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Assessment of Turkish Industrial Base from a Military Systems Acquisition Perspective[1]

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Abstract – Weapon systems acquisition process in any country is one of the main tools to develop national manufacturing and management capabilities. This paper suggests a methodology for Turkish Armed Forces on how to manage the process of identifying provinceal strongholds in industrial subsectors from the military systems acquisition perspective and how to assess the technology processes management capability profiles of firms located in these provinces.

I. INTRODUCTION

Although the cold war is over, Turkey's geopolitical situation makes it necessary for her to maintain a certain level of military power. Turkish Armed Forces (TAF) still keeps its attractive position for the firms (see Appendix A for the number of defense industry firms in different provinces of the country doing business with Ministry of Defense Undersecretariat for Defense Industry). We suggest that in order to be able to successfully make "Make or Buy" decisions on military weapons systems, Turkey needs to assess the existing industrial base.

Rapid technologogical changes make it necessary for Turkish Armed Forces (TAF) to monitor the current capabilities of national defense industry firms and use military systems acquisition to proactively improve core competencies of firms. We strongly believe that TAF must play an active role to manage the capability development process for local defense industry firms. Especially for technologies critical for national defense capabilities, Turkey needs to develop and maintain both design and manufacturing capabilities in local firms. To increase the share of Turkish local manufacturing firms in the supply of defense systems to TAF, close coordination and collaboration between universities, firms and government agencies is essential.

Porter [1,2] has argued that a country's international competitiveness depended on how competitive its firms were. An analysis of a firm's resources, capabilities and competencies would result in a better understanding of the sources of competitive advantage. It is clear that we need a methodology which would enable the TAF to assess both the industrial base capabilities in different parts of the country and the technology processes management capabilities of firms in those provinces.

Prahalad and Hamel [3] suggested that companies need to understand fully their core competencies and capabilities in order to successfully exploit their resources. Javidan [4] discussed the process of moving from resources to core competencies (Figure 1). So, determining the current industrial capabilities of provinces and the current capabilities of defense industry firms, will make it possible to design a roadmap and process for developing the core competences of firms.

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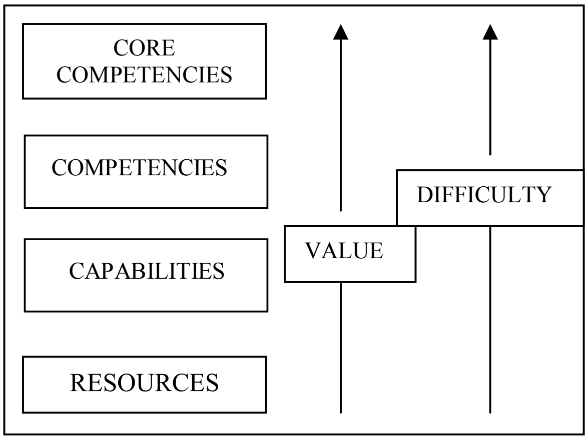

Figure 1: Levels toward Competitiveness.[4]

In Figure 1, the lower two levels are of interest to us. At the bottom of the hierarchy is the "resources". **Resources** are the building blocks of competencies. Resources are the inputs into the organization's (provinces's, country's) value chain. Resources has been categorized into three groups: [18]

1. Physical resources, such as plant, equipment, location and assets
2. Human resources, such as manpower, management team, training and experience
3. Organizational resources, such as culture and reputation.

Some resources are tangible and physical such as plant and equipment and others are intangible like brand name. Each corporation has a bundle of resources, but not every firm can put its resources into best use. Companies vary how they leverage their resources. We can say that the same is true and valid for different provinces of a country.

Capabilities refer to the corporation's (country's) ability to exploit its resources. The distinguishing feature of capabilities is that they are functionally based on:

1. Marketing capabilities
2. Production capabilities
3. Distribution and logistics capabilities
4. Human resource capabilities
5. Technology management capabilities.

