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**Construction, Engineering and Turnkey Services – Building from  
the Bottom Up**

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# **CONSTRUCTION, ENGINEERING AND TURNKEY SERVICES – BUILDING FROM THE BOTTOM UP BEST PRACTICES FROM TURKEY**

## **1. Introduction**

Turnkey projects are defined in FIDIC (Federation International de Ingenier Conseil) as EPC projects or contracts. The stakeholders of this type of projects are Engineers, Procurers, and Constructors.

In this type of contracts, it is recommended that an entity (e.g.: a contractor) take total responsibility for design and execution of the engineering project. The entity will carry out all the engineering, procurement and construction, providing a fully adequate facility, ready for operation.

If we take operation part of the project into consideration, than we should think the financing of the project. Large-scale privately financed projects are often very complex owing the large number of stakeholders involved, the high costs and risks, and the long duration of project development and the contract period.

The term DBFO (Design, Built, Finance & Operate) refers to the main project financing models; BOT, (Built, Operate, Transfer), BOO (Built, Operate, Own) and PFI (Private Finance Initiative) and related with PFI, the PPP (Public Private Partnership).

Financing such projects in the 21<sup>st</sup> century involves a large range of stakeholders and success depends on these parties uniting to secure the optimum result.

The competitiveness and the main causes failure of the turnkey projects might be discussed under the topic of; sustainability, technology & innovation, whole life cycle costing, partnership and co-operation, procurement and risk management.

In the following presentation, sustainable solutions for project financing and the strategic options for an individual firm to penetrate into the international market and the roles of public and private sector are going to be discussed.

## **2. What Makes the Project Competitive and What Are the Main Causes of Failure?**

Principal elements of a project financing system might be listed as below.

- Sustainability
- Technology and Innovation
- Whole Life Cycle Costing
- Partnership and Cooperation
- Procurement
- Risk Management

Taking into consideration of the above-mentioned elements, the competitiveness and the failures are as follows. It is obvious that if you take the precautions and take into account the following principal elements your offer (your project) becomes competitive. Your operation cost, which is a major indicator of the competitiveness, reduces. Likelihood if it is not, your bid most probably fails.

### **2.1 Sustainability**

The main advantages of adapting sustainability principles for building construction & operations are: Reduced risk protected and enhanced reputation, reduced and avoided costs and increased opportunities to generate revenue. These principles address the social, economical and environmental aspects of sustainable development.

### **2.1.1 Social aspects include:**

Health and safety, staff, community, equity and social opportunity and amenity.

### **2.1.2 Economical aspects include:**

Corporate viability, legal compliance, investments, risk assessment, initial project viability, ongoing project viability and market opportunities.

### **2.1.3 Environmental aspects include:**

Energy consumption, energy sources, water, waste, transport, pollution, habitat, materials, land use, and noise and other nuisances.

## **2.2 Technologies and Innovation.**

Technology has a major impact on DBFO projects, in terms of timesaving potential of information technology, raised standards of predictive accuracy and its ability to underpin the development of genuinely innovative solutions.

On the other hand:

In construction industry as elsewhere, technical innovation can be a two-edged sword. This means it can slice through problems, cutting time and cost or can create new problems. This means that if technology is used properly it makes your project competitive otherwise may cause failure.

Some of the technological aspects that strengthen your offer and make you competitive in a Turnkey project are:

- a- Renewable Energy: In 21<sup>st</sup> century, in building developments, DBFO projects with heavily heating demands and fairly constant electrical loads that benefits from solar power, wind power and photovoltaic.
- b- Energy efficiency in buildings: The design of a building or a plant, heat recovery systems and new heating and lighting technologies will have an important impact on the operation and maintenance costs.
- c- Building materials technology: Continuing research in materials area, designers have a far grater range to choose. Both economically and functionally.
- d- Water and waste water: In the water sector, a distinction exists between tax-driven and concession-driven DBFO configurations. In the tax-driven variant, government maintains its responsibility to collect fees and taxes. In the concession variant, fee collection becomes an integral part of the project design
- e- Transportation demand and revenue modeling: Transport projects are different than other projects, it gives concessionaire an opportunity to be create and innovative with regard to revenue generation as well as with control.

