A STUDY ON DEFENSE ACQUISITION MODELS WITH AN EMERGING MARKET PERSPECTIVE. THE CASE OF TURKEY

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With the end of the Cold War, the static environment, characteristic of the bipolar world, has changed quickly into a dynamic and complicated environment with new actors. These changes have also affected the countries' armed forces and new approaches to procurement/acquisition come into progress. After the Cold War, countries have focused on responding to changing threats with their decreasing defense budgets. In this study, acquisition models and their effects on Turkey's technology acquisition and defense industry are evaluated. The evaluation is performed based on criteria such as contribution to national economy, customization, acquisition cost, time and risk, life cycle cost, and technology acquisition. Major acquisition models in this study are determined as direct procurement, production under license, joint venture, indigenous development, production via international consortium. Finally, it is observed that the best model is indigenous development while the others will serve as technology acquisition for indigenous development.

Key words: *acquisition models, technology acquisition, defense systems, defense acquisition, Turkey.*

1. INTRODUCTION

With the end of Cold War, the environment in which countries are in conflict for their interest has undergone a fundamental change. The static environment based on the confrontation created in all areas by the bipolar world is rapidly replaced by a dynamic and complex one. Because of a small and highly effective troop-based concept imposed by changing threats and priorities, world arms market has experienced major changes, too. The major arms-producing countries have especially been faced with budget shortages and a decrease in the domestic market [1]. In response, companies have increased their international sales of high performance defense products and have presented the opportunity to supply those high-performance products at low prices [2]. In this regard, underdeveloped and developing countries that have high defense expenditures and supply their defense products through external purchase, have started to transfer more

sources to the leading defense companies.

Additionally, since the mid 90s, the total number of companies in the world defense sector has importantly decreased because of the mergers and acquisitions. For example, new clusters have been created in USA by this condensation [3]. From this perspective, because of downsizing of their own armed forces, companies of the countries that have a competitive edge in the defense industry were forced to immediately find new markets in order to maintain production in scale economies. In upcoming years, it would not be wrong to advocate that armed forces are likely to create a commercial-based secondary defense market. Indeed, this is already the case in some countries such as France and Israel [4].

It is obvious that developed countries supply their defense products from domestic sources. On the contrary, developing/underdeveloped countries which are willing to increase their military abilities or are planning to modernize their armed forces, procure directly through foreign sources.

A review of the literature on acquisition models reveals a lack of consensus concerning theoretical concepts, taxonomies and empirical studies. Despite more than years of interest for developing and understanding acquisition strategies for Turkey, rigorous research on defense acquisition models remains a nascent area. To this end, there are three things that motivate researchers to develop and introduce acquisition models for developing countries. First, a common understanding on acquisition terminology is considered. Next, more concrete acquisition models are needed to have been identified. Third, a comprehensive and coherent acquisition model framework would encourage both practitioners and researchers to better apply lessons-learned from relevant academic research.

In this study, acquisition models employed in the defense industry projects of Turkish Armed Forces are classified and then advantages and disadvantages of the models are discussed. With the study, it is aimed to develop a common understanding in acquisition models used in defense projects, and thus a contribution is made to the limited pool of current literature. Within this framework, the models employed for defense acquisition programs in Turkey are discussed in terms of contribution to the national economy, customization, supply cost, supply time, supply risk, life cycle costs, and technology acquisition. The rest of the paper is organized as follows. The second chapter discusses acquisition models currently employed in Turkey. The following chapter provides a general evaluation of the models. In the conclusion area the desired end-state is indicated and limitations of the study, as well as recommendations for future research are stated.

2. ACQUISITION MODELS EMPLOYED IN TURKEY

The main goal of the acquisition may be defined as development/production of the most advanced defense systems allocated to Armed Forces using limited resources in the required time. This can generally be described as a process directed to a single ultimate goal including development of the technology on one hand and possession of the equipment on the other.

The institutions in charge of defense systems acquisition in Turkey employ several different models. For instance, Kurç [5] underlies duplication of projects and states that Turkish General Staff mostly favors direct procurement while Undersecretariat for Defense Acquisition seeks opportunities for joint projects to improve national defense industry. In this context, five main acquisition models mainly used by defense systems acquisition authorities are listed below:

1) Direct Procurement,
2) Production under the License,
3) Joint Production,
4) International Consortium,
5) Indigenous Development.

