STAFF APPRAISAL REPORT

REPUBLIC OF TURKEY

TECHNOLOGY DEVELOPMENT PROJECT

JANUARY 29, 1991

Industry, Trade and Finance Division
Country Department I
Europe, Middle East and North Africa Region
CURRENCY EQUIVALENTS

Currency Unit = Turkish Lira (TL)

<table>
<thead>
<tr>
<th>Year</th>
<th>Value (TL)</th>
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<tr>
<td>1986*</td>
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<tr>
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</tr>
<tr>
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<td>1,422.3</td>
</tr>
<tr>
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<td>2,121.7</td>
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<tr>
<td>1990*</td>
<td>2,629.0</td>
</tr>
<tr>
<td>1991 (January)</td>
<td>2,961.0</td>
</tr>
</tbody>
</table>

* Annual Average

LIST OF ABBREVIATIONS

AFCs - Allowable Full Costs
EACHH - Economic Affairs Higher Coordination Council
EC - European Community
FSAL - Financial Sector Adjustment Loan
FWCT - Foundation for World Class Technology
GAC - General Advisory Council
GATT - General Agreement of Trade and Tariffs
GNP - Gross National Product
GOT - Government of Turkey
IEC - International Electrotechnical Commission
IEMP - Industrial Export Development Project
IGEME - Export Promotion Board
IPks - Intellectual Property Rights
ISO - International Standards Organisation
ITD - Industrial Technology Development
KSRI - Korea Standards Research Institute
MLF - Matching Laboratory Fund
MSTIQ - Metrology, Standards, Testing and Quality System
NAC - National Accreditation Council
NATO - North Atlantic Treaty Organisation
NICs - Newly-Industrialised Countries
NMSI - National Measurement Standards Institution
OECD - Organizations for Economic Co-operation and Development
PIU - Project Implementation Unit
PTB - Physikalisch-Technische Bundesanstalt
R&D - Research and Development
SAL - Structural Adjustment Lending
SBIC - Small Business Investment Corporation
SDC - Science Documentation Centre
SMEs - Small and Medium Enterprises
SMI - Small and Medium Industries
SMIDO - Small and Medium Industries Development Organisation
S&T - Science and Technology
SPPO - State Planning Organisation
TETM - Information Technologies Centre
TSE - Turkish Standards Institute
TUBITAK - Scientific and Technical Research Organisation of Turkey
TUSIAD - Turkish Industrialists and Businessmen Association
UCICE - Union of Chambers of Industry and Commerce and of Commodity Exchanges
UNIDO - United Nations Industrial Development Organisation
UNDP - United Nations Development Program
VCC - Venture Capital Company
VCF - Venture Capital Fund
VCM - Venture Capital Management Company
VCMF - Venture Capital Management Company and Fund
YOK - Higher Education Council

REPUBLIC OF TURKEY

FISCAL YEAR

January 1 - December 31
# Staff Appraisal Report

## Turkey

### Technology Development Project

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This report was prepared by Mr. Oppenheim (EM1ID), Mr. Malas (IFC), Mr. Shetty (EMTIE) and Messrs. Hitchins, Woodcock, Street, Mast, Rathbone and Lalkaka (Consultants). The Peer Reviewer is Mr. Dahlman (IENIN). The responsible Division Chief is Ms. Nishimizu (EM1ID) and Director, Mr. Wiehen (EM1).
List of Annexes

ANNEX 1  The Scientific and Technical Research Council of Turkey (TÜBİTAK)
ANNEX 2  The Turkish Standards Institution (TSE)
ANNEX 3  Documents in Project File
TURKEY

TECHNOLOGY DEVELOPMENT PROJECT

LOAN AND PROJECT SUMMARY

**Borrower:** Republic of Turkey

**Beneficiaries:**
- The Turkish Standards Institute (TSE)
- The Scientific and Technical Research Organisation of Turkey (TÜBITAK)
- The Foundation for World Class Technology (FWCT)

**Amount:** US$100.0 million equivalent.

**Terms:** Seventeen years including a five year grace period at the Bank’s standard variable interest rate.

**Relending Terms:**
- **Metrology, Standards, Testing & Quality Component.** US$42.4 million of the Bank loan would be on-lent to TSE as an income note with payments based on TSE revenues over 17 years. Foreign exchange risk will be assumed by the Government. The remaining US$14.3 million of the Bank loan for this component will be allocated by the Government as a grant to TÜBITAK.

- **Research and Development (R&D) Component.** US$43.3 million of the Bank loan will be allocated as a grant by the Government to the Foundation for World Class Technology.

- **Venture Capital Component.** IFC will invest up to US$5.0 million in the Venture Capital Fund and US$0.1 million in the related Management Company. There is no Bank loan financing for this component.

**Project Description:** The strategy of the Government of Turkey for industrial technology development (ITD) has been to support firm-level productivity growth within competitive markets through (a) investing in the Metrology, Standards, Testing and Quality System (MSTQ), (b) funding research and development activities and (c) strengthening the framework for capital market activities. Despite gains made in these three areas, weaknesses persist constraining the performance of the Turkish economy. The project therefore has three components. The first component will bring the MSTQ system to OECD standards by (a) capacity building in the key public sector institutions and (b) fostering private participation in
the system. The second component finances a Foundation that will use seed capital to catalyse private sector investment in ITD (especially applied research). The third component aims to develop a venture capital industry by (a) establishing a legal and regulatory framework, (b) rationalizing the tax treatment of venture capital funds and (b) financing through the IFC a role model venture capital fund and management company.

**Benefits and Risks:**

The project will facilitate the outward-oriented industrial strategy of the GOT. Its main beneficiary will be the private sector whose technological effort and consequent productivity growth will be stimulated and assisted by the project. The project will generate three principal benefits. **First,** it will catalyse private investment in technical know-how. For some firms, the project will provide venture capital for innovative investments. For a much larger group, the main consequence will be a MSTQ system that enables improved quality management of existing operations. **Second,** the project will strengthen the organisation and delivery of public sector services in those areas where market imperfections or commercial uncertainty result in an under-investment of private resources. In this respect, the project has focused on investment in MSTQ, preempting a potential competitive disadvantage of Turkish firms in their OECD markets, and on the provision of seed capital for ITD in industries where Turkey can develop a dynamic comparative advantage. **Third,** the Project will strengthen linkages across the different stakeholders in the technology community.

This project is financing two new institutions, the Venture Capital Company and the Foundation that will invest in sub-projects where the payback can be hard to quantify and where failures are an inevitable part of the innovative process. Nevertheless, the project has been designed to minimise these risks. **First,** the major financial commitment of this project is to its lowest risk component - the MSTQ system. This aspect of Turkey's technology infrastructure can only grow in importance and its long term significance will not be affected by short term economic cyclicality. **Second,** the private sector through their participation in a National Steering Committee for the proposed Project, has played an active role in all phases of the Project preparation and implementation. This involvement helps to ensure the commercial relevance of the proposed operations and to build a culture of client orientation. Moreover, the selected interventions which this project
supports have parallels in other OECD countries. The design of each component transfers best international practices to Turkey.

**Estimated Costs:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Local (US$ million)</th>
<th>Foreign (US$ million)</th>
<th>Total (US$ million)</th>
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<tr>
<td>MSTQ</td>
<td>17.2</td>
<td>57.0</td>
<td>74.2</td>
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<td>R&amp;D</td>
<td>49.1</td>
<td>43.3</td>
<td>92.4</td>
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<td>Venture Capital</td>
<td>58.0</td>
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<td>95.6</td>
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<td><strong>Total Costs</strong></td>
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<td><strong>137.9</strong></td>
<td><strong>262.2</strong></td>
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**Financing Plan:**

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<th>Foreign (US$ million)</th>
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<td>Government of Turkey</td>
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<td>TSE</td>
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<td>Bilateral Donors</td>
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<td>95.0</td>
<td>100.0</td>
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<tr>
<td><strong>Total Financing</strong></td>
<td><strong>124.3</strong></td>
<td><strong>137.9</strong></td>
<td><strong>262.2</strong></td>
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**Estimated Disbursement:**

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<th>92</th>
<th>93</th>
<th>94</th>
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<tr>
<td>Annual</td>
<td>5.1</td>
<td>10.4</td>
<td>22.7</td>
<td>28.4</td>
<td>18.0</td>
<td>15.4</td>
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<tr>
<td>Cumulative</td>
<td>5.1</td>
<td>15.5</td>
<td>38.2</td>
<td>66.6</td>
<td>84.6</td>
<td>100.0</td>
</tr>
<tr>
<td>%</td>
<td>5.1</td>
<td>15.5</td>
<td>38.2</td>
<td>66.6</td>
<td>84.6</td>
<td>100.0</td>
</tr>
</tbody>
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**Economic Rate of Return:**

Not applicable

**Map:**

IBRD 22207
I. INTRODUCTION

1.01 Technology development is a firm-level activity that drives productivity growth and international competitiveness. Firms that invest in renewing their productive knowledge base and that compete by creating specialised assets - technical, organisational and human capital - lie at the heart of the process. It is their investment in technology development that sets the speed at which an economy changes the basis of its comparative advantage and raises the standard of living.

1.02 Competitive pressure from the market and the human capital endowment are the two main factors that influence the willingness and capacity of firms to increase productivity. Even in an economy where these two factors are present, there are nevertheless a number of reasons why, from a welfare perspective the private sector is likely to under-invest in technology development. First, the field is characterised by extensive free rider problems where measurement techniques, standards and reputation are concerned. Second, externalities make it hard for firms to capture the full return from investments in acquiring information and creating knowledge. Third, imperfections and information asymmetries in the capital markets may limit the supply of finance for innovative business ventures. The role of the public sector in technology development is therefore to catalyse private resource mobilisation for these activities.

1.03 The reform of Turkey's policy framework over the last decade has fostered an era of rapid economic growth and structural change. Trade liberalisation and domestic deregulation have created competitive pressure on firms to increase productivity. Incentives to export have generated opportunities for learning through interaction with buyers and suppliers in the international markets. Financial market reform is providing signals for resource reallocation towards high productivity sectors. At the same time, the rate of technological and economic change in the OECD markets is posing a fresh set of challenges to Turkish firms. To build a sustainable competitive position in the OECD markets, they will need to increase productivity and acquire know-how in the evolving technologies of informatics, biotechnology and materials development.

1.04 The strategy of the Government of Turkey for industrial technology development (ITD) has been to support firm-level productivity growth within competitive markets through (a) investing in the Metrology, Standards, Testing and Quality System (MSTQ), (b) funding research and development activities and (c) strengthening the framework for capital market activities. Despite gains made in these three areas, weaknesses persist constraining the performance of the Turkish economy. The project therefore has three objectives. The first is to develop the MSTQ system to OECD standards by (a) capacity building in the key public sector institutions and (b) establishing the mechanisms for
greater private sector participation in the system. Second, the project will stimulate private investment in ITD by providing seed capital for projects that generate business-university collaboration. A third objective is to foster the growth of a venture capital industry that can finance innovative business projects.

1.05 Turkey's ITD strategy is at a point of transition. Only a few years ago, the core policy problem was how to create a competitive environment in which firms would have an incentive to demand modern technological inputs and services. Today, the problem has become more a function of supply side weaknesses. If Turkish firms are to exploit opportunities created by an open economic environment, the public policy agenda of MSTQ, an effective system for research and development, and specialised finance for innovation need to be brought into line with the most progressive elements in Turkey's economic framework. In future years, the ITD agenda is likely to grow, incorporating the issues of intellectual property rights, extension services and informatics policy. By providing technical and financial support at this point, the proposed project can exert a positive influence over the future direction of the ITD program in Turkey.

1.06 This report is organised in 6 main chapters. Chapter II analyses the industrial and financial context for the proposed project and summarises the Bank's lending strategy in these two sectors. Against an international background of growing public sector investment in national manufacturing competitiveness, Chapter III lays out the GOT's strategy for intervention in ITD and identifies the key steps required to strengthen the public sector role. Chapter IV provides a detailed description of the proposed project, while Chapter V explains how the loan and credit would operate. Chapter VI summarises the agreements reached with the Government and participating institutions.

II. THE STRATEGY FOR INDUSTRIAL COMPETITIVENESS

A. Background

2.01 In the 1980s, the Government of Turkey moved decisively away from the model of import substituting industrialisation led by direct public sector investment. In its place came a strategy to accelerate industrial growth through policies that increase the efficiency of sectoral investment and enhance international competitiveness. The main instruments of this strategy have been:

* market liberalisation to increase incentives for firm-level technology development and to discipline producers;
* export orientation to generate productivity growth through economies of scale and learning externalities; and
* financial sector reform to improve the efficiency of resource allocation.
At the same time, the COT's own investment program has shifted away from direct competition with the private sector. Rather, the emphasis has been on those infrastructural investments in transport and communication that are more complementary to private investment.

2.02 Perhaps the most striking indication that this strategy is succeeding has been the export response of the manufacturing sector. A significant shift in relative prices in favor of export industries coupled with domestic stabilisation efforts resulted in a sustained growth of Turkish manufactured exports from US$1.0 billion in 1980 to just over US$9.0 billion in 1989. Studies of productivity growth before and after 1980 confirm the improvement in the performance of Turkish industry. The trend of negative productivity growth experienced in the latter half of the 1970s was reversed after 1980 in both the private (-4% to +3.5% per annum growth) and public (-7% to +6%) manufacturing sectors. This improvement was not restricted to the narrow range of export leading sectors (textiles, garments, leather products). Rather, it has been a broad based phenomenon embracing industries which enjoy scale economies (iron and steel, chemicals, fertilisers) as well as those characterised by batch production techniques (machinery, appliances, ceramics). This Chapter examines the three main policy instruments employed by the GOT and describes how the Bank has supported the strategy. It concludes with a brief discussion of the challenge facing Turkey in the 1990s.

B. Industrial and Financial Sector Strategy in the 1980s

2.03 The manufacturing sector in Turkey accounts for 1/4 of GNP, 1/8 of formal sector employment and over the last decade has grown at an average rate of 7% per annum. The composition of production has also changed markedly over the period. As might be expected from the change in relative prices, the last decade has seen faster growth in the labor intensive sub-sectors of apparel (including leather), pottery and machinery accompanied by a relative contraction in the production share of petroleum products, rubber products and non-ferrous metals. Export performance has been impressive (see para. 2.02), with the share of manufactured goods in total exports increasing from 1/3 to 3/4 over the period. Most of this growth has come from the penetration of OECD markets.

