

## **Overview of Feasibility Study Procedures for Public Construction Projects in Arab Countries**

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*Abstract.* Feasibility study is simply defined as precise reviews and examinations to decide the feasibility of different investment alternatives. Generally, there are no standard procedures to carry out the feasibility study, especially for public projects, in Arab countries. In addition to the limited and constrained capital resources, these countries are characterized by imprecise and lack of different social, economical and environmental information. The paper presents an overview of the feasibility study procedures used in the public sector in different Arab countries along with their advantages, disadvantages, and items of inconsistency. A pilot study of 91 highway public projects, in Egypt, was conducted by the authors to gain a better understanding of the Egyptian public sector as a sample study of the Arab countries. The study concluded the existence of inconsistency in the used feasibility study procedures. This study stresses the need for developing, in light of the reviewed different used procedures, a standard feasibility study procedures that eliminate this inconsistency.

*Keywords.* Feasibility study procedure, Public projects, and Arab countries.

### **1. Introduction**

Managers usually face the challenging decision of choosing between large numbers of development projects. They make many general, non-recurring investment decisions, involving investing in fixed assets<sup>[1]</sup>, according to their feasibility studies results. Generally, the word “feasibility study” is an expression in the economical and accounting sciences that appeared in the early sixties to simply define precise reviews and examinations to determine the feasibility of different investment alternatives by calculating costs and benefits to extract measurements for every alternative. Based on these measurements, decision-makers compare different alternatives and make the investment decision. Usually, many expressions are commonly used for feasibility studies

like project evaluation, investment appraisal, or capital budgeting<sup>[2]</sup>.

Commonly, development projects are never exactly alike as their individual circumstances make each one of them a unique instance. Yet despite their individuality, every project passes through common procedures. The fundamental goal of this paper is to present an overview of the used feasibility study procedures and their advantages and disadvantages related to the public sector in Arab countries. Presenting different feasibility procedures and highlighting their advantages and disadvantages is aimed at helping the public projects' managers in their decision making process and, in turn, their overall performance.

## **2. Overview of Public and Private Sectors in the Arab Countries**

With a population of more than 250 million and a notable strategic position between the North and the South, the Arab region constitutes a distinct region of the developing world. Its future development is a matter of crucial importance to the world. However, the economies of these countries have undergone major military and political transformations, which affected the overall economic performance despite the potential and the natural and human resources available.

Usually, the public sector in the Arab countries continues to play a great role in the area's development while the private sector, despite its achievements, fails to play a central role in the development process. Generally, the ratio of private investment to public investment is only 2 while some ratios stand at 6 in the Organization of Economic Cooperation and Development countries and around 5 for countries in Southeast Asia<sup>[3]</sup>. After all, the private sector in the Arab countries can not prosper while a large part of the community is still suffering from poverty, illiteracy, and other ills. Another big problem is the absence of technical expertise policies in the areas of production because no financial resources are devoted for research and development (R&D) activities by large companies in many countries<sup>[4]</sup>. The efforts exerted in the private sector as a whole in the Arab region are almost zero and R&D spending in the Arab countries is limited to a small number of government institutions. As a matter of fact, the Arab region (together with Africa) spends the least on R&D compared to the rest of the world.

On the other hand, the foreign direct investment (FDI), which is a useful instrument for economic growth and essential for developing countries as it helps bring in capital, technology, and other skills, was marked by stagnant or declining trade in the Arab countries<sup>[3]</sup>. Global FDI inflows increased by 605 per cent from an average of \$180 billion in 1985-95 to \$1.27 trillion in 2000. This shows that foreign direct investment has come to play a vital role in international finance and is ultimately responsible for growth, employment, and trade. However, FDI was not utilized well in the Arab world as these countries

have only been able to attract small sums of that great liquidity. The highest FDI inflows in the Arab world were recorded in 1975 at 2.6%. After that it followed a downward spiral to less than 1.0% between 1975 and 1998 and the figure went further down to 0.4% by the year 2000. Foreign direct investment in the world decreased, by 40%, to \$823.82 billion in 2001. However, it is argued that the Arab world did rather better that year, attracting \$10.68 billion at 1.29%. As a consequence, public investments are opted to be increased in infrastructure and long term projects.