2.1. Direct Procurement

Direct Procurement is a model in which the development and qualification processes are already completed and the

products are licensed. In other words, it is a model used for buying already existing products on the shelf, i.e. COTS. It is possible to purchase domestic or foreign products. Products may be sold in substantial quantities and offered to the buyer without any modification [6].

Figure 1 depicts a comparison for the criteria employed in the study. In the case of direct foreign procurement, it is not possible to provide business share to the domestic companies but offset advantages.

Besides, change of the product, which is planned to be supplied, according to the special needs that were defined as a result of requirement analysis is not preferred; hence it leads to a new qualification process. From this view, it is almost impossible to meet all of the requirements.

In addition, because the supplied product is in use, it is highly reliable, its supply time is very short and its supply risk is very low. Because development costs, as well as fixed costs are being undertaken by the manufacturer, it is not uncommon to see competitive prices in the market.

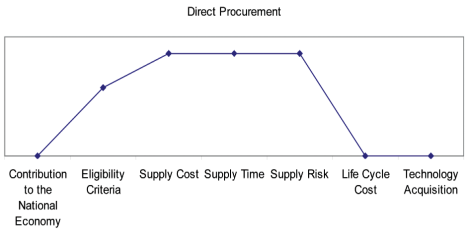

Fig. no. 1. Direct Procurement

However, the unit costs of the systems supplied using the direct procurement method and the life cycle costs are high because of the dependence on the manufacturer in terms of logistics. To this end, if the cost and supply time are the main factors in the decision, this model is possibly preferred. Another common scenario for direct procurement is meeting urgent requirements such as the ones for defense against terrorism.

2.2. Production under the License

This model can broadly be defined as the domestic production of a finished product, which has passed the product development and qualification processes and has been brought into use to end users, and whose domestic production line has been built up by means of technical support by a foreign firm holding industrial rights. Production is based on commercial arrangements generally including a series of provisions regulating the rights of the recipient with regard to transfer of technology and know-how [6, 7].

Figure 2 depicts a comparison for criteria employed in the study. This acquisition model involves supplying foreign sub-system(s) and domestic integration under a strict license to a product that has domestic participation in its particular sub-system. In other words, the main factors determining the level of the contribution to the national economy are the level of domestic capabilities and the attitude of the company with which the licensing agreement is signed.

Similar to the direct procurement model, its reliability is quite high. In addition, supply time is relatively shorter compared to indigenous development, but longer compared to direct procurement because of the required additional time for establishment of the domestic production line, and in-house and on-the-job training.

The risk for acquisition non-fulfillment is higher than in the case of the direct procurement model because of the extra time required for qualification of the product. Because the copyright holder firm holds the right for use of the product and industrial rights, all marketing activities to third parties can only be performed after an agreement is signed. In addition, any changes to the products can be done on a limited scale, like in direct procurement model, but it is not preferred in practice because of an increase in supply time and additional costs. From this perspective, it seems quite impossible to meet all requirements.

If this model is managed appropriately, technology acquisition can be provided at sub-system level. The model becomes prominent among the models given its highest life cycle costs. It is obvious that reducing these costs is possible by increasing the level of domestic contribution to sub-systems.

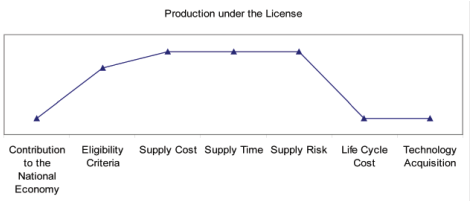

Fig. no. 2. Production under the License

2.3. Joint Production

This model can be defined as the production of a main system with joint ventures, which are capable of manufacturing different sub-systems. Another form may be the development of a licensed system by a domestic company with the technical support provided by the license holder firm in order to meet the requirements identified by the analysis teams. The more complicated a defense equipment is, the higher the share of technical support is [8]. The main issue here is to foster cooperation in research and development, production, and logistics of defense equipment to meet the requirements of one or more allied or friendly nations [6].