2.04 Market liberalisation. The policy regime inherited by the GOT was one of widespread public sector ownership of industrial assets, market intervention and a protectionist trade regime characterized by non-tariff barriers. Although this regime had succeeded in generating rapid economic growth with low inflation during the 1960s and early 1970s, the external price shocks of the 1970s (coupled with inadequate adjustment) revealed the inherent unsustainability of this approach.

2.05 Starting in 1980, the authorities implemented an extended stabilisation program and initiated a wide-ranging program of structural reforms. A progressive liberalisation of the foreign trade regime has been the hallmark of reforms to increase competition and to generate a more efficient set of price signals. Non-tariff barriers have been eliminated. The tariff structure has been rationalised and average rates significantly
reduced. To accelerate industrial sector adjustment, the Government has (a) raised the financial return on investment through the tax, incentive and preferential credit systems, (b) improved state enterprise efficiency by cutting low productivity capital expenditure and initiating a privatisation program, (c) liberalised the regime for direct foreign investment (Box 2.1) and (d) reduced barriers to entry and growth through domestic market deregulation.

2.06 The private sector has responded vigorously to the challenge of catching up with international competitors by (a) importing more modern technology (both embodied in machinery and disembodied in the form of licenses and technical agreements), (b) buying designs¹ and marketed know-how from international consultancies and (c) where possible, forming strategic alliances with foreign partners. As Table 2.1 indicates, demand for modern technology has jumped since the early 1980s. Demand is expected to strengthen further as a result of proposed changes in the tax code that lower corporate tax liability to 10% for companies using or producing advanced technologies.

Table 2.1: Inflows of Foreign Technology (embodied and disembodied) - 1982 to 1989

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<tbody>
<tr>
<td><strong>Direct Foreign Investment</strong></td>
<td></td>
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</tr>
<tr>
<td>Permits ($)</td>
<td>167</td>
<td>364</td>
<td>537</td>
<td>825</td>
<td>1471</td>
</tr>
<tr>
<td>Realised investments ($m)</td>
<td>55</td>
<td>125</td>
<td>106</td>
<td>354</td>
<td>738</td>
</tr>
<tr>
<td><strong>Investment Good Imports ($m)</strong></td>
<td>1940</td>
<td>34.0</td>
<td>3816</td>
<td>3989</td>
<td>3850</td>
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<tr>
<td><strong>Foreign License Agreements (#)</strong></td>
<td>25</td>
<td>76</td>
<td>94</td>
<td>76</td>
<td>74</td>
</tr>
</tbody>
</table>

Source: SPO

2.07 As Turkish firms approach the international productivity frontier, the catch-up potential of foreign technical know-how will diminish. To strengthen competitiveness, firm-level strategies will need to emphasize complementarities between local ITD effort and outward-oriented technology scanning and acquisition. Today however, private sector research and development remains weak, as revealed by the 1989 total of 13 firms applying for R&D fiscal incentives. Few firms have the in-house skills needed to succeed in the local ITD process of adapting, capital-stretching and upgrading their imported technological base. There is little systematic monitoring of competitors' core technological competences. Total quality management is only

¹ in both "mature" industries (e.g., textiles) as well as "technology intensive" industries (e.g., consumer electronics).
The Turkish Government has targeted the auto industry as a leading sector for the 1990s. The main policy instruments are:

- liberal OFR regime to bring leading international auto companies to Turkey and create competition for domestic licensees;
- tariff harmonisation with the EC to make Turkey an attractive export base for auto-assembly and components production;
- incentives to large-scale final assembly operations.

The Government strategy relies on rapid expansion of final assembly operations to generate backward linkages into the auto components and materials industry. The most dramatic results of this policy are the TOYOTA/SABANCI and possible PEUGEOT/CITROEN/PPI/ÇUKUROVA joint ventures, each representing investments of roughly US$500 million and a possible initial capacities of 100,000 p.a. The existing domestic suppliers are already responding. FIAT licensee TOFAS will invest US$320 million to produce 200,000 of the new Tempra line. RENAULT/OYAK, another long-time presence on the market, will also do away with revamped models from the 1970s and move to produce 100,000 of the newly unveiled R21 model.

GM has adopted a different approach. Investing in only a limited assembly operation (10,000 Vectras p.a.) as a defensive market strategy, GM has used the experience to identify and integrate leading Turkish suppliers of electrical harness equipment, exhausts and textiles into the GM (Europe) supplier network. Turkey's advantages (low wages, strong engineering base, low EC tariffs) together with a major shakeout in the European components industry is attracting other manufacturers. BOSCH (FRG), VALEO (France), ABB, AK-ZO and PHILLIPS (both of Holland) and SIEMENS (FRG) have all made investments, while VOLVO (Sweden) is discussing body parts manufacture. On the materials side, Turkey's three largest steel producers have all announced new investments in sheet metal production to meet rising demand for car bodies.

beginning to supersede more limited product testing. The public sector institutions to support (a) applied R&D, (b) product testing and quality assurance, (c) market intelligence and (d) industrial extension remain inadequately developed.

2.08 Export Orientation. The key to the Government's industrial strategy has been the export response, particularly in the private sector.
Stabilisation accompanied by aggressive exchange rate policy, trade liberalisation and export promotion measures quickly led to a large shift of production capacity from domestic to export markets. The economy raised its total factor productivity in the short run, rapidly increasing capacity utilisation. Aided initially by buoyant Middle East markets and latterly by successful penetration of OECD markets, exports grew over 20% per year in real terms and tripled their share in GNP by 1985. Industrial exports (especially processed foods, textiles and iron/steel) grew fastest.

2.09 Nevertheless, real exchange rate appreciation since 1989 and a sharp reduction in export incentives have resulted in a plateauing of manufactured exports at the 1988 level of US$9.0 billion. OECD analysis\(^2\) points to three underlying problems. First, the regional composition of exports still leaves Turkish firms exposed to relatively unstable demand from the Middle East. Second, firms have enjoyed only limited success in entering the international market for investment goods (the fastest growing segment of intra-OECD trade), making commodity composition of exports unattractive. Third, the majority of exports are in labor and scale-intensive industries that are highly price-sensitive and pro-cyclical. Sustained productivity growth through know-how acquisition and a shift into products that are less price and more quality sensitive is essential if firms are to build a competitive advantage in more discriminating market segments (Box 2.2). Collective action (by the public sector, industry and consumer associations, horizontal pre-competitive alliances by firms) is needed to capture the full economic return on investments in knowledge, reputation, information and human capital development.

2.10 Financial Sector Reform. The objectives of the Government's financial sector program have been to (a) increase the efficiency of resource mobilisation and allocation through financial liberalisation, (b) create an independent Central Bank and (c) strengthen banking sector adjustment to the real and financial shocks experienced early in the 1980s. Initiated under the SAL and FSAL I programs, the banking system component of financial sector reform has now been successfully accomplished under FSAL II. The introduction of prudential regulations on loan classification, provisioning, capital adequacy and loan concentration, the impact of the Central Bank in redefining its role as an autonomous monetary authority, the severe curtailment of preferential credits and near elimination of net interest subsidies, the establishment of a bank restructuring institution and the formulation of a strategy for the state banks all constitute radical change in the banking system.

2.11 The Government is now emphasising development of capital markets, today accounting for 10% of financial assets. The Capital Market Law, enacted in 1981, together with subsequent laws and regulations, provided a framework for their development. A Capital Market Board was established in 1985 to regulate and supervise private issuers and brokerage firms. The Istanbul Stock Exchange was reopened in 1986. Measures to stimulate capital markets

Despite the problems of its owner (Polly Peck UK Ltd.), Vestel has suddenly become Turkey's largest manufacturer of electronic consumer goods and a growing presence on the global market. In an international market where margins are razor thin, Vestel has managed to steal market share from competitors primarily located in the East Asian NICs.

With exports accounting for 70% of the firm's 1989 annual turnover of US$320 million, the key success factors appear to be:

- **Global Strategy** - Vestel is a key player in PPI's strategy to compete in international markets;
- **Technology Acquisition** - Vestel acquires technology through (a) intrafirm linkages with PPI subsidiaries SANSUI and IMPERIAL, (b) interfirm partnerships with GOLDSTAR and VIDEOCOLOUR and (c) consumer-supplier relations with IBM and AKAI;
- **Brand Management** - Vestel is graduating from its role as a supplier to OEM producers, and is establishing its own brand recognition in selected European markets.

Established firms have also moved to duplicate this strategy. PROFLO Holding has now sold 20% of its shares to France's Thompson with an option for a further 20%. KOC Holding in an unprecedented move has entered into negotiations to acquire either of two German firms, MIELE or AEG. At the same time, SHARP, WESTINGHOUSE, and ELECTROLUX of Sweden are also establishing links in Turkey, hoping to use operations there as a base for exports to the Middle East and the USSR.

<table>
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<th>Hi-Fi</th>
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<tr>
<td>Goldstar</td>
<td>Imperial</td>
<td>Videocolour</td>
<td>SANSUI</td>
<td>Goldstar</td>
<td>IBM</td>
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<tr>
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<td>Vestel</td>
<td>SANSUI</td>
<td>Vestel</td>
<td>W. Europe</td>
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</tr>
<tr>
<td>IMPERIAL</td>
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<td>Turkey</td>
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<td>Turkey</td>
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activity include (a) elimination of double taxation of corporate income and of withholding tax on dividends, (b) introduction of preferential corporate tax for companies with a wide shareholding base, (c) tax incentives for domestic mutual funds, (d) internationalisation of auditing standards and (e) in 1989, liberalisation of foreign investment in Turkish securities. Market capitalisation of the Istanbul Stock Exchange jumped from US$2.1 billion in January 1989 to US$18.6 billion by July 1990.

Despite these improvements in the financial system, the supply of long term finance for technological modernisation or development remains limited. Investments in technology development embodied in new equipment can be externally financed via the on-lending of multi- and bi-lateral funds by development, investment banks and most recently a small number of commercial banks. Technology development that comprises investments in intangibles such as process adaptation, product innovation and commercialisation, human capital
formation, software development or brand creation can be externally financed only by the top 100 firms that have access to equity capital markets. Small firms that produce knowledge-intensive goods and services have no access to external financing for technology development. One result is that many of Turkey's best technologists leave for more attractive business opportunities in other OECD countries. The "brain drain" may account for as many as 25% of scientific and engineering graduates from the elite (anglophone) universities.

2.13 To overcome this external financing constraint faced by small firms, the policy response of the Government is to establish a framework supportive of a venture capital industry. One lesson from the OECD (particularly USA) is that small entrepreneurial companies are an important source of innovation, productivity growth and employment for the economy. However, these companies often require specialised financing since (a) they are too small/risky to raise equity funds through a public offering and (b) the type of assets (ideas and people), the negative cash flow in the initial high growth years and the lack of collateral makes traditional bank loans unsuitable. The role of the venture capital industry is to provide equity (and quasi-equity) finance for this class of small innovative company.

2.14 As yet there are no venture capital companies operating in Turkey, frustrating the prospects of idea-rich but cash-poor entrepreneurs. In addition to a lack of venture capital know-how, this has been due to tax policies that significantly reduce the incentive to invest through venture capital funds. In countries where venture capital has flourished, the tax system places nominal tax incidence on investors in the funds (thereby avoiding taxation of financial intermediation), and taxes income derived from capital gains either at a zero rate\(^2\) or at the same rate as dividend income. In Turkey, tax policy is not consistent with this model. First, with the legal vehicles that are today available for venture capital, nominal tax incidence would be on the venture capital funds rather than on their shareholders. Potential shareholders with marginal effective tax rates lower than that estimated for the funds would therefore be unwilling to bear additional tax liability resulting from venture capital financial intermediation. Second, income derived from capital gains is taxed, and moreover without any adjustment for the impact of inflation on the real value of financial assets. At the standard corporate tax rate of 49.3%, the result is that positive returns pre-tax become negative post-tax (except at real growth rates that are in excess of 100% per annum). Development of the venture capital industry has become a victim of distortions created elsewhere by the current tax regime and its interaction with high rates of inflation.

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\(^2\) Theoretically sound tax policy would tax all sources of income (including real capital gains) in the hands of the final beneficiary, and would not tax corporate income before distribution to shareholders. Capital gains should not be taxed in systems where corporate profits are taxed (in effect, a withholding tax), where there is no inflation accounting for financial assets or where taxation can be levied only on realized capital gains.
2.15 The Government faces a number of challenges in creating a more rational tax treatment of corporate income. Corporate income taxes are today set at 49.3%, but nominal interest rate deductibility combined with a variety of other incentives and tax exemptions generate a much lower effective tax incidence. Dividends are tax-exempt. However capital gains are taxed on a nominal basis except for gains on shares listed on the Istanbul Stock Exchange (that are temporarily tax exempt). There are in addition certain tax exemptions for reinvested corporate income. In the medium term, the Government's strategy is to rationalize corporate income tax by (a) eliminating tax exemptions and inflation-dependent tax shields, (b) bringing the tax treatment of capital gains into line with that of dividends, and (c) lowering taxation on financial intermediation. Implementation of this overall strategy would remove tax constraints on venture capital industry development.

2.16 A first step towards corporate tax reform consistent with venture capital industry development would shift nominal tax incidence for venture capital profits from the funds to their shareholders. There would be two benefits from this approach. First, it would remove the tax-created non-neutrality between returns on direct and indirect (or intermediated) investment. Second, if potential shareholders in venture capital funds face a tax rate lower than 49.3%, it would reduce the effective tax rate on venture capital profits. This would help to offset disincentives created by the interaction of inflation with the 49.3% tax rate on nominal capital gains. The Government has therefore decided to establish a legal and regulatory framework for venture capital under Capital Market Board (para. 2.11) that will permit the introduction of this tax treatment.

C. Bank Lending to Industry and Finance

2.17 Bank lending has supported Turkey's medium term objectives of restructuring the economy by placing greater reliance on market forces and adopting a more outward-oriented development strategy. In the first half of the 1980s, the main vehicle for the Bank's assistance was the structural adjustment lending (SAL) program. Five SALs were made, ending in June 1984 and totaling US$1.6 billion. Since 1985, the lending program has focused on broadening and deepening the adjustment process at the sectoral level, through a mix of sectoral adjustment and complementary project lending.