Ulusoy, Bilgic and Oner [13] have developed the "Objective MaTeS Index" which facilitates quantitative comparison of industrial base resources and capabilities of provinces.

Competencies, the third level in the hiearchy, is a cross-functional integration and coordination of capabilities. They add greater value because they expand the boundaries of capabilities and result from synergy among capabilities.

At the top of the hierarchy lie the **core competencies** which add the greatest value because they exploit resources and capabilities at the broadest level. A core competency is a collection of competencies that are widespread in the corporation (in the province, in the country).

Prahalad and Hamel [3] argued that a company can develop a core competence by learning from partners and pointed out the importance of strategic outsourcing with potential suppliers for partnership. Outsourcing a core activity concerns the maintenance of knowledge (design skills, management skills, manufacturing...) which enables the technology of the core activity to be exploited, even when it is provided by another partner. Establishing partnership relationships with suppliers is an important step towards forming clusters in a province.

Porter [1, 2] suggested that a company's dominant market share and accelerated growth are supported by a unique combination of firms tied together by knowledge and production flows and used the term "cluster" to describe such a group. Competitiveness originated from the unique combination of firms, *clusters* or *development blocks*. In clusters, firms (industries), universities, government agencies and other related associations are the basic players and form the industrial base of that province and/or that country.

In spite of critics [5], clusters have been considered as the driving engines of economic activities [6 - 12]. Industrial clusters are common in a wide range of countries and sectors. There is increasing agreement that clustering helps enterprises overcome growth constraints and compete in distant markets [9]. One should note that there are no standard factors or procedures to define and identify clusters (Table I and II). Since there are difficulties in accessing the appropriate data sets at regional and national level for cluster definition process, the data used by countries varies [11].

Table I: San Diego Cluster Definition Factors [6 – 8]

Factor
Economic Concentration Factor
Cluster Dependency Factor
Economic Prosperity Factor

Table II: DRI/McGraw-Hill Cluster Factors [9]

Factor	**Weight**
Regional Employment Size	40 %
Employment Concentration	40 %
Supplier Factor	10 %
Regional Employment Growth	10 %

In this paper, we will

1. extend the work of Ulusoy, Bilgic, Oner [13] on analyzing the strengths of 9 provinces in Turkey to cover all 80 provinces (MaTeS Objective Indices);
2. analyze the strengths of the provinces in the technology sub-areas (defined by ISIC codes 2411, 2710, 2720, 3110, 3120, 3130, 3210, 3312) determined to cover all components of a designated military system [14];
3. apply "Technology Processes Management Capability Profile" (TPMCP) method [15] to two defense industry firms as a sample application of the TPMCP methodology.

II. METHODOLOGY

The approach used in this paper is sequential application of three methodologies:

A. MaTeS Objective Levelling, [13]
B. Clustering, [6 – 12],
C. Technology Processes Management Capability (TPMC) Profiles. [15]

A. MaTeS Objective Levelling

Manufacturing and Technology Strategies (MaTeS) Research Group at Boğaziçi University has developed a model for assessing and leveling the present and future capabilities of provinces in Turkey [12]. The model is based on 52 criteria grouped into five categories (Table III).

The data were gathered from the printed publications and the internet site of the Turkish State Institute of Statistics, State Planning Organization, internet sites of local businessmen and industrialists' associations.

Table III: Categories of MaTeS Objective Index

Categories
Human Resources
Physical Infrastructure
Technology and Industry
Trade and Finance
Quality of Life

Data were standardized by using Z-scoring method (Table IV). The Z-scores were put in a scale 1 – 10, 1 being the worst, 10 being the best.

Table IV: Sample Z-Scoring Method

Definition	**Data**
Province 01	X_1
Province 02	X_2
Province 03	X_3
....	...
....	...
Province 79	X_{79}
Province 80	X_{80}
Average	$X_{AVG} = SUM(X_i) / 80$
Std. Deviation	X_{STD}
Z-Score$_1$	$(X_1 - X_{AVG})/X_{STD}$

B. Clustering

In assessing the existing capability concentrations of provinces in the 8 technology sub-areas (Table V), we used the factors defined and discussed in the following sub-sections. The technology sub-areas were identified by Yildirim (2000) after consultation with the relevant TAF units. A more detailed analysis could be carried out by the TAF personnel in case the TAF chooses to use the suggested approach to their decision processes.