Figure 3 depicts a comparison of the criteria employed in the study. The model can be applied with the partnership of two or more domestic companies or with domestic and foreign company partnership. The main characteristic that separates it from the Production under the License is the authenticity of the product. Because foreign partners have mature technology and high-tech abilities, new products may be designed and produced.

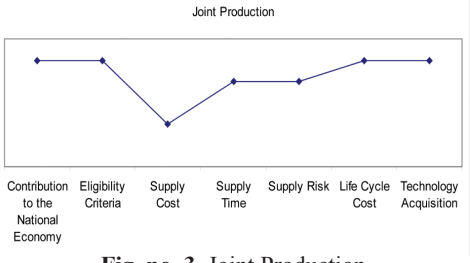

Fig. no. 3. Joint Production

The rate of the contribution to the national economy is directly proportional to the domestic contribution to systems. On the other hand, unlike previously discussed models, the need for the development of technological capabilities within the framework of a new product is expected to be perfectly fulfilled.

In parallel with the level of experience and competence of the parties participating in joint production, supply costs, supply time and supply risk may differ. The cost, supply time and supply risk of the product are inversely proportional to the similarity of the qualified product on the market. As the similarity increases, those decrease. Similarly, technology acquisition is possible in the model. A decrease in life cycle costs may be expected in the long-term.

2.4. International Consortium

International consortium is an acquisition model in which the costs are shared by the partners and the technological capabilities of two or more international parties are directed towards the development of a shared system. The model is often being preferred by international actors because of recent shrinking defense budgets. Also, the model provides an opportunity to harmonize requirements, sustain competition, and utilize capabilities. In addition, interoperability and military transformation are other arguments to lead to international consortium, especially motivated by NATO [5]. Significant contributions by all partners in the consortia are made to research and development, design, building, production, marketing, maintenance as well as funding and risk sharing [8].

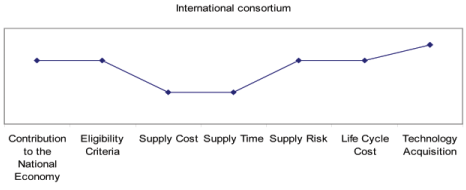

Fig. no. 4. International Consortium

Figure 4 depicts a comparison for the criteria employed in the study. Technological ability or the owner of economic power, which may be considered dominant in the model, is a handicap in terms of common interests. Meanwhile, domestic defense industry,

which has the will to manufacture a product qualified by the international authorities, is likely to have a higher market share in the long term. From this point of view, the model is one of the acquisition models that contribute much to the national economy.

The decisive factor in this model is the attitude of the international actors in terms of the eligibility requirements. Yet, it is almost impossible to fully meet the needs of many countries by a shared system. That is to say, the weakest aspect of the model is that diversification in the needs has a negative impact on the cost of the product.

In general, since each party does not want to include other partners in its strong fields, it is almost impossible to gain additional technological capabilities in the international consortium model. Supply cost, supply risk and supply time are directly related to the complexity of the project, abilities of the parties and the will to use this ability.

2.5. Indigenous Development

Indigenous development is the process of development of an authentic product using the maximum rate of domestic capabilities (by means of technical assistance mainly based on research and development). Development includes design, building, modification, or improvement of the prototype of a vehicle, engine, instrument, or the like as determined by the basic idea or concept [6].

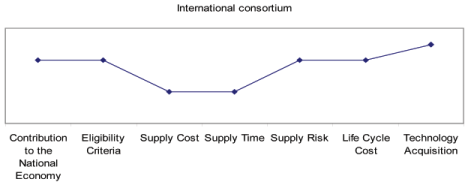

Fig. no. 5. Indigenous Development

Figure 5 depicts a comparison for the criteria employed in the study. The indigenous development model has the highest contribution rate to the national economy.

If the model is implemented by means of R&D activities, its maximum contribution might be doubled. At the same time, identified needs are met at the highest rate as technical support is provided so that R&D activities are performed in niche areas.

After a well-planned and well-managed process, this model allows the acquisition of basic skills and core competences in certain areas. The main issue to be considered here is that foreign technical support is devoted to the acquisition of a competence. The ability acquired at sub-system level leads to joint production model while probably resulting in no recognition of benefits with the indigenous development model.