Generally, investments by the public sector are relatively inefficient and result in wastefulness of resources. This inefficiency is due to the conflict and instability in the area, unpredictable macro-economic conditions and wrong public policy, inadequate infrastructure, weak institutions and high administrative barriers, underdeveloped financial sector, and inadequate availability of a skilled and flexible workforce. This sector is challenged by limited and constrained capital sources for acquiring and sustaining their projects. It also suffers from lack of supporting automation tools and techniques for analyzing capital investment and project execution decisions. Besides, this sector is characterized by the imprecise and lack of different social, economical and environmental information.

### **3. Traditional Classification of Feasibility Studies**

Traditionally, there are many classifications for feasibility studies. They can be mainly classified according to the type of profit and the function of the study.

#### ***3.1 According to the Type of Profit***

The main aim of the feasibility study is to evaluate a new project and take a decision, whether to invest in this project, or reject it. That is done by determining the relative profits of this project to its investors or founders <sup>[2]</sup>.

For private sector, this is known as the private profitability of the investment project. It expresses self-benefits of the project, regardless of any side effect of those benefits on other projects or on the national economy of the country. The main aim of private profitability-feasibility studies is to maximize self-benefits of the project to its investors or founders.

For public sector, this is known as the social profitability of the investment project. It expresses self-benefits of the project and any side effect of this project on other projects or the national economy of the country. The main aim of social profitability-feasibility studies is to maximize self-benefits of the project to the society as a whole (Table 1).

**Table 1. Classification of Feasibility Studies According to the Type of Profit.**

Type	Costs	Benefits	Purpose
Private Feasibility Study	Include costs of the project assets.	Expresses the self-benefits of the project.	Maximize the self-benefits of the project to its investors or founders
Public Feasibility Study	Include costs of the project assets and externalities costs.	Expresses the self-benefits of the project, the externalities benefits and any side effect of this project on other projects or the national economy of the country	Maximize the self-benefits of the project to the society as a whole.

### 3.2 According to the Function

Feasibility studies can be classified according to the function of each portion of studies as follows:

- **Legal feasibility study:** This is done when the legal aspects are given a central importance in taking the investment decision.
- **Marketing feasibility study:** Whenever applicable, marketing studies are done for different projects.
- **Technical and engineering feasibility study:** That is always done for different types of projects.
- **Financial and economical feasibility study:** This study is always carried after the previous studies for all types of projects. It converts the results of marketing, technical and engineering studies into financial and economical value. This includes cost, required funds, and expected benefits.
- **Social feasibility study:** This study is carried to review the feasibility of investment from the social point of view. It measures the social profitability of the investment project.

There is no formal arrangement for the previous studies. Usually they are carried out in parallel. Sometimes, there is no need to carry out a legal study or marketing study for some types of projects (Table 2).

## 4. Overview of Feasibility Study Procedures

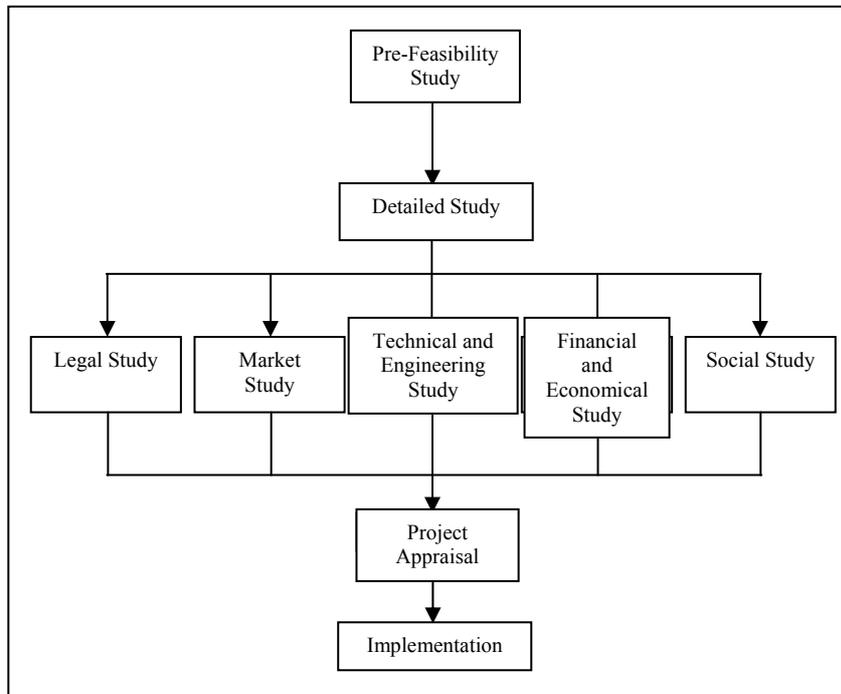
Generally, there are no specific approaches to carry out feasibility studies for all types of projects. However, there are consensus procedures or schools to carry out feasibility studies phases. The traditional feasibility study and its new trends are the most famous procedures used mainly for private projects and many of the public projects. Other international procedures as the World Bank procedure <sup>[5]</sup> and the Japan Grant Aid <sup>[6]</sup> are widely used for public projects that use international fund or aid. Meanwhile, other donors and fund organizations do not require determined feasibility study procedures.