Table V: ISIC Code and Definitions of Tactical Rocket Technology Sub-areas [14]

ISIC Rev.3 Code	Definition
2411	Manuf. of basic chemicals
2710	Manuf. of basic iron and steel
2720	Manuf. of basic precious and non-ferrous metals
3110	Manuf. of electric motors, generators + transformers
3120	Manuf. of electricity distribution and control apparatus
3130	Manuf. of isolated wire and cable
3210	Manuf. of electron valves and tubes; othr electrnic cmpnt
3312	Manuf. of instruments/applncs for measuring, testing, navigating and other purposes

(i) Employment Concentration Factor (ECF)

In clustering studies, one standard approach is to use a "location quotient" which identifies the industries that employ more workers in the region than the national average for that same industry. The theory is that by employing more workers than the national average, the industry is producing more goods and services than the region alone can consume; thus the industries export the excess product out of the region.

ECFs are determined by calculating the percentage of employment in a four-digit ISIC code industry within a specified province to total provincal employment. If an industry's ECF is greater than 1.0, the national average, it can be assumed that some portion of its production is exported out of province.

$$ECF = (EAX/EAT) / (ETX/ETT) \quad (1)$$

where, EAX: number of employees in province A, industry sector X

EAT: total number of employees in province A

ETX: number of employees in Turkey, industry sector X

ETT: total number of employees in Turkey

While ECF is the most broad and accessible tool in the initial clustering process, industry knowledge, data, research and dialogue with representatives from the province should serve as important supplemental tools.

Table VI: Sample ECF Calculation

	Province 1	Province 2	Country
Emplymnt Ttl	25	21	490
Industry 1	4	5	80
Industry 2	7	7	53
Industry 3	14	9	101
$ECF_{IND\ 1}$	(4/25)/(80/490) = 0,98	1,45	1,00
$ECF_{IND\ 2}$	(7/25)/(53/490) = 2,58	3,08	1,00
$ECF_{IND\ 3}$	(14/25)/(101/490)= 2,71	2,07	1,00

ii) Firm Concentration Factor (FCF)

The hypothesis about FCF (and the following factors) is the same as ECF. As a result of development in an industry, the number of firms in a province will increase and reach a higher firm concentration compared with other provinces. This factor will be meaningful and descriptive for provincial progress in an industry when used and evaluated together with other factors of the model.

FCF = (FAX/FAT) / (FTX/FTT) (2)

where, FAX: number of firms in province A, industry sector X

FAT: total number of firms province A

FTX: number of firms in Turkey, industry sector X

FTT: total number of firms in Turkey

(iii) Economic Prosperity Factor (EPF)

Each product or industrial activity has different levels of wage levels; e.g., wage levels in software engineering and mining will differ. The annual avarege worker wages are used as a measure of economic prosperity in the relevant sector.

EPF = (WAX/WAT) / (WTX/WTT) (3)

where, WAX: annual wage of a worker in province A, industry sector X

WAT: annual wage of a worker in province A (total)

WTX: annual wage of a worker in Turkey, industry sector X

WTT: annual wage of a worker in Turkey (total)

(iv) Value Added Factor (VAF)

The hypothesis is the same as in the previous factors. The value added by an industry sector in a province shows the economic value and place of that sector in the province. If the value-added created by an industrial activity in a province is higher than the one in other provinces, one can say that there is a capability concentration in that industry within that province.