The main features that separate this model from the discussed ones are its relatively high supply costs, long supply time and high supply risks. However, with the national capability acquisition, the model may form a transition through domestic direct procurement, may lower life cycle costs and may reduce overseas dependency. Thus, cost increases may be ignored because of the untrivial long term outcomes and benefits.

The performance of the indigenous development model based on well-managed R&D activities can be seen as a long-term guarantee for high level of prosperity,anation'sscientificdevelopment, employment, and technological progress and export opportunities.

3. FINDINGS

In this section, a risk-benefit analysis has been employed by the researchers and the matrix is displayed below in **Table 1**. The scale ranges from -3 to +3. Positive rates are shown by (+), while negatives are indicated by (-). The rationale behind completing the table is to compare models with respect to the criteria determined by the researchers based on their experience and literature review. At first, researchers rate all acquisition models individually. This approach does not require a comparison among models. "0" means that researcher is neutral about the model. If rating is negative, then the model is considered risky. Similarly, if rating is positive, then the model is referred to as beneficial. Aftermath all researchers rate acquisition models, average of each criterion is computed and put in the cells. Thus, the table displays

the means of each criterion. Having this methodology in mind, one can read first line as direct procurement is the riskiest model concerning contribution to the National economy, life cycle cost, and technology acquisition while it is the most beneficial model regarding supply cost, supply time, and supply risk. On the other side, it is a bit beneficial model on behalf of eligibility criteria.

Table 1. Comparison of the Acquisition Models Employed in Turkey.

	Contribution to the National Economy	Eligibility Criteria (Requirements)	Supply Cost	Supply Time	Supply Risk	Life Cycle Cost	Technology Acquisition
Direct Procurement	- - -	+	+ + +	+ + +	+ + +	- - -	- - -
Production Under the License	- -	+	+ +	+ +	+ +	- -	- -
Joint Production Model	+ +	+ +	-	+	+	+ +	+ +
International Consortium	+	+	-	-	+	+	+
Indigenous Development	+ + +	+ + +	- -	- -	-	+ + +	+ + +

The defense sector has an important role in the national economy because it is a sector that allows secondary technology entry into other areas and accommodates high value-added products. The state of the nation's economy, development of national defense industry, competent manpower and scientific competence can be said to be the main determinants of defense acquisition models. In this context, underdeveloped countries, in terms of the above-mentioned factors, are forced to supply the goods using direct foreign procurement and production under the license model while the countries with sufficient infrastructure tend to supply the goods using joint production and indigenous development models.

While direct procurement and production under license models have been intensely used in defense procurement due to the lack of the aforementioned factors before 1990s, the indigenous development model has recently begun to be preferred following the development of the national defense industry.

To this end, the products that meet 100% of the needs of the Turkish Armed Forces are supplied, thus contributing to the development of the national defense industry. The next step consists in providing the opportunities to the national defense industry for marketing products to foreign markets and that has already been taken.

Table 1 shows a 6-level rating, of the models investigated in this paper, in terms of their contribution to the national economy, eligibility requirements, supply cost, supply time, supply risk, life cycle costs, and technology acquisition.

For the first four top to down procurement models presented in Table 1, the contribution to the national economy, compliance requirements, and technology acquisition increase in customers' favor while supply cost, supply time, supply risk and life cycle cost increase to customers' detriment.

As seen, even though the international consortium model has some negative aspects, it can be used when joint ventures of the leading

international actors are desired with a long-term cooperation and opportunity of technology transfer.

4. RESULTS

A review of the literature on acquisition models reveals a lack of consensus concerning theoretical concepts, taxonomies and empirical studies. Despite years of interest for developing and understanding acquisition strategies for Turkey, rigorous research on defense acquisition models remains a nascent area. This study, therefore, is the first one to compare the defense acquisition models employed by the Turkish Armed Forces in terms of certain criteria. When the limited pool of current literature examined, it is concluded that there is no consensus on the classification of the models. The underlying reasons here are differences in the countries' requirements and policies. From this perspective, to our best knowledge, this is the first study aimed at classifying and comparing defense system acquisition models.

Overall, the objective of the study is to shed some critical light on the acquisition management. Therefore, a common understanding of acquisition terminology is investigated. Next, acquisition models are identified. Moreover, a comprehensive and coherent acquisition model framework is displayed to encourage both practitioners and researchers to better apply lessons-learned from relevant academic research.

