamein airport failed to achieve the expected planned development of airport concerning time frame & airport construction cost, it also failed to construct related projects as planned in early studies of airport.

BOT airports performance varies with respect to the private sector financial ability to achieve the planned studies for the airport; as financial status of private sector entity operating the airport is considered one of the most important issues for success of airport.

4.5.2 Architectural Airport Comparison

It studies the evaluation comparison of architectural design aspects of cases studied, taking in consideration evaluation of airports design performance of airport facilities, airport extension & airport facilities performance as shown in Table 4-89.

Table 4-89: architectural airport comparison evaluation

	Dynamic Extension (time)	Dynamic Extension (cost)	Airport design	Airport city
Hurghada	Airport extension performed was behind schedule estimated due to lack of financial recourses	Extension performed was almost double cost estimated at early studies of airport	Airport facilities satisfy the hospitality requirement of world hospitality standard user, it didn't achieve airport world design standards	Airport achieved airport city concept as it is considered one of oldest tourism attraction centers along red sea in Egypt.
Borg El Arab	Airport extension performed was behind schedule estimated due to lack of financial recourses caused to stop airport during ext.	N/A	Airport facilities is yet failed to satisfy the world hospitality standard user requirement.	It succeeded to achieve concept of airport city by being center of large industrial city & being the future extension of Alexandria.
Marsa Matruh	It hadn't witnessed any extensions due to low rate of airport; Marsa Matruh as is not relying on aviation as domestic fees is so high.	N/A	Airport facilities is yet failed to satisfy the world hospitality standard user requirement.	It failed due to low operational rates of airport as result of high domestic fees; as Marsa Matruh based on domestic tourism
Marsa Alam	Airport extension performed was ahead planned extension of early airport studies, due to high operational rates	Performed cost is 6% more than planned cost	Airport facilities succeeded to reach world hospitality standard requirements through services & activities provided	Airport succeeded to achieve concept of airport city through different projects related to airport
Al Alamein	Airport extension performed was behind estimated schedule due to late start of construction phase & low rates of operational airport rates	Performed cost is 40% more than planned cost	Airport facilities failed to satisfy world hospitality standard due to late execution of airport extension planned	Airport failed to achieve concept of airport city as planned due to low rate of airport performance; that led to late execution of airport

4.5.3 Statistical Airport Comparison

Table 4-90 shows the summary of airport evaluation rates for statistical analysis as shown in evaluation rating system applied in the cases studied analysis.

Table 4-90: Airports evaluation rates

Points of Evaluation	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
Airport Share Flights Percentage	0.46	0.40	0.45	0.55	0.49
Airport Share Passengers	0.53	0.46	0.47	0.54	0.53
International Flights	0.49	0.40	0.40	0.47	0.48
Domestic Flights	0.43	0.12	0.20	0.40	0.49
International Flights / Floor Area	0.67	0.48	0.31	0.56	0.39
Domestic Flights / Floor Area	0.44	0.25	0.38	0.40	0.43
Flights / Floor Area	0.65	0.11	0.63	0.53	0.39
International Passengers	0.50	0.44	0.47	0.54	0.53
Domestic Passengers	0.46	0.21	0.30	0.55	0.51
International Passengers / Floor Area	0.72	0.51	0.37	0.60	0.38
Domestic Passengers / Floor Area	0.48	0.28	0.42	0.56	0.46
Passengers / Floor Area	0.72	0.51	0.51	0.67	0.47
Monthly Flights Cumulative Frequency Distribution	0.95	0.99	0.75	0.92	0.82
Monthly Flights Relative Frequency Distribution	0.51	0.61	-0.27	0.51	-0.63
Mean Monthly Flights	0.52	0.75	0.82	0.64	0.88
Monthly Passenger Cumulative Frequency Distribution	0.93	0.96	0.70	0.93	0.71
Monthly Passenger Relative Frequency Distribution	0.62	0.40	-1.09	0.66	-0.92
Mean Monthly Passengers	0.54	0.76	0.86	0.57	0.76
Flight Frequency Distribution	0.52	0.61	-0.27	0.51	-0.63
Pass. Frequency Distribution	0.50	0.40	-1.09	0.67	-0.92
Passenger / month . M2	0.68	0.90	0.57	0.74	0.61
Airport Revenues	0.72	0.50	0.40	0.76	0.47

Table 4-91 shows the weights of each item in the evaluation of airport statistical analysis for the operation process, these weights are estimated as a result of literature study. The different aspects studied has not the same weights in evaluation of the operation process

Table 4-91: Airport Statistical weigths

Airports Points of Evaluation	Hurghada
Airport Share Flights Percentage	1.82
Airport Share Passengers	2.27
International Flights	3.18
Domestic Flights	3.18
International Flights / Floor Area	5.00
Domestic Flights / Floor Area	5.00
Flights / Floor Area	3.64
International Passengers	5.91
Domestic Passengers	5.91
International Passengers / Floor Area	5.00
Domestic Passengers / Floor Area	5.45
Passengers / Floor Area	4.09
Monthly Flights Cumulative Frequency Distribution	3.64
Monthly Flights Relative Frequency Distribution	3.18
Mean Monthly Flights	1.82
Monthly Passenger Cumulative Frequency Distribution	6.36
Monthly Passenger Relative Frequency Distribution	5.45
Mean Monthly Passengers	3.64
Flight Frequency Distribution	5.45
Pass. Frequency Distribution	5.00
Passenger / month . m^2	5.45
Airport Revenues	9.55
TOTAL EVALUATION	**100**

Table 4-92: Airport statistical evaluation points

Points of Evaluation	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
Airport Share Flights Percentage	0.83	0.73	0.82	1.00	0.88
Airport Share Passengers	1.19	1.06	1.06	1.23	1.21
International Flights	1.56	1.27	1.27	1.50	1.54
Domestic Flights	1.38	0.38	0.65	1.28	1.57
International Flights / Floor Area	3.35	2.41	1.57	2.79	1.96
Domestic Flights / Floor Area	2.21	1.26	1.88	2.01	2.16
Flights / Floor Area	2.38	0.40	2.29	1.93	1.42
International Passengers	2.97	2.58	2.75	3.19	3.15
Domestic Passengers	2.69	1.25	1.77	3.23	3.01
International Passengers / Floor Area	3.61	2.54	1.84	2.99	1.89
Domestic Passengers / Floor Area	2.63	1.51	2.28	3.05	2.50
Passengers / Floor Area	2.95	2.07	2.11	2.74	1.90
Monthly Flights Cumulative Frequency Distribution	3.45	3.60	2.73	3.33	2.99
Monthly Flights Relative Frequency Distribution	1.62	1.95	-0.87	1.63	-2.01
Mean Monthly Flights	0.95	1.36	1.49	1.15	1.60
Monthly Passenger Cumulative Frequency Distribution	5.95	6.08	4.45	5.92	4.53
Monthly Passenger Relative Frequency Distribution	3.37	2.19	-5.93	3.58	-5.04
Mean Monthly Passengers	1.98	2.76	3.14	2.05	2.75
Flight Frequency Distribution	2.85	3.34	-1.49	2.79	-3.45
Pass. Frequency Distribution	2.52	2.00	-5.44	3.37	-4.62
Passenger / month . M2	3.74	4.90	3.10	4.03	3.31
Airport Revenues	6.87	4.81	3.82	7.21	4.45
TOTAL EVALUATION	61.04	50.45	25.29	62.03	27.72

Table 4-92 shows that Marsa Alam & Hurghada airports scores the highest evaluation rates with slight difference between two airports while Marsa Matruh & Al Alamein airports scores least evaluation rates as shown in Figure 4-87.
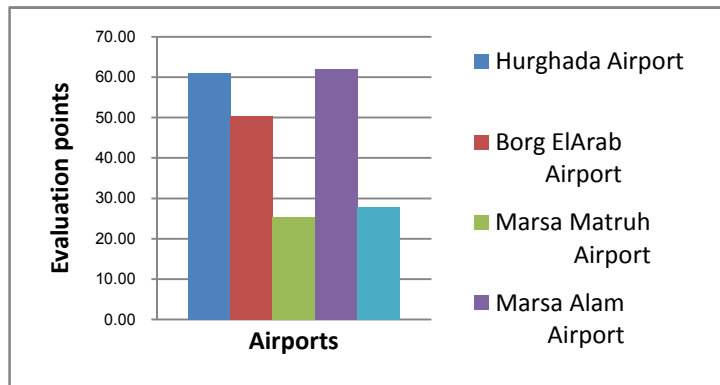
Figure 4-87: Statistical analysis

Chapter 5
Conclusion and Recommendation

5. Chapter 5: Conclusion and Recommendation

5.1 Theoretical Conclusion

5.1.1 Infrastructure projects

- By the early 1980's, large numbers of developing countries were having trouble financing their foreign debt; All this accompanied by several factors that affected the world economy at that time; the International Funding Monetary stated that for 1981 the total balance of payments deficit of the non-oil-producing developing countries will rise to $ 97 million, from $ 86 million in 1980.

- In 1984, many of the world's developing nations, particularly those in Latin America, continued to grapple with problem of repayment of staggering foreign debts; due to rise of oil prices all over the world, strong relation between dollar and world economy, high increase of inflation rates.[1]

- The developing countries need more financing for infrastructure projects that cannot be provided by governmental finances. The cost of maintaining existing infrastructure and implementing necessary extensions for its coverage is estimated by OECD[2] at 7 % of developing GNP, equivalent to about 600 billion US Dollar per year. However, public spending on infrastructure in developing countries is around 3 % only.

- Governments were lacking to financial supports provided by international institutions that used to provide financial loans to governments.[3]

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[1] International Banking and Finance Article for year 1987, Encarta Encyclopedia, 2009
[2] Investment for African development: making it happen. Background information in support of session 5 of the Roundtable: Encouraging Public Private Partnership in the Utilities sector: The Role of Development, 25-27 May 2005, NEPAD/OECD Initiative.
[3] البنك الدولى – تقرير عن التنمية فى العالم: البنية الأساسية من أجل التنمية – ترجمة الأهرام للترجمة و النشر، مطابع الأهرام التجارية، القاهرة، 1994.

- Privatization of infrastructure systems is classified into different phases with respect to role of government & with respect to type of agreement.

- Privatization system according to role of government: Displacement, Divestment & Delegation

- Privatization systems according to type of agreement: Greenfield, Management, Concession, Lease & Short term service

- BOT system (Greenfield) is considered an alternative system in financing and construction of infrastructure projects instead of ordinary system applied in most countries that drains the foreign government loans or general budget resources, while in BOT system government could keep control over project transferred to it after the end of contract period.

5.1.2 Airport privatization

- Airport privatization is no longer a novelty, it is a global trend followed by most worldwide countries. Privatization of airports has been an ongoing and accelerating global trend over the past two decades.

- Airport privatization (BOT Airports) in Egypt has main objectives concerning the two main parties of this industry; government and private sector.

- Government objectives towards construction of BOT Airports in Egypt; Achievement of integrated development for promising cities through construction of airport as a development attractive potential, Reduction of financial burdens, Transfer of latest technology through private sector, The need for new facilities, Expansion and dependence on private sector in growth & Development of local finical markets.

- Private sector objectives towards construction of BOT Airports in Egypt; Increase profit of private sector, as the airport is considered a quasi-monopolies project, Satisfaction of users towards services provided,

Risk allocation for different stages of the project, Airport is a good investment return project, & Diversity of investment opportunities.

5.1.3 Airport BOT system

In contrast to previous, airport industry needs to focus on costs, revenues, traffic, risks, operation and management methodology.

5.1.3.1 Design Stage

- Airport is considered the first place for the tourist to see in the country, airport facilities must match international standards.

- Airport is considered a part of integrated system that helps in development of cities and countries. This system consists of airport facility, hotel facility, Entertainment and economical facilities; they must be implemented all together (airport city concept).

- Private sector participation in airport industry increased the orientation of profits and economic efficiency. it also enhances criteria excellence to focus on cost effectiveness, value for money, profitability and efficiency in both technical and economic aspects.

5.1.3.2 Construction stage

- Private sector is keener towards commitment to time schedule and estimated cost for airport than government's commitment.

- Private sector is more able to apply latest technology in airport projects, as it is easier for him to import latest technology from developed countries.

5.1.3.3 Operation& maintenance

- Operator must seek to apply maintenance upon airport facilities without direct influence on airport operation rates. Airport as an economic generator shouldn't be affected by any delay or stoppage in rates.

- Operator must prepare maintenance plan for airport facilities under supervision of government; to guarantee application of such plan; to bene-

fit from latest technology used by private investor to be applied in governmental operated airport and after transfer.

5.2 Case Study Conclusion

Airport Evaluation criteria was established in 3 different aspects; BOT performance, architectural design evaluation & airport operational evaluation, they can be concluded as follows:

5.2.1 Comparison of BOT airports evaluation:

It studies the evaluation comparison of BOT airport projects constructed in Egypt, taking in consideration evaluation of airports performance with respect to feasibility studies for cases studied planned at the early stages of the projects.