VAF = (VAX/VAT) / (VTX/VTT) (4)

where, VAX: value added by industry sector X in province A

VAT: total value added by all industry sectors X in province A

VTX: value added by industry sector X in Turkey

VTT: value added by all industry sectors in Turkey

(v) Total Power Capacity Factor (TPCF)

Total power capacity of a company reflects the total energy requirement of that company's equipment and machinery and is a measure of manufacturing capacity. The total power capacity in a province in a certain sector can be taken as a measure of manufacturing capacity in that sector in the province. TPCF is the arithmetic average of the following two factors.

TPCF = (TPCF1 + TPCF2) / 2 (5)

TPCF1 = (TAX/TAT) / (TTX/TTT) (6)

where, TAX: total power capacity of equipment in industry sector X in province A

TAT: total power capacity of equipment in industry sectors X in province A

TTX: total power capacity of equipment in industry sector X in Turkey

TTT: total power capacity of equipment in all industry sectors in Turkey

TPCF2 = TAX/(Number of firms in an industry sector in a province) (7)

By using data from State Institute of Statistics we calculated the above-mentioned factors for all the provinces in Turkey. After determining the factors we standardized them using Z-scoring method. We put the Z-scores into a scale between 1 and 10, where 10 is given to best Z-score and 1 to the worst Z-score. The total Z-score of a province was calculated as the arithmetic average of all Z-scores in the 5 above-explained factors.

C. TPMC Profiles

TPMC Profiles measure a firm's technology processes management capabilities at normative, strategic and operational management levels via a questionnaire. [15]

The model assumes that three levels of management plays a role in the management of technology processes. Normative level contains the far-reaching issues, such as company policy, company culture, and the structures of top management. The strategic level consists of the business strategy, the strategic structures and the strategic behaviour. The operational level contains the operational goals such as project goals, or any short-term goals, operational structures, and operational behaviour. [16].

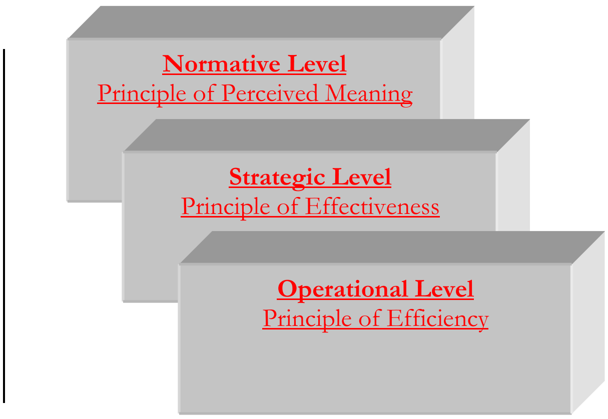

Figure 2: Three levels of management [16]

Yuksel [15] has developed a scoring method using the process model of technology management developed by Ozgur [17] at three management levels as defined in Tschirky [16]. The process model of technology management assumes 6 sub-processes:

1. Technology Identification
2. Technology Selection
3. Technology Acquisition
4. Technology Exploitation
5. Technology Protection
6. Technology Abandonment

III. RESULTS AND DISCUSSION

General MaTeS ranking of provinces are given in Table VII. Their rankings in the 5 categories (listed in Table III) can be found in Table VIII. Rankings in the rockets technology sub-areas are given in Table IX.

Table VII: General MaTeS Ranking of Provinces (Top 10; see Appendix A for the whole list)

	Z-Scores	Province
1	10,000	İSTANBUL
2	7,332	ANKARA
3	6,483	İZMİR
4	6,033	KOCAELİ
5	5,010	BURSA
6	4,736	BİLECİK
7	4,598	ESKİŞEHİR
8	4,477	ADANA
9	4,400	TEKİRDAĞ
10	4,330	KIRKLARELİ

TABLE VIII: Top 20 Provinces according to their modified Z-scores in Five Categories of MaTeS Objective Index