**Table 2. Classification of Feasibility Studies According to the Function.**

Function	Central Consideration	Study Purpose
Legal feasibility study	Legal aspects	The legality of the project
Marketing feasibility study	Market studies	The project marketing
Technical and engineering feasibility study	Technical studies	Study the technical aspects of the project
Financial and economical feasibility study	Funds and economical Studies	Convert the above studies to costs, required funds, and expected benefits
Social feasibility study	Social benefits	Measures the social profitability of the project

**4.1 Traditional Feasibility Study**

The traditional feasibility study implies the collection and arrangement of data of different project alternatives to extract information and measurements to appraise each alternative in order to support decision-making <sup>[7,8]</sup>. Usually, it is divided into the following steps ( Fig. 1).



**Fig. 1. Traditional Feasibility Study Procedure.**

#### **4.1.1 Pre-feasibility Study (Concept and Initiation Phase)**

This step implies the discussion of the investment idea. It may include a representation of the investment idea with a simple legal, marketing, technical and engineering, financial and economical, or social criterion that lead to a primary approval or refusal of the idea.

#### **4.1.2 Detailed Feasibility Study (Design and Development Phase)**

Theoretically, the detailed feasibility study includes more detailed studies of the investment idea with a detailed legal, marketing, technical and engineering, financial and economical, or social criterion that lead to project appraisal. Generally, the tasks associated with such studies include the following

- Legal study, that includes the legal aspects of the project, any legal issues forbidding the project and any legal modifications required to proceed in this project.
- Market study that includes the supply, the demand, the supply and demand analysis, and the project market share.
- Technical and engineering studies that define the project capacity, type, complete design, construction process and method, site location, and planning schedules.
- Financial and economical studies that define the investment costs which include the fixed costs (land, building, equipment...etc.), financial schedule, resources and budgets, and revenues or benefits.
- Social study that measures the social profitability of the project.

#### **4.1.3 Project Appraisal**

In this step, the expected economic and social revenues of the project are evaluated and analyzed using a variety of techniques to decide the project feasibility. Traditionally, investment decisions on public projects are made by the investing government based on the cost-benefit analysis and economic viability of the projects <sup>[9]</sup>. The most common methods for the assessment of financial viability are the payback period, average account rate of return, net present value (NPV), and internal rate of return (IRR) methods. Decisions derived from these methods are based on the forecasts of base-case cash flows. However, public projects are characterized by high capital outlays, long lead times, and long operating periods, which lead to inadequate cash flows forecasting.

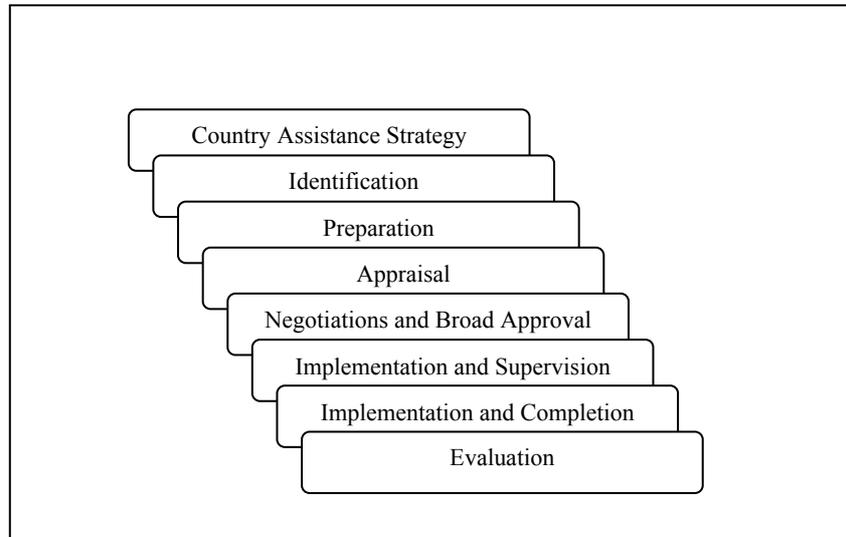
#### **4.2 New Trends in Feasibility Studies**