Marsa Alam airport succeeded to achieve forecast cost & time due to well study of the project during the construction phase, while it succeeded to achieve operational forecast & exceed in different aspects due to the commitment to airport city concept & completion of related project planned, that helped a lot in the development of the airport.

Al Alamein airport failed to achieve forecast & time due to lack of recourses and planning in construction phase. It failed to achieve operational forecast, it was constructed 4 years behind the planned schedule. It faced lack of attraction nodes for airport so it faced low rates of airports with respect to planned rates in early study of airport.

5.2.2 Comparison of architectural airport evaluation

It studies the evaluation comparison of architectural design aspects of cases studied, taking in consideration evaluation of airports design performance of airport facilities, airport extension & airport facilities performance.

Marsa Alam airport is the best airports concerning architectural aspects with respect to other airports, it applied airport city concept in airport facilities, while Al Alamein airport failed to apply this concept as planned in early studies. Hurghada & Borg EL Arab airports are working on application of airport city, but they act slowly towards application of concept due to low financial resources of airport. While Marsa Matruh airport failed to achieve this concept due to low rate of airport & dependence upon domestic aviation.

5.2.3 Statistical comparison of airport operational:

It studies the evaluation of statistical comparison of operational aspects of cases studied, taking in consideration airport operational performance of airport aspects such as flights rates, passengers rates, airport floor rates, airport revenues, etc…
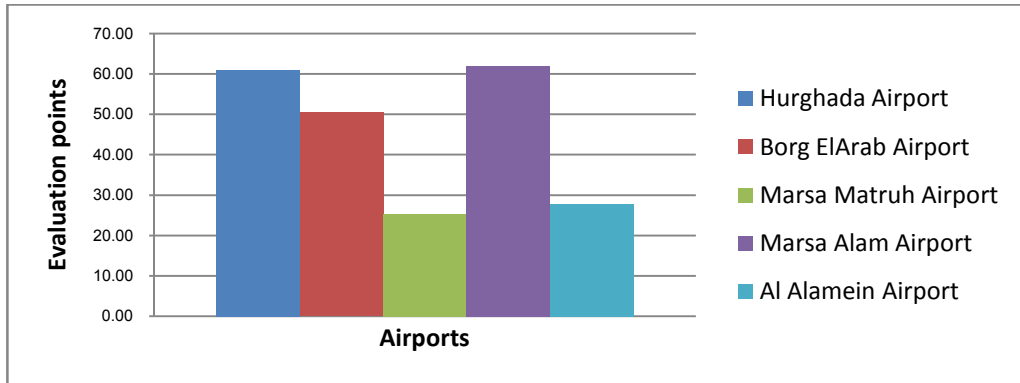
BOT Airports in Egypt are not necessarily more efficient than governmental operated airports.

- Marsa Alam Airport is the most efficient airport due to:
  o Capability of investor to construct the airport and service facilities on schedule.
  o Presence of service facilities around the airport that increased the attraction forces of investors in the area.
  o Governmental care to encourage international tourism to invest in Marsa Alam city.
  o Following Latest technology in Airport Operation and maintenance.
  o Presence of entertainment facilities in the airport for passengers.

- Hurghada Airport Placed second due to:
  o Lack of Maintenance planning techniques that caused to decrease the airport operation rates.
  o Lack of entertainment facilities in the airport.

- Borg el Arab Airport placed the third due to:

- o Lack of Maintenance planning techniques that caused to Airport stoppage for four months.
- o Lack of entertainment facilities in the airport.
- o Borg El Arab city have not work with full capacity, it will be a substitute for Alexandria Airport in 2011.
- o Borg El Arab city is an industrial city rather than touristic

- Marsa Matruh Airport Placed Fourth due to:
   - o Lack of Maintenance planning techniques that caused to Airport stoppage for four months.
   - o Lack of entertainment facilities in the airport.
   - o Marsa Matruh depends on local tourism that can't afford airport cost in transportation.

- Al Alamein Airport placed the last, it witnessed lack of efficient with respect to estimated rates in the feasibility study due to:
   - o Delay in land acquisition to Project Company.
   - o Problems in construction of hotels nearby that serve the airport due location near Dabaa Nuclear plant.
   - o Tourism in Al Alamein City and North Coast depends mainly on local seasonal tourism.

Marsa Alam Airport is the most efficient airport, while Marsa Matruh Airport is the least efficient. This shows that not all private operated airports are successful; there are some factors that need to be achieved to guarantee the success of airports. It also shows that successful privately operated airports are more successful from governmental operated airports.

BOT system is considered as more efficient for operation of airports in the worldwide airports. Although it is not ultimately the best solution, some governmental airports may have a better performance than BOT airports. Success of BOT system depends on success of the whole system of airport, hotel and commercial facilities.

Airports in BOT systems is more efficient because Private sector is capable to; Provide profitable projects in the airport; Decrease costs of project and increase revenues; Import latest technology to be used in airport to increase effi-

ciency of airport; Reconsider feasibility study of airport periodically to improve efficiency of airport.

5.2.4 Thesis Conclusion:

The thesis concluded that BOT airports in Egypt are not necessary more effective than governmental airports; if they were badly handled they will be worse than any governmental airports.

Private operated airports are more efficient than governmental airports if they are right oriented towards the world standard of airport operational aspects; because private sector have the ability to direct the airport towards profitability & application of latest technology with financial resources can't be afforded by governmental entities.

5.3 Recommendation

- Further studies should be performed concerning financial evaluation of BOT airport in Egypt.
- Further studies should be performed concerning contractual evaluation of BOT airport in Egypt.
- Similar studies to be performed upon different BOT systems in Egypt in order to evaluate such projects
- Benefit from EMAk experience in construction of Marsa Alam Airport.
- Get use of Al Alamein historical potentials and work on development of international tourism in order to improve efficiency of Al Alamein city.
- Improve efficiency of Al Alamein airport by increase investment along north coast in investing of international Tourism.
- Recommendation schedule for main points need to be applied in evaluation of airports or as a checklist for construction of new airports as illustrated in appendix C1.

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Appendix

A.1 Airport flights share rate

Table A.1 - 1			Airport Flights Share		
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Total Flights	228,751	235,370	275,972	323,256	320,697
Hurghada	32,824	33,296	39,992	47,821	46,925
Borg El Arab	1,494	2,452	2,350	1,548	3,544
Marsa Matruh	584	626	638	640	830
Marsa Alam	3,729	4,091	4,871	6,353	7,489
Al Alamein	14	273	344	521	619

Table A 1 - 2			Airport Flights Share Percentage		
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	14.35%	14.15%	14.49%	14.79%	14.63%
Borg El Arab	0.65%	1.04%	0.85%	0.48%	1.11%
Marsa Matruh	0.26%	0.27%	0.23%	0.20%	0.26%
Marsa Alam	1.63%	1.74%	1.77%	1.97%	2.34%
Al Alamein	0.01%	0.12%	0.12%	0.16%	0.19%

Table A 1 - 3			Airport Flights share coefficient		
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.97	0.96	0.98	1.00	0.99
Borg El Arab	0.59	0.94	0.77	0.43	1.00
Marsa Matruh	0.96	1.00	0.87	0.74	0.97
Marsa Alam	0.70	0.74	0.76	0.84	1.00
Al Alamein	0.03	0.60	0.65	0.84	1.00

Table A 1 - 4			Airport Flights Share Evaluation			
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 0.008x + 0.854	0.01	0.04	0.85	0.87	0.46
Borg El Arab	y = 0.030x + 0.654	0.03	0.14	0.65	0.67	0.40
Marsa Matruh	y = -0.022x + 0.978	-0.02	-0.10	0.98	1.00	0.45
Marsa Alam	y = 0.085x + 0.697	0.09	0.39	0.70	0.71	0.55
Al Alamein	y = 0.217x - 0.028	0.22	1.00	-0.03	-0.03	0.49

A.2 Airport International flights

Table A.2 - 1		Airport International flights			
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Egyptian aviation	149,361	156,460	181,138	208,516	212,862
Hurghada	27,807	28,157	33,538	38,601	38,103
Borg El Arab	1,343	2,397	2,293	1,478	3,447
Marsa Matruh	0	158	218	176	411
Marsa Alam	3,362	3,788	4,587	5,685	6,446
Al Alamein	6	164	290	332	418

Table A 2 - 2		Airport International flights Percentage			
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	18.62%	18.00%	18.52%	18.51%	17.90%
Borg El Arab	0.90%	1.53%	1.27%	0.71%	1.62%
Marsa Matruh	0.00%	0.10%	0.12%	0.08%	0.19%
Marsa Alam	2.25%	2.42%	2.53%	2.73%	3.03%
Al Alamein	0.00%	0.10%	0.16%	0.16%	0.20%

Table A 2 - 3		Airport International flights coefficient			
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	1.00	0.97	0.99	0.99	0.96
Borg El Arab	0.56	0.95	0.78	0.44	1.00
Marsa Matruh	0.00	0.52	0.62	0.44	1.00
Marsa Alam	0.74	0.80	0.84	0.90	1.00
Al Alamein	0.02	0.53	0.82	0.81	1.00

Table A 2 - 4	Airport international flights Evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = -0.004x + 0.99	0.00	-0.02	1.00	1.00	0.49
Borg El Arab	y = 0.038x + 0.629	0.04	0.17	0.63	0.63	0.40
Marsa Matruh	y = 0.191x - 0.057	0.19	0.86	-0.06	-0.06	0.40
Marsa Alam	y = 0.061x + 0.671	0.06	0.27	0.67	0.67	0.47
Al Alamein	y = 0.223x - 0.034	0.22	1.00	-0.03	-0.03	0.48

A.3 Airport domestic flights

Table A.3 - 1		Airport domestic flights			
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Egyptian aviation	79,390	78,910	94,834	114,740	107,835
Hurghada	5,017	5,139	6,454	9,220	8,822
Borg El Arab	151	55	57	70	97
Marsa Matruh	584	468	420	464	419
Marsa Alam	299	303	284	668	1,043
Al Alamein	8	109	54	189	201

Table A 3 - 2		Airport domestic flights Percentage			
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	6.32%	6.51%	6.81%	8.04%	8.18%
Borg El Arab	0.19%	0.07%	0.06%	0.06%	0.09%
Marsa Matruh	0.74%	0.59%	0.44%	0.40%	0.39%
Marsa Alam	0.38%	0.38%	0.30%	0.58%	0.97%
Al Alamein	0.01%	0.14%	0.06%	0.16%	0.19%

Table A 3 - 3		Airport domestic flights coefficient			
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.77	0.80	0.83	0.98	1.00
Borg El Arab	1.00	0.37	0.32	0.32	0.47
Marsa Matruh	1.00	0.81	0.60	0.55	0.53
Marsa Alam	0.39	0.40	0.31	0.60	1.00
Al Alamein	0.05	0.74	0.31	0.88	1.00

Table A 3 - 4	Airport domestic flights Evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 0.064x + 0.584	0.06	0.32	0.58	0.55	0.43
Borg El Arab	y = -0.11x + 0.825	-0.11	-0.54	0.83	0.78	0.12
Marsa Matruh	y = -0.12x + 1.057	-0.12	-0.59	1.06	1.00	0.20
Marsa Alam	y = 0.142x + 0.111	0.14	0.70	0.11	0.11	0.40
Al Alamein	y = 0.203x - 0.013	0.20	1.00	-0.01	-0.01	0.49

A.4 Airport passengers share rate

Table A.4 - 1	Airport Passengers Share				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Total passengers	24,682,436	25,801,449	30,609,671	35,769,424	34,834,746
Hurghada	4,524,022	4,832,530	5,945,254	6,741,017	6,728,291
Borg El Arab	119,773	230,225	233,762	187,598	371,154
Marsa Matruh	20,661	41,592	50,019	42,294	71,479
Marsa Alam	435,300	500,155	642,807	819,885	938,858
Al Alamein	226	17,723	28,800	39,228	31,092

Table A 4 - 2	Airport passengers Share Percentage				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	18.33%	18.73%	19.42%	18.85%	19.31%
Borg El Arab	0.49%	0.89%	0.76%	0.52%	1.07%
Marsa Matruh	0.08%	0.16%	0.16%	0.12%	0.21%
Marsa Alam	1.76%	1.94%	2.10%	2.29%	2.70%
Al Alamein	0.00%	0.07%	0.09%	0.11%	0.09%

Table A 4 - 3	Airport passengers share coefficient				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.94	0.96	1.00	0.97	0.99
Borg El Arab	0.46	0.84	0.72	0.49	1.00
Marsa Matruh	0.41	0.79	0.80	0.58	1.00
Marsa Alam	0.65	0.72	0.78	0.85	1.00
Al Alamein	0.01	0.63	0.86	1.00	0.81

Table A 4 - 4	Airport Passengers Share Evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 0.010x + 0.942	0.01	0.05	0.90	1.00	0.53
Borg El Arab	y = 0.074x + 0.477	0.07	0.37	0.50	0.56	0.46
Marsa Matruh	y = 0.097x + 0.420	0.10	0.49	0.40	0.44	0.47
Marsa Alam	y = 0.082x + 0.553	0.08	0.41	0.60	0.67	0.54
Al Alamein	y = 0.198x + 0.065	0.20	1.00	0.06	0.07	0.53

