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# Investment Promotion Sectoral Strategy 2005-2007: Electronics Assembly

Final Report

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*This report was prepared by Gabi Afram and Lutfi Sayegh, in collaboration with Chemonics International Inc., prime contractor to the U.S. Agency for International Development for the AMIR Program in Jordan.*

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## ABSTRACT

This report evaluates Jordan's competitive position in the electronics assembly industry and develops an appropriate three-year inward investment promotion strategy for implementation by the Jordan Investment Board.

## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AMIR | Achievement of Market-friendly Initiatives and Results Program |
| AFTA | Arab Free Trade Agreement |
| CE | Conformité Europeené |
| CIS | Commonwealth of Independent States |
| CKD | Complete Knock-Down |
| DDI | Domestic Direct Investment |
| EJADA | Euro-Jordanian Action for Development |
| EU | European Union |
| FDI | Foreign Direct Investment |
| FTA | Free Trade Agreement |
| GSP | General System of Preferences |
| ICT | Information and Communication Technology |
| ITA | Information Technology Agreement |
| JAED | Jordanian Authority for Economic Development |
| JD | Jordanian Dinar |
| JIB | Jordan Investment Board |
| MENA | Middle East & North Africa (Region) |
| MNC | Multinational Corporation |
| NAFTA | North American Free Trade Agreement |
| NTR | Normal Trade Relations |
| PC | Personal Computer |
| PCB | Printed Circuit Board |
| PSPI | Private Sector Policy Initiative |
| QIZ | Qualifying Industrial Zone |
| SIC | Standard Industry Classification system |
| SKD | Semi Knock-Down |
| SMT | Surface-Mounted Technology |
| SWOT | Strengths, Weaknesses, Opportunities, and Threats |
| USAID | United States Agency for International Development |
| WTO | World Trade Organization |
| VCR | Video Cassette Recorder |

## DEFINITIONS

| | |
|---|---|
| Original Design Manufacturer (ODM) | An ODM both designs and manufactures its products. To make use of the distribution and sales channels of companies with established brand names, an ODM often sells its products to such a company, which resells the products under its name (since it is cheaper than designing and manufacturing products by itself). |
| Original Equipment Manufacturer (OEM) | An OEM produces hardware to be marketed under another company's brand. For example, Mitsumi produces CD-ROM drives that dozens of companies would label as their own. |

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# EXECUTIVE SUMMARY

Jordan's electronics assembly industry enjoys certain competitive strengths within the region and the world that make this industry potentially attractive to foreign investors.

The objective of this consultancy is to work with the Jordan Investment Board (JIB) to evaluate Jordan's competitive position in the electronics assembly industry, in light of global trends that influence the industry, and to develop an appropriate three-year strategy to promote inward investment.

Investors in the electronics assembly industry consider the following technical factors among others when deciding on the location of a production plant. (See Section 3.1 for further details.)

- Technical skills and capabilities of workforce
- Sophistication of production methods
- Cost of final product (i.e., low-cost assembly and local component sourcing)
- Shape of product (i.e., complex assembly using flexible or hard circuit boards to fit complex geometries), ergonomics, and aesthetics (i.e., use of precision plastics)
- Compliance with proper size and weight dimensions of components and final products
- Functionality and performance levels (i.e., number of functions, capacity and speed of operation, and energy consumption)

They may also consider the following general factors among others.

- Political and economic stability
- Economic openness and liberalization
- Sufficient supply of professional and technical human resources
- Logistics and reduction of manufacturing lead-time
- Diversification of geographic locations of firm's existing production facilities
- Access to local and regional markets
- Availability of preferential agreements in quotas and tariffs

A strengths, weaknesses, opportunities and threats (SWOT) analysis of Jordan's electronics assembly industry reveals the following. (See Section 3.2 for further details.)