A matrix is formed by the researchers, displaying five acquisition models on the lines and criteria on the columns. The models identified by the researchers are direct procurement, production under the license, joint production, international consortium, and indigenous development. On the other hand some criteria are also determined in order to compare the models. They are evaluated according to contribution to the national economy, eligibility criteria, supply cost, supply time, supply risk, life cycle cost, and technology acquisition.

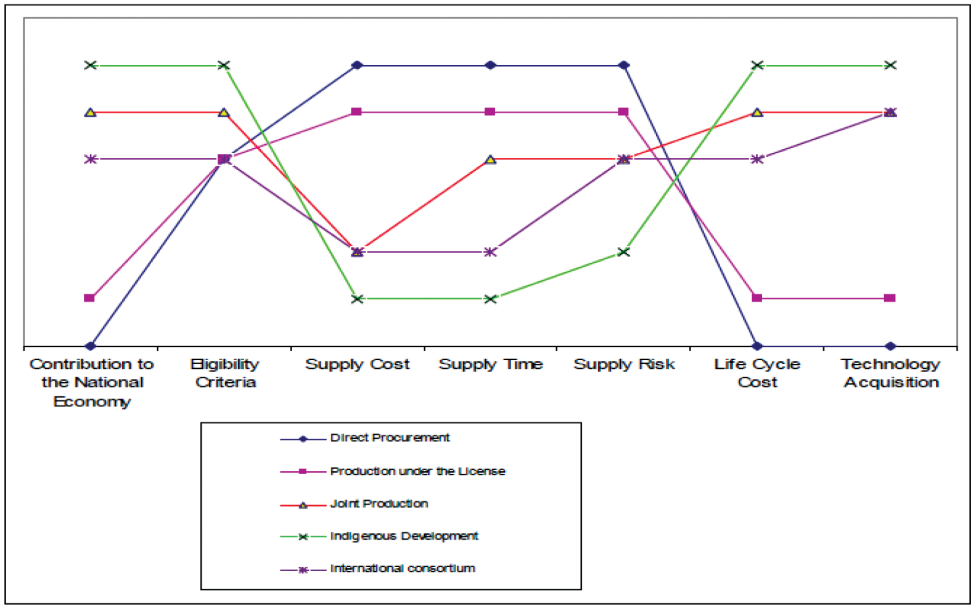

Fig. no. 6. Comparison of the Defense Acquistion Models

Meeting the defense needs by means of indigenous development is in fact a desired end-state in defense acquisition. This is also approved to be an indicator of technological level. This finding is consistent with Korkmazyurek and

Basım [9] that highlight new armaments strategy of Turkey based on a policy of eliminating foreign dependencies in the critical defense capabilities area.

The creation of a new system based on indigenous technology and capability acquisition in defense industry is the main incentive. But, in order to achieve this goal, human resource, investments and capital should be sufficient and ready to use. From this perspective, it is possible to see the other models as the model leading to the main purpose.

It would not be wrong to say that dual-use materials and use of by-products of R&D results in the investments made in defense industry have a multiplier effect on the country's technological competence.

As a result, indigenous development-oriented defense investments made on the basis of R&D activities increase scientific power and the level of technological development while providing effective use of national resources. This tendency requires the right technology policies. Yet, wrong technology policies could result in a waste of resources.

Towards this end, indigenous development is particularly required to be the essential model for emerging markets that contribute the most to national economy, as well as national sovereignty. But, this just can be used after an evaluation under the criteria such as the technological level of preparedness of other models, the urgency of need, and available resources at hand.

There are also some limitations regarding the study. First, the evaluation is based on the experience of the authors. Hence, it is strongly recommended that the study needs to be extended by a qualitative and quantitative research, which gets professionals from government, acquisition authorities and the industry involved. Next, the evaluation undertaken in this study is from the perspective of an emerging market. Therefore, one should be careful to generalize the results for developed or underdeveloped countries.

This study also opened pathways for future research on acquisition models. Three areas are identified here for future defense acquisition research. First, criteria would be determined by means of a Delphi survey or a questionnaire whose participants might be from government, industry and academy. Second, criteria would be normalized or weighted by using Analytical Hierarchical Process or Analytical Network Process. Third, the study may be repeated in different countries to generalize the results.

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