A.5 Airport International Passengers

Table A.5 - 1	Airport international passengers				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Egyptian aviation	19,103,442	20,740,654	24,414,841	28,503,141	28,380,814
Hurghada	4,198,056	4,520,977	5,513,855	6,235,120	6,244,651
Borg El Arab	117,878	229,393	233,162	186,804	369,631
Marsa Matruh	0	18,584	30,984	23,272	53,090
Marsa Alam	428,255	492,078	635,223	793,207	898,404
Al Alamein	214	17,179	28,397	38,415	30,213

Table A 5 - 2	Airport international passengers Percentage				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	21.98%	21.80%	22.58%	21.88%	22.00%
Borg El Arab	0.62%	1.11%	0.96%	0.66%	1.30%
Marsa Matruh	0.00%	0.09%	0.13%	0.08%	0.19%
Marsa Alam	2.24%	2.37%	2.60%	2.78%	3.17%
Al Alamein	0.00%	0.08%	0.12%	0.13%	0.11%

Table A 5 - 3	Airport international passengers coefficient				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.97	0.97	1.00	0.97	0.97
Borg El Arab	0.47	0.85	0.73	0.50	1.00
Marsa Matruh	0.00	0.48	0.68	0.44	1.00
Marsa Alam	0.71	0.75	0.82	0.88	1.00
Al Alamein	0.01	0.61	0.86	1.00	0.79

Table A 5 - 4	Airport international passengers Evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 0.001x + 0.974	0.00	0.01	0.97	1.00	0.50
Borg El Arab	y = 0.070x + 0.5	0.07	0.36	0.50	0.51	0.44
Marsa Matruh	y = 0.195x - 0.068	0.20	1.00	-0.07	-0.07	0.47
Marsa Alam	y = 0.071x + 0.697	0.07	0.36	0.70	0.72	0.54
Al Alamein	y = 0.194x + 0.070	0.19	0.99	0.07	0.07	0.53

A.6 Airport Domestic Passengers

Table A.6 - 1	Airport domestic passengers				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Egyptian aviation	5,578,994	5,060,795	6,194,830	7,266,283	6,453,932
Hurghada	325,966	311,553	431,399	505,897	483,640
Borg El Arab	1,895	832	600	794	1,523
Marsa Matruh	20,661	23,008	19,035	19,022	18,389
Marsa Alam	7,045	8,077	7,584	26,678	40,454
Al Alamein	12	544	403	813	879

Table A 6 - 2	Airport domestic passengers Percentage				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	5.84%	6.16%	6.96%	6.96%	7.49%
Borg El Arab	0.03%	0.02%	0.01%	0.01%	0.02%
Marsa Matruh	0.37%	0.45%	0.31%	0.26%	0.28%
Marsa Alam	0.13%	0.16%	0.12%	0.37%	0.63%
Al Alamein	0.00%	0.01%	0.01%	0.01%	0.01%

Table A 6 - 3	Airport domestic passengers coefficient				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.78	0.82	0.93	0.93	1.00
Borg El Arab	1.00	0.48	0.29	0.32	0.69
Marsa Matruh	0.81	1.00	0.68	0.58	0.63
Marsa Alam	0.20	0.25	0.20	0.59	1.00
Al Alamein	0.02	0.79	0.48	0.82	1.00

Table A 6 - 4	Airport domestic passengers Evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	$y = 0.054x + 0.627$	0.05	0.27	0.63	0.64	0.46
Borg El Arab	$y = -0.077x + 0.789$	-0.08	-0.39	0.79	0.81	0.21
Marsa Matruh	$y = -0.08x + 0.978$	-0.08	-0.40	0.98	1.00	0.30
Marsa Alam	$y = 0.192x + 0.131$	0.19	0.96	0.13	0.13	0.55
Al Alamein	$y = 0.200x + 0.020$	0.20	1.00	0.02	0.02	0.51

A.7 Airport Total flights per airport floor area

Table A.7 - 1	Airport floor area
Flights	Floor area
Hurghada	90,000
Borg El Arab	34,000
Marsa Matruh	3,290
Marsa Alam	10,000
Al Alamein	8,600

Table A 7 - 2	Airport total flights per airport floor area				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.36	0.37	0.44	0.53	0.52
Borg El Arab	0.04	0.07	0.07	0.05	0.10
Marsa Matruh	0.18	0.19	0.19	0.19	0.25
Marsa Alam	0.37	0.41	0.49	0.64	0.75
Al Alamein	0.00	0.03	0.04	0.06	0.07

Table A 7 - 3	Airport total flights per airport floor area coefficient				
Flights5	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.69	0.70	0.84	1.00	0.98
Borg El Arab	0.42	0.69	0.66	0.44	1.00
Marsa Matruh	0.70	0.75	0.77	0.77	1.00
Marsa Alam	0.49	0.55	0.65	0.85	1.00
Al Alamein	0.02	0.44	0.56	0.84	1.00

Table A 7 - 4	Airport total flights per airport floor area Evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	$y = 0.089x + 0.572$	0.09	0.38	0.57	0.93	0.65
Borg El Arab	$y = 0.090x + 0.372$	-0.09	-0.38	0.37	0.60	0.11
Marsa Matruh	$y = 0.061x + 0.616$	0.06	0.26	0.62	1.00	0.63
Marsa Alam	$y = 0.132x + 0.309$	0.13	0.56	0.31	0.50	0.53
Al Alamein	$y = 0.235x - 0.134$	0.24	1.00	-0.13	-0.22	0.39

A.8 Airport International flights per airport floor area

Table A.8 - 1	Airport floor area
Flights	Floor area
Hurghada	90,000
Borg El Arab	34,000
Marsa Matruh	3,290
Marsa Alam	10,000
Al Alamein	8,600

Table A 8 - 2	Airport international flights per airport floor area				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.31	0.31	0.37	0.43	0.42
Borg El Arab	0.04	0.07	0.07	0.04	0.10
Marsa Matruh	0.00	0.05	0.07	0.05	0.12
Marsa Alam	0.34	0.38	0.46	0.57	0.64
Al Alamein	0.00	0.02	0.03	0.04	0.05

Table A 8 - 3	Airport international flights per airport floor area coefficient				
Flights5	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.72	0.73	0.87	1.00	0.99
Borg El Arab	0.39	0.70	0.67	0.43	1.00
Marsa Matruh	0.00	0.38	0.53	0.43	1.00
Marsa Alam	0.52	0.59	0.71	0.88	1.00
Al Alamein	0.01	0.39	0.69	0.79	1.00

Table A 8 - 4	Airport international flights per airport floor area Evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	$y = 0.080x + 0.619$	0.08	0.34	0.62	1.00	0.67
Borg El Arab	$y = 0.095x + 0.349$	0.10	0.40	0.35	0.56	0.48
Marsa Matruh	$y = 0.204x - 0.144$	0.20	0.86	-0.14	-0.23	0.31
Marsa Alam	$y = 0.125x + 0.365$	0.13	0.53	0.37	0.59	0.56
Al Alamein	$y = 0.237x - 0.133$	0.24	1.00	-0.13	-0.21	0.39

A.9 Airport Domestic flights per airport floor area

Table A.9 - 1	Airport floor area
Flights	Floor area
Hurghada	90,000
Borg El Arab	34,000
Marsa Matruh	3,290
Marsa Alam	10,000
Al Alamein	8,600

Table A 9 - 2	Airport domestic flights per airport floor area				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.06	0.06	0.07	0.10	0.10
Borg El Arab	0.00	0.00	0.00	0.00	0.00
Marsa Matruh	0.18	0.14	0.13	0.14	0.13
Marsa Alam	0.03	0.03	0.03	0.07	0.10
Al Alamein	0.00	0.01	0.01	0.02	0.02

Table A 9 - 3	Airport domestic flights per airport floor area coefficient				
Flights5	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.54	0.56	0.70	1.00	0.96
Borg El Arab	1.00	0.36	0.38	0.46	0.64
Marsa Matruh	1.00	0.80	0.72	0.79	0.72
Marsa Alam	0.29	0.29	0.27	0.64	1.00
Al Alamein	0.04	0.54	0.27	0.94	1.00

Table A 9 - 4	Airport domestic flights per airport floor area Evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 0.116x + 0.371	0.12	0.50	0.37	0.38	0.44
Borg El Arab	y = -0.061x + 0.75	-0.06	-0.27	0.75	0.77	0.25
Marsa Matruh	y = -0.057x + 0.97	-0.06	-0.25	0.98	1.00	0.38
Marsa Alam	y = 0.177x + 0.035	0.18	0.77	0.04	0.04	0.40
Al Alamein	y = 0.231x - 0.137	0.23	1.00	-0.13	-0.13	0.43

A.10 Airport total passengers per airport floor area

Table A.10 - 1	Airport floor area
Flights	Floor area
Hurghada	90,000
Borg El Arab	34,000
Marsa Matruh	3,290
Marsa Alam	10,000
Al Alamein	8,600

Table A 10 - 2	Airport total passengers per airport floor area				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	50.27	53.69	66.06	74.90	74.76
Borg El Arab	3.52	6.77	6.88	5.52	10.92
Marsa Matruh	6.28	12.64	15.20	12.86	21.73
Marsa Alam	43.53	50.02	64.28	81.99	93.89
Al Alamein	0.03	2.06	3.35	4.56	3.62

Table A 10 - 3	Airport total passengers per airport floor area coefficient				
Flights5	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.67	0.72	0.88	1.00	1.00
Borg El Arab	0.32	0.62	0.63	0.51	1.00
Marsa Matruh	0.29	0.58	0.70	0.59	1.00
Marsa Alam	0.46	0.53	0.68	0.87	1.00
Al Alamein	0.01	0.45	0.73	1.00	0.79

Table A 10 - 4	Airport total passengers per airport floor area Evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	$y = 0.093x + 0.572$	0.09	0.44	0.57	1.00	0.72
Borg El Arab	$y = 0.124x + 0.243$	0.12	0.58	0.24	0.43	0.51
Marsa Matruh	$y = 0.143x + 0.203$	0.14	0.67	0.20	0.35	0.51
Marsa Alam	$y = 0.141x + 0.386$	0.14	0.67	0.39	0.68	0.67
Al Alamein	$y = 0.212x - 0.039$	0.21	1.00	-0.04	-0.07	0.47

A.11 Airport International passengers per airport floor area

Table A.11 - 1	Airport floor area
Flights	Floor area
Hurghada	90,000
Borg El Arab	34,000
Marsa Matruh	3,290
Marsa Alam	10,000
Al Alamein	8,600

Table A 11 - 2	Airport international passengers per airport floor area				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	46.65	50.23	61.27	69.28	69.39
Borg El Arab	3.47	6.75	6.86	5.49	10.87
Marsa Matruh	0.00	5.65	9.42	7.07	16.14
Marsa Alam	42.83	49.21	63.52	79.32	89.84
Al Alamein	0.02	2.00	3.30	4.47	3.51

Table A 11 - 3	Airport international passengers per airport floor area coefficient				
Flights5	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.67	0.72	0.88	1.00	1.00
Borg El Arab	0.32	0.62	0.63	0.51	1.00
Marsa Matruh	0.00	0.35	0.58	0.44	1.00
Marsa Alam	0.48	0.55	0.71	0.88	1.00
Al Alamein	0.01	0.45	0.74	1.00	0.79

Table A 11 - 4	Airport international passengers per airport floor area Evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	$y = 0.093x + 0.576$	0.09	0.45	0.58	1.00	0.72
Borg El Arab	$y = 0.124x + 0.241$	0.12	0.60	0.24	0.42	0.51
Marsa Matruh	$y = 0.208x - 0.152$	0.21	1.00	-0.15	-0.26	0.37
Marsa Alam	$y = 0.138x + 0.308$	0.14	0.66	0.31	0.53	0.60
Al Alamein	$y = 0.171x - 0.038$	0.17	0.82	-0.04	-0.07	0.38

A.12 Airport Domestic passengers per airport floor area

Table A.12 - 1	Airport floor area
Flights	Floor area
Hurghada	90,000
Borg El Arab	34,000
Marsa Matruh	3,290
Marsa Alam	10,000
Al Alamein	8,600

Table A 12- 2	Airport domestic passengers per airport floor area				
Flights	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	3.62	3.46	4.79	5.62	5.37
Borg El Arab	0.06	0.02	0.02	0.02	0.04
Marsa Matruh	6.28	6.99	5.79	5.78	5.59
Marsa Alam	0.70	0.81	0.76	2.67	4.05
Al Alamein	0.00	0.06	0.05	0.09	0.10

Table A 12 - 3	Airport domestic passengers per airport floor area coefficient				
Flights5	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.64	0.62	0.85	1.00	0.96
Borg El Arab	1.00	0.44	0.32	0.42	0.80
Marsa Matruh	0.90	1.00	0.83	0.83	0.80
Marsa Alam	0.17	0.20	0.19	0.66	1.00
Al Alamein	0.01	0.62	0.46	0.92	1.00