Many new trends have been introduced to enhance the traditional procedure <sup>[8]</sup>, among the most commonly used are the following:

- It is no longer required to pass through all the steps of the traditional approach. Historical data and experiences about the market, technical and engineering requirements, and financial and economical input may be used directly to cover many parts of the traditional approach. This new trend aims at saving a lot of time and cost spent to cover previously known information.
- The extended use of “Ready Made” studies, which are industrial profiles for many small and medium size projects. Those studies are concentrated into few pages and are available in banks and fund organizations to encourage investments in some projects. Usually, those studies do not have a market study, as they are assumed to cover a real market gap. Generally, the study includes many items as a general description of the project, the expected capacity of the production, the nature and requirements of the suitable location for the project, and the raw materials required to the production including their quantities and prices. Besides, it includes the production method, required equipment, invested capital money, operating costs, and expected revenues.
- Usually, the traditional feasibility study concentrates on the demand gap as a quantity where **Demand Gap = Demand – Supply**. New trends advocate the analysis of other types of gaps between the supply and the demand and try to cover those gaps by new products or services. This includes the price gap, quality gap, seasonal gap, and geographic gap.
- Studying the technical future of the project and not only the economic future as in the traditional feasibility studies approach. In this new trend, the expected development in the product, its quality, and its influence on the price is studied.
- New shape for the steps of the traditional feasibility study including the study of what is called the 5M (market, money, machines, materials, manpower). This new trend assumes that all types of projects commonly have the above five elements.

### ***4.3 Feasibility Study According to the World Bank Procedure***

The World Bank (WB) provides funds to governments and public organizations guaranteed by their governments to execute public projects. Each year the World Bank lends between US\$15-\$20 billion for projects in more than 100 countries. Projects range across the economic and social spectrum in these countries, e.g., infrastructure, education, and health projects. The projects the bank finances are conceived and supervised according to a well-documented project cycle that constitutes the feasibility study of the project from the bank point of view <sup>[5]</sup>. The feasibility study steps followed by the WB are shown in Fig. 2.



**Fig. The World Bank Project Cycle.**

- **Country Assistance Strategy:** Under its current development policy, the bank helps governments take the lead in preparing and implementing development strategies in the belief that programs that are owned by the country, with widespread stakeholder support, have a greater chance of success. The bank prepares lending and advisory services, based on the selectivity framework and areas of comparative advantage, targeted to country poverty reduction efforts.

- **Identification:** Projects that can be funded as part of the agreed development are identified. For tailoring bidding documents to the project concerned, the bank prepare an outline of the basic elements of the project, its proposed objective, likely risks, alternative scenarios to conducting the project, and a likely timetable for the project approval process.

- **Preparation:** This part of the process is driven by the country that the Bank is working with and can take from a few months to three years, depending on the complexity of the project being proposed. The Bank provides policy analysis and project advice along with financial assistance where requested. During this period, the technical, institutional, economic, environmental, and financial issues facing the project are studied and addressed.