2.18 The strategy for Bank lending to the industrial and financial sectors has been to help Turkey (a) achieve greater macroeconomic stability through focusing on key macro-sectoral linkages and (b) strengthen international competitiveness by supporting the export and technology development goals of the Government. The main instruments employed by the Bank have been:

- policy based operations in the financial sector to improve the efficiency of financial intermediation within the context of a more sustainable macroeconomic position (FSAL I, FSAL II);

- complementary technical assistance provided under investment credit operations to strengthen the institutional framework of
the banking system and to aid compliance of participating banks with new prudential regulations (SMI I/II/III, IEDP I); and

- the provision of investment credits (a) to small and medium companies (SMI I/II/III) and (b) export-oriented companies (IEDP I) to foster the growth of an internationally competitive private sector.

2.19 As Turkey moves beyond the era of structural adjustment, the question that confronts the authorities today is how to generate sustained economic growth. The need to achieve this transition has been accelerated by changes in the international trading and investment environment. The 1992 single market initiative in the EC, the paradigmatic shifts taking place in Eastern Europe and the opening up of many Asian economies all create a range of unexploited market opportunities for Turkish firms, but also a new set of competitive challenges. Moreover, exponential rates of change in manufacturing technology are rewriting conventional notions of export product hierarchies by allowing firms located in the more advanced industrial nations to compete in product lines where, in the past, NICs have enjoyed a significant labor cost advantage.

2.20 Within an appropriate medium-term macroeconomic framework, Turkey's ability to "catch-up" and to join the rank of industrialised nations will depend on her ability to generate productivity growth faster than in competing nations. The Bank's lending program will support the Government's development strategy for increased competitiveness through (a) sectoral reform, (b) enterprise restructuring, (c) financial sector deepening and (d) technology development. The sectoral reform program aims to improve allocative and dynamic efficiency through measures that reduce inflation, rationalise the tax and incentive system, accelerates the privatisation initiative and improves the business climate for private investors. Restructuring projects are under discussion in strategic sub-sectors with particular attention to environmental control and privatization. The financial sector program, in addition to strengthening commercial banks' role in term operations, emphasises capital market development (especially the insurance and pension industries) as a mechanism to create competition for the banking sector. The technology development program will accelerate productivity growth by assisting the Government to (a) stimulate private investment in ITD, (b) restructure public ITD institutions and (c) define policy framework for informatics and other knowledge-based industries.

III. THE STRATEGY FOR INDUSTRIAL TECHNOLOGY DEVELOPMENT

A. The International Situation

3.01 ITD is a market-based process that largely takes place in industrial firms. Continuous product/process modifications and organisational innovations, driven through an iterative exchange of information with suppliers, consumers and competitors, constitutes the bulk of ITD in all countries. At the same time, a smaller sub-set of firms invest heavily in R&D
to achieve more revolutionary technological breakthroughs. The role of the public sector is (a) to stimulate ITD by encouraging private risk-taking and (b) to help society capture the full returns from ITD investments.

3.02 There are 2 basic objectives in national policies and programs designed to increase the rate of technological change in industry. The most fundamental is to raise productivity levels and thereby welfare in the domestic economy. A second related goal is to enhance the international competitiveness of national firms by diversifying/sharing the risk of new product and process development. It is perhaps this second objective which commands greater attention in the advanced industrial nations and is best viewed as a central aspect of strategic trade policy. In the major OECD economies, the role of ITD interventions by the government is largely to create a "first-mover" advantage for national firms and thereby to earn monopoly profits in the international markets through technological leadership. In effect, ITD programs in these countries substitute for the explicit export subsidies prohibited under GATT.

3.03 ITD encompasses four main sets of programs/policies. First, all OECD Governments finance initiatives in applied and basic research for both civilian and military application. These projects are normally located at some mix of university, government laboratory and private sector company or consortia. Second, collective action is required to support a range of "infratechnologies" that provide a common tool kit for ITD. The public sector therefore plays a key role in financing primary databases, metrological capacity and standards development. Third, many governments are committed to facilitating technological change and productivity growth in small and medium enterprises (SMEs) through extension and subsidised consulting services. The economic justification for these "diffusion" programs is that imperfect information and capital markets constrain (respectively) the willingness and capacity of SMEs to change. Fourth, there is widespread public sector intervention in the capital markets to catalyse private investments in projects with above average technological risk. Interventions range from government guarantees through conditional loan programs (e.g., Japan) to the establishment of institutions to finance ITD (e.g., Korean Technology Development Corporation). The main lessons to have emerged are that:

(a) programs should be catalytic, crowding in rather than substituting for private investments in ITD;

(b) "infratechnologies" generate a high economic return, since they raise the productivity of all other ITD projects;

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4 directly through grants and procurement contracts and/or indirectly through the tax system.

5 The Small Business Investment Corporation (SBIC) Program in the USA provided government guarantees (and securitisation) that helped finance the venture capital industry.
(c) R&D programs need to be outward-oriented, monitoring the international scientific frontier and developments in related fields; barriers to commercialisation of R&D tend to be underestimated;

(d) a greater emphasis on "diffusion" programs is needed to narrow the wide intra-industry productivity gap between leading and lagging firms; and

(e) the public sector can take the lead in building partnerships that reconcile the interests of business, labor and the scientific community with regard to ITD.

3.04 There are three other aspects of ITD where public policy considerations have emerged over the last decade. First, in markets characterised by rapid technological change, companies are more aware of the relationship between technological leadership and competitive success. In many OECD countries there has been a renewed emphasis on the adequacy of the legal protection for intellectual property rights (IPRs) and other trade secrets, both cross-border and at home. One result is that IPRs are today on the GATT agenda. A second related issue has been the role of governments in limiting foreign access to core "technology assets". One aspect of this policy has been export licensing for technologies which have a potential military application. As part of a more broadly based strategy to preserve leadership in the key sectors of informatics, avionics and new materials, there is now an active debate whether governments should prevent foreign takeovers of national technology "champions". A third issue is the relationship between anti-trust and technology policy. Horizontal industry alliances in response to globalising competition and increasing costs of product development are forcing policymakers to reconsider the relevance of traditional anti-trust models.

B. The Strategy for ITD in Turkey

3.05 The strategy of the Government of Turkey for ITD is to support firm-level productivity growth within a competitive market economy. Learning from the Japanese and Korean experience, the vision is of a manufacturing sector that moves beyond cost-based entry tactics by first building core skills in production engineering and quality management, and then creating competitive advantage in knowledge-intensive goods and services. While this process will not take place at an even pace either between inter or intra-

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8 and would also tend to shorten the product cycle by increasing competitive pressure on the leading firms.

7 See also Special Study on Institutional Arrangements and Training for Technology Development: Republic of Turkey (IBRD, 1985, Report No. 5612-TU) for further background information on the science and technology sector.
industry, it is nevertheless the critical path along which all firms must travel. To facilitate this transition, the Government’s ITD program aims to:

- generate incentives for investment in product quality and in specialised sub-contracting relationships by strengthening the metrology, standards, testing and quality (MSTQ) infrastructure;
- exploit complementarities between local technological effort and foreign know-how by creating a system for market-oriented research and development; and
- accelerate the rate of intra-industry technological learning by establishing a network of SME extension centres;

The role of the public sector is to catalyse private sector investment in ITD and to finance ITD activities where market imperfections or free rider problems (para. 1.02) create a need for collective action.

3.06 While a range of public agencies exists to deliver specific ITD services, the institutional mechanisms to integrate these initiatives remains relatively weak. The Ministry of Science and Technology is only now beginning to play a leadership role (as in the Korean case) within the government. The Scientific and Technical Research Council of Turkey (TÜBİTAK), although reporting directly to the Prime Ministry, has a pronounced basic sciences orientation and has been largely unable to fulfill the mandate of advising the Government on broader ITD issues. The Higher Council for Science and Technology (S&T), although established by law in 1933, met for the first and only time in 1989. While the Government regards ITD as a fundamental aspect of economic modernisation, the coordinating mechanisms which exist in Government - for example, the State Planning Organisation (SPO) - are under-resourced to manage this complex set of responsibilities.

3.07 The Government is beginning to address this situation through (a) the Science and Technology (S&T) Policy Statement and (b) the establishment of an S&T Fund. In 1987, the Government issued an S&T Policy Statement, outlining the major existing and proposed initiatives in the field of ITD. This Statement spelled out the principles of S&T Policy, the instruments available to the Government and also an action program to correct a number of the deficiencies in the existing system. The priority actions that the Policy proposed were (a) improved tax incentives for R&D, (b) improvements in Government procurement policies (both civilian and defence related) to encourage greater local technological effort, (c) mechanisms for better collaboration between the scientific and business communities and (d) enhanced participation in international (EC and NATO) research programs. Although certain steps have been taken to implement this program, the overall scope of action remains limited. At present, the Parliament is reviewing a proposal from the Prime Ministry for funds that would be invested by a Science and Technology Board in inter alia (i) university-based R&D in biological sciences, computer and information sciences, engineering, geosciences and mathematical & physical sciences, (ii) an overseas scholarship program in S&T, (iii) teacher training and materials development program in S&T (secondary
schools through college), and (iv) participation of Turkish researchers/companies in international R&D programs. The composition of this Board would include representation from TÜBİTAK, Yüksek Öğrenci Kurtarma ve Koordinasyon Kurulu (YÖK) and the Economic Affairs Higher Coordination Council (EAHCC). Allocation of funds to the Board would be reviewed annually by the EAHCC.

Table 3.1: Composition of Public Expenditures on Technology-related Services Turkey

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<tr>
<th></th>
<th>1987</th>
<th>1988</th>
<th>1989</th>
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<tbody>
<tr>
<td>Direct Financial Support for R&amp;D *</td>
<td>81.6</td>
<td>74.1</td>
<td>84.4</td>
</tr>
<tr>
<td>Indirect Fiscal Support for R&amp;D</td>
<td>5.9</td>
<td>5.5</td>
<td>5.4</td>
</tr>
<tr>
<td>Other Expenditures:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metrology, Calibration &amp; Standards</td>
<td>5.6</td>
<td>8.6</td>
<td>8.0</td>
</tr>
<tr>
<td>Extension Services</td>
<td>3.0</td>
<td>3.2</td>
<td>3.5</td>
</tr>
<tr>
<td>Information Services</td>
<td>0.5</td>
<td>0.7</td>
<td>1.0</td>
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<tr>
<td><strong>TOTAL:</strong></td>
<td>96.6</td>
<td>92.1</td>
<td>102.3</td>
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*Central Government financed expenditures at TÜBİTAK, the Universities and other public research institutes.

Source: SPO, YÖK, TSE, Ministry of Industry

3.08 The Metrology, Standards, Testing and Quality (MSTQ) System.

Industry demand for refinements in measurement accuracy and for rigorous product specifications embodied in public standards continues to grow in all the OECD countries. Leadership in the R&D intensive industries (especially optics, materials and electronics) is increasingly measurement-dependent. The thickness of micro-chip circuitry is today measured in microns and computing time in nanoseconds. Future advances in (inter alia) informatics technology will inevitably require refinements in measurement techniques and a set of agreed standards. At a less elevated level, transactions involving simple components - screws or ball-bearings - would be much more difficult in the absence of an agreed system that (a) maintains the accuracy of primary measurement units, (b) defines and disseminates standards for product specifications and testing procedures, (c) calibrates working level instrumentation against more accurate measurement units, (d) accredits organizations that provide product, system and laboratory certification. An effective MSTQ system generates a set of implicit guarantees regarding product attributes, thereby reducing transaction costs in both the domestic and international markets. MSTQ also drives incremental learning in firms through the nested relationship between product testing, identification of technical
problems and process innovation. The role of the public sector is typically to (a) invest where free-rider problems are present (primary measurement units, standards), (b) to set up testing facilities in areas of public interest (environment, health, safety) and (c) to establish an independent accreditation process for product, system and laboratory certification schemes that will enhance their information content to consumers, and permit the development of a competitive market in these services.

3.09 Demand from industry continues to grow for an integrated MSTQ system that can provide measurement accuracy traceable to international standards. At the beginning of the export drive in the 1980s, firms entering the main OECD markets rapidly discovered that their products, even if low priced commodity items, had to pass certain tests and to meet minimum specifications. In the 1990s, the "quality" requirements for competitive success are likely to become more stringent. Competition from low-cost suppliers of Turkey's main manufactured exports (textiles and garments) make it imperative that Turkish firms move beyond cost-based "imitative" entry strategies towards the production of higher value added goods and a defensible market position based on a reputation for quality (Box 3.1). In addition to these market pressures, the introduction of strict product liability legislation and insurance provisions in OECD markets creates a legal requirement for exporting firms to demonstrate quality against internationally accepted standards.

**BOX 3.1 QUALITY MANAGEMENT AND COMPETITION IN THE CERAMICS INDUSTRY**

Ceramics and sanitaryware is a "mature" industry in which OECD competition is based more on product quality and design than on innovation. Although Italian companies are industry leaders, a number of Turkish firms including VITRA have already succeeded in entering export markets. VITRA is the largest sanitaryware producer in Europe, producing 1.2 million pieces of ware and exporting 65% of output. VITRA already carries out basic statistical techniques for testing product samples but a lack of quality management tools at each stage of production significantly constrains performance:

- **Product Design.** Prototype design and model making is limited by lack of CAD-CAM technology, increasing development costs, slowing down product commercialisation and adding to future manufacturing costs.

- **Clay Body Fabrication.** Testing is carried out on final product not of the green clay bodies. Techniques for detecting flaws at the green clay stage would save VITRA unnecessary firing and glazing costs.

- **Glazing.** Cleanliness problems in the factory allow dust to settle on the glaze before firing, generating wastage and higher product costs.

- **Firing.** Equipment to monitor firing temperatures provides inadequate control, adding to energy costs and final product failures.

- **Testing.** Testing is carried out in-house in an under-utilized and unaccredited laboratory. Products for export need to be retested in each export market to demonstrate compliance with OECD standards.

If VITRA is to improve its international competitiveness, improvements are needed in the national system for quality management training, for firm certification to ISO9000 standards and for laboratory accreditation.

3.10 The Government, responding to industry demand, has already established the basis for a modern MSTQ system. A National Laboratory for Measurement Standards is being established at TÜBİTAK. The Turkish Standards
Institution (TSE), an autonomous public agency with independent financial status, has developed a set of core competences in (a) standards preparation, (b) product certification and (c) testing. Further testing facilities are provided by the Small and Medium Industries Development Organisation (SMIDO), by the universities and within the large private sector corporations. Despite the growth in the MSTQ system (which in the case of TSE has been self-financing), its evolution to OECD standards will require three main actions. First, investments in metrology and calibration are essential to establish traceability for tests performed in Turkey against international measurement standards. Second, an independent accreditation body is required to "audit" organizations (both public and private) as qualified to provide certification of (a) laboratories, (b) product quality and (c) company-wide quality systems. This accreditation process, by removing the monopoly currently enjoyed by public agencies to provide quality certificates, is central to mobilizing private sector resources for this market. Third, an expansion of training would increase the supply of quality engineers and inspectors, of laboratory and instrument maintenance/repair technicians, of assessors for firm certification and laboratory accreditation and finally of senior management in total quality awareness.