Table A 12 - 4	Airport domestic passengers per airport floor area Evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 0.100x + 0.511	0.10	0.44	0.51	0.52	0.48
Borg El Arab	y = -0.04x + 0.719	-0.04	-0.18	0.72	0.73	0.28
Marsa Matruh	y = -0.037x + 0.98	-0.04	-0.16	0.98	1.00	0.42
Marsa Alam	y = 0.211x + 0.189	0.21	0.93	0.19	0.19	0.56
Al Alamein	y = 0.227x - 0.080	0.23	1.00	-0.08	-0.08	0.46

A.13.1 Hurghada Airport monthly flights frequency rates

	Hurghada						MEAN
	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009	Yr 2010	
January	2,828	2,789	3,106	3,965	3,477	4,184	3,392
February	2,595	2,420	2,771	3,677	3,033	3,815	3,052
March	3,169	2,898	3,509	4,551	3,798	4,668	3,766
April	3,203	3,436	3,838	4,705	4,357	4,993	4,089
May	3,044	2,743	3,153	4,207	3,938	4,740	3,638
June	2,607	2,471	2,727	3,498	3,476	3,877	3,109
July	2,862	2,676	3,134	3,758	3,867	0	3,259
August	2,718	2,827	3,383	4,035	4,227	0	3,438
September	2,413	2,792	3,143	3,810	3,973	0	3,226
October	3,186	3,500	4,354	4,924	5,205	0	4,234
November	2,960	3,317	4,475	4,716	4,720	0	4,038
December	2,626	3,094	4,002	3,698	4,103	0	3,505
Total Flights	34,211	34,963	41,595	49,544	48,174		42,744

	Hurghada Rates				
	Yr 05 -Yr 06	Yr 06 -Yr 07	Yr 07 -Yr 08	Yr 08 -Yr 09	Yr 09 -Yr 10
January	-1.4	11.4	27.7	-12.3	20.3
February	-6.7	14.5	32.7	-17.5	25.8
March	-8.6	21.1	29.7	-16.5	22.9
April	7.3	11.7	22.6	-7.4	14.6
May	-9.9	14.9	33.4	-6.4	20.4
June	-5.2	10.4	28.3	-0.6	11.5
July	-6.5	17.1	19.9	2.9	
August	4.0	19.7	19.3	4.8	
September	15.7	12.6	21.2	4.3	
October	9.9	24.4	13.1	5.7	
November	12.1	34.9	5.4	0.1	
December	17.8	29.3	-7.6	11.0	
Max Value	5,205		5210	Mean	3,557
Min Value	0		2415	Mode	2,955
Range	5,205		743.57143	Median	3,410

Frequency Distribution					
	Flights Range		Frequency	Relative	Cumulative
	Max	Min	# counts		
3	5,210	4,800	3	4.55	4.55
10	4,800	4,390	7	10.61	15.15
18	4,390	3,980	8	12.12	27.27
30	3,980	3,570	12	18.18	45.45
41	3,570	3,160	11	16.67	62.12
56	3,160	2,750	15	22.73	84.85
66	2,750	2,340	10	15.15	100.00

A.13.2 Borg El Arab Airport monthly flights frequency rates

Borg El Arab							MEAN
	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009	Yr 2010	
January	130	186	194	110	418	596	272
February	110	144	166	100	390	491	234
March	118	168	189	106	367	531	247
April	190	154	213	174	0	505	206
May	178	188	252	159	0	378	193
June	158	233	214	129	0	518	209
July	290	369	235	168	0		212
August	280	380	276	256	415		321
September	226	307	396	113	470		302
October	196	354	371	68	521		302
November	158	194	128	210	555		249
December	178	199	188	440	581		317
Total Flights	2,212	2,876	2,822	2,033	3,717	3,019	3,064

Borg El Arab Rates					
	Yr 05 -Yr 06	Yr 06 -Yr 07	Yr 07 -Yr 08	Yr 08 -Yr 09	Yr 09 -Yr 10
January	43.1	4.3	-43.3	280.0	42.6
February	30.9	15.3	-39.8	290.0	25.9
March	42.4	12.5	-43.9	246.2	44.7
April	-18.9	38.3	-18.3	-100.0	#DIV/0!
May	5.6	34.0	-36.9	-100.0	#DIV/0!
June	47.5	-8.2	-39.7	-100.0	#DIV/0!
July	27.2	-36.3	-28.5	-100.0	
August	35.7	-27.4	-7.2	62.1	
September	35.8	29.0	-71.5	315.9	
October	80.6	4.8	-81.7	666.2	
November	22.8	-34.0	64.1	164.3	
December	11.8	-5.5	134.0	32.0	
Max Value	596		596	Mean	253
Min Value	0		0	Mode	213
Range	596		85.142857	Median	198

Frequency Distribution					
	Flights Range		Frequency	Relative	Cumulative
	Max	Min	# counts		
3	600	514	6	9.09	9.09
10	514	428	4	6.06	15.15
18	428	342	10	15.15	30.30
30	342	256	5	7.58	37.88
41	256	170	19	28.79	66.67
56	170	84	17	25.76	92.42
66	84	0	5	7.58	100.00

A.13.3 Marsa Matruh Airport monthly flights frequency rates

Marsa Matruh							MEAN
	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009	Yr 2010	
January	26	36	32	38	36	26	32
February	26	34	26	32	31	24	29
March	28	40	30	40	31	34	34
April	24	36	40	34	52	66	42
May	38	48	64	32	80	118	63
June	100	94	82	60	128	164	105
July	124	90	92	100	140		109
August	62	88	98	96	118		92
September	56	66	66	100	134		84
October	34	52	57	74	94		62
November	34	28	39	48	32		36
December	34	28	36	44	30		34
Total Flights	586	640	662	698	906	432	724

Marsa Matruh Rates						
	Yr 05 -Yr 06	Yr 06 -Yr 07	Yr 07 -Yr 08	Yr 08 -Yr 09	Yr 09 -Yr 10	
January	38.5	-11.1	18.8	-5.3	-27.8	
February	30.8	-23.5	23.1	-3.1	-22.6	
March	42.9	-25.0	33.3	-22.5	9.7	
April	50.0	11.1	-15.0	52.9	26.9	
May	26.3	33.3	-50.0	150.0	47.5	
June	-6.0	-12.8	-26.8	113.3	28.1	
July	-27.4	2.2	8.7	40.0		
August	41.9	11.4	-2.0	22.9		
September	17.9	0.0	51.5	34.0		
October	52.9	9.6	29.8	27.0		
November	-17.6	39.3	23.1	-33.3		
December	-17.6	28.6	22.2	-31.8		
Max Value	164		164	Mean	59	
Min Value	24		24	Mode	34	
Range	140		20	Median	42	

Frequency Distribution					
	Flights Range		Frequency	Relative	Cumulative
	Max	Min	# counts		
3	164	144	1	1.52	1.52
10	144	124	4	6.06	7.58
18	124	104	2	3.03	10.61
30	104	84	10	15.15	25.76
41	84	64	7	10.61	36.36
56	64	44	9	13.64	50.00
66	44	24	33	50.00	100.00

A.13.4 Marsa Alam Airport monthly flights frequency rates

	Marsa Alam						MEAN
	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009	Yr 2010	
January	229	246	299	365	443	542	354
February	198	240	263	339	465	624	355
March	292	330	409	532	567	771	484
April	340	520	486	586	694	868	582
May	314	348	404	597	681	852	533
June	364	348	394	539	589	718	492
July	424	366	404	538	651		477
August	400	444	556	738	832		594
September	304	349	442	516	607		444
October	322	305	410	604	675		463
November	268	298	409	542	750		453
December	274	297	415	459	535		396
Total Flights	3,729	4,091	4,891	6,355	7,489	4,375	5,626

	Marsa Alam Rates				
	Yr 05 -Yr 06	Yr 06 -Yr 07	Yr 07 -Yr 08	Yr 08 -Yr 09	Yr 09 -Yr 10
January	7.4	21.5	22.1	21.4	22.3
February	21.2	9.6	28.9	37.2	34.2
March	13.0	23.9	30.1	6.6	36.0
April	52.9	-6.5	20.6	18.4	25.1
May	10.8	16.1	47.8	14.1	25.1
June	-4.4	13.2	36.8	9.3	21.9
July	-13.7	10.4	33.2	21.0	
August	11.0	25.2	32.7	12.7	
September	14.8	26.6	16.7	17.6	
October	-5.3	34.4	47.3	11.8	
November	11.2	37.2	32.5	38.4	
December	8.4	39.7	10.6	16.6	
Max Value	868		870	Mean	469
Min Value	198		200	Mode	342
Range	670		95.714286	Median	433

Frequency Distribution					
	Flights Range		Frequency	Relative	Cumulative
	Max	Min	# counts		
3	870	774	3	4.55	4.55
10	774	678	6	9.09	13.64
18	678	582	8	12.12	25.76
30	582	486	11	16.67	42.42
41	486	390	14	21.21	63.64
56	390	294	16	24.24	87.88
66	294	198	8	12.12	100.00

A.13.5 Al Alamein Airport monthly flights frequency rates

Al Alamein							MEAN
	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009	Yr 2010	
January	0	9	12	10	6	45	14
February	0	14	14	14	6	30	13
March	0	43	33	8	14	41	23
April	0	12	26	32	18	34	20
May	0	18	26	62	16	56	30
June	0	12	30	61	46	48	33
July	0	29	68	80	145		64
August	0	63	40	160	175		88
September	0	27	34	34	57		30
October	8	14	35	38	58		31
November	0	22	10	8	37		15
December	2	14	16	14	41		17
Total Flights	10	277	344	521	619	254	378

Al Alamein Rates					
	Yr 05 -Yr 06	Yr 06 -Yr 07	Yr 07 -Yr 08	Yr 08 -Yr 09	Yr 09 -Yr 10
January	0.0	33.3	-16.7	-40.0	650.0
February	0.0	0.0	0.0	-57.1	400.0
March	0.0	-23.3	-75.8	75.0	192.9
April	0.0	116.7	23.1	-43.8	88.9
May	0.0	44.4	138.5	-74.2	250.0
June	0.0	150.0	103.3	-24.6	4.3
July	0.0	134.5	17.6	81.3	
August	0.0	-36.5	300.0	9.4	
September	0.0	25.9	0.0	67.6	
October	75.0	150.0	8.6	52.6	
November	0.0	-54.5	-20.0	362.5	
December	600.0	14.3	-12.5	192.9	
Max Value	175		175	Mean	31
Min Value	0		0	Mode	13
Range	175		25	Median	20

Frequency Distribution					
	Flights Range		Frequency	Relative	Cumulative
	Max	Min	# counts		
3	175	150	2	3.03	3.03
10	150	125	1	1.52	4.55
18	125	100	0	0.00	4.55
30	100	75	1	1.52	6.06
41	75	50	7	10.61	16.67
56	50	25	21	31.82	48.48
66	25	0	34	51.52	100.00

A.14 Airport Monthly cumulative flights frequency

Table A.14 - 1		Airport Monthly cumulative flights frequency			
Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
range 1	4.55	9.09	1.52	4.55	3.03
range 2	15.15	15.15	7.58	13.64	4.55
range 3	27.27	30.30	10.61	25.76	4.55
range 4	45.45	37.88	25.76	42.42	6.06
range 5	62.12	66.67	36.36	63.64	16.67
range 6	84.85	92.42	50.00	87.88	48.48
range 7	100.00	100.00	100.00	100.00	100.00

Table A 14 - 2	Airport Monthly cumulative flights frequency evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 16.45x - 17.31	16.45	0.97	-17.32	0.92	0.95
Borg El Arab	y = 16.55x - 16.01	16.56	0.98	-16.02	1.00	0.99
Marsa Matruh	y = 14.50x - 24.89	14.50	0.86	-24.89	0.64	0.75
Marsa Alam	y = 16.88x - 19.26	16.88	1.00	-19.26	0.83	0.92
Al Alamein	y = 13.96x - 19.65	13.96	0.83	-19.65	0.81	0.82

A.15 Airport Monthly relative flights frequency

Table A.15 - 1		Airport Monthly relative flights frequency			
Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
range 1	4.55	9.09	1.52	4.55	3.03
range 2	10.61	6.06	6.06	9.09	1.52
range 3	12.12	15.15	3.03	12.12	0.00
range 4	18.18	7.58	15.15	16.67	1.52
range 5	16.67	28.79	10.61	21.21	10.61
range 6	22.73	25.76	13.64	24.24	31.82
range 7	15.15	7.58	50.00	12.12	51.52

Table A 15 - 2	Airport Monthly relative flights frequency evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 2.164x + 5.627	2.16	0.28	5.43	0.74	0.51
Borg El Arab	y = 1.731x + 7.359	1.73	0.22	7.36	1.00	0.61
Marsa Matruh	y = 6.006x - 9.740	6.01	0.78	-9.74	-1.32	-0.27
Marsa Alam	y = 2.218x + 5.411	2.22	0.29	5.41	0.74	0.51
Al Alamein	y = 7.738x - 16.66	7.74	1.00	-16.67	-2.26	-0.63