- Main strengths
  - Proximity and access to growing local and regional market
  - Available and skilled workforce
  - Relatively low overall labor costs compared to regional competitors
  - Flexibility and timing
  - Preferential access agreements to Arab markets
  - Good quality production and reputation in consumer electronics
- Main weaknesses
  - Small electronics market because of small population (5.2 million) possessing limited purchasing power
  - Lack of backward and forward linkages
  - Lack of design capabilities
  - Relatively slow logistics and customs transactions, especially at Aqaba port
  - High transportation costs from Amman to Aqaba (i.e., truck transport costs half as much per container as shipping from Aqaba to New York)
  - High utility costs, especially power
- Main opportunities
  - Growing global trend towards outsourcing to lower cost producers

    - To remain competitive and reduce costs, companies in Western Europe and Far East are restructuring and looking to relocate.
    - Growing local and regional market (i.e., demand in Jordan and the MENA market is growing and is expected to continue growing, especially in appliances)
    - Currently expensive rental and increasingly competitive market in Dubai, deterring new entrants
    - Current lack of serviced land in Saudi industrial estates because demand outstrips supply
- Main threats
    - Price competition and sustained low profit margins plaguing entire industry, locally and globally
    - Strict and differing standards and regulations by U.S. and E.U., as well as Saudi and other regional markets
    - Continuously-changing production technology makes production equipment outdated quite rapidly and necessitates greater financial resources to invest in state-of-the-art equipment

Based on the results of the SWOT analysis, Jordan has the best opportunities to compete within the following niche areas of the electronics assembly industry. (See Section 4.1 for further details.)

- Short-term
    - Household electrical equipment
    - Refrigeration and heating equipment
    - Calculating and accounting machines
    - House-ware and fans (incl. heaters/cookers, etc.)
- Medium-term
    - Electro-medical and therapeutic apparatus
    - Semi-conductors and telecom devices

Furthermore, Jordan may expect future investments to come from the following sources. (See Section 4.2 for further details.)

- Appliance manufacturers wishing to establish a presence in the Middle East in order to increase sales to the local and regional market, often for the first time
- Companies (especially from Korea, Hong Kong, and Taiwan) wishing to establish a presence in the Middle East as a production platform from which to export to Europe
- Companies (especially from East Asia) relocating from Dubai or disinclined to locate there due to the high rental costs and intense competition in that market
- Some investment expansions from factories operating in Saudi Arabia's industrial estates, where the capacity for expansion is extremely limited
- European companies (especially German companies which suffer from high labor costs) wishing to outsource operations to low-cost producers
- Israeli companies wishing to outsource assembly operations to technically-capable, but low-cost Jordanian producers

Consequently, target markets and investors for investment promotion are as follows. (See Sections 5.3-5.4 for further details.)

- First priority
    - South Korea
    - Taiwan
    - Germany
- Second priority
    - Saudi Arabia

    - China
    - Hong Kong
    - Israel
- Third priority
    - United States

The profile of the targeted investment project is as follows. (See Section 5.4 for further details.)

- Project Size (including buildings): > $7 million
- Employment: 400-500 workers
- Markets: > 60% of exports to regional markets
- Typical product categories: Household electronics and appliances, such as TVs, VCRs, radios, and air conditioners or telecom parts and measuring devices

The suggested three-year targets for the effort to attract investment in this sector are as follows. (See Section 5.5 for further details.)

- Cumulative number of projects: 7
- Total employment: 3,500
- Total investment: $54 million

# CHAPTER 1: INTRODUCTION

## 1.1 Background

The electronics industry constitutes a sizeable and growing segment of the modern world economy. This is hardly surprising in a world characterized by rising sophistication, purchasing power, and technological savvy. The industry's large electronic components sector increasingly operates on an international basis, both in terms of manufacturing and design. Moreover, with the electronic supply chain steadily globalizing, the electronics assembly sector is growing not only in size, but also in geographic reach. It is this last phenomenon that Jordan needs to capitalize on, in order to be a player in this industry.

### Industry Definition

It is necessary to begin any discussion of this sector by defining it. This is not an easy task, given the sector's breadth and diversity. However, generally speaking, the combination of electronic components, assembly equipment, and processes used in the production of electronic products is referred to as the electronics assembly sector. It covers a wide range of products and components, from relatively simple devices that use fixed capacitors/resistors to complicated semiconductors, integrated circuits, and printed circuit boards (PCB) – the microchip industry. Electronics assembly as categorized by end-use includes assembly of the following.