3.11 Research and Development. In an economy where the leading firms are approaching international productivity levels, private sector demand for R&D is expected to grow rapidly. One result, however, of their previous reliance on imported technological know-how is that today, these leading firms face a challenge to develop in-house R&D competence. The Government's strategy for R&D, acknowledging the need to accelerate private sector R&D capacity-building, contains two main strands. The first is to encourage private investment in R&D through tax credits and holidays (see para. 2.07). The second is to improve the productivity of public sector R&D assets by (a) improving funding conditions (para. 3.07), (b) establishing mechanisms for collaboration between the business and scientific communities and (c) strengthening information-based research tools. The Government is also reviewing the legal framework for intellectual property rights.

3.12 Turkey is today at the beginning of this path and exhibits residual characteristics from an era when there was little industrial demand for R&D (Table 3.2). First, the levels of R&D expenditure in Turkey have been declining and are low when compared to its peer country group. Total registered R&D expenditures in Turkey accounted for only 0.22% of GNP in 1989, significantly lower than comparable figures for India (0.9% in 1987), Hungary (2.0% in 1986), Korea (2% in 1987), Brazil (0.6% in 1986) and Mexico (0.6% in 1984). Second, most R&D is still financed and carried out by the public sector (and universities). 87% of registered R&D expenditures in 1989 were financed by the various public sector Ministries and agencies. The main sources of finance are the Defence Industries Administration, TÜBİTAK and the Higher Education Council (the public agency responsible for university funding and administration). Third, market signals continue to have a weak influence

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8 Annex 1 contains a more complete account of TÜBİTAK and TSE.
Table 3.2: Composition of R&D Expenditures

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<tbody>
<tr>
<td>Universities</td>
<td>73.3</td>
<td>56.2</td>
<td>49.6</td>
<td>57.6</td>
</tr>
<tr>
<td>Public Research Institutes</td>
<td>36.0</td>
<td>29.7</td>
<td>27.6</td>
<td>26.9</td>
</tr>
<tr>
<td>Industrial Sector</td>
<td>19.3</td>
<td>10.9</td>
<td>7.8</td>
<td>7.7</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>128.6</strong></td>
<td><strong>96.7</strong></td>
<td><strong>85.0</strong></td>
<td><strong>92.2</strong></td>
</tr>
</tbody>
</table>

Source: SPO

on R&D resource allocation. One recent study documents the mismatch. On the one hand, 30% of R&D resources were allocated in 1987 to those 13 sectors where the collective "potential use" for R&D services is estimated at only 3% of total demand. On the other, for the 8 largest sectors which together account for 64% of the estimated demand for R&D services, a mere 25% of resources was made available.

3.13 The Government is taking a number of steps to correct these weaknesses. First, under the Higher Education Law (1981), universities (and TÜBITAK) are allowed to establish Revolving Funds as a legal mechanism for contracting with industry to perform research and consultancy work. The revenues from these contracts are divided in fixed proportions between the University Research and Equipment Fund (35%), university overheads (25%) and income supplements (40%). Scientists can earn up to a 200% bonus over their basic university income. Each university manages its own Revolving Fund under the supervision of the Higher Education Council (YÖK). Since 1984, Revolving Funds have grown 20% per annum in real terms. However, the majority of work is public sector funded with medical science the main source of revenue. Private companies remain hesitant to develop links with the universities because of concerns about (a) lack of confidentiality, (b) ability of universities to meet deadlines, (c) poor management framework and individual accountability within universities and (d) inadequately specified Revolving Fund contracts. Within the universities, Revolving Fund work is seen largely as an income supplement and is not a criteria for promotion or seniority.

3.14 Second, the State Planning Organisation (SPO) is sponsoring a Technopark initiative at five of the leading technical universities. The technoparks are to serve three main functions: as business incubators for small technology oriented companies, as a channel for commercialising technical know-how developed at the universities and as attractive sites for the research arms of larger corporations. The first of these technoparks, at

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8 Promotion of Linkages between Universities, Research Institutes and Manufacturers (Report to SPO, 1989).
Eskesehir University, is expected to be operational by 1991. To succeed, the technoparks will need to (a) attract management expertise, (b) establish strict entry and exit criteria, (c) be run on a commercial basis and (d) develop strong links with venture capital or other channels of innovation financing.

3.15 The Government has also focused on information services as a key research tool ("infratechnology") to increase the productivity of public sector R&D. To avoid unnecessary duplication, centralised investments have been made in on-line database facilities, comprehensive journal collections and (to a lesser extent) CD-ROM information search and retrieval technology at TURKDOC (a division of TÜBİTAK), at the Science Documentation Centre (SDC) and at the National Library. All researchers have access to these facilities, which offer an efficient remedy for local deficiencies in the technical collections of individual universities and institutes. Specialised information is also available through the Turkish Standards Institute (TSE) (local and international standards, international patents) and through the Intellectual Property Division of the Ministry of Industry (local patents). In an effort to make sure that these investments are fully utilised, the Government is planning a review of the informatics sector that will inter alia, analyse the scope for private delivery of information and data services.

3.16 To strengthen incentives for commercial innovation, the Government is bringing intellectual property rights (IPR) law in line with the EC conventions. A draft law has recently been presented to Parliament, updating the 1879 (patents) and 1965 (trademarks) law, that would (inter alia):

- remove the exemptions on patentability of pharmaceuticals, veterinary medicines and seed technology;
- rationalise the investigation of novelty process for domestic applicants (introducing an inventive step requirement and requiring comprehensive international searches);
- establish service marks; and
- provide protection of lower level IPRs, including industrial design and utility models.

Parliament is debating whether the potential benefits of the required changes (e.g., stronger incentives for local invention and cross-border technology transfer, consumer protection through trade and service-mark.) offset welfare costs that include (a) barriers to technological learning through reverse engineering and (b) the transfer of monopoly rents to foreign companies. The Government has initiated a program to modernise the Industrial Property Department of the Ministry of Industry, enhancing institutional capability to implement the new legislation.

3.17 Extension Services. As a necessary complement to the MSTQ system, the Government is supporting the delivery of extension services to small and medium enterprises (SMEs). Smaller firms, if they are to benefit from access
to product testing facilities, often need assistance at the next stages of problem identification and process innovation (see para. 3.08). The main public sector supplier of extension services is the Small Industries Development Organisation (SMIDO). Established in 1983 with the support of UNIDO, today SMIDO has a professional staff of 125, an operating budget of US$3.5 million per annum and provides a range of consulting, information and product testing services from 7 geographically diversified locations. A major expansion program is planned in which SMIDO will rapidly increase its client base from approximately 4,500 small companies (2.5% of manufacturing firms with less than 25 employees) to almost 19,000 firms (10% of the potential market). Key issues that SMIDO must resolve include how to (a) raise cost-recovery from above the existing 15% ratio; (b) maintain the quality of services at a time of rapid organisational growth; (c) identify the "progressive" SMEs with growth and fee-generating potential; and (d) strengthen coordination with TSE, the technoparks, information services etc.

C. Conclusions

3.18 The Government has made considerable progress over the last decade in implementing its ITD strategy. A competitive market environment is encouraging firms to increase productivity through local R&D effort and better quality management. Financial market liberalisation is enhancing the flexibility with which resources can be reallocated to innovative high productivity investments. Nevertheless, weaknesses remain constraining the performance of Turkish industry. In particular:

- the Government's ITD program is poorly coordinated, generating institutional overlaps and lacunae (para. 3.06);

- the MSTQ system remains below OECD standards, creating problems for exporting companies and limiting the potential for specialised sub-contracting arrangements (para. 3.10);

- research and development activities, funded 90% by the public sector, remain largely unresponsive to market forces (para. 3.12). As a consequence, universities have only limited links with business (para. 3.13);

- there is no innovation or venture capital finance (para. 2.12). Many graduates from the top technical universities (the potential class of technology entrepreneurs) leave the country (para. 2.13); and

- further actions are needed to stimulate the private delivery of database and information services (para. 3.15).
IV. THE PROJECT, LOAN AND CREDIT

A. Objectives and Scope

4.01 The objectives of this project are to:

- develop the MSTQ system to international standards by (a) capacity building in the key public sector institutions and (b) establishing a framework for greater private participation in the system;

- make research and development market driven by financing projects on a matching basis with the private sector; and

- foster the growth of a venture capital industry by (a) rationalising the tax environment and (b) establishing a role model company.

B. Justification for Bank Intervention

4.02 With its structural adjustment program nearing completion, the Government regards industrial technology development (ITD) as central to its strategy for raising productivity and international competitiveness. In an economy where ITD is a process of learning driven by competition and market interaction, the public sector role is to capture the externalities associated with knowledge acquisition and to ensure equitable access to the benefits of technological know-how and information. To accelerate its own learning in this field of public policy, the Government has therefore asked the Bank for technical and financial support. Bank involvement at this time can have a major impact on the Government’s ITD program.

4.03 Through a decade of investment in research followed by operational experience in a number of countries (Korea, Mexico, Brazil, Hungary and India), the Bank is well positioned to transfer knowledge and advise the Government on best ITD practices. The lessons of this international experience have fed directly into project design, which emphasises (a) the role of the private sector in ITD, (b) the balance between knowledge generation (i.e., R&D), commercial innovation (Venture Capital) and technology diffusion (MSTQ), (c) the internal incentives needed to make public institutions client-oriented and (d) the linkages between ITD and competition policy. The Bank has been able to play a leadership role in catalysing and coordinating international support (multilateral, bilateral and private) for ITD investment in Turkey.

4.04 The project will also address a set of public sector failures in the coordinated delivery of technology services. Public agencies (TÜBITAK, KUSGEM, TSE, YÖK), universities as well as Ministries (especially Planning,

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10 GOT preparation of this Project was partly funded by the Japan Grant Facility.
Finance, Defence, Industry and Education) have overlapping responsibilities for ITD. The Bank's presence has helped to facilitate working relationships between the major stakeholders and to enhance the dialogue between public and private sectors. As part of Project preparation, a National Steering Committee was established with senior representation from leading private firms, banks and the Government. This Committee will meet semi-annually to review progress on Project implementation and to advise the Government on key next steps. The Project has widespread ownership in Turkish industry and supports the transition from regulation to economic catalyst as the prevailing mode of public governance.

C. Detailed Project Description

I. The MSTQ System

4.05 US$56.7 million of the loan will be invested by the Government in a total US$74.2 million program\[1\] to develop a MSTQ system that meets OECD requirements and also the demands of Turkey's evolving industrial base. The Government's program for MSTQ development emphasizes four main tasks: (a) to upgrade public sector facilities for metrology, calibration and those aspects of testing where externalities and uncertain commercial returns deter private resource mobilisation, (b) to strengthen the human capital base in fields necessary for total quality management, (c) to reorganise the system to create a more efficient institutional division of labor and a greater role for the private sector in existing activities and (d) to improve the coordination between MSTQ and the SME extension activities. Within that overall program, the Technology Project will finance investments in three components:

(a) the medium term development of the National Measurement Standards Institution (NMSI) at the Gebze site of TÜBITAK;

(b) the Development Plan of TSE, including the establishment of a Quality Campus to provide training, calibration and specialised testing in the Istanbul industrial locality;

(c) the MSTQ "Infrastructure", including (i) the start-up costs of National Accreditation Council (NAC), (ii) initial programming of the Professional Institute for Quality Assurance, and (iii) a National Campaign for Quality Education. The NAC will provide supervision and secretariat support for the Professional Institute and National Campaign sub-components.

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\[1\] This figure excludes the related investment plan of SMIDO which is expected to equal US$25 million per annum during the life of the project.
Figure 4.1: Overview of Technology Development Project

<table>
<thead>
<tr>
<th>PROJECT COMPONENT</th>
<th>AGENCY</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>METROLOGY</td>
<td>TÜBİTAK</td>
<td>DEVELOP NATIONAL LABORATORY FOR MEASUREMENT STANDARDS</td>
</tr>
<tr>
<td>STANDARDS TESTING QUALITY</td>
<td>TSE</td>
<td>ESTABLISH QUALITY CAMPUS (ISTANBUL)</td>
</tr>
<tr>
<td></td>
<td>NATIONAL ACCREDITATION COUNCIL</td>
<td>STRENGTHEN FINANCIAL MANAGEMENT, PERSONNEL POLICY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PROVIDE ACCREDITATION SERVICES</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SUPERVISE NATIONAL MEDIA CAMPAIGN AND PROFESSIONAL INSTITUTE</td>
</tr>
<tr>
<td>APPLIED RESEARCH AND DEVELOPMENT</td>
<td>FOUNDATION FOR WORLD CLASS TECHNOLOGY</td>
<td>EXECUTE STRATEGIC STUDIES</td>
</tr>
<tr>
<td></td>
<td>PUBLIC SECTOR</td>
<td>FINANCE ITD CHALLENGE PROGRAM</td>
</tr>
<tr>
<td>VENTURE CAPITAL</td>
<td>PRIVATE SECTOR/IFC</td>
<td>CAPITAL MARKET BOARD TO DEFINE LEGAL AND REGULATORY FRAMEWORK</td>
</tr>
<tr>
<td></td>
<td>MINISTRY OF FINANCE TO RATIONALISE TAX TREATMENT OF VENTURE FUNDS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ESTABLISH VENTURE CAPITAL MANAGEMENT COMPANY AND FUND</td>
<td></td>
</tr>
</tbody>
</table>
4.06 National Measurement Standards Institution. Established in 1984 as a specialised division of TÜBITAK, NMSI has been designated by the Government as custodian of primary measurement standards in the key industrial fields. Currently, NMSI has a professional staff of 14 who are supported by the research expertise available at TÜBITAK's Gebze Research Center. The objective of the Government is to meet industrial need for primary standards for 6 selected measurement fields: dimensional metrology, electrical, mechanical, thermal and pressure, volume and, mass and optic measurements. To realise this objective, NMSI staff have prepared a Development Plan that envisages:

- an expansion of technical staff from 14 to 50, with a net addition of 10 qualified staff per annum from 1991 through 1993;
- an investment in specialised training of US$3.8 million;
- equipment costs (including procurement consulting) of US$11.6 million;
- investment in physical infrastructure of US$2.5 million; and
- financial and management separation of NMSI from the Gebze Research Center to ensure autonomous status in line with international practice for metrological institutes.