A.16 Airport Mean Monthly flights

Table A.16 - 1	Airport Mean Monthly flights				
Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
January	3,392	272	32	354	14
February	3,052	234	29	355	13
March	3,766	247	34	484	23
April	4,089	206	42	582	20
May	3,638	193	63	533	30
June	3,109	209	105	492	33
July	3,259	212	109	477	64
August	3,438	321	92	594	88
September	3,226	302	84	444	30
October	4,234	302	62	463	31
November	4,038	249	36	453	15
December	3,505	317	34	396	17
	42,744	3,064	724	5,626	378

Table A 16 - 2	Airport Mean Monthly flights evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 0.070x + 7.174	0.07	0.21	6.77	0.84	0.52
Borg El Arab	y = 0.216x + 6.928	0.22	0.63	6.93	0.86	0.75
Marsa Matruh	y = 0.285x + 6.476	0.29	0.83	6.48	0.80	0.82
Marsa Alam	y = 0.092x + 8.057	0.09	0.27	8.06	1.00	0.64
Al Alamein	y = 0.342x + 6.109	0.34	1.00	6.11	0.76	0.88

A.17.1 Hurghada Airport monthly passengers frequency rates

	Hurghada						MEAN
	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009	Yr 2010	
January	340,792	369,612	413,836	495,527	431,597	584,630	439,332
February	328,665	325,233	392,796	497,735	408,209	560,707	418,891
March	426,728	400,958	526,336	629,918	526,653	707,893	536,414
April	429,397	502,728	569,609	654,891	615,741	724,438	582,801
May	378,566	366,598	458,737	567,829	534,941	669,132	495,967
June	318,931	324,836	385,065	460,462	464,160	535,105	414,760
July	384,253	369,536	461,007	534,643	554,639		460,816
August	370,614	399,708	498,840	572,794	611,242		490,640
September	325,060	386,336	464,806	517,252	567,531		452,197
October	457,468	496,029	621,116	695,374	753,480		604,693
November	424,824	483,068	640,969	648,114	693,578		578,111
December	339,992	409,329	514,499	468,660	568,316		460,159
Total pass	4,525,290	4,833,971	5,947,616	6,743,199	6,730,087		5,934,78

	Hurghada Rates				
	Yr 05 -Yr 06	Yr 06 -Yr 07	Yr 07 -Yr 08	Yr 08 -Yr 09	Yr 09 -Yr 10
January	8.5	12.0	19.7	-12.9	35.5
February	-1.0	20.8	26.7	-18.0	37.4
March	-6.0	31.3	19.7	-16.4	34.4
April	17.1	13.3	15.0	-6.0	17.7
May	-3.2	25.1	23.8	-5.8	25.1
June	1.9	18.5	19.6	0.8	15.3
July	-3.8	24.8	16.0	3.7	
August	7.9	24.8	14.8	6.7	
September	18.9	20.3	11.3	9.7	
October	8.4	25.2	12.0	8.4	
November	13.7	32.7	1.1	7.0	
December	20.4	25.7	-8.9	21.3	

Max Value	753,480	760,000	Mean	493,365
Min Value	318,931	310,000	Mode	408,000
Range	434,549	64,286	Median	489,298

Frequency Distribution				
	Flights Range		Frequency	Relative	Cumula-tive
	Max	Min	# counts		
3	760,000	696,000	3	4.55	4.55
10	696,000	632,000	6	9.09	13.64
18	632,000	568,000	8	12.12	25.76
30	568,000	504,000	11	16.67	42.42
41	504,000	440,000	13	19.70	62.12
56	440,000	376,000	14	21.21	83.33
66	376,000	312,000	11	16.67	100.00

A.17.2 Borg El Arab Airport monthly passengers frequency rates

	Borg El Arab						MEAN
	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009	Yr 2010	
January	8,571	17,578	18,293	13,707	38,163	51,351	24,611
February	6,494	12,994	14,247	13,694	39,223	53,834	23,414
March	7,468	10,641	12,736	9,958	27,098	50,652	19,759
April	4,889	9,523	14,875	13,377	0	56,552	16,536
May	5,198	13,404	13,396	10,549	0	41,405	13,992
June	9,625	21,655	16,856	14,791	0	56,463	19,898
July	14,671	24,355	19,791	16,825	0		15,128
August	13,319	34,154	23,381	18,000	46,137		26,998
September	13,161	27,406	32,936	9,771	51,442		26,943
October	13,931	29,130	35,332	5,114	52,864		27,274
November	13,877	14,373	12,317	19,043	59,206		23,763
December	13,983	15,836	21,975	44,235	57,472		30,700
Total pass	125,187	231,049	236,135	189,064	371,605		269,017

	Borg El Arab Rates				
	Yr 05 -Yr 06	Yr 06 -Yr 07	Yr 07 -Yr 08	Yr 08 -Yr 09	Yr 09 -Yr 10
January	105.1	4.1	-25.1	178.4	34.6
February	100.1	9.6	-3.9	186.4	37.3
March	42.5	19.7	-21.8	172.1	86.9
April	94.8	56.2	-10.1	-100.0	#DIV/0!
May	157.9	-0.1	-21.3	-100.0	#DIV/0!
June	125.0	-22.2	-12.3	-100.0	#DIV/0!
July	66.0	-18.7	-15.0	-100.0	
August	156.4	-31.5	-23.0	156.3	
September	108.2	20.2	-70.3	426.5	
October	109.1	21.3	-85.5	933.7	
November	3.6	-14.3	54.6	210.9	
December	13.3	38.8	101.3	29.9	

Max Value	59,206		59,150	Mean	22,171
Min Value	0		0	Mode	12,675
Range	59,206		8,450	Median	14,833

Frequency Distribution				
	Flights Range		Frequency	Relative	Cumula-tive
	Max	Min	# counts		
3	59,150	50,700	8	12.12	12.12
10	50,700	42,250	3	4.55	16.67
18	42,250	33,800	5	7.58	24.24
30	33,800	25,350	4	6.06	30.30
41	25,350	16,900	9	13.64	43.94
56	16,900	8,450	28	42.42	86.36
66	8,450	0	9	13.64	100.00

A.17.3 Marsa Matruh Airport monthly passengers frequency rates

	Marsa Matruh						MEAN
	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009	Yr 2010	
January	1,023	1,482	1,201	1,665	1,303	1,214	1,315
February	1,024	1,388	1,095	1,425	1,112	1,141	1,198
March	1,166	1,671	1,305	1,385	1,246	1,879	1,442
April	994	1,513	2,107	1,247	2,712	5,736	2,385
May	1,371	2,588	6,215	1,244	5,982	12,780	5,030
June	1,994	6,665	8,049	2,024	10,688	19,073	8,082
July	2,734	6,877	7,974	8,308	13,877		7,954
August	3,564	6,698	8,927	9,227	12,658		8,215
September	2,555	6,458	6,387	7,656	13,615		7,334
October	1,385	3,824	3,824	4,804	5,795		3,926
November	1,433	1,310	1,611	2,204	1,341		1,580
December	1,422	1,157	1,379	1,320	1,413		1,338
Total pass	20,665	41,631	50,074	42,509	71,742		49,799

	Marsa Matruh Rates				
	Yr 05 -Yr 06	Yr 06 -Yr 07	Yr 07 -Yr 08	Yr 08 -Yr 09	Yr 09 -Yr 10
January	44.9	-19.0	38.6	-21.7	-6.8
February	35.5	-21.1	30.1	-22.0	2.6
March	43.3	-21.9	6.1	-10.0	50.8
April	52.2	39.3	-40.8	117.5	111.5
May	88.8	140.1	-80.0	380.9	113.6
June	234.3	20.8	-74.9	428.1	78.5
July	151.5	16.0	4.2	67.0	
August	87.9	33.3	3.4	37.2	
September	152.8	-1.1	19.9	77.8	
October	176.1	0.0	25.6	20.6	
November	-8.6	23.0	36.8	-39.2	
December	-18.6	19.2	-4.3	7.0	
Max Value	19,073		19,000	Mean	4,067
Min Value	994		940	Mode	2,230
Range	18,079		2582.714	Median	1,937

Frequency Distribution				
	Flights Range		Frequency	Relative	Cumula-tive
	Max	Min	# counts		
3	19,000	16,420	1	1.52	1.52
10	16,420	13,840	1	1.52	3.03
18	13,840	11,260	3	4.55	7.58
30	11,260	8,680	3	4.55	12.12
41	8,680	6,100	10	15.15	27.27
56	6,100	3,520	7	10.61	37.88
66	3,520	940	41	62.12	100.00

A.17.4 Marsa Alam Airport monthly passengers frequency rates

	Marsa Alam						MEAN
	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009	Yr 2010	
January	19,488	24,563	30,051	36,390	42,960	61,577	35,838
February	19,275	26,634	31,480	38,610	50,061	71,641	39,617
March	35,785	41,604	55,812	70,286	78,158	95,981	62,938
April	45,472	70,237	66,892	75,486	93,928	106,669	76,447
May	41,012	41,178	51,639	81,117	89,664	108,342	68,825
June	44,463	43,077	55,286	73,999	78,280	90,949	64,342
July	51,444	43,989	56,537	74,213	87,559		62,748
August	49,692	59,645	78,901	105,151	115,952		81,868
September	35,418	43,685	61,982	70,445	79,570		58,220
October	37,962	38,786	58,129	77,876	87,340		60,019
November	31,689	36,594	53,292	68,757	79,143		53,895
December	23,907	30,163	42,806	47,555	56,243		40,135
Total pass	435,607	500,155	642,807	819,885	938,858		704,893

	Marsa Alam Rates				
	Yr 05 -Yr 06	Yr 06 -Yr 07	Yr 07 -Yr 08	Yr 08 -Yr 09	Yr 09 -Yr 10
January	26.0	22.3	21.1	18.1	43.3
February	38.2	18.2	22.6	29.7	43.1
March	16.3	34.2	25.9	11.2	22.8
April	54.5	-4.8	12.8	24.4	13.6
May	0.4	25.4	57.1	10.5	20.8
June	-3.1	28.3	33.8	5.8	16.2
July	-14.5	28.5	31.3	18.0	
August	20.0	32.3	33.3	10.3	
September	23.3	41.9	13.7	13.0	
October	2.2	49.9	34.0	12.2	
November	15.5	45.6	29.0	15.1	
December	26.2	41.9	11.1	18.3	

Max Value	115,952		115,950	Mean	58,674
Min Value	19,275		19,000	Mode	39,775
Range	96,677		13850	Median	55,549

	Frequency Distribution				
	Flights Range		Frequency	Relative	Cumula- tive
	Max	Min	# counts		
3	115,950	102,100	4	6.06	6.06
10	102,100	88,250	4	6.06	12.12
18	88,250	74,400	10	15.15	27.27
30	74,400	60,550	10	15.15	42.42
41	60,550	46,700	12	18.18	60.61
56	46,700	32,850	17	25.76	86.36
66	32,850	19,000	9	13.64	100.00

A.17.5 Al Alamein Airport monthly passengers frequency rates

	Al Alamein						MEAN
	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009	Yr 2010	
January	0	570	754	471	292	1,845	655
February	0	21	1,176	973	255	84	418
March	0	466	1,455	1,203	1,543	487	859
April	0	1,195	2,118	3,633	1,433	1,652	1,672
May	0	1,570	2,901	7,705	1,383	2,600	2,693
June	0	1,940	4,128	9,635	4,160	3,700	3,927
July	0	2,822	4,519	4,504	4,582		3,285
August	0	4,174	2,647	3,666	7,804		3,658
September	0	2,256	3,686	3,783	6,051		3,155
October	40	1,163	4,055	2,649	2,407		2,063
November	0	1,086	764	415	14		456
December	189	460	597	591	1,168		601
Total pass	229	17,723	28,800	39,228	31,092		23,443

	Al Alamein Rates				
	Yr 05 -Yr 06	Yr 06 -Yr 07	Yr 07 -Yr 08	Yr 08 -Yr 09	Yr 09 -Yr 10
January	0.0	32.3	-37.5	-38.0	531.8
February	0.0	5500.0	-17.3	-73.8	-67.1
March	0.0	212.2	-17.3	28.3	-68.4
April	0.0	77.2	71.5	-60.6	15.3
May	0.0	84.8	165.6	-82.1	88.0
June	0.0	112.8	133.4	-56.8	-11.1
July	0.0	60.1	-0.3	1.7	
August	0.0	-36.6	38.5	112.9	
September	0.0	63.4	2.6	60.0	
October	2807.5	248.7	-34.7	-9.1	
November	0.0	-29.7	-45.7	-96.6	
December	143.4	29.8	-1.0	97.6	
Max Value	9,635		9,590	Mean	1,931
Min Value	0		0	Mode	685
Range	9,635		1370	Median	1,199

	Frequency Distribution				
	Flights Range		Frequency	Relative	Cumula-
	Max	Min	# counts		tive
3	9,590	8,220	1	1.52	1.52
10	8,220	6,850	2	3.03	4.55
18	6,850	5,480	1	1.52	6.06
30	5,480	4,110	6	9.09	15.15
41	4,110	2,740	8	12.12	27.27
56	2,740	1,370	14	21.21	48.48
66	1,370	0	34	51.52	100.00