## **2.3 Whole Life Cycle Costing**

Whole life cost analysis considers capital, maintenance, operational, energy, replacement and disposal costs over the entire lifetime of an asset.

Research shows that the cost composition of an entire building project's life cycle is made up of:

- Operation and replacement costs: 70-80%
- Construction costs: 20-30%
- Design costs: 2-5%

Thus, an additional 1% expenditure at the design stage can save many percent through the whole project.

## **2.4 Partnerships and Co-operation**

DBFO projects involve more stakeholders than other type of construction project. The parties should co-operate in order to achieve goals for 20-30 years.

Therefore the cooperation and the partnership criteria should sit on a win-win situation. No contract, no project management system, no project organization can succeed without such partnership.

## **2.5 Procurement**

DBFO projects are a relatively new phenomenon, requiring the stakeholder to develop new working methods-and the procurement process is no exception. Because these projects are different, a radical new approach is required that recognizes the partnership between the stakeholders, the contractual flexibility that must be built into the system, and the exceptional duration of DBFO project timescales. It is hardly surprising therefore that a faulty procurement process is frequently the root cause of failure in DBFO projects.

## **2.6 Risk Management**

Preparing and concluding contracts for a term of 20 or 30 years involves high risk which, in principle, are shared between the client and the concessionaire or contractor.

The first rule of risk management is to avoid and minimize them. In a large-scale construction project, this is the natural task of consulting engineers. They have the technical knowledge and the experience required to understand the dynamics of the project throughout its entire life cycle and are therefore in a position to determine precisely where, when and to what degree risk is present.

Even the best-designed DBFO projects contain many risks. To manage these risks effectively, it is necessary to allocate them to those parties who are best positioned to deal with them, according to their role in the project team and their commercial/legal status. Transferring risk 'to the other side'- to a party who is not logically suitable for accepting them-is usually the most expensive way in the long run. Either it costs too much or it ends up disputes as soon as the risk becomes realities.

The duty to seek out insurance cover lies primarily with the party who has been nominated to accept the risk. However, it is possible that joints insurance packages for several or all projects stakeholders may secure a better deal in the market.

## **3. Role of Private Sector and the Public Sector on DB (O) Projects**

To fully benefit from modern projects financing and procurement concepts, project delivery needs to be on output-based procurement rather than on cost-prescriptive procurement. Within the European Union, the UK has shown the lead in adopting this approach.

Type of the projects that might be taken into consideration are; new-build housing /non housing- public/private, infrastructure, repairmen, maintenance and refurbishment (renovation)

Within each of the project types, the indicators against which the project has to be measured are:

- Client satisfaction – product
- Client satisfaction – service
- Defects
- Safety
- Construction time Construction cost
- Productivity
- Profitability
- Predictability – cost
- Predictability – time

Each indicator is provided with a benchmark against which the assessment can be made.

### **3.1 Case Study**

Consider two typical projects:

- a) A PFI (PP) hospital constructed under a straightforward DB contract, but which also contains a concession agreement encompassing all non-medical services such as cleaning, laundering, building maintenance and equipment. The concession agreement revenue can be dependent either on patient throughput or on an annual contract.
- b) A road built under a BOOT (built, own, operate, transfer) contract where the construction costs and concession agreement could be paid for either through toll charging or a road maintenance contract.

In the first example, the contractor, during the construction phase, can only guess at the revenue likely to be generated through the concession agreement. In the second example, however, the contractor can benefit in the concession agreement from life cycle assessment during the design phase, but takes the financial risk of toll revenue.

From a client perspective, KPIs (Key Performance Indicator) such as defects may not be significant or unless they are so extensive as to have an adverse effect on commercial or operational objectives, whereas if the client was also the operator, the KPI would be significant.

Ultimately, it is the performance of the concession agreement, which will be critical to the client and measuring the project's overall value for money. Accordingly, the service standard targets should be clearly stated within the contract and the concession agreement, so that they can act as a mechanism for gauging the contractor's reward.

### **3.2 Client, Contractor, and Concessionaire's, Considerations**

KPIs must reflect these criteria and each will be depend on the shared objectives of the client and the contractor:

- Value for many
- Predictability of costs
- Predictability of time
- Service level standards.