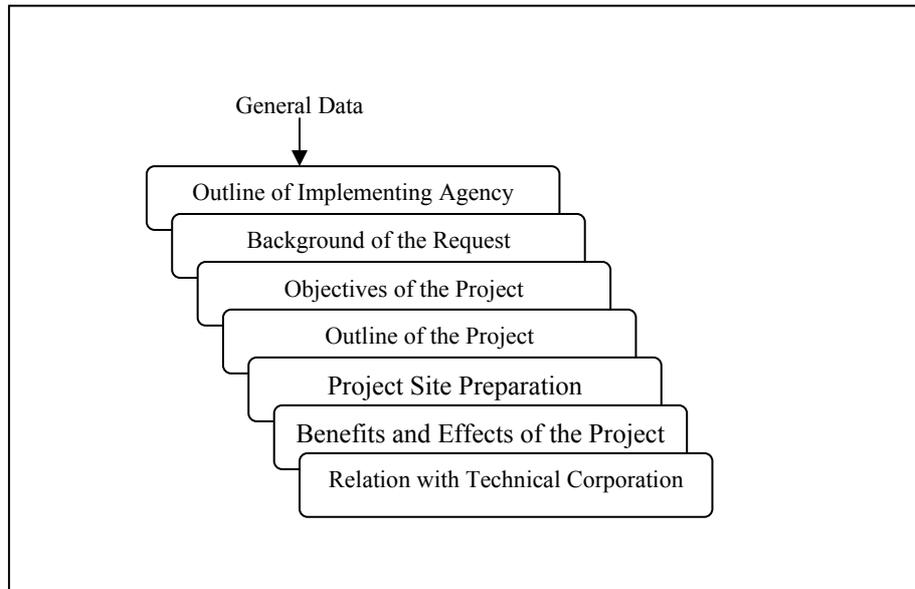
- **Appraisal:** The bank assesses the economic, technical, institutional, financial, environmental, and social aspects of the project. The project appraisal document and draft legal documents are prepared.

- **Negotiations and Broad Approval:** The bank and the country that is seeking to borrow the funds negotiate on loan or credit agreement. Both sides come to an agreement on the terms and conditions of the loan.
- **Implementation and Supervision:** The borrower implements the project. The bank ensures that the loan proceeds are used for the loan purposes with due regard for economy, efficiency, and effectiveness.
- **Implementation and Completion:** The implementation and completion report is prepared to evaluate the performance of both the bank and the borrower.
- **Evaluation:** The bank prepares an independent audit report and evaluates the project. Analysis is used for future project design.

#### **4.4 Application for Japan's Grant Aid**

Japan supports developing countries by providing non-refundable aids to implement public projects. The application for Japan's Grant Aid (JGA) has a strict form that had to be filled by the public organization <sup>[6]</sup>. This includes the following tasks that are shown in Fig. 3:

- **General Data:** A description for the general data of the project such as the project type, sector, target location, expected total cost, amount of grant aid required, implementation agency, and the name and address of person in charge.
- **Outline of Implementing Agency:** The implementing agency outlines the agency-responsibilities in the government, and its authorities including its duties and the service area and population. Besides, a list that includes the total number of engineers, technicians, labors, administrative personnel and other employees for the whole agency and the department or the division administrating the proposed project has to be prepared. Finally, the past three-years annual-budget and the future prospect of the implementing agency has to be evaluated.
- **Background of the Request:** It provides detailed information of the importance, necessity, and urgency of the requested project in terms of the current situation and problems found in the target sector by referring to related statistics and data. Furthermore, the relation with the government's development plan and other sectors overall program has to be provided.
- **Objectives of the project:** It illustrates the proposed objectives over short-term, medium, and long term life of the project.
- **Outline of the project:** It includes the construction plan, methods to operate, manage, and maintain the facilities, financial sources for management and maintenance after project completion, together with a breakdown of total amount and cost of the required facilities and equipment.



**Fig. 3. The Japan's Grant Aid.**

- **Project Site Preparation:** It provides data about the proposed sites including address, total area, and the current situations of the project site such as leveling, drainage, availability of power, water supply, telephone, etc.
- **Benefits and Effects of the Project:** It specifies the area that will benefit from the project, population that will benefit directly and indirectly, and the expected social and economical effects.
- **Relation with Technical Corporation:** Finally, any other requests to other donors, if any, and their expected contribution for the same project or related fields has to be provided.

### 5. Characteristic of Different Procedures

The previous analysis of different procedures shows that each of them has some advantages and disadvantages and may lack some of the strengths of the other procedures. Some of them use more precise input and save a great amount of time and cost. On the other hand, some need a great amount of data and information that leads to heavy front-end input both in term of cost and time, besides they require extensive documentation. Moreover, some procedures use misleading, subjective, or incomplete data. Table (3) presents advantages and disadvantages of different procedures.