The total investment in fixed and technical human capital over the 5 year period is therefore expected to equal US$17.9 million (including price and physical contingencies). The Plan has been extensively reviewed within TÜBITAK and by external technical experts from Physikalisch-Technische Bundesanstalt (PTB) and from UNIDO. Financing has been mobilised from (a) the German Government (US$2.0 million), (b) UNDP/UNIDO (US$0.3 million) and (c) the Government (US$3.3 million), leaving a residual gap of US$12.3 million that the Bank will finance. The public good nature of this investment makes cost-recovery unlikely and it is expected that (as in other OECD countries) the Government will provide financing to the NMSI on an equity basis. A further US$2.0 million has been allocated from Bank finance to support initiatives by new management to improve overall operational efficiency at TÜBITAK (see Annex I) and in particular, to address the existing constraints on recruiting and retaining qualified staff. Total Bank financing for this sub-component is therefore estimated at US$14.3 million.

4.07 The Development Plan of TSE. The medium term strategy of TSE is to champion the introduction of quality management procedures to Turkey, while providing coordination and leadership for the whole MSTQ system. To implement this strategy, TSE plans to:

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12 PTB is the German Metrological Institute and is the executing agency for German bilateral assistance to NMSI and TSE.
• establish a **Quality Campus** at the industrialised municipality of Pendik near Istanbul. This Campus is to be a center of excellence for quality assurance training and certification (to international standards). It will also provide a complementary range of calibration and testing services to industry. The site already possesses basic utility infrastructure. During the first 5 year development phase, fixed investments are planned in (a) training facilities, (b) testing and applied research laboratories in the electrical, environmental/chemical, information technology/electronic, construction materials, mechanical, and packaging, and (c) calibration equipment. Safeguards will be introduced to ensure environmentally sound disposal of liquid and solid wastes that result from laboratory tests. Total development costs for the Campus are estimated at US$39.6 million of which World Bank financing is US$34.1 million;

• build human capital through a **training program** in the fields of quality assessment, computer applications, supplier quality assurance and product liability. Total costs of the training program are estimated at US$3.4 million over the five years and are to be financed by the World Bank (US$1.3 million), the German Government and TSE;

• improve institutional effectiveness by introducing a **modern financial and management information system**, and improving **personnel policies**. Total costs of technical assistance, hardware and software (including training) are estimated at US$2.2 million and are to be financed by the World Bank;

Total Bank financing for the TSE component of the Quality Infrastructure Plan is therefore estimated at US$37.6 million.

4.08 **MSTQ "Infrastructure".** The Government has identified independent third party certification of demonstrated quality as fundamental to the MSTQ system. To establish the framework and foster the development of a competitive market in these services, the Government has decided to (a) liberalize regulations that limit quality certification powers to public organizations, and (b) establish an independent NAC that will accredit certification organizations (both public and private) against published criteria covering integrity and technical competence. In July 1990, TSE established the National Quality Council with 15 members (majority private sector), representing all the key stakeholders e.g., Government Ministries with major purchasing and legislative requirements, SMIDO, TUBITAK, the Union of Chambers, the Chambers of Industry and Commerce, and the universities. TSE has one representative (the chairperson) on the Council and acts as its secretariat. The Plan proposes that by 1994, the National Quality Council should be transformed into a fully independent NAC, and that by 1996 the NAC should be self-financing through accreditation fees. Costs during the Council's transitional phase for training, definition of accreditation criteria, equipment and publicity are estimated at US$1.1 million and are to be financed by the Bank. Recurrent costs (largely personnel) during the
start-up phase are to be covered by TSE. It is envisaged that by 1993 public organizations (e.g., TSE, TÜBİTAK, SMIDO, IGEME) providing certification services will be subject to accreditation procedures and examination, thereby demonstrating the credibility of the system to potential private entrants in the certification/testing market.

4.09 The NAC (initially as the National Quality Council) will also be responsible for supervising two further initiatives under the Plan: the start-up of a Professional Institute for Quality Assurance, and a National Media Campaign for Quality Education. The Professional Institute aims to: (i) improve training of quality managers, technicians and assessors; (ii) create a professional qualification in the field; (iii) track international developments in MSTQ on behalf of the membership; and (iv) provide annual quality awards. Bank financing of US$1.0 million is to provide support for the start-up of this Institute. After 1994, it is anticipated that the Institute will be self-financing through membership and other fees. The goals of the National Media Campaign modelled after the successful UK experience, are to: (i) increase consumer awareness about the importance of quality, the meaning of quality certificates and of legal metrology; (ii) educate industry about certification schemes and modern quality assurance practices; (iii) provide public agencies with better information on standards relevant to procurement practices; and (iv) advertise available facilities for product testing, system certification and quality management training. A comprehensive campaign is planned over 5 years and is estimated to cost US$6.9 million. TSE will provide the secretariat under the guidance of the NAC. Bank financing for this sub-component is estimated at US$2.7 million.

4.10 Management of MSTQ Component. TSE has established a Project Implementation Unit (PIU) that (i) in the case of the TSE Development Plan reports directly to the President of TSE and Board, (ii) in the case of the Professional Institute and National Media Campaign reports directly to the NAC (initially the National Quality Council) and (iii) supports coordination between TSE and TÜBİTAK in the metrology and calibration fields. Two project managers with international experience are being recruited to run the unit. In the case of the National Measurement Standards Institute, TÜBİTAK will have full implementation and reporting responsibility.

4.11 Financing of MSTQ Component. The MSTQ program is being financed by a number of different parties. The total cost of the program is US$74.2 million, excluding the investments made by SMIDO in the extension infrastructure. The Bank is the main source of funds (US$56.7 million), supported by the Government (US$5.6 million), TSE (US$7.6 million) and the bi/multilaterals (US$4.3 million). The Bank's Project is coordinated with technical assistance of the German Government and UNDP. Table 4.1 breaks down the financing by MSTQ sub-component.

4.12 The NMSI (TÜBİTAK) is to be financed by a budgetary allocation from the Government in the form of a grant. In the case of all other program components, in which TSE has primary implementation responsibility, the Government has designed a financial package reflecting the fact that:
Table 4.1: Financing of MSTQ Component

<table>
<thead>
<tr>
<th>Component</th>
<th>Bank</th>
<th>Government</th>
<th>TSE</th>
<th>Bi/Multi-Lateral</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Lab #</td>
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<td>3.3</td>
<td>0.0</td>
<td>2.3</td>
<td>19.9</td>
</tr>
<tr>
<td>Quality Campus</td>
<td>34.1</td>
<td>0.0</td>
<td>4.0</td>
<td>1.5</td>
<td>39.6</td>
</tr>
<tr>
<td>TSE Development</td>
<td>3.5</td>
<td>0.0</td>
<td>1.6</td>
<td>0.5</td>
<td>5.6</td>
</tr>
<tr>
<td>MSTQ Infrastructure*</td>
<td>4.8</td>
<td>2.3</td>
<td>2.0</td>
<td>0.0</td>
<td>9.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>56.7</td>
<td>5.6</td>
<td>7.6</td>
<td>4.3</td>
<td>74.2</td>
</tr>
</tbody>
</table>

# Includes technical assistance to TÜBİTAK.

* Includes National Accreditation Council and Professional Institute start-up costs, and National Media and Quality Education Campaign.

- TSE is self-financing on recurrent cost basis but that to finance capital expenditures, TSE would have to take greater advantage of its monopoly position;

- TSE provides unremunerated services to the public sector, especially in the field of standards preparation for legislative and procurement purposes;

- Standards Institutes in other OECD countries receive significant public support for both recurrent and investment budgets;

- the MSTQ Development Program contains a mix of public goods and more commercial services; and

- other public organizations (especially SMIDO) continue to compete with TSE at highly subsidized rates for testing and calibration services.

TSE is also committed to an appropriate balance between its (non-profit) public service mandate and financial discipline. TSE is establishing a business development department (including the appointment of a Business Director at Assistant Secretary-General equivalent level), developing a profit center accounting framework and reviewing the profitability of its services and products. Net of the NMSI component, the MSTQ Plan is estimated to cost...

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12 The Korea Standards Research Institute (KSRI) covers only 38% of its recurrent costs from R&D projects and technical services to industry. About 50% of revenues (i.e., 19% of costs) is derived from publicly financed research projects.
US$54.3 million (including physical and price contingencies). To generate consistent incentives for TSE, Government therefore plans to on-lend Bank funds to TSE as an income note with repayments of not less than 5% of TSE revenue, with foreign exchange risk assumed by the Government and with no negative amortization. The instrument imposes financial (especially cost) discipline on TSE while recognizing that the public good aspects of TSE’s activities make future revenues uncertain.

II. Research and Development Component

4.13 The Government’s R&D strategy is to increase productivity in the public sector while encouraging greater private R&D effort (see para. 3.08). The project will help to implement this strategy by establishing an independent Foundation that will bridge the business and scientific communities by providing seed capital for:

- **Strategic Studies** on the competitiveness of key Turkish industries vis-a-vis economic and technological changes occurring in the international marketplace (100% grant finance);

- **ITD Challenge Programs** between universities and business, whose aim is to build local technological capacity especially in those areas identified by the strategic studies. The content of this program (although not to be prescribed prior to the studies) is likely to involve a mix of applied research, development of training programs, establishment of information services, industry-wide investments in MSTQ facilities, international joint ventures for technology transfer etc. The Foundation would provide a mix of grants, income notes and conditional loans that match the private sector contribution.

4.14 **Strategic Studies.** An important role for the Foundation is to act as one of Turkey’s "windows on the world", helping both firms and policymakers anticipate the impact of technological change. The first phase of strategic studies focuses on 6 main fields:

- export prospects for the auto-components industry;
- competition in the OECD textiles industry post the Uruguay Round;
- technological spin-offs from the defence industry;
- energy conservation technology needs in Turkish industry;
- opportunities in the European consumer electronics industry; and
- key issues in R&D; including intellectual property rights, scientific manpower and facilities/equipment audit.

An initial set of outline papers is due to be delivered in 1991. These will provide the framework for a more detailed set of sub-sector studies. In addition, it is proposed that TSE will complete a study during 1991 on the potential for the Foundation to provide matching finance to industrial associations for investments in cooperative testing facilities, certification schemes and quality management training courses.
4.15 Technology Challenge Programs. The Foundation is to provide seed capital for projects that develop Turkey's technology infrastructure, preferably through collaboration between private sector and the research establishment. Applicants must demonstrate that the proposed projects (a) will meet identifiable market needs, (b) possess scientific and technical merit, (c) have qualified personnel and (d) enjoy significant financial support from the private sector. Preference will be given to projects that fall within the fields of special emphasis and that have consortia backing 

The Challenge Program provides the Foundation with the flexibility to support a range of ITD initiatives outside applied R&D. In particular, the Foundation aims to broker (and at times invest in) joint ventures between international contract research organisations and local groups.

4.16 The Foundation is able to employ a full range of debt, equity and quasi-equity financing instruments. Projects will normally be financed on a conditional loan basis where repayments are tied to the success of the project. In exceptional cases where, for example, the Foundation retains all the intellectual property rights generated by the project, grant financing will be available. Following the European model, the Foundation will finance an agreed percent of the "allowable full costs" (in the case of private participants) or 100% of "marginal costs" (in the case of research institutes or universities. Allowable full costs (AFCs) are defined to include direct labor costs, expenses, external assistance (including sub-contracts), depreciation on equipment and overheads calculated in accordance with principles acceptable to the Foundation. Marginal costs are similar to AFCs except that (a) in the direct labor category, only incremental labor expenses are permitted and (b) overhead charges are fixed at 20%. Contracts between the Foundation and universities/research institutes will therefore not be subject to Revolving Fund regulations (para. 3.13) that specify mandatory contributions to University Research and Equipment Funds.

4.17 Management and Institutional Structure. The Foundation has been structured as a "vakif" that under Turkish law, is equivalent to a non-profit organisation and is tax-exempt. The highest decision-making body of the Foundation is the Constitutive Assembly, which acts as a Board of Trustees and meets a minimum of once a year. The members of the Constitutive Assembly have been selected on the basis of financial contribution to the vakif and are drawn mainly from private sector. At a more operational level, decisions are taken by the 9 member Executive Committee. Three members of the Executive Committee are appointed under the Foundation's Articles of Incorporation and represent Treasury, TÜBİTAK and the Union of Chambers. Five members of the Executive Committee are elected by the Constitutive Assembly and are therefore drawn from the private sector. The Executive Committee is responsible for (a) translating the strategic study results into operational guidelines for the Foundation's activities, (b) approving research programs over the US$50,000 level, leaving operational responsibilities and smaller projects to the staff, (c) monitoring the performance of the Foundation against financial and

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14 since consortia projects are more likely to be pre-competitive in nature and generate greater externalities.
technical evaluation criteria, and (d) auditing and reporting requirements. The Foundation will have a Secretary-General (responsible for managing operations including personnel and budget functions) and a small staff, initially comprising 3 professional and 2 support personnel, with a mix of business, scientific and legal backgrounds. The staff is responsible for (a) identifying programs, (b) facilitating and evaluating proposals with the help of external peer review committees, (c) negotiating contracts between participants and the Foundation, (d) monitoring the projects, (e) establishing and defending intellectual property rights emerging from the program, (f) designing operational procedures and (f) developing the revenue stream of the Foundation.

4.18 The Foundation will adopt an active approach to its portfolio of projects, offering management reviews on a regular basis and enforcing the parties' contract. For each project, there will be major milestones after 3 months and then at the end of the first year at which point a decision will be taken regarding second year funding. The Executive Committee will review each project (greater than US$50,000) at the time of grant negotiation, at the first year review and at the end of the project. On an exception basis, further funding (25%) might be available in Year 3.