- Consumer electronics or "brown goods" (e.g., TVs, VCRs, radios, cameras, clocks)
- Commercial and scientific products (e.g., office equipment, air conditioners, medical equipment)
- Household appliances or "white goods" (e.g., washing machines, refrigerators, dishwashers)
- Small appliances (e.g., hair dryers, blenders, mixer, toasters, coffee machines)
- Computer hardware (e.g., PC assembly)
- Communications/telecom equipment (e.g., mobile telephones, network equipment)
- Industrial, automotive, and military components

The industry can be divided into several process-oriented activities, including finished products, sub-assemblies, and components. Finished products are diverse and of varying complexity. Sub-assembly and components manufacturing operations typically involve strong relationships with the buyers of the assembled goods, in most cases the original equipment manufacturers (OEM). In most assembly operations, logistics, transportation, and inventory management are as important as basic manufacturing.

The Standard Industry Classification (SIC) system codifies electronics activities using such categories as food-products machinery, calculating and accounting machines, house wares and fans, semiconductors and related devices, electro-medical and electro-therapeutic apparatuses, and electrical components.

For the sake of clarity and consistency, this report will define this industry in terms of the end-uses or the products of assembly operations, as per the list above.

## 1.2 Objective

The objective of this consultancy is to work together with the Jordan Investment Board (JIB) to evaluate Jordan's competitive position in the electronics assembly industry and to develop an appropriate three-year inward investment promotion strategy.

## 1.3 Methodology

The methodology used to perform this study includes the following.

- Review of available literature on the topic, including literature mentioned in the consultant scope of work (See Annex 1 for further information.)
- Interviews of selected stakeholders in the local market (See Annex 2 for further information.)
- Desk research on global and regional electronics assembly industry trends
- SWOT analysis of the electronics assembly industry in Jordan

The focus of this study is to identify niche products and markets for FDI attraction, as well as to provide JIB with a practical promotional plan to approach potential investors. The study is not meant to be a sectoral study. Therefore, the sectoral-analysis component of this study serves only as a means to identify target markets and provide profiles of potential investors who may be attracted to invest in Jordan.

Chapter Two provides an overview of the electronics assembly sector. Starting with an overview of the sector in Jordan, it identifies existing current trends in investment and trade, existing market access agreements, current operational costs and efficiency issues, and available technology and technical expertise. The purpose of this overview is to determine the main features of the sector in Jordan. It then provides a review of the global electronics assembly industry to determine trends in the global industry and to identify major importers and exporters. A similar review is undertaken for the regional industry, with the additional aim of identifying the potential for FDI in Jordan by regional players.

Chapter Three uses the local, global, and regional overviews as the basis for a SWOT analysis of the sector in Jordan, in comparison with competing locations in the global market.

Chapter Four builds on this analysis to identify product and market niches in which Jordan has advantages over its competitors and recommends product types on which JIB should focus its targeting efforts. In addition, the principal constraints that limit the growth of the industry are identified and ways of reducing these constraints are recommended.

Finally, Chapter Five proposes a three-year promotional strategy that includes the following.

- Core message and selling points
- Identification of target markets and profiles of target investors
- Promotional approaches for JIB to follow in its targeting efforts
- Annual investment targets
- Resource requirements to prepare and execute promotional plans
- Research tools
- Personnel
- Budget

# CHAPTER 2: SECTOR OVERVIEW

## 2.1 Local Overview

### Demand and Investment Conditions

Jordan's manufacturing sector represented 16.8 percent of gross domestic product (GDP), employed over 11 percent of the labor force, and accounted for around 64 percent of domestic exports in 2002.[1] It registered an impressive 10.7 percent growth in 2002, following a 10 percent expansion in 2001. This growth has been driven primarily by the spectacular increase in garment production and helps to explain the 5.0 percent real GDP growth rate in 2002.

Within manufacturing, food and