**Table 3. Advantages and Disadvantages of Different Procedures.**

Procedure	Application	Disadvantages	Advantages
Traditional feasibility study	<ul style="list-style-type: none"> <li>- All types of projects (new and extension)</li> <li>- Big to small size projects</li> </ul>	<ul style="list-style-type: none"> <li>- Require a heavy front-end loading both in term of cost and time</li> <li>- Needs extensive documentation</li> </ul>	<ul style="list-style-type: none"> <li>- Precise input</li> </ul>
Use of historical data and experiences for the input	<ul style="list-style-type: none"> <li>- Frequent projects</li> <li>- Industrial projects</li> </ul>	<ul style="list-style-type: none"> <li>- Historical data may be misleading or subjective</li> <li>- Documentation is external to the work</li> </ul>	<ul style="list-style-type: none"> <li>- Save a great amount of time and cost to cover input</li> </ul>
Ready Made studies	<ul style="list-style-type: none"> <li>- Frequent projects</li> <li>- Industrial projects</li> <li>- Small and medium size projects</li> </ul>	<ul style="list-style-type: none"> <li>- No market studies as they assume to cover a real market gap</li> <li>- Historical data may be misleading or subjective</li> <li>- Documentation is external to the work</li> </ul>	<ul style="list-style-type: none"> <li>- Save a great part of time and costs</li> <li>- Encourage investments in some projects</li> </ul>
Other gap analysis	<ul style="list-style-type: none"> <li>- All types of projects (new and extension)</li> <li>- Big to small size projects</li> </ul>	<ul style="list-style-type: none"> <li>- A great concern on the market and gap analysis could lead to weakness of other input</li> <li>- Needs extensive documentation</li> </ul>	<ul style="list-style-type: none"> <li>- Precise input</li> </ul>
Technical future aspects	<ul style="list-style-type: none"> <li>- All types of projects (new and extension)</li> <li>- Big size projects</li> </ul>	<ul style="list-style-type: none"> <li>- Require a heavy front-end loading both in terms of cost and time</li> <li>- Needs extensive documentation</li> </ul>	<ul style="list-style-type: none"> <li>- Precise input</li> <li>- More emphasis on the future influence of the project</li> </ul>
New shape (5M)	<ul style="list-style-type: none"> <li>- Projects that had the 5M elements as main elements</li> </ul>	<ul style="list-style-type: none"> <li>- Assume that all types of projects had the 5M elements as a common</li> <li>- Limited studies to the 5M elements</li> </ul>	<ul style="list-style-type: none"> <li>- Save a great amount of time and cost</li> </ul>
World Bank Feasibility Study	<ul style="list-style-type: none"> <li>- Refundable loan for public projects that can be part of the agreed upon national development.</li> </ul>	<ul style="list-style-type: none"> <li>- Long time spent into the procedure</li> <li>- No market studies</li> <li>- Needs extensive documentation</li> </ul>	<ul style="list-style-type: none"> <li>- Ensure the presence of the required funds</li> </ul>
Japan's Grant Aid Application	<ul style="list-style-type: none"> <li>- Non-refundable aid for public projects that meet their criteria</li> </ul>	<ul style="list-style-type: none"> <li>- Incomplete studies</li> <li>- No guarantee for the project success</li> </ul>	<ul style="list-style-type: none"> <li>- Ensure the presence of the required funds</li> <li>- Save a great amount of time and cost</li> </ul>

## 6. Inconsistency of Used Procedures

Public sectors in the Arab countries are characterized by some unique features. These sectors suffer from poor distribution of services over different areas, limited financial resources with indigent distribution. Besides, it endures lack of organization, adequate management and decision-making tools. Furthermore, it always suffers from cost over-run and schedule and fund delays. It is characterized by the non-precise and incomplete information, scarcity of uncertainty analysis, and social cost and benefit studies that lead to incorrect decisions and budget deficits. The main reason of the above problems is the unreliability of the starting feasibility studies.

Generally, most of the public projects in the Arab countries can be approved after filling simple forms by the public organization. The forms usually include the general data of the project such as the project name and location, general aims and goals of the project, expected total cost, and the amount of fund required. A small number of public projects use a more strict feasibility study procedure. They generally follow some of the above mentioned traditional procedures, unless applied for the World Bank or the Japan's Grant Aid procedures.