A.18 Airport Monthly cumulative passengers frequency

Table A.18 - 1	Airport Monthly cumulative passengers frequency				
Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
range 1	4.55	12.12	1.52	6.06	1.52
range 2	13.64	16.67	3.03	12.12	4.55
range 3	25.76	24.24	7.58	27.27	6.06
range 4	42.42	30.30	12.12	42.42	15.15
range 5	62.12	43.94	27.27	60.61	27.27
range 6	83.33	86.36	37.88	86.36	48.48
range 7	100.00	100.00	100.00	100.00	100.00

Table A 18 - 2	Airport Monthly cumulative passengers frequency evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 16.50x - 18.61	16.50	1.00	-18.16	0.87	0.93
Borg El Arab	y = 15.09x - 15.58	15.10	0.91	-15.84	1.00	0.96
Marsa Matruh	y = 13.74x - 27.92	13.75	0.83	-27.92	0.57	0.70
Marsa Alam	y = 16.55x - 18.39	16.56	1.00	-18.40	0.86	0.93
Al Alamein	y = 14.44x - 28.78	14.45	0.87	-28.79	0.55	0.71

A.19 Airport Monthly relative passengers frequency

Table A.19 - 1		Airport Monthly relative passengers frequency			
Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
range 1	4.55	12.12	1.52	6.06	1.52
range 2	9.09	4.55	1.52	6.06	3.03
range 3	12.12	7.58	4.55	15.15	1.52
range 4	16.67	6.06	4.55	15.15	9.09
range 5	19.70	13.64	15.15	18.18	12.12
range 6	21.21	42.42	10.61	25.76	21.21
range 7	16.67	13.64	62.12	13.64	51.52

Table A 19 - 2	Airport Monthly relative passengers frequency evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 2.435x + 4.545	2.44	0.32	4.5455	0.91	0.62
Borg El Arab	y = 3.084x + 1.948	3.08	0.41	1.9481	0.39	0.40
Marsa Matruh	y = 7.521x - 15.80	7.52	1.00	-15.801	-3.17	-1.09
Marsa Alam	y = 2.356x + 4.978	2.36	0.31	4.9784	1.00	0.66
Al Alamein	y = 7.034x - 13.85	7.03	0.94	-13.853	-2.78	-0.92

A.20 Airport Mean Monthly passengers

Table A.20 - 1		Airport Mean Monthly passengers			
Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
January	439,332	24,611	1,315	35,838	655
February	418,891	23,414	1,198	39,617	418
March	536,414	19,759	1,442	62,938	859
April	582,801	16,536	2,385	76,447	1,672
May	495,967	13,992	5,030	68,825	2,693
June	414,760	19,898	8,082	64,342	3,927
July	460,816	15,128	7,954	62,748	3,285
August	490,640	26,998	8,215	81,868	3,658
September	452,197	26,943	7,334	58,220	3,155
October	604,693	27,274	3,926	60,019	2,063
November	578,111	23,763	1,580	53,895	456
December	460,159	30,700	1,338	40,135	601
	5,934,781	269,017	49,799	704,893	23,443

Table A 20 - 2	Airport Mean Monthly passengers evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 0.089x + 6.852	0.09	0.23	6.85	0.86	0.54
Borg El Arab	y = 0.271x + 6.567	0.27	0.70	6.57	0.82	0.76
Marsa Matruh	y = 0.388x + 5.811	0.39	1.00	5.81	0.73	0.86
Marsa Alam	y = 0.050x + 8.005	0.05	0.13	8.01	1.00	0.57
Al Alamein	y = 0.266x + 6.604	0.27	0.69	6.60	0.82	0.76

A.21 Airport flights frequency distribution

Table A.21 - 1		Airport flights frequency distribution			
Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
Mean	3,557	253	59	469	31
Mode	2,955	213	34	342	13
Median	3,410	198	42	433	20

Table A 21 - 2			Airport flights frequency distribution evaluation			
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 1.428x + 3.714	1.43	0.28	3.71	0.76	0.52
Borg El Arab	y = 1.142x + 4.857	1.14	0.22	4.86	1.00	0.61
Marsa Matruh	y = 3.964x - 6.428	3.96	0.78	-6.43	-1.32	-0.27
Marsa Alam	y = 1.464x + 3.571	1.46	0.29	3.57	0.74	0.51
Al Alamein	y = 5.1071x - 11	5.11	1.00	-11.00	-2.26	-0.63

A.22 Airport passengers frequency distribution

Table A.22 - 1		Airport passengers frequency distribution			
Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
Mean	493,365	22,171	4,067	58,674	1,931
Mode	408,000	12,675	2,230	39,775	685
Median	489,298	14,833	1,937	55,549	1,199

Table A 22 - 2	Airport passengers frequency distribution evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 1.607x + 2.242	1.61	0.32	2.24	0.68	0.50
Borg El Arab	y = 2.035x + 1.285	2.04	0.41	1.29	0.39	0.40
Marsa Matruh	y = 4.964x - 10.42	4.96	1.00	-10.43	-3.17	-1.09
Marsa Alam	y = 1.735x + 3.285	1.74	0.35	3.29	1.00	0.67
Al Alamein	y = 4.642x - 9.142	4.64	0.94	-9.14	-2.78	-0.92

A.23 Airport monthly passengers per unit floor area

Table A.23 - 1	Airport monthly passengers per unit floor area				
Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
January	4.88	0.72	0.40	3.58	0.08
February	4.65	0.69	0.36	3.96	0.05
March	5.96	0.58	0.44	6.29	0.10
April	6.48	0.49	0.72	7.64	0.19
May	5.51	0.41	1.53	6.88	0.31
June	4.61	0.59	2.46	6.43	0.46
July	5.12	0.44	2.42	6.27	0.38
August	5.45	0.79	2.50	8.19	0.43
September	5.02	0.79	2.23	5.82	0.37
October	6.72	0.80	1.19	6.00	0.24
November	6.42	0.70	0.48	5.39	0.05
December	5.11	0.90	0.41	4.01	0.07

Table A.23 - 2	Airport monthly passengers per unit floor area rate				
Frequency	Hurghada	Borg El Arab	Marsa Matruh	Marsa Alam	Al Alamein
January	0.73	0.80	0.16	0.44	0.17
February	0.69	0.76	0.15	0.48	0.11
March	0.89	0.64	0.18	0.77	0.22
April	0.96	0.54	0.29	0.93	0.43
May	0.82	0.46	0.61	0.84	0.69
June	0.69	0.65	0.98	0.79	1.00
July	0.76	0.49	0.97	0.77	0.84
August	0.81	0.88	1.00	1.00	0.93
September	0.75	0.88	0.89	0.71	0.80
October	1.00	0.89	0.48	0.73	0.53
November	0.96	0.77	0.19	0.66	0.12
December	0.76	1.00	0.16	0.49	0.15

Table A 23 - 3	Airport monthly passengers per unit floor area evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 0.008x + 0.720	0.01	0.37	0.72	1.00	0.68
Borg El Arab	y = 0.023x + 0.575	0.02	1.00	0.58	0.80	0.90
Marsa Matruh	y = 0.004x + 0.689	0.00	0.18	0.69	0.96	0.57
Marsa Alam	y = 0.023x + 0.352	0.02	0.99	0.35	0.49	0.74
Al Alamein	y = 0.015x + 0.394	0.02	0.67	0.39	0.55	0.61

A.24 Airport revenues
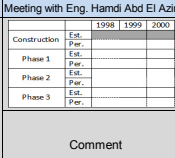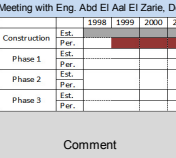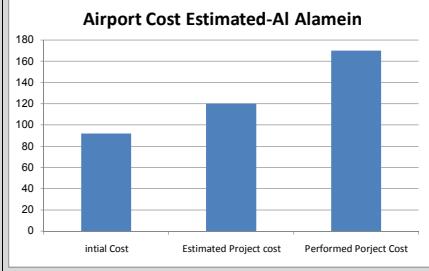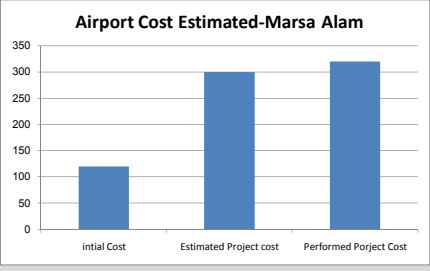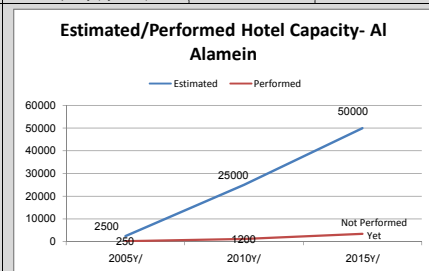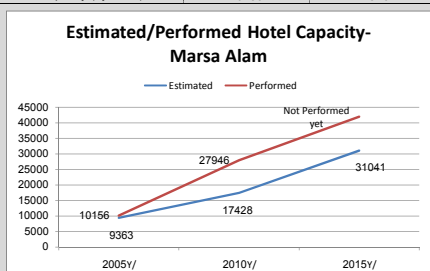
Table A.24 - 1	International passengers				
Airport	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	4,198,056	4,520,977	5,513,855	6,235,120	6,244,651
Borg El Arab	117,878	229,393	233,162	186,804	369,631
Marsa Matruh	0	18,584	30,984	23,272	53,090
Marsa Alam	428,255	492,078	635,223	793,207	898,404
Al Alamein	214	17,179	28,397	38,415	30,213

Table A.24 - 2	Domestic passengers				
Airport	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	325,966	311,553	431,399	505,897	483,640
Borg El Arab	1,895	832	600	794	1,523
Marsa Matruh	20,661	23,008	19,035	19,022	18,389
Marsa Alam	7,045	8,077	7,584	26,678	40,454
Al Alamein	12	544	403	813	879

Table A.24 - 3	Airport revenues				
Airport	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	21,316,246,000	22,916,438,000	28,000,674,000	31,681,497,000	31,706,895,000
Borg El Arab	591,285,000	1,147,797,000	1,166,410,000	934,814,000	1,849,678,000
Marsa Matruh	20,661,000	115,928,000	173,955,000	135,382,000	283,839,000
Marsa Alam	2,148,320,000	2,468,467,000	3,183,699,000	3,992,713,000	4,532,474,000
Al Alamein	1,082,000	86,439,000	142,388,000	192,888,000	151,944,000

Table A.24 - 4	Airport revenues rate				
Airport	Yr 2005	Yr 2006	Yr 2007	Yr 2008	Yr 2009
Hurghada	0.67	0.72	0.88	1.00	1.00
Borg El Arab	0.32	0.62	0.63	0.51	1.00
Marsa Matruh	0.07	0.41	0.61	0.48	1.00
Marsa Alam	0.47	0.54	0.70	0.88	1.00
Al Alamein	0.01	0.45	0.74	1.00	0.79

Table A 24 - 3	Airport monthly passengers per unit floor area evaluation					
Airport	Equation	slope	Slope coefficient	constant	Constant coefficient	Coefficient points
Hurghada	y = 0.093x + 0.575	0.09	0.44	0.58	1.00	0.72
Borg El Arab	y = 0.124x + 0.241	0.12	0.59	0.24	0.42	0.50
Marsa Matruh	y = 0.192x - 0.062	0.19	0.91	-0.06	-0.11	0.40
Marsa Alam	y = 0.178x + 0.383	0.18	0.84	0.38	0.67	0.76
Al Alamein	y = 0.211x - 0.038	0.21	1.00	-0.04	-0.07	0.47

		ID	BOT Airports			
	Point of Comparison		**El Alamein Airport**		**Marsa Alam Airport**	

participants

Investor	4	International Airport Company (IAC)	EMAK Marsa Alam for Management and Operation of Airports
		subsidiary of Kato Group, was established to bid for the tender of Al Alamien international airport. It got the tender with a 50 year BOT concession, extendable to 99 years.	subsidiary of El Kharafi Group for development, was established to bid for the tender of Marsa Alam international Airport. It got the tender with 40 years BOT concession, it is a part of EMAk Marsa Alam Group which is responsible for development in Marsa Alam in different aspects (Airport Operation, Construction,Touirsm and Real Estate Development)
Reference		Al Alamein International Airport Brochure, International Airport Company, 2006	EMAK Marsa Alam Airport Company, International Marsa Alam Airport Brochure, October 2005
Consultant Designer	5	A.C.C	Netherlands Airports Consultants (NACO)
Contractors	6	Main Contractor — Kato Group for Contracting	Main Contractor — Egyptian Consultants Group (ECG)
		Roads and runways — Nile Company for Contracting and Roads	Roads and runways — Nile Company for Contracting and Roads
			Interior Contractor — Arab Contractors
Reference		Dr. Ahmed Abd El-Warith Consultants, Al Alamein airport feasibility study, 1998	P.M.P. Services, Marsa Alam Airport Feasibility study, 1996