HUMAN RESOURCES		PHYS. INFRASTRUC.		INDUSTRY + TECHNOLOGY		TRADE + FINANCE		QUALITY OF LIFE	
10,000	İSTANBUL	10,000	BİLECİK	10,000	İSTANBUL	10,000	İSTANBUL	10,000	ANKARA
7,275	ANKARA	9,773	KOCAELİ	5,598	KOCAELİ	7,582	ANKARA	8,587	İSTANBUL
6,761	İZMİR	9,488	İZMİR	4,585	KIRIKKALE	4,912	İZMİR	8,437	ESKİŞEHİR
5,977	BURSA	9,149	İSTANBUL	4,540	OSMANİYE	4,443	KOCAELİ	8,373	İZMİR
5,742	ESKİŞEHİR	8,164	KIRKLARELİ	4,404	İZMİR	3,680	BURSA	7,592	KOCAELİ
5,707	ADANA	8,039	TEKİRDAĞ	3,800	KIRŞEHİR	3,333	DENİZLİ	7,307	MUĞLA
5,656	BİLECİK	7,488	ZONGULDAK	3,784	MARDİN	3,177	MUĞLA	6,929	BURSA
5,387	KONYA	7,075	ANKARA	3,537	ANKARA	3,032	TEKİRDAĞ	6,897	ISPARTA
4,959	KAYSERİ	6,686	BURSA	3,397	İÇEL	2,994	ANTALYA	6,821	ADANA
4,800	BALIKESİR	6,325	ADANA	3,376	BATMAN	2,956	ADANA	6,739	ZONGULDAK
4,778	SAMSUN	6,214	ÇANAKKALE	3,363	SAKARYA	2,950	BİLECİK	6,658	ANTALYA
4,768	İÇEL	6,182	NEVŞEHİR	3,087	YALOVA	2,766	ESKİŞEHİR	6,626	EDİRNE
4,741	MANİSA	5,943	EDİRNE	3,008	BURSA	2,722	KAYSERİ	6,615	ARTVİN
4,721	RİZE	5,764	ELAZIĞ	2,648	KİLİS	2,715	KIRKLARELİ	6,599	BURDUR
4,720	KOCAELİ	5,751	HATAY	2,581	MUĞLA	2,699	İÇEL	6,522	BALIKESİR
4,702	EDİRNE	5,745	İÇEL	2,540	KAYSERİ	2,544	EDİRNE	6,407	TEKİRDAĞ
4,698	SAKARYA	5,707	BOLU	2,380	KIRKLARELİ	2,445	MANİSA	6,384	KIRKLARELİ
4,683	KARAMAN	5,327	KIRIKKALE	2,361	ÇANAKKALE	2,444	ZONGULDAK	6,368	AYDIN
4,637	KIRIKKALE	5,217	ANTALYA	2,346	TEKİRDAĞ	2,444	AYDIN	6,362	ÇANAKKALE
4,599	BARTIN	5,191	MUĞLA	2,336	ZONGULDAK	2,415	UŞAK	6,219	DENİZLİ