A previous pilot investigation for 91 highway public projects assigned in the third general national plan for economical and social development 1992/1993 – 1996/1997, throughout the national plan life, was conducted by the authors in Egypt. The aim was to gain a better idea about the Egyptian public sector as a case study of the Arab countries. The analysis of the available data revealed the following results:

- It was difficult to precisely find the required data about specific projects. About 46% of those projects suffer from non-precise information, 57% suffer from incomplete information, 34% suffer from the presence of different information from different resources, and 32% suffer from delaying of information.
- A total of 72 projects that represent about 79% of the total number of investigated projects, whenever information was available, suffer from budget overruns. The total executed investments in the five years reached a mean of about 280% of the primary estimated investments. In 50 projects, where more information was available, 100% suffer from the unreliability of project feasibility studies and cost estimates, 18% suffer from delaying of funds over years that led to cost increase during this period, and 94% suffer from poor control and management. Furthermore, 98% suffer from lack of communication and information exchange between project participants.
- A total number of 49 projects, which represents about 54% of the investigated highway projects, were subjected to schedule delay. A 100% of those projects suffer from delaying of funds over years.

- All the projects used simplified versions of the traditional procedure via forms to be filled by the public organization.

On the other hand, the World Bank uses a very organized procedure with association of many independent agencies and departments. However, a general study analyzing the World Bank's experience with public projects evaluation, for a sample of 1015 projects around the world, was conducted <sup>[10]</sup>. The study that compared estimated rates of return at appraisal with re-estimated rates of return after construction work was completed, usually 5 to 10 years after appraisal, showed a high degree of uncertainty in project analysis. A wide range of variables has been introduced to explain the observed divergence in appraisal and re-estimated rates of return, but only a relatively small part of the divergence could be explained, even with the benefit of hindsight. Project analysis thus has to cope with a large degree of uncertainty, which the traditional methods of project evaluation and selection have not been able to reduce.

**Table 4. Items of Inconsistency of Used Procedures.**

<b>Procedure</b>	<b>Items of Inconsistency</b>
Traditional feasibility study	- Incomplete and/or non-precise data. - Lack of organization and management tools make it difficult to complete the extensive documentation required.
Use of historical data and experiences for the input	- Historical data are usually not available and/or not precise. - Lack of organization and management tools make it difficult to complete the extensive documentation required.
Ready Made studies	- Market studies are required to cover the geographic gap in different areas. - Historical data are usually not available and/or not precise. -Lack of organization and management tools make it difficult to complete the extensive documentation required.
Other gap analysis	- Lack of organization and management tools make it difficult to complete the extensive documentation required.
Technical future aspects	-Future aspects are not always available in the public sector. - Lack of organization and management tools make it difficult to complete the extensive documentation required.
New shape (5M)	- Other elements than the 5M elements are of great concern to the public sector such as sustainability, social studies.
World Bank Feasibility Study	- Lack of organization and management tools make it difficult to complete the extensive documentation required. - A different methodologies and measurements are of main concern to the national economy had to be taken into account.
Japan's Grant Aid Application	- Other elements are to be studied such as sustainability, social studies. - Projects are refunded.

The Japan Grant Aid and other donors or fund organizations do not guarantee project success, as well. They conduct incomplete studies and their main concern is to ensure the presence of the required funds.

In conclusion, the analysis, in the above case study and many other projects in the Arab countries together with the results of the World Bank's experience with public project evaluation, shows inconsistency of the used feasibility study procedures. It stresses the need for developing standard feasibility study procedures that eliminate this inconsistency and benefit from the strengths of the other used procedures. Table 4 shows the items of inconsistency of the used procedures.

## 7. Conclusions

This paper reviewed the feasibility study procedures used in the public sector in different Arab countries along with their advantages, disadvantages, and items of inconsistency. A pilot study of 91 highway public projects, in Egypt, was conducted by the authors to gain a better understanding of the Egyptian public sector as a sample study of the Arab countries. The study showed a great inconsistency in the procedures used for different projects. The following are the main points that can be concluded from feasibility study procedures, review conducted by the authors:

- The most commonly used feasibility study procedures, in the Arab countries, are the traditional procedure, the new trends used in association with the traditional procedure, the World Bank procedure, and the application for the Japan's Grant Aid procedure.
- Most of the used procedures proved inconsistency with respect to the public sector in the Arab countries. This inconsistency is due to the incomplete and/or inaccurate data used and the lack of organization and management tools that make it difficult to complete the extensive documentation required for different procedures. Besides, historical data are usually not available and/or not precise.
- The above results promote the need to develop new procedures to overcome the inconsistency of the commonly used procedures.
- It is to be noted that there is a research project currently conducted, by the authors, at Cairo University to develop an integrated system for feasibility appraisal of public construction projects. One of the objectives of the prospective system is to eliminate the inconsistency and pitfalls discussed earlier in this paper.

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