4.19 Financing the Foundation. Total financing requirements of the Foundation are estimated at US$50.6 million over the first 5 years (see Table 4.2). High initial expenditures on the strategic studies (which peak in 1993) are used to establish the basic framework for the technology action program, which builds up over the first 3 years to reach a stable portfolio of between 22 and 24 live projects (12 new projects each year with an average project duration of 24 months) by 1995. The major sources of funds will be IBRD (US$43.3 million), private sector contributions to the seed capital of the "vakif" (US$1.0 million), grants from bi/multilateral donors (US$3.7 million) and income generated by the Foundation itself (US$1.7 million). Internally generated revenues are expected to grow in importance with the long-term aim that the Foundation be self-financing through (a) licensing of intellectual property vested in the Foundation, (b) management fees and (c) specially commissioned studies and strategic/policy advice. Until the Foundation is in a position to cover overheads, TÜBİTAK has agreed to provide accommodation and other material support to reduce the burden of administrative costs. The Government will also ensure the tax-exempt status of the Foundation immediately upon the Foundation's satisfaction of the legal requirements according to the Law for Foundations. Total component costs, assuming matching private sector contributions to the Challenge Programs, would be US$92.4 million.

III. Venture Capital Component

4.20 There is a large potential market for venture capital finance in Turkey. First, deregulation of domestic markets has significantly reduced barriers to entry and growth. The number of private firms entering the market more than doubled from 6,340 in 1981 to 14,882 in 1989, with the sharpest increase in the manufacturing sector (1,275 to 3,871). Second, the pool of engineers and scientists (especially in electronics, computer sciences) is
Table 4.2: Sources and Use of Foundation Funds
1991 to 1996 (CYs) US$ current million

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<tbody>
<tr>
<td>Start-up Costs</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Administration Costs</td>
<td>0.2</td>
<td>0.5</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Strategic Studies</td>
<td>0.3</td>
<td>0.4</td>
<td>1.5</td>
<td>1.1</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Challenge Grants</td>
<td>0.0</td>
<td>3.6</td>
<td>6.8</td>
<td>9.7</td>
<td>10.6</td>
<td>10.9</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.7</td>
<td>4.7</td>
<td>9.2</td>
<td>11.7</td>
<td>12.1</td>
<td>12.4</td>
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<tr>
<td>Government</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Own Resources</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>IBRD Resources</td>
<td>0.3</td>
<td>4.2</td>
<td>8.3</td>
<td>10.2</td>
<td>10.3</td>
<td>10.3</td>
</tr>
<tr>
<td>Private Sector</td>
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<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Bi &amp; Multi-laterals</td>
<td>0.1</td>
<td>0.2</td>
<td>0.5</td>
<td>0.9</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Internal Funds</td>
<td>0.0</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
<td>0.4</td>
<td>0.7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.7</td>
<td>4.7</td>
<td>9.2</td>
<td>11.7</td>
<td>12.1</td>
<td>12.4</td>
</tr>
</tbody>
</table>

Note: Real Expenditures stabilise at 1996 levels

Source: IBRD/TÜBİTAK Estimates

growing rapidly. University enrollment in scientific fields (excluding medicine) is estimated at 116,000 in 1987. The total number of graduate engineers is estimated at 159,000 (1989). Third, market surveys revealed an existing pipeline of possible deals for the proposed VCC in a range of subsectors with significant foreign exchange earning potential (electronics and software, tourism services, control equipment, precision instruments, telecom components, business consultancy). Many of the potential clients for the VCC appear willing to make the tradeoff between internal control and external equity financing. However, despite the market opportunity, the supply of venture capital finance appears to be constrained by tax considerations, the existing legal framework and lack of know-how.

4.21 The Government has identified the growth of a venture capital industry as central to its financial sector strategy for ITD (see para. 2.13). Accordingly, the Project will help to catalyse the industry by:

* defining a legal and regulatory structure for the venture capital industry under the amended Capital Market Board Law;
- 31 -

* providing appropriate tax treatment for venture capital funds that overcomes tax-related disincentives to venture capital financial intermediation; and

* establishing a private venture capital company and fund (VCCF) to act inter alia as a role model for the industry.

The Bank and IFC are providing joint assistance to the Government on this component. The role of the Bank (with the support of IFC) has been to (a) provide advice to the Government on legal, tax and regulatory aspects of venture capital, (b) to assist in the market analysis and identification of technology-oriented deals. The proposed regulatory and tax changes provide an opportunity for IFC, as a shareholder in the Fund and Management Company (para. 4.21) and together with a foreign technical partner, to transfer venture capital know-how to Turkey.

4.22 **Legal and Regulatory Structure.** To accelerate healthy development of the venture capital industry, the Government has decided to introduce a regulatory and legal framework for the industry consistent with the model in other European countries (notably Spain and Portugal). Capital Market Board is responsible for supervising the industry, and has prepared draft guidelines that:

* define a legal structure for the industry based on a separation of venture capital management companies from venture capital funds;

* with regard to the management companies, specify the legal structure, minimum capitalization and minimum qualifications for venture capital fund managers;

* with regard to the funds, specify the legal structure (modified from the legal vehicle for mutual funds), minimum size of fund, minimum number of shareholders, minimum investment per shareholder, minimum and maximum life of funds, acceptable changes in shareholding structure, and "firewalls" between the fund shareholders and the fund portfolio companies;

* with regard to portfolio management, specify prudential guidelines for allocation of fund assets, and for reinvestment of realised profits;

* define registration, reporting and auditing requirements; and

* regulate the relationship between the management companies and funds, including fee structures/incentive packages for the management companies, contract termination provisions and fund draw-down agreements;

After further revision and consultation with the financial community, these Guidelines are due to be issued officially in the first quarter of 1991.
4.23 **Tax Treatment of Venture Capital Funds and Management Companies.** Management Companies under the draft regulations will be structured as "anonym sirket" companies under the commercial code, and will be subject to standard tax treatment for corporate income. For Venture Capital Funds registered with the Capital Market Board (and in full compliance with the regulations), the proposal of the Ministry of Finance is that they will not be subject to tax. Rather, tax incidence will be shifted from the Funds to the shareholders in the Funds at the time that income is realized and distributed. This tax "pass-through" treatment will be consistent with that for venture capital in other OECD countries, and also with that proposed for similar financial vehicles (e.g., mutual funds) in Turkey. Although not correcting for the asymmetric treatment of dividend and capital gains income, tax pass-through for venture capital funds has benefits (see para. 2.14) of (i) eliminating distortionary taxation of venture capital financial intermediation, and (ii) allowing shareholders maximum control over their own tax strategies. Legal and real personalities (both domestic and foreign) that have a marginal effective tax rate significantly lower than the standard 49.3% will therefore be able to minimize (to some extent) the adverse impact on capital gains income that results from the interaction of high inflation with the corporate income tax regime. A tax amendment has been drafted by the Ministry of Finance, and will be presented to the legislature upon Issuance of Regulations for the Venture Capital Industry by Capital Market Board.

4.24 **Venture Capital Company and Fund (VCMF).** In accordance with the proposed regulations, the VCMF has been structured on a two-tier basis. An independent venture capital management company (the VCM) will manage a fee a closed-end venture capital fund (the VCF). The IFC is the only common shareholder in both the VCM and the VCF. This two-tiered structure is widely practiced in the venture capital industry. Its main justification is that it mitigates the risk that larger shareholders in the Fund might have undue influence over the portfolio decisions of the management.

4.25 Shareholders in the VCM are the IFC, a leading international venture capital management company and the local management team. The total equity of the VCC is estimated at US$0.6 million. The VCM will have a small staff (4 professionals) to identify, evaluate and structure deals as well as providing managerial support to the portfolio companies. The foreign technical partner is training staff in best practice appraisal and valuation techniques. Compensation for the VCM is market-driven and is estimated at (a) an annual fee of 3% for the first US$30.0 million of the VCF and 2% of VCF funds thereafter, and (b) carried interest\(^{15}\) of 20% of the VCF's net returns. Shareholders in the VCC will receive a share of carried interest pro rata their equity stake in the Company. These terms are in line with standard international practice.

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\(^{15}\) Carried interest is defined as the net proceeds of the Venture Capital Fund once the initial capitalisation of the Fund (inflation adjusted) has been returned to Fund shareholders.
4.26 The VCF has been structured as an investment fund under the regulations of the Capital Market Board with (as part of the Shareholders' Agreement) a limited life of 8 years and restrictions on the transfer of shares to (a) reflect the illiquidity of the investments and (b) maintain a balanced shareholder group. Conservative projections suggest that the demand for equity finance over the first three years of the VCF's life would be a minimum of US$40.0 million with a draw-down schedule of 40%, 30% and 30%. The main shareholders in the VCF are expected to be (a) IFC (US$5.0 million), (b) other international investors (US$11.0 million), (c) Turkish private sector (US$20.0 million), and (d) the Development Banks (US$4.0 million). Annual management fees will be paid in at the beginning of each year with remaining VCF shareholder funds calleable in line with portfolio financing requirements.

4.27 The funds will be invested in the equity of companies with innovative business ideas ("portfolio companies") where the type of assets (often intangible), the cash demands of rapid growth, a lack of collateral and the high risk nature of the proposed ventures makes traditional bank financing inappropriate (para. 2.13). The portfolio is expected to contain a mix of start-ups, expansion and buyout portfolio companies. A number of the investments are expected to emerge from the Technology Challenge Program of the Foundation (para. 4.12). There will be no restriction on the type of portfolio company. However international experience indicates that the funds will be disproportionately invested in technology oriented companies. The size of investments is expected to range from US$0.5 million to US$2.0 million where, in no case, will the investment be greater than 5% of the VCF's total capital or 50% of the shareholder capital in the portfolio company. In larger deals, the VCC will aim to lead manage syndicated financial packages. Total project costs are estimated at US$89.0 million, assuming (i) average equity contributions of 60% by portfolio companies and (ii) net investible funds (after management fees) of the VCF equal US$33.4 million.

4.28 Appraisal procedures have been designed in line with international practice and the full cycle (from application to Board approval) will take a maximum of 45 days. The VCM is projecting an approval to application ratio of 1:40 with approval of between 10 and 15 projects per year. As part of the final review, the VCM will seek external advice from independent industry specialists. Consultation with the proposed Foundation (see para. 4.08) will take place on a regular basis to pool information on (a) potential deal pipeline, (b) lessons from the strategic studies and (c) availability of industry experts. Potential portfolio companies (although expected to have an exceptionally low probability of causing environmental damage) will be required to demonstrate compliance with the environmental regulations of the GOM and municipal authorities. This approach to environmental protection will be reflected in the policy statement of the Venture Capital Fund.

4.29 The projected return to investors in the Fund is highly sensitive to assumptions regarding project success ratios, the timing of exit and the reinvestment ratio. The VCF's projections assume that:
• 40% completely fail, 40% achieve a modest 10% per annum real return on equity and the 20% of high performers achieve a 30% per annum real return on equity;

• there is no reinvestment during the first 8 years; and

• there are no dividend payments made by the investee companies.

On the basis of these assumptions, the earnings on the VCF will equal a real rate of 15% per annum. If divestment took place before the 8th year and reinvestment at equivalent rates by the VCM were assumed, then the overall IRR would be significantly higher over the life of the Fund. However reinvestment decisions will be taken at a later point by the VCM's management, subject to approval by the Board of the VCF.

D. Benefits and Risks

4.30 Benefits. The project will strengthen the framework for ITD in Turkey through interventions that accelerate know-how diffusion and acquisition in industry. Three main principles lie behind the project design. First, the project will catalyse private firms to invest in the technology development necessary for competitive success in the international markets. Second, the project will improve the focus and delivery of public sector ITD services in those areas where market imperfections or a high degree of commercial uncertainty are likely to result in an under-investment of private sector resources. Third, the project will strengthen linkages between the different stakeholders in the technology community. One major lesson of OECD experience over the last decade is that ITD depends on a partnership between private business, the scientific community and the government to overcome the coordination costs and complexity of "technology strategies". The project provides a practical opportunity in Turkey for the key stakeholders to create a shared framework for technological development.

4.31 Metrology, Standards, Testing and Quality (MSTQ). There are two main benefits associated with this component. First, the component will close the international productivity gap by addressing a potential competitive disadvantage of Turkish firms in their main export markets. EC integration will result in a progressive introduction of ISO9000/EN45000 quality assurance standards, generating market entry barriers for those firms which cannot prove compliance. The development of an MSTQ system to international standards will therefore support the outward-oriented industrial strategy of the Government. Second, an effective MSTQ system helps to narrow the internal productivity gap in industry, raising international competitiveness and generating consumer welfare gains. On the one hand, the certification of production techniques against quality assurance standards will encourage the larger firms, as prime contractors to become more discriminating purchasers of inputs and to provide technical assistance to their suppliers. On the other, standards material and testing facilities, if widely available, are sources of

10 in many cases, as a requirement for product liability insurance.
technical know-how that help smaller firms improve their practices and understand market requirements.

4.32 **Research and Development Component.** The proposed Foundation is central to the Government's R&D strategy. First, the program of strategic studies will improve decision making at a time when public and private organisations are expanding the resource base for technology development. Second, the seed capital program for ITD is expected to mobilise private sector investment for medium term technology acquisition and diffusion projects. Third, the Foundation will have a positive impact on the management and accounting practices in universities, thereby supporting stronger links between business and academia.

4.33 **Venture Capital Component.** This component is expected to generate three main benefits. First, the Government has established a regulatory and tax framework for venture capital that should enable the industry to flourish. Second, the establishment of a role model venture capital company addresses a key gap in Turkey's capital markets. The success of the company in devising a range of specialised instruments to meet the needs of its clients should stimulate financial innovation in other segments of the domestic capital market. Third, the availability of venture capital will strengthen the framework for entrepreneurship and for commercial innovation in the Turkish economy. The component is a necessary complement to the Government's technopark initiative (para. 3.14) and will support its program to make R&D more commercial.

4.34 **Risks.** This project is financing two new institutions, the Venture Capital Company and the Foundation, that will invest in sub-projects where the payback can be hard to quantify and where failures are an inevitable part of the innovative process. Nevertheless, the project has been designed to minimise these risks. **First,** the major financial commitment of this project is to its lowest risk component - the MSTQ system. This aspect of Turkey's technology infrastructure can only grow in importance and its long term significance will not be affected by short term economic cyclicality. **Second,** the private sector has played an active role in all phases of the project preparation and implementation. This involvement helps to ensure the commercial relevance of the proposed operations and to build a culture of client orientation. Moreover, the selected interventions which this project supports have parallels in other OECD countries. The design of each component transfers best international practices to the Turkey.