Table IX: Ranking of Provinces in different Rocket Technology Sub-Areas

General Ranking		2411	BASIC CHEMICALS	2710	IRON AND STEEL	2720	NON-FERROUS METALS	3110	ELECTRIC MOTOR GENERATORS
10,000	İSTANBUL	10,000	BALIKESİR	10,000	HATAY	10,000	KONYA	10,000	DİYARBAKIR
8,160	ANKARA	4,980	KARS	9,657	KARABÜK	6,061	SAMSUN	5,425	İZMİR
7,567	KOCAELİ	3,062	KOCAELİ	6,354	ZONGULDAK	5,234	KIRIKKALE	2,249	İSTANBUL
4,481	BALIKESİR	2,182	İÇEL	5,171	KIRIKKALE	3,465	KOCAELİ	2,029	KOCAELİ
3,996	KONYA	2,063	NİĞDE	4,857	SİVAS	2,518	KAYSERİ	1,964	ANKARA
3,850	DİYARBAKIR	2,032	MANİSA	4,289	ELAZIĞ	1,875	SİVAS	1,604	MALATYA
3,833	İZMİR	1,638	AKSARAY	2,707	KOCAELİ	1,716	TRABZON	1,580	BİLECİK
3,282	KIRIKKALE	1,598	ÇANKIRI	2,516	ANTALYA	1,682	İSTANBUL	1,559	BALIKESİR
3,084	HATAY	1,456	YALOVA	2,495	İZMİR	1,574	ÇORUM	1,335	UŞAK
3,005	KARABÜK	1,453	İSTANBUL	2,228	BURSA	1,405	ANKARA	1,243	SAKARYA
2,774	SAMSUN	1,378	ANKARA	1,912	DENİZLİ	1,353	BİLECİK	1,137	İÇEL
2,342	ADANA	1,319	ELAZIĞ	1,831	BALIKESİR	1,336	BURSA	1,081	BURSA
2,322	KARS	1,232	KONYA	1,718	ANKARA	1,148	SAKARYA	1,000	ADANA
2,240	ZONGULDAK	1,188	SAMSUN	1,548	İSTANBUL	1,087	MANİSA	1,000	ADIYAMAN
2,165	SİVAS	1,180	KÜTAHYA	1,538	İÇEL	1,086	DENİZLİ	1,000	AFYON
2,061	BİLECİK	1,177	ISPARTA	1,302	KONYA	1,082	ADANA	1,000	AĞRI
1,868	ELAZIĞ	1,106	UŞAK	1,204	ADANA	1,059	GAZİANTEP	1,000	AMASYA
1,798	İÇEL	1,095	İZMİR	1,134	BOLU	1,033	İZMİR	1,000	ANTALYA
1,676	KIRKLARELİ	1,078	AFYON	1,092	BİLECİK	1,000	ADIYAMAN	1,000	ARTVİN
1,645	MANİSA	1,077	SAKARYA	1,078	KAYSERİ	1,000	AFYON	1,000	AYDIN

General Ranking		3120	ELECTRICITY DISTRIB. AND CONTROL APPARATUS	3130	WIRE AND CABLE	3210	ELECTRONIC COMPNENTS	3312	MEASURE TEST CHECK NAVIGATING INSTRUMENTS
10,000	İSTANBUL	10,000	İSTANBUL	10,000	KOCAELİ	10,000	İSTANBUL	10,000	ANKARA
8,160	ANKARA	5,942	ANKARA	5,588	İSTANBUL	6,153	ANKARA	4,098	İSTANBUL
7,567	KOCAELİ	5,850	ADANA	2,404	BİLECİK	2,554	AYDIN	2,330	KIRKLARELİ
4,481	BALIKESİR	4,680	KOCAELİ	1,685	DENİZLİ	1,822	MANİSA	1,284	BURSA
3,996	KONYA	4,469	İZMİR	1,424	ESKİŞEHİR	1,801	KOCAELİ	1,190	İZMİR
3,850	DİYARBAKIR	1,965	BİLECİK	1,397	KAYSERİ	1,156	İZMİR	1,000	ADANA
3,833	İZMİR	1,908	İÇEL	1,380	ÇORUM	1,000	ADANA	1,000	ADIYAMAN
3,282	KIRIKKALE	1,896	TOKAT	1,294	SAKARYA	1,000	ADIYAMAN	1,000	AFYON
3,084	HATAY	1,809	SAKARYA	1,294	TEKİRDAĞ	1,000	AFYON	1,000	AĞRI
3,005	KARABÜK	1,635	KIRKLARELİ	1,255	BOLU	1,000	AĞRI	1,000	AMASYA
2,774	SAMSUN	1,492	SAMSUN	1,049	BURSA	1,000	AMASYA	1,000	ANTALYA
2,342	ADANA	1,464	BALIKESİR	1,033	İZMİR	1,000	ANTALYA	1,000	ARTVİN
2,322	KARS	1,452	AYDIN	1,000	ADANA	1,000	ARTVİN	1,000	AYDIN
2,240	ZONGULDAK	1,351	BOLU	1,000	ADIYAMAN	1,000	BALIKESİR	1,000	BALIKESİR
2,165	SİVAS	1,292	ESKİŞEHİR	1,000	AFYON	1,000	BİLECİK	1,000	BİLECİK
2,061	BİLECİK	1,203	KONYA	1,000	AĞRI	1,000	BİNGÖL	1,000	BİNGÖL
1,868	ELAZIĞ	1,068	BURSA	1,000	AMASYA	1,000	BİTLİS	1,000	BİTLİS
1,798	İÇEL	1,000	ADIYAMAN	1,000	ANKARA	1,000	BOLU	1,000	BOLU
1,676	KIRKLARELİ	1,000	AFYON	1,000	ANTALYA	1,000	BURDUR	1,000	BURDUR
1,645	MANİSA	1,000	AĞRI	1,000	ARTVİN	1,000	BURSA	1,000	ÇANAKKALE