In comparing the constructors' bids for the project, client should consider the following aspects in relation to KPIs:

- Innovation
- Previous track record
- Value for money
- Predictability
- Service levels achieved.

Similarly, contractors should be considering the following in terms of KPIs:

- Profit/value for money
- Risk exposure
- Certainty of costs
- Certainty of time

### **3.3 Conclusion**

In conclusion, there are currently three different types of Key Performance Indicators:

- Those by which a client wishes to judge its consultants, contractor or concessionaires.
- Those by which a consultant, contractor or concessionaire wishes to be judge against its peers.
- Those by which a consultant, contractor or concessionaire wishes to measure its own performance.

Some indicators will be common to all three, others will apply to one only. However, since we all rely on satisfied clients for future work, client satisfaction must take precedence over the other indicators, which would otherwise be meaningless in the absence of such appointments.

#### **4. Best Practices from Turkey**

##### **4.1 A successful PPP project example Istanbul Atatürk Airport**

Design, Finance, Built, Operate, Transfer Project.

Client: Public

Completion time: 22 months, 8 months ahead of the main contract

Operation time bidding: 3 years, 8 months, 20days

Finance: 306 Mio. USD

Revenue generation centers:

- Passenger fee (4 mio. pax/year guarantee)
- Boarding Bridge Fee
- Check-in counter fee
- Can-pack fee
- Retail area fee (Duty free, food, Beverage, Adds. etc)

Design: Chosen by the client among alternatives.

Upgrading (30% capacity): + 91.0 mio USD

The operation time expired in July 2005. In bidding the existing concessionaire gave an offer for 10 years without pax guarantee, 3 Billion USD.

##### **4.2 Ministry of Health: 24 Regional Hospitals (Finance, Design, Construction and Operation Project. (PPP))**

This project is now on preparation phase. The ministry intends to realize this project on a PPP financing scheme. Land and the concept design will be given by the Ministry, the hospitals will be constructed and operated by the concessionaire.

The health services – medical services- (employment of doctors, and the clinical services) will be handled by the Ministry the other services, (listed below) will be provided by the concessionaire.

Services to be provided by the Concessionaire:

Complete maintenance of the building, Waste management, Safety of the Hospital, Laundry service, Cleaning of the building, Management of clinical and administrative files, Management of Reception and Information staff, Maintenance of inner access roads and gardens, Complete sterilization service, Stock and distribution management, Cafeteria and Restaurant service,

Operation of complementary and commercial areas – Income:

Parking, Cafeteria/Restaurant service, Vending machines, Telephone and TV inside the rooms, Telephone booths, Bank branch, Hairdressers, Newsstand, Florists...etc.

##### **4.3 Ankara, Esenboğa Airport New Terminal Construction (BOT Project)**

Finance, Built, Operate, Transfer Project. (BOT)

Client: Public

Completion time: 24 months, (Under construction, will be finished 29.October.2006)

Operation time bidding: 10 years (29.10.2016)

Finance: 175 Mio .USD + 45 Mio .USD (extension and new facilities)=220 Mio. USD

Revenue generation centers:

- Passenger fee (No. Pax /year guarantee)
- Boarding Bridge Fee
- Check-in counter fee

- Can-pack fee
- Retail area fee (Duty free, food, Beverage, Adds. etc)

Design: Given by the client

## **5. Conclusion**

For project financing to move forwards to meet the changing demands of society, stakeholders must work together to achieve sustainable solutions. These solutions involve a range of tools dealing with technological innovation, risk management, whole life costing and benchmarking, all of which are to be found in the consulting engineering industry. It is self-evident that their management should be entrusted to those who best understand how these factors interrelate-consulting engineers.

By giving consulting engineers the leading role, the stakeholders are entrusting the project direction to professional who are focused on the factors that genuinely determine success. These factors prepared the ground on which multi-disciplinary teams can devise sophisticated contracts and refined financing schemes.

To optimize a project and create a win-win situation requires knowledge, strength and fair unbiased management during the development and procurement phase. It such a strong foundation, the DBFO management can ensure that the overall quality of the project meets the expectation of all stakeholders, makes proper use of market mechanisms for procurement, and is ultimately acceptable to the public.

If the public and the private sector fulfill the liabilities of their tasks, there will be no doubt that the DBFO projects can't succeed.

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