4.35 Other major risks include (i) the management capacity in counterpart institutions and (ii) uncertainties in the policy and financial environment. On the management side, a number of steps are being taken to strengthen skills and procedures at the counterparts. **First,** the Project is assisting all counterparts institutions in preparing and implementing personnel development programs. **Second,** internal incentive structures have been introduced to tie senior management compensation to performance. **Third,** the reporting requirements for project supervision will flag problems at an early stage. Semi-annual reports will provide detailed information on (a) performance to date, (b) new sub-projects (in the case of the Venture Capital
Company and Foundation), (c) 6 month action plan (including investment pipeline) and (d) overall financial position. Intensive supervision will be provided in the first year of the project to ensure the rapid development of institutional competence.

4.36 The reform process of the Government for the industrial and financial sectors appears to be well entrenched. Turkey will continue its commitment to an open competitive market economy. Nevertheless, the latest oil shock raises additional concerns about the Government's stabilisation program. Venture capital is the only component directly affected by volatility in the financial markets. However, the 5 to 7 year timeframe of the Company's investment strategy makes portfolio returns less dependent on short run financial conditions and more on medium to long term expectations about inflation and the internal macroeconomic balances.

E. Project Costs and Financing

4.37 Project Costs. Total project cost is estimated at US$262.2 million of which US$137.9 million is estimated to be in foreign exchange. In estimating the financial requirements of the proposed investment program in the MSTQ system, a physical contingency of 15% has been included and current price financial estimates are based on (a) projected local inflation rates of 50% in 1991 declining to 30% by 1995, and (b) projected international inflation rates of 4.0% per annum from 1991 to 1994. The financial requirements for the Venture Capital and the R&D Components have been based on estimates of demand combined with the mission's judgment about the absorptive capacity of the two institutions. In both cases, the number of sub-projects to be financed would be revised to reflect the funds available. Consequently, physical and price contingencies have not been calculated for these components. Table 4.3 summarises the projects costs.

<table>
<thead>
<tr>
<th>Table 4.3: Project Cost Summary</th>
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<tbody>
<tr>
<td>Local</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>MSTQ System</td>
</tr>
<tr>
<td>Price Contingency*</td>
</tr>
<tr>
<td>Physical Contingency*</td>
</tr>
<tr>
<td>Research and Dev't</td>
</tr>
<tr>
<td>Venture Capital</td>
</tr>
<tr>
<td>Total Project Cost</td>
</tr>
</tbody>
</table>

* applied to MSTQ Component
4.38 **Financing Plan.** The proposed Bank loan of US$100.0 million will finance the US$95.0 million (69%) of the foreign exchange costs of the project, and will also finance US$5.0 million of local costs for civil works under the MSTQ component. The remaining US$42.9 million of foreign exchange costs are to be financed by (a) IFC (US$5.1 million), (b) Private Sources (US$32.3 million), (c) UNDP (US$1.5 million), (d) the German Government (US$3.3 million), (e) the US Government (US$0.5 million), and (f) the UK Government (US$0.2 million). The project is providing the vehicle for other multilateral, bilateral and foreign private institutions to co-finance the development of Turkey's technological infrastructure. A summary breakdown of the total US$262.2 million project financing is presented in Table 4.4.

<table>
<thead>
<tr>
<th>Project Category</th>
<th>IBRD/IFC</th>
<th>Bi/Multilateral</th>
<th>Public Sector</th>
<th>Private Sector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSTQ System</td>
<td>56.7</td>
<td>4.2 (a)</td>
<td>13.2 (b)</td>
<td>0.0</td>
<td>74.1</td>
</tr>
<tr>
<td>Research and Dev't</td>
<td>43.3</td>
<td>3.8 (c)</td>
<td>0.5 (d)</td>
<td>44.8 (e)</td>
<td>92.4</td>
</tr>
<tr>
<td>Venture Capital</td>
<td>5.1 (f)</td>
<td>0.0</td>
<td>4.0 (g)</td>
<td>86.5 (h)</td>
<td>95.6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>105.1</td>
<td>8.0</td>
<td>17.7</td>
<td>131.3</td>
<td>262.2</td>
</tr>
</tbody>
</table>

(a) Bilateral German (3.5), UNDP (0.5), Bilateral UK (0.2)
(b) Treasury (5.6), TSE (7.6)
(c) UNDP (3.0), USTDP (0.5), Bilateral UK (0.2)
(d) Seed capital (SMIDO, TUBITAK); contribution to overheads
(e) Sub-Project Contributions (43.7), Direct Contributions to Foundation (1.0)
(f) IFC (5.0) in VCF, IFC (0.1) in VCM
(g) Development Banks (4.0) in VCF
(h) Equity Investment in sub-projects (55.2), Investment in VCF (31.0), Investment in VCF (0.3)

4.39 After IBRD, private sector sources are the single most important source of financing for the project. They are expected directly to contribute US$32.4 million to the project and indirectly a further US$98.9 million through their sponsorship of individual sub-projects. This is wholly consistent with the overall thrust of the Government's technology strategy, which aims to use public funds as a catalyst rather than as a substitute for the mobilisation of ITD resources by the private sector.

4.40 The public sector (including the development banks) is expected to finance a total of US$17.7 million (6.8%) out of their own resources. These
funds represent a mix of funding from (a) exceptional allocations by Treasury (US$5.6 million), (b) TSE's internally generated resources (US$7.6 million), (c) contributions from TUBITAK and SMIDO to the Foundation, and (d) the Development Banks (US$4.0 million equity investment in VCF). The Government is using the Project to reexamine its decentralised approach to ITD financing. As public expenditures on ITD rise, a more transparent (and integrated) accounting framework is needed to track sources and uses of funds. During Project implementation, the Bank intends to provide ongoing technical assistance to TUBITAK, which is leading this Government initiative.

F. Environmental Impact

4.41 The proposed Project has been reviewed under the provisions of Operational Directive 4.00, Annex A, "Environmental Assessment" and placed in Environmental Screening Category B. The project will not require the preparation of an environmental assessment; however, environmental review procedures have been adopted for project supported activities. The proposed Project will support the environmental objectives of the GOT. First, the MSTQ component will strengthen the institutional capacity to prepare standards that reflect environmental and energy conservation guidelines (e.g., in the building materials industry), and to ensure accurate testing of vehicle emissions. Under the second component, the Foundation is planning to include energy conservation as an area of strategic focus for applied research and development. Third, portfolio companies under the venture capital component are expected to have an exceptionally low probability of causing environmental damage. Each portfolio company will however, be required to demonstrate compliance with the environmental protection guidelines of the GOT and municipal authorities. This approach to environmental protection will be reflected in the policy statement of the Venture Capital Fund and Management Company.

V. PROPOSED LOAN

A. Terms and Conditions

5.01 The loan for US$100.0 million would be made to the Government of Turkey at the Bank's standard variable interest rate with a repayment period of 17 years including 5 years of grace. The legal arrangements would involve a loan agreement between the Bank and the GOT. Separate project agreements would be signed between (a) TSE and the Bank and (b) TUBITAK and the Bank, specifying the basis on which the funds would disbursed, the way in which the recipient institution would manage the projects and project evaluation criteria. In the case of the Foundation, a separate schedule in the loan agreement substitutes for a specific project agreement. The IFC's investment in the VCM and VCF is covered by a separate shareholders' agreement. The signing of the subsidiary loan agreement would be a condition of loan effectiveness.

5.02 Relending/Repayment Terms and Conditions. The Government intends to finance the MSTQ investments with a mix of grant and loan finance. The
project design envisages a budgetary allocation in the form of a grant to Tübitak (including bi/multilateral grants) for US$19.9 million to finance the NMSI and related institutional strengthening. Government financing of other elements in the MSTQ Development Plan (US$42.4 million sourced from the Bank) will be structured as an income note based on not less than 5% of TSE revenues over 17 years (para. 4.09). Foreign exchange risk will be borne by the Government, and there will be no negative amortization. These financial arrangements are detailed in the subsidiary loan agreement, signed by TSE and the GOT.

5.03 The Government intends to finance the Foundation by passing on the Bank loan as an annual grant to cover the program expenditures. Details of this arrangement are contained in a subsidiary agreement between the Government and the Foundation. The operating expenses of the Foundation are expected to be financed by (a) seed capital contributions from the private sector (para. 4.17), (b) fees charged by the Foundation for services in managing the Challenge Grant program, and (c) other income derived from intellectual property and equity stakes.

B. Administrative Requirements

5.04 Procurement. Procurement procedures under the proposed project would be as follows for the two components financed by the Bank:

(a) MSTQ system. Contracts for goods costing more than US$250,000 per contract shall be subject to ICB procedures except for contracts for metrology and calibration equipment, for which the limited number of suppliers makes LIB procedures more appropriate. For contracts procured under LIB procedures, a maximum contract value of US$1.0 million will apply. For contracts for goods costing less than US$250,000 equivalent, procurement shall be on the basis of at least three competitive quotations. Total procurement under this procedure shall not exceed US$5.0 million. For consultants, TSE and TÜBITAK would follow the Guidelines for the use of consultants issued by the Bank in August 1981. For civil works (total of approximately US$15.0 million), the procurement procedures shall be those for ICB. TÜBITAK and TSE (both as principal, and as agent of the National Accreditation Council) will be required to maintain records of procurements made under the proposed project, with summaries of offers received and awards made under each tender.

(b) Foundation. For consultants to carry out the strategic studies, the Foundation will follow the Guidelines for use of consultants issued by the Bank in August 1981. Recipients of Foundation Grants will be required to follow the following procurement procedures: for contracts of goods costing more than US$250,000 equivalent per contract, procurement will be through the ICB procedures. Where the Foundation (subject to Bank approval) certifies that equipment requirements are highly specialised, limited international bidding procedures would be
acceptable. For contracts procured according to LIB procedures, a maximum contract value of US$1.0 million will apply. For contracts for goods costing less than US$250,000 per contract, procurement shall be on the basis of at least three competitive quotations. Total procurement under this procedure shall not exceed US$9.0 million. The Foundation would also have to certify that these goods were purchased at reasonable and competitive prices, due account being taken also of other relevant factors such as time of delivery, quality and reliability of goods and availability of maintenance facilities and spare parts. The Foundation will be required to maintain records of the procurements made under each of the grants, with summaries of offers received and awards made under each grant. These records would be used by external auditors in auditing the Foundation's certified statements of expenditure and would be examined by Bank missions on a sampling basis.

Contracts for goods and services greater than US$500,000 will be subject to prior review by the Bank, and are expected to account for 60% of procurement financed by the Bank. Contracts for goods and services less than US$500,000 will be subject to post-review by the Bank (due to the fact that there will be many contracts in this range), and will be examined by Bank missions on a sampling basis.

5.05 The Government will establish a single separate Special Account (at the Central Bank) with an initial deposit of US$5.0 million, representing approximately 3 months expected disbursements. Sub-accounts will be established by the Central Bank for TSE, TÜBİTAK and the Foundation. Disbursements will take place according to Disbursement Guidelines against fully documented Withdrawal Applications for contracts greater than US$250,000 equivalent, and against certified Statements of Expenses for contracts less than US$250,000 equivalent. The Bank loan would finance up to 100% of the foreign exchange cost of imported equipment (CIF costs), foreign training, up to 100% of the ex-factory cost of domestically supplied equipment when procurement takes place under ICB/LIB procedures, and up to 50% of other local procurement costs (to cover the costs of imported components). The Bank loan would finance up to 100% of consultancy fees. The Bank loan would also finance up to 80% of the expenditures for civil works (under the MSTQ component).

5.06 Although the Bank has little experience in executing such a project, the expected disbursement profile for the MSTQ component based on the investment program timeline is that funds will be fully committed within 4 years and disbursed within 6 years. There is no precedent upon which to base the expected disbursement profile of the Foundation component since it depends upon attracting matching private funds for the sub-projects. Based on a conservative estimate of the Foundation's ability to identify attractive sub-projects, it is anticipated that the funds will be fully committed by the end of Year 4 and fully disbursed by end of Year 6. The closing date will be December 31, 1996. For each of the project components, documentation will be
Table 5.1: Disbursements

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount US$ Million</th>
<th>Percentage of Expenditures to be financed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machinery &amp; Equipment</td>
<td>66.5</td>
<td>100% of foreign expenditures; 100% of ex-factory cost of domestically supplied equipment under ICB/LIB; 50% of other expenditures (for FX costs)</td>
</tr>
<tr>
<td>Consultants</td>
<td>17.0</td>
<td>100% of expenditures</td>
</tr>
<tr>
<td>Training</td>
<td>6.5</td>
<td>100% of foreign expenditures</td>
</tr>
<tr>
<td>Civil Works</td>
<td>10.0</td>
<td>80% of expenditures</td>
</tr>
</tbody>
</table>

maintained and withdrawal applications submitted by the respective managing institutions - TSE, TÜBITAK and the Foundation. Supporting documentation for the SOEs will be subject to review by Bank supervision missions and to an annual audit by auditors acceptable to the Bank, such audit to be submitted within four months after the close of each financial year.

5.07 Reports, Accounts and Audits. Progress reports will be submitted semi-annually for each component. TSE/TÜBITAK’s semi-annual report should include a detailed description of (a) progress under each component of investment program, (b) cost or time over-runs (and savings), (c) revised disbursement profile and (d) major actions to be taken in the next 6 month period. The Foundation will submit, in addition to a financial summary of operations, detailed summaries of each new sub-project in the previous six month period, including, inter alia, a description of (a) distinctive contribution made by sub-project to ITD, (b) participating institutions, researchers and companies, (c) key success factors, (d) project timeframe, (e) major risks and (f) potential implications for Foundation’s future revenue stream. Each report of Foundation will also contain brief status reports on previous investments/grants and development of investment/grant pipeline.

5.08 Audited financial statements will be submitted to the Bank by the three managing institutions - TSE, TÜBITAK and the Foundation. These audits will be prepared in accordance with the Bank’s standard reporting requirements by independent auditors acceptable to the Bank. Audits for all SOEs will be submitted within six months of the close of the fiscal year. Since most Foundation sub-projects would be financed on the basis of certified statements of expense (SOEs), the audit of the Foundation shall include a special opinion by the auditors on the adequacy of SOE procedures. Upon completion of the
project, each managing institution will prepare an overall project audit report within six months of the closing date, December 31, 1996.