Examining Tables VII – IX, we see that the proposed approach allowed us to identify the accummulated capacities in provinces, although they have lower rankings in general MaTeS objective index. We have determined that 45 provinces out of 80 do have some capability concentrated in the 8 technology sub-areas of rockets and missiles technology.

TAF should direct its acquisition work toward bringing together researchers, e.g., at Balıkesir University with firms in that province in order to enhance already existing capabilities in ISIC 2411 area. Applying the same argumentation to other ISIC areas, we get Table X.

Table X: Suggested Rocket Technology Concentration Areas

ISIC Code	Province	University
2411	Balıkesir Kars	Balıkesir Unv Kars Unv
2710	Karabük+ Zonguldak Hatay	Karaelmas Unv Çukurova Unv
2720	Konya Samsun Kırıkkale	Selçuk Unv 19 Mayıs Unv
3110	Diyarbakır	Dicle Unv
3120	Istanbul Ankara	ITU METU
3130	Kocaeli	Kocaeli Unv
3210	Istanbul	Boğaziçi Unv
3312	Ankara	METU

The list of companies active in defense industry may be found in Appendix B. The mismatch between the "already existing capabilities in the technology sub-areas" and the number of defense industry firms in those provinces should draw the attention of both the public policy makers and private firm executives.

Although the provinces Kars (68th) and Diyarbakır (69th) are low in the MaTeS Objective Index listings, there exist capability concentrations in technology sub-areas 2411 and 3110, respectively.

TAF should design the aquisition programs in such a way that unhealthy concentration of defense industry firms in 5 or 6 provinces are avoided and nationwide-distributed local manufacturing capacity building can be achieved..

After completing our analysis of provinces and technology sub-areas, we determined the "Technology Processes Management Capability" profiles of two defense industry firms located in the province of Ankara. Firm A is a private/public firm quoted on the Istanbul Stock Exchange. Firm B is a state economic enterprise. Their scores on the different management levels are shown in Table XII. We suggest that TAF apply this audit to all defense industry firms and proactively monitor the process of how the firms improve their scores at different management levels as a function of time.

TAF should not forget that its future system requirements will only be met by local firms if they are aware of their technology processes management capabilities and constantly work on improving them. A strategic level score of a firm less than 50 should ring alarm bells. (Table XI)

Table XI: Normative, Strategic, Operational Scores of Firm A and B.

Management Level	**Firm A**	**Firm B**
Normative	68,3%	28,0%
Strategic	49,5%	44,4%
Operational	83,6%	40,7%

IV. CONCLUSIONS

In this paper, we have attempted to analyze how the Turkish Armed Forces could use its weapon systems acquisitions programs to improve on the already-existing manufacturing capabilities distributed differently among 80 provinces of the country.

Table XII summarizes the steps of the suggested approach for the TAF.