Contract

Time Schedule

BOT Contract Duration	7	4 years	Construction Period	4 years	Construction Period
		15 years	Period after which the project can start to profit and benefit from the Egyptian government revenue	11 years	Period after which the project can start to profit and benefit from the Egyptian government revenue
		31 years	Concession Period	25 years	Concession Period
		50 Years	Total BOT Contract	40 Years	Total BOT Contract
Reference		Dr. Ahmed Abd El-Warith Consultants, Al Alamein airport feasibility study, 1998	عقد منح الزام و إنشاء و تشغيل مطار مرسى علم الدولى بنظام (BOT)، ملحق الوقائع المصرية، عدد 264 لعام 1998 و عدد 53 لعام 1999.

			construction	1st phase	2nd phase	3rd phase	construction	1st phase	2nd phase	3rd phase
Estimated	9		1998	2002	2015	2028	1998	2002	2013	2026
Reference			Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998				عقد منح الزام و إنشاء و تشغيل مطار مرسى علم الدولى بنظام (BOT)، ملحق الوقائع المصرية، عدد 264 لعام 1998 و عدد 53 لعام 1999.			
Performed	9		construction	1st phase	2nd phase	3rd phase	construction	1st phase	2nd phase	3rd phase
			2001	2005	NA	NA	1998	2001	2009	NA
Reference			Meeting with Eng. Hamdi Abd El Azim, General Manager of Al Alamein Airport, April 2010				Meeting with Eng. Abd El Aal El Zarie, Deputy Manager of Marsa Alam Airport, April 2010			

Time Schedule Graph	10		
		Comment — Al Alamein Airport was delayed in start of construction phase due to problems concerning land acquisition with ECAA. It was ended in 2001 and started to construct the airport	Comment — Marsa Alam Airport succeeded to start the operation of the airport in first phase few months earlier than scheduled. It also succeeded to start the second phase 4 years before the time scheduled for this phase
Reference		prepared by the researcher	prepared by the researcher

Airport Cost

			initial cost estimated	Estimated study cost		total cost	initial cost estimated	Estimated study cost	cost of construction	total cost
Estimated	11		72 Million LE	120 Million LE		NA	80 Million LE	120 Million LE	300 Million LE	NA
Reference			Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998				P.M.P. Services, Marsa Alam Airport Feasibility study, 1996			
Performed	12		Construction Cost				Construction Cost			
			170 Million LE				320 Million LE			
Reference			Meeting with Eng. Hamdi Abd El Azim, General Manager of Al Alamein Airport, April 2010				Meeting with Eng. Abd El Aal El Zarie, Deputy Manager of Marsa Alam Airport, April 2010			

Airport Cost Graph	13		Comment — initial cost of Airport was near the estimated cost of the project which was increased due to the additional projects related to the airport. Performed cost was increased by 40 million LE and was Late 4 years		Comment — Initial Cost of the airport was significantly small. The estimated cost of project increased due to the additional development projects related to the airport project. Performed cost was increased by 20 million LE and was before schedule by 4 months.
Reference		prepared by the researcher		prepared by the researcher	

BOT Agreement

Financial Study

Project Finance	14	Project Finance		Project Finance	
		40 % Self Financing	60% Loans	40 % Self Financing	60% Loans
Reference		Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998		P.M.P. Services, Marsa Alam Airport Feasibility study, 1996	

			Arrival and Departure Halls	Flight Revenues	Parking Projects	Related projects	Arrival and Departure Halls	Flight Revenues	Parking Projects	Related projects
Fiscal Revenue	15		Advertisements	Airlines Companies	Parking spots	Cargo Village	Advertisements	Airlines Companies	Parking spots	Local Integrated Market
			Free Duty Market	Traveling Agencies	Advertisement	Cafeteria	Free Duty Market	Traveling Agencies	Advertisement	Cargo Village
			VIP Center	Passengers		Agriculture land	VIP Center	Passengers		Gas Station
			Exchange House			industrial & commercial park	Exchange House			Cafeteria
Reference			Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998				P.M.P. Services, Marsa Alam Airport Feasibility study, 1996			

Related Projects

			Related project	Project Description	Status	Related project	Project Description	Status
Related Projects to Airport Facility	16		Ghazala Bay Resort	1st Move pick on North Coast, 19 km from airport with 2500 room	1st Phase Constructed	Port Ghalib Marina	30,000 sq. m contains 3 hotels with total cost 200 million	2nd Phase Constructed
			Cargo Village	include storage, refrigeration, warehousing center	Postponed	Diving Training Center	Training diving center equipped with latest tech.	2nd Phase Constructed
			Industrial & Commercial park	total area 25km2 geared towards export to western markets	Postponed	Harbor Yacht Club	it accommodate 1000 yachts with different scales	2nd Phase Constructed
			Organic agriculture land are	16 km2, perform additional export to European markets	Postponed	International Conference Center	Conference Center opposite to Port Ghalib	under construction
			Hotels And resort	4 hotels and resort located near the airport	Canceled due to location in range of Dabaa Plant	Service Facilities	Water desalination, Sewage treatment plant, central, medical center, stores, sporting club for residents of region	constructed
Reference			Meeting with Eng. Hamdi Abd El Azim, General Manager of Al Alamein Airport, April 2010			EMAK Marsa Alam Airport Company, International Marsa Alam Airport Brochure, October 2005		
			Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998			P.M.P. Services, Marsa Alam Airport Feasibility study, 1996		

Feasibility study

Hotel Rooms To be served

			Year	2005	2010	2015	Year	2005	2010	2015
No. of Hotel Rooms	17		Hotel capacity (by room) Est.	2500	25000	50000	Hotel capacity (by room) Est.	9363	17428	31041
			Hotel capacity (by room) Per.	250	1200	NA	Hotel capacity (by room) Per.	10156	27946	NA

Hotel Rooms Graph	18		Comment — hotels and resorts along the north coast is extremely under estimated hotel capacity for Al Alamein		Comment — Hotels and resorts around the airport along the north coast is expected to reach to 17428 room in 2010; it will be doubled during the period from 2010 to 2015
Reference		Meeting with Eng. Hamdi Abd El Azim, General Manager of Al Alamein Airport, April 2010		Tourism Development Authorities, Ministry of Tourism, Report on Tourism in Red Sea, December 2009	
		Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998		EMAK Marsa Alam Airport Company, International Marsa Alam Airport Brochure, October 2005	

			Year	Flights Estimated	Flights Performed	Status	Year	Flights Estimated	Flights Performed	Status
Airport Traffic Estimated	19		2002	195	0	-195	2002	840	1235	395
			2006	474	277	-197	2007	3750	4891	1141

		Point of Comparison	ID	BOT Airports							
				El Alamein Airport				Marsa Alam Airport			
				2015	975	NA	NA	2010	9370	11054	1684
Operation		Airport Traffic Estimated Graph	20	Estimated /Performed Flights-Al Alamein			Comment — Al Alamein Airport could not afford Estimated Flights due to the delay in construction project and Lack of hotels around the airport	Estimated /Performed Flight Rate -Marsa Alam			Comment — Marsa Alam Succeeded to afford estimated flights due to the great potentials around the airport
		Reference		Meeting with Eng. Hamdi Abd El Azim, General Manager of Al Alamein Airport, April 2010				Meeting with Eng. Abd El Aal El Zarie, Deputy Manager of Marsa Alam Airport, April 2010			
				Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998				EMAK Marsa Alam Airport Company, International Marsa Alam Airport Brochure, October 2005			
		Passenger Traffic Estimated	21	Year	Pax. Estimated	Pax. Performed	Status	Year	Pax. Estimated	Pax. Performed	Status
				2002	62,400	0	-62400	2002	94200	169600	75400
				2006	151,704	17723	-133981	2007	200400	642807	442407
				2015	312,226	NA	NA	2010	403200	938858	535658
		Passenger Traffic Estimated Graph	22	Estimated/Performed Pax.-Al Alamein			Comment — Al Alamein airport Pax. Performed witnessed remarkable retard behind estimated Pax. Due to Late in implementation of airport and lack of tourism attraction potentials around airport	Estimated/Performed Pax.-Marsa Alam			Comment — Marsa Alam Airport Succeeded to exceed estimated Pax. By almost the double due to enrichment of Tourism movement around the airport which affected mutually with each other
		Reference		Meeting with Eng. Hamdi Abd El Azim, General Manager of Al Alamein Airport, April 2010				Meeting with Eng. Abd El Aal El Zarie, Deputy Manager of Marsa Alam Airport, April 2010			
				Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998				EMAK Marsa Alam Airport Company, International Marsa Alam Airport Brochure, October 2005			

Point of Comparison	ID	Governmental Operated Airports			BOT Airports	
		Borg El-Arab Airport	Marsa Matruh airport	Hurghada Airport	El Alamein Airport	Marsa Alam Airport

Airport City

Point of Comparison	ID	Borg El-Arab Airport	Marsa Matruh airport	Hurghada Airport	El Alamein Airport	Marsa Alam Airport
Location	1	60 kilometers to the south west of Alexandria / 7 kilometers from the shore of Mediterranean sea	240 kilometers west of Alexandria / 22 kilometers from Sallum	600 kilometers from Cairo / 82 kilometers along the Red Sea shore	106 kilometers west of Alexandria / 240 Kilometers north west of Cairo	280 South of Hurghada City / 65 kilometers along Red Sea Shore
Governorate	2	Alexandria Governorate	Matruh Governorate	Red Sea Governorate	Matruh Governorate	Red Sea Governorate
Main Activity	3	Touristic investments / Industrial investments / Residential investments	Touristic investments / Diving - Wind Surfing / Resort Beaches	Touristic investments / Aquatic sports (Wind Surfing, Sailing, Deep sea fishing, Snorkeling and diving)	Touristic investments / Historical Sites / Resort Beach	Touristic investments / Resort Beach / Worldwide Diving Center
Reference	1	Ministry of Trade & Industry, Alexandria international trade point website, Overview, http://www.alextp.gov.eg/borgloc.html, Accessing (28-04-2010)	Official site for Marsa Matruh Governorate, http://www.matrouh.gov.eg/matrouhsite/egypt.htm/, Accessing 29-5-2010	Official Site for Hurghada City, Site http://www.hurghada-tourism.com/index-ar.php?menu=1, Accessing 29-5-2010.	Official Site for El Alamein City, Maps http://www.el-alamein.world-guides.com/el_alamein_maps.html, 5/5/2010	Wikipedia Marsa Alam city, http://en.wikipedia.org/wiki/Marsa_Alam, Accessing (5/5/2010)
	3	Ministry of Trade & Industry, Alexandria international trade point website, City Plane, http://www.alextp.gov.eg/borgplane.html, Accessing (28-04-2010)	Official site for Marsa Matruh Governorate, http://www.matrouh.gov.eg/matrouhsite/egypt.htm/, Accessing 28-5-2011	Official Site for Hurghada City, Touristic Features http://www.hurghada.com/index.aspx, Accessing 8/5/2010	Official Site for El Alamein City, Historical Visits, http://www.el-alamein.world-guides.com/el_alamein_landmarks.html, Accessing (5/5/2010)	Marsa Alam Official site, www.marsaalam.co.uk/, Accessing (10/5/2010)