VI. AGREEMENTS REACHED AND RECOMMENDATIONS

6.01 Assurances have been provided in the Legal Documents that the Government:

(a) with respect to the MSTQ component: (i) would provide budgetary allocations in the form of a grant to TÜBİTAK for US$19.9 million (para. 4.06); (ii) would provide US$42.4 million for investment by TSE in the form of an income note with a 17 year amortization schedule including a five year grace period (para. 5.02); (iii) would place the National Accreditation Council on a legal basis independent of TSE by December 31, 1994 (para. 4.08); and (iv) would revise any legislation that provides TSE with a de jure monopoly over certification services by December 31, 1992 (para. 4.08);

(b) with respect to the Foundation component: (i) would ensure the contractual freedom of the Universities and public research institutes in their transactions with the Foundation (para. 4.16); (ii) would provide the Foundation with tax-exempt status at the end of the minimum two year "probation" period (para. 4.19); and (iii) would ensure the appointment of the Secretary-General of the Foundation by October 31, 1991 (para. 4.17).

(c) with respect to the Venture Capital component would maintain: (i) a regulatory framework conducive to the development of the venture capital industry (para. 4.22); and (ii) tax treatment that eliminates double taxation of venture capital funds as defined under Capital Market Board regulations (para. 4.23);

(d) with respect to the flow of funds under the project: (i) would establish a Special Account at the Central Bank with sub-accounts for the three beneficiaries of the Project - TSE, TÜBİTAK and the Foundation (para. 5.05); and (ii) would transfer funds from the SA to beneficiary institutions upon receipt of appropriate documentation and requests;

(e) with respect to public funding for ITD, would develop at TÜBİTAK, a consolidated budgeting framework which identifies the sources and uses of resources (para. 4.40) allocated to technology development;

6.02 Assurances have been provided in the separate Project Agreement with TÜBİTAK with regard to: (i) financial and managerial separation of the NMSI from the Gebze Research Center (para. 4.06); (ii) recruitment and training of a further 10 professional staff (in addition to existing staff) for NMSI by December 31, 1991, 20 by December 31, 1992, and 30 by December 31, 1993 (para.
4.06); (iii) disbursement, procurement, reporting and auditing procedures (para. 5.04); (v) guidelines as to the hiring of consultants; (vi) establishment of a Project Implementation Unit (para. 4.10); (vii) examination before June 30, 1993 of TÜBİTAK testing services according to accreditation procedures to be established by the National Quality Council (para. 4.08); and (viii) hiring of consultants to provide technical assistance on strategy, organizational structure, information systems, financial management and personnel policies (para. 4.06).

6.03 Assurances have been provided in the separate Project and Subsidiary Loan Agreement with TSE with regard to: (i) the establishment by TSE of a Project Implementation Unit (para. 4.10); (ii) the execution of a personnel development plan (para. 4.35); (iii) the appointment of a Business Development Director at Assistant Secretary-General equivalent level (para. 4.12); (iv) performance of a secretariat function for the Council (para. 4.08); (v) management of the Professional Institute and National Media Campaigns as agent of the Council (para. 4.09); (vi) examination before June 30, 1993 of TSE certification and testing services according to the accreditation procedures to be established by the Council (para. 4.08); (vii) disbursement, procurement, reporting and auditing procedures (para. 5.04); (viii) guidelines as to the hiring of consultants; (ix) TSE's repayment obligations under the Subsidiary Loan Agreement (para. 5.02); (x) a review of all TSE standards preparation procedure by June 30, 1992 (Annex 2.3); and (xi) the completion of a study by December 31, 1991 on the potential for testing laboratories to be jointly owned and managed by industrial associations (para. 4.14).

6.04 Assurances have been provided in the separate schedule to the Loan Agreement with regard to the following actions by the Foundation: (i) issuance of guidelines for the selection of strategic studies (para. 4.14); (ii) issuance of guidelines for the implementation of the ITD Challenge Program including project selection, financing, monitoring and evaluation criteria (para. 4.15); (iii) disbursement, procurement, reporting and auditing procedures (para. 5.04); (iv) guidelines as to the hiring of consultants; and (v) annual audits for the Foundation by external auditors acceptable to the Bank.

6.05 The only Condition of Effectiveness of the proposed Loan will be signing of the Subsidiary Loan Agreement between GOT and TSE.

Recommendation

6.06 The proposed Industrial Technology Development Project constitutes a suitable basis for a Bank loan of US$100.0 million to Turkey. The Loan and Credit would be made on standard variable interest Bank terms of 17 years, including 5 years of grace.


1. **Introduction.** TÜBİTAK was established in 1963 by Law No. 278 (amended by decree No. 294 of 1987) as an autonomous agency attached to the Prime Ministry. The main objectives of TÜBİTAK are:

- to develop, organise and coordinate basic and applied research in positive services;
- to assist the Government in formulating National Science and Technology Policy;
- to support the Government’s initiatives in the field of international scientific and technical cooperation; and
- to formulate procedures/policies for education in positive sciences.

2. **Organisation.** To carry out its work program, TÜBİTAK has established:

- **In-house Institutes** to carry out research in basic sciences, industrial technology, electronics and defense;
- **Research Groups** to coordinate and finance research outside TÜBİTAK in (a) mathematical, physical and biological science, (b) engineering, (c) medicine, (d) veterinary medicine and animal husbandry, (e) agriculture and forestry, (f) marine and environmental science and (g) building materials;
- **TURKDOC** to provide a centralised source of scientific and technical information (including on-line databases);
- **Information Technologies Centre (TETM)** that offers data-processing services as well as system analysis.

In addition, there are a number of Directorates, including (a) International Relations, (b) Industrial Relations and (c) Planning and Coordination that perform the other responsibilities of TÜBİTAK. The day to day management of TÜBİTAK is in the hands of the President who reports on a regular basis to the Executive Board. TÜBİTAK employs a total of 1,130 staff, of whom 700 are technical/professional.
3. **Budget and Financing.** TÜBİTAK is almost entirely financed from the Central Government budget. A small percentage of income (2% in 1988) is earned through contract research. Operating budget has grown only slowly in real terms since 1981, increasing from US$11.1 million to US$15.0 million in 1989 (current US$ millions). Almost 90% of funds are used in-house, either to cover the costs of research or administrative overheads. The remaining 10% was channelled to external projects through the 7 Research Groups, each of which is allocated 300 million TL per annum.

4. **Relationship with Industry.** An important part of TÜBİTAK’s mission is to work with industry on problems requiring applied research capability. A number of mechanisms exist within TÜBİTAK to facilitate this relationship.

- **The Scientific and Industrial Research Institute** at Marmara is the premier public research institute and has a mandate to work closely with industry. The Institute has 9 departments, including operations research, electronics, materials sciences, applied mathematics, nutrition and food technology, mechanical and energy systems, chemical engineering, applied physics and electronics data processing. The materials science and the food/nutrition groups have good relations with industry. However, overall revenues from contract work represent less than 20% of the Institute’s operating budget, cost accounting techniques remain under-utilised and coordination problems make it difficult to put together the multi-disciplinary teams needed in industrial research work. Industry continues to be largely unaware of the Institute’s potential contribution to their operations.

- **The Industrial Relations Directorate** was established in 1979 to strengthen TÜBİTAK’s ties with industry. The Directorate has established Industrial Extension Units at Östım (a large industrial estate for SMEs outside Ankara) and more successfully, at Izmir. An example of successful collaboration (initiated at Izmir and addressed at Marmara) has been the development of a process to reduce the sulfur content in dried apricots for exports. The key success factor in this work was the market research that identified potential customers for the research.

5. Despite the existence of these mechanisms, the relationship of TÜBİTAK with industry remains at a nascent stage. There are five main reasons. First, the Executive Board continues to display a pronounced basic sciences orientation. Second, the internal incentive structure promotes on the basis of published articles and scientific originality rather than on a commitment to near-market research with industry. Third, the organisation of TÜBİTAK into monodisciplinary groups works against the teamwork needed to solve industrial problems. Fourth, management practices at TÜBİTAK do not
provide the accountability and control that industry expects in contractual relations. Finally, the willingness of the Government to finance more than 90% of TÜBİTAK's operating budget reduces the incentive to perform contract research.

6. Recent Developments. TÜBİTAK is committed to strengthening its relevance to the process of industrial technology development. New management has made an increase in contract research revenues (as a percentage of total operating budget) a leading indicator of its success in this field. Representation from the private sector has been introduced into the Research Committees. In addition, TÜBİTAK is planning greater emphasis on the economic analysis in its evaluations of:

(i) new research proposals (both in-house and external); and

(ii) the applications of Universities to establish Centres of Excellence in science and technology fields.

To address outstanding issues at TÜBİTAK, senior management has requested technical assistance support from the Bank in a number of fields including:

- design of a medium term institutional strategy;
- personnel and internal incentive policy;
- budgeting and financial control;
- revenue generation and achievement of higher self-financing ratios;
- identification and specification of new initiatives; and
- laboratory upgrading.
1. Introduction. TSE was established in 1954 within the framework of the Turkish Union of Chambers of Industry and Commerce and of Commodity Exchanges (UCICCE). In 1960, under Law No. 132 TSE was separated from the UCICCE and established as an autonomous company, reporting directly to the Prime Ministry. The main functions of TSE are:

- to prepare and publish industrial standards;
- to participate in the International Standards Organisation (ISO) and the International Electrotechnical Commission (IEC); generally, to work with other National Standards Bodies in areas of technical cooperation;
- to provide information to Turkish industry on international standards;
- to deliver testing and calibration services for private and public sector organisation;
- to establish quality artification and training activities.

2. Organisation. To carry out these responsibilities, TSE has established:

- 21 Standards Preparation Groups to (a) recommend subjects for new Turkish Standards, (b) review international practice, (c) draft proposals in consultation with industry and other potential users and (d) submit draft standards to TSE's Technical Board for final approval. The Groups also propose revisions to existing Standards in line with the evolving needs of industry;

- Central Laboratories in Ankara to provide testing services for (a) electrical products, (b) chemistry and materials, (c) machinery and materials, (d) building materials, (e) electronics, (f) packaging research and development and (g) second-level metrology and calibration. These laboratories also carry out the research necessary for the development (and revision) of Standards;
• **TSE Certification Mark** that companies may use to demonstrate product compliance with the specification of Turkish Standards;

• **Training Division** to provide courses for industry and Governments on (a) testing procedures, (b) quality assurance techniques and (c) instrument maintenance.

TSE is also developing capabilities in the fields of (a) quality certification to ISO9000 standards and (b) accreditation procedures. TSE employs approximately 700 staff, of whom 450 have a technical training. Since 1980, the Institution has rapidly expanded its activities with the number of Turkish Standards doubling from 1980 to 1989 and the number of firms with a TSE trademark increasing from 157 to 2655. An important issue that TSE faces over the next decade is how to manage continued growth without compromising on the quality of service. Table A.1 lays out the key statistics.

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<td>Number of firms with TSE Trademark</td>
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3. **Budget and Financing.** TSE is completely self-financing on a recurrent cost-basis. Over 95% of revenues come from providing services to the private sector. TSE certification activities provide almost 2/3 of income, with testing services accounting for approximately 10%. These proportions are however misleading in that cost accounting techniques at TSE do not attribute any certification income to the testing laboratories. Other sources of revenues include the sale of publications and annual levies on (inter alia) the Union of Chambers. In real terms, income has remained static at 1988 levels despite a significant growth in activity. The explanation for this is that TSE, as a non-profit organisation, sets charges in line with overall costs. One casualty of the low price policy has, however, been real investment which has declined from TL 8.5 billion in 1988 to TL 2.5 billion (1990 constant) in the year to April 1990. Table A.2 provides the profit and loss amount for TSE since 1988. TSE has already taken a first step in improving its financial management and market information by (a) carrying out a 10 year financial programming exercise as part of Project preparation, (b) completing an external audit by an international auditing firm of financial...
accounts (since 1987) and of accounting systems, and (c) completing a marketing study to analyse potential revenue growth and sources of competition in TSE's main businesses. Nevertheless weaknesses remain that constrain the performance of the Institute including:

- personnel policy (recruitment criteria, job specifications, training program and internal incentives);
- financial management (automation, billing procedures, information for senior management, pricing policy); and
- business development strategy (marketing skills, management of client relations, ongoing analysis of market needs, assessment of competition).

These are addressed in the Development Plan of TSE (para. 4.04).

| Table A.2: TSE Profit and Loss: 1988-1990 (Constant 1990 TL billions) |
|-------------------|---|---|---|
| **Revenues**      |      |      |      |
| Certification Income | 10.7 | 9.3  | 14.0 |
| Testing Income    | 1.5  | 1.8  | 2.7  |
| Other             | 9.7  | 7.0  | 5.1  |
| Total             | 21.9 | 18.1 | 21.8 |
| **Costs**         |      |      |      |
| Wages             | 8.1  | 9.2  | 12.6 |
| Admin. Overheads  | 3.0  | 2.9  | 3.4  |
| Other             | 3.2  | 4.0  | 2.7  |
| Total             | 14.3 | 15.1 | 18.7 |
| **Net**           | 7.6  | 3.0  | 3.1  |
| **Investments from Own Revenues** | 8.6  | 6.2  | 2.6  |

Note: (1) Year end is April 30  
(2) Certification income includes quality certification, import documentation, vehicle services and TSE mark.
4. **Relationship with Industry.** TSE enjoys strong and growing links with industry in all its major activities:

- **Client Services.** Private industry is the major user of TSE and contributes over 90% to TSE revenues;

- **Participation in Standards Preparation.** Industry is represented on all the Preparation Groups and is consulted extensively throughout the drafting process.

- **Membership of General Assembly.** The General Assembly meets once a year to review the work of TSE. The Assembly is also responsible (every 3 years) for electing the President and Executive Board of TSE. Private industry has approximately 1/4 of the voting rights in the Assembly.

TSE is actively looking for ways to deepen the relationship with industry. Proposals include (a) a major expansion of training for engineers and managers on quality assurance techniques, (b) secondments from industry to TSE staff and vice versa and (c) opening up TSE laboratory space for use by private industry.

5. **Development Strategy.** At the same time as strengthening its current activities, TSE aims at:

- promote private sector testing facilities and certification schemes by (a) establishing a National Accreditation Council, and (b) expanding training facilities;

- provide leadership on introducing Quality management and certification services (to internationally recognised standards) by (a) enhancing in-house capability, (b) establishing the Quality Campus in Istanbul (para. 4.05), and (c) requesting from the NAC accreditation for its own testing and certification activities; and

- increase internal commercial awareness (while maintaining a non-profit philosophy) by (a) introducing modern financial management and cost accounting practices, (b) establishing a Business Development and Marketing Division with direct representation on the senior management team and (c) reducing the percentage of income derived from mandatory tests (currently approximately 40%) within the context of 7% to 10% annual growth in real income.
TURKEY

TECHNOLOGY DEVELOPMENT PROJECT

DOCUMENTS IN PROJECT FILE