Table XII: Steps of Suggested Methodology for Assessing the Industrial Base of Turkey

1. Identify the weapons systems to be developed in the country
2. Identify all technology sub-areas contributing to the manufacture of the chosen weapons system in the country
3. Calculate the relevant clustering factors for all provinces and rank the provinces
4. Start a program to assess the technology processes management capabilities of firms in the top 10 provinces
5. Start university – industry – army joint reseach programs in the top 10 provinces
6. Monitor the technology processes management capabilities of the defense industry companies and industrial base capabilities of provinces

The TAF has a unique position in developing the industrial base of Turkey, if they choose local manufacture of weapons systems instead of importing them. The methodologies put forward in this paper should help the TAF to manage this process of local manufacture successfully.

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Appendix A

Table A: General MaTeS Ranking of Provinces

	Z-Scores	Province		Z-Scores	Province
1	10,000	İSTANBUL	41	3,167	KARABÜK
2	7,332	ANKARA	42	3,122	HATAY
3	6,483	İZMİR	43	2,992	SİNOP
4	6,033	KOCAELİ	44	2,992	NİĞDE
5	5,010	BURSA	45	2,958	GİRESUN
6	4,736	BİLECİK	46	2,957	ÇORUM
7	4,598	ESKİŞEHİR	47	2,919	KÜTAHYA
8	4,477	ADANA	48	2,913	SİVAS
9	4,400	TEKİRDAĞ	49	2,825	BARTIN
10	4,330	KIRKLARELİ	50	2,735	ÇANKIRI
11	4,238	MUĞLA	51	2,673	MALATYA
12	4,146	ZONGULDAK	52	2,666	ERZİNCAN
13	4,119	İÇEL	53	2,648	TUNCELİ
14	4,076	KIRIKKALE	54	2,628	AKSARAY
15	3,997	DENİZLİ	55	2,613	OSMANİYE
16	3,976	KAYSERİ	56	2,599	KİLİS
17	3,924	EDİRNE	57	2,540	AFYON
18	3,873	ÇANAKKALE	58	2,434	K.MARAŞ
19	3,850	BALIKESİR	59	2,409	TOKAT
20	3,828	ANTALYA	60	2,388	ORDU
21	3,801	SAKARYA	61	2,321	ERZURUM
22	3,778	BOLU	62	2,198	YOZGAT
23	3,680	MANİSA	63	2,180	GÜMÜŞHANE
24	3,675	KIRŞEHİR	64	2,125	MARDİN
25	3,673	YALOVA	65	2,087	BAYBURT
26	3,596	AYDIN	66	2,049	BATMAN
27	3,515	BURDUR	67	2,021	ARDAHAN
28	3,488	KARAMAN	68	1,953	KARS
29	3,459	KONYA	69	1,916	DİYARBAKIR
30	3,445	ISPARTA	70	1,902	BİNGÖL
31	3,437	SAMSUN	71	1,770	ŞANLIURFA
32	3,434	UŞAK	72	1,708	ADIYAMAN
33	3,432	NEVŞEHİR	73	1,634	IĞDIR
34	3,330	ARTVİN	74	1,604	SİİRT
35	3,262	KASTAMONU	75	1,527	HAKKARİ
36	3,260	RİZE	76	1,524	BİTLİS
37	3,213	ELAZIĞ	77	1,449	VAN
38	3,210	AMASYA	78	1,204	AĞRI
39	3,200	TRABZON	79	1,200	MUŞ
40	3,178	GAZİANTEP	80	1,000	ŞIRNAK

Appendix B:

Distribution of Defense Industry Firms among different provinces in Turkey as reported by Ministry of Defense Undersecretariat of Defense Industry

Table-B

Province	# of Firms
Ankara	84
Istanbul	69
Izmir	24
Bursa	21
Kocaeli	13
Eskisehir	6
Kayseri	6
Kırıkkale	6
Konya	6
Sakarya	4
Manisa	3
Adana	2
Aksaray	2
Balıkesir	2
Bilecik	2
Denizli	2
Hatay	2
Samsun	2
Sivas	2
Aydın	1
Cankırı	1
Corum	1
Kırşehir	1
Niğde	1
Tekirdag	1
Ordu	1
Zonguldak	1