Architecture data

Point of Comparison	ID	Borg El-Arab Airport	Marsa Matruh airport	Hurghada Airport	El Alamein Airport	Marsa Alam Airport
Airport General Data	4	**Airport Area** 43.69 Kilometers square — **Airport Capacity** 600 Pax. / Hour — **Airport Location** 43 Km south west of Alexandria East of New Borg El Arab City — **Airport Type** International — **Airport History** the Egyptian civil authority started in 1998 to study the possibility of establishing another international airport at Borg El Arab city on part of Borg El Arab Military air base land — **Airport Mission** To ease the traffic congestion at Alexandria Airport, it will be the replacement of El Nozha international Airport in Alexandria	**Airport Area** 15.54 Kilometers square — **Airport Location** 1.1 sea miles to the south west of the city — **Airport Type** International — **Airport History** one of the airports that was delivered to the Egyptian civil company from the English army in 1945. it is operating now for both Military and civil — **Airport Capacity** 300 Pax. / Hour — **Airport Mission** To serve the Western shores of Mediterranean Sea for Egypt. It is considered the west gate for Egypt.	**Airport Area** 40.3 km Square — **Airport Capacity** 2500 Pax. / Hour — **Airport Location** 5 km to the south west of Hurghada Downtown — **Airport Type** international — **Airport History** in May 1966 Egypt located 102 thousand Egyptian Pound to prepare Hurghada Airport to receive jet aircrafts carrying tourists in an answer to travel agencies request to land planes arriving directly from Europe — **Airport Mission** To serve touristic flow directly from Europe to Red Sea Touristic sites	**Airport Area** 64 kilometers square — **Airport Capacity** 300 Pax. / Hour — **Airport Location** located near the coastal road and the road connecting Cairo / Alexandria desert road — **Airport Type** international - Cargo Airport — **Airport History** International Airport Company won the tender to construct Al Alamein airport in 1998 under BOT system with the supervision of ECAA. It witnessed difficulties in land acquisition, it was inaugurated in 2005_4 years behind the schedule. — **Airport Mission** To serve the Western shores of Mediterranean Sea for Egypt. It is considered the west gate for Egypt.	**Airport Area** 21 km square — **Airport Capacity** 600 Pax. / Hour — **Airport Location** 60 Km North of Marsa Alam city — **Airport Type** international — **Airport History** EMAk Marsa Alam Got the tender in 1998 to construct international airport in Marsa Alam under BOT system with the supervision of ECAA. It was first inaugurated in 2001 for international aviation — **Airport Mission** To serve touristic flow directly from Europe to Red Sea Touristic sites
Reference		EGYPTIAN HOLDING COMPANY FOR AIRPORTS AND AIR NAVIGATION (EHCAAN) Official site http://www.ehcaan.com/about_comp.aspx 12/4/2010	EGYPTIAN HOLDING COMPANY FOR AIRPORTS AND AIR NAVIGATION (EHCAAN) Official site, http://www.ehcaan.com/about_comp.aspx 12/4/2010	EGYPTIAN HOLDING COMPANY FOR AIRPORTS AND AIR NAVIGATION (EHCAAN) Official site http://www.ehcaan.com/about_comp.aspx 12/4/2010	Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998 / Kato Group Official Website, http://www.katoinvestment.com/divisions/Logistics.htm, Accessing 2/5/2010	دفتر شروط المزايدة لإنشاء و تشغيل مطار مرسى علم الدولي بنظام (BOT)- مشغل الوقائع المصرية، عدد ٢٦٤ لعام ١٩٩٨ و عدد ٢٣ لعام ١٩٩٩. / EMAK Marsa Alam Airport Company, International Marsa Alam Airport Brochure, October 2005
Airport Perspective	5					AIRSIDE / MAIN HALL / LANDSIDE
Reference		EGYPTIAN HOLDING COMPANY FOR AIRPORTS AND AIR NAVIGATION (EHCAAN) Official site http://www.ehcaan.com/about_comp.aspx 12/4/2010	EGYPTIAN HOLDING COMPANY FOR AIRPORTS AND AIR NAVIGATION (EHCAAN) Official site http://www.ehcaan.com/about_comp.aspx 12/4/2010	EGYPTIAN HOLDING COMPANY FOR AIRPORTS AND AIR NAVIGATION (EHCAAN) Official site http://www.ehcaan.com/about_comp.aspx 12/4/2010	Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998 / Kato Group Official Website, http://www.katoinvestment.com/divisions/Logistics.htm, Accessing 2/5/2010	EMAK Marsa Alam, ECAA - Marsa Alam Airport Presentation, 2001 / EMAK Marsa Alam Airport Company, International Marsa Alam Airport Brochure, October 2005
Airport Layout	6					

Governmental Operated Airports / BOT Airports

General

Runway (ID 7)

Airport	Runway Width	Runway Length
Borg El-Arab Airport	45 meters	3400 meters
Marsa Matruh airport	45 meters	3000 meters
Hurghada Airport	45 meters	4000 meters
El Alamein Airport	45 meters	3500 meters
Marsa Alam Airport	45 meters	3000 meters

Parallel Taxi (ID 8)

Airport	Width	Length
Borg El-Arab Airport	30 meters	3000 meters
Marsa Matruh airport	45 meters	3000 meters
Hurghada Airport	45 meters	4000 meters
El Alamein Airport	30 meters	3500 meters
Marsa Alam Airport	30 meters	3000 meters

Terminal Building (ID 9)

Airport	TB Facilities	TB Area	TB Capacity	Service Provided
Borg El-Arab Airport	Arrival Hall; Departure Hall; Free Duty zone; Cargo Export; Electronic Check-In Counters; computerized counters	1376.25 meters square	600 Pax. / Hour	Service Provided
Marsa Matruh airport	Arrival Hall; Departure Hall; Free Duty zone; VIP Hall	1570 meters square	300 Pax. / Hour	Service Provided; Electronic Check-In Counters
Hurghada Airport	Arrival and Departure Halls; Free Duty zone; Public Lounge; Airlines Facilities; Departure Lounge; Visa Counters	15534 meters square	2500 Pax. / Hour	Service Provided; Electronic Check-In Counters; Visa Counters
El Alamein Airport	Arrival and Departure Halls / VIP Facilities; Free Duty zone / First Aid Center; Public Lounge / Tour Agents; Airlines Facilities / Banking; Departure Lounge / inspection points; Food and Beverage / gov. facilities; information center / cargo facilities	13019 meters square	600 Pax. / Hour	Service Provided; Electronic Check-In Counters; Visa Counters
Marsa Alam Airport	Arrival and Departure Halls / VIP Facilities; Free Duty zone / First Aid Center; Public Lounge / Tour Agents; Airlines Facilities / Banking; Departure Lounge / inspection points; Food and Beverage / gov. facilities; information center	2500 meters square	600 Pax. / Hour	Service Provided; Electronic Check-In Counters; Visa Counters

Reference:
- Borg El-Arab / Marsa Matruh / Hurghada: EGYPTIAN HOLDING COMPANY FOR AIRPORTS AND AIR NAVIGATION (EHCAAN) Official site http://www.ehcaan.com/main_airports.aspx, Accessing 12/4/2010
- El Alamein: Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998; Kato Group Official Website, http://www.katoinvestment.com/divisions/Logistics.htm, Accessing 2/5/2010
- Marsa Alam: EMAK Marsa Alam Airport Company, International Marsa Alam Airport Brochure, October 2005

Expansion Development

Expansion Time schedule (ID 10)

Borg El-Arab Airport

No. of Phase	Planned Delivery of Phase	Performed Delivery of Phase	Status
1st Phase (Current)	2009	current	Behind 1 years
2nd Phase	2014	NA	NA
3rd Phase	2024	NA	NA

Marsa Matruh airport

No. of Phase	Planned Delivery of Phase	Performed Delivery of Phase	Status
1st Phase	NA	2006	NA

Hurghada Airport

No. of Phase	Planned Delivery of Phase	Performed Delivery of Phase	Status
1st Phase	2005	2007	Behind 2 years
2nd Phase (Current)	2015	NA	NA
3rd Phase	NA	NA	NA

El Alamein Airport

No. of Phase	Planned Delivery of Phase	Performed Delivery of Phase	Status
1st Phase	2002	2005	Behind 4 years
2nd Phase	2015	NA	NA
3rd Phase	NA	NA	NA

Marsa Alam Airport

No. of Phase	Planned Delivery of Phase	Performed Delivery of Phase	Status
1st Phase	2002	2001	Advanced 4 Months
2nd Phase	2013	2009	Advanced 4 Years
3rd Phase	2026	NA	NA

Charts: Planned/Performed Expansion Plan – Borg El Arab Airport (Estimated Delivery / Performed Delivery; 1st Phase (Current), 2nd Phase; "Current", "Not Performed Yet"). Marsa Matruh: NA. Planned/Performed Expansion Plan Hurghada ("Not Preformed Yet"; 1st Phase, 2nd Phase (Current)). Planned/Performed Expansion Plan Alamein ("Not Performed yet"; 1st Phase, 2nd Phase, 3rd Phase). Planned/Performed Expansion Plan Marsa Alam ("Not performed yet"; 1st Phase, 2nd Phase, 3rd Phase).

Reference:
- Borg El-Arab / Marsa Matruh / Hurghada: EGYPTIAN HOLDING COMPANY FOR AIRPORTS AND AIR NAVIGATION (EHCAAN) Official site http://www.ehcaan.com/main_airports.aspx, Accessing 12/4/2010
- El Alamein: Meeting with Eng. Hamdi Abd El Azim, General Manager of Al Alamein Airport, April 2010
- Marsa Alam: Meeting with Eng. Abd El Aal El Zarie, Deputy Manager of Marsa Alam Airport, April 2010

Airport Expansion Cost (ID 11)

Airport	No. of Phase	Planned Cost of Phase	Performed Cost of Phase	Status
Borg El-Arab Airport	1st Phase	52 Million USD	NA	NA
Marsa Matruh airport	1st Phase	NA	NA	NA
Hurghada Airport	1st Phase	60 Million USD	115 Million USD	Almost Doubled
El Alamein Airport	1st Phase	120 Million LE	170 million LE	Increased by 42 %
Marsa Alam Airport	1st Phase	300 Million LE	320 Million LE	Increase by 6.6 %

Reference:
- Borg El-Arab: Egyptian Airport Company Official Website, http://www.eac-airports.com/OurAirports_BorgElarab.aspx, Accessing 12/5/2010
- Marsa Matruh / Hurghada: Zawya Network, Major Airport Projects in the MENA Region, August 2005; ACI World with Corporation of Momberger airport information, Airport Development News, February 2010
- El Alamein: Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998; Meeting with Eng. Hamdi Abd El Azim, General Manager of Al Alamein Airport, April 2010
- Marsa Alam: P.M.P. Services, Marsa Alam Airport Feasibility study, 1996; Meeting with Eng. Abd El Aal El Zarie, Deputy Manager of Marsa Alam Airport, April 2010

Terminal Building Capacity (ID 12)

Airport	No. of Phase	Terminal Building Capacity
Borg El-Arab Airport	1st Phase	600 Pax. / Hour
	2nd Phase	1000 Pax. / Hour
	3rd Phase	NA
Marsa Matruh airport	1st Phase	300 Pax. / Hour
Hurghada Airport	1st Phase	2500 Pax. / Hour
	2nd Phase	4700 Pax. / Hour
	3rd Phase	NA
El Alamein Airport	1st Phase	600 Pax. / Hour
	2nd Phase	1200 Pax. / Hour
	3rd Phase	2000 Pax. / Hour
Marsa Alam Airport	1st Phase	600 Pax. / Hour
	2nd Phase	1200 Pax. / Hour
	3rd Phase	2000 Pax. / Hour

Reference:
- Borg El-Arab / Marsa Matruh / Hurghada: EGYPTIAN HOLDING COMPANY FOR AIRPORTS AND AIR NAVIGATION (EHCAAN) Official site http://www.ehcaan.com/main_airports.aspx, Accessing 12/4/2010
- El Alamein: Dr. Ahmed Abd El-Warith Consultants, Al Alamein feasibility study, 1998
- Marsa Alam: P.M.P. Services, Marsa Alam Airport Feasibility study, 1996

No. of Hotel Rooms (ID 16)

Borg El-Arab Airport

	2007	2010	2015
Hotel Capacity (by rooms)	4127	6804	NA
Investment	NA	NA	NA
No. of projects	72 project	80 project	NA

Comment: Borg El Arab witnessed large rise in hotel capacity

Marsa Matruh airport

	2007	2010	2015
Hotel Capacity (by rooms)	4881	14811	NA
Investment	NA	NA	NA
No. of projects	47 project	83 project	NA

Comment: Marsa Matruh has large potentials in tourism, it witnessed remarkable rise in hotel capacity

Hurghada Airport

	2007	2010	2015
Hotel Capacity (by rooms)	35027	28935	51185
Investment	NA	5663 million LE	8360 million LE
No. of projects	NA	86 Project	149 project

Comment: Hurghada witnessed remarkable development in tourism movement that exceeded expectations for this area

El Alamein Airport

	2007	2010	2015
Hotel Capacity (by rooms)	206	206	2500
Investment	NA	NA	NA
No. of projects	1 project	1 project	NA

Comment: 4 projects were postponed due to the location of these hotels is near El Dabaa necular plant in Egypt, this led to delay of these projects that affected tourism in Al Alamein. Tourism in North Coast depends on local tourism in resorts and hotels that are focused in summer semester (June, July, August, September)

Marsa Alam Airport

	2007	2010	2015
Hotel Capacity (by rooms)	4746	5337	36528
Investment	840 million LE	2319 million LE	NA
No. of projects	NA	56 Project	123 project

Comment: Marsa Alam witnessed remarkable development in tourism movement that exceeded expectations for this area. Marsa Alam Airport and Tourism Development in Marsa Alam has large mutual influence on each other that enriched both

Reference:
- Borg El-Arab: Ministry of Tourism, Report on Tourism in Egypt, 2007
- Marsa Matruh: Ministry of Tourism, Report on Tourism in Egypt, 2007
- Hurghada: Tourism Development Authorities, Ministry of Tourism, Report on Tourism in Red Sea, December 2009
- El Alamein: Meeting with Eng. Hamdi Abd El Azim, General Manager of Al Alamein Airport, April 2010
- Marsa Alam: Tourism Development Authorities, Ministry of Tourism, Report on Tourism in Red Sea, December 2009

Point of Comparison		Governmental Operated Airports			BOT Airports	
		Borg El-Arab Airport	Marsa Matruh airport	Hurghada Airport	El Alamein Airport	Marsa Alam Airport
Airport share rate	Total flights Share rate					
	International Flight share rate					
	Domestic Flight share rate					
	Total Passengers share rate					
	International passengers share rate					
	Domestic passenger share rate					
Airport Share per floor area rate	Total flights per floor area rate					
	International flights per floor area rate					
	Domestic flights per floor area rate					
	Total passengers per floor area					
	International passenger per floor area rate					
	Domestic passengers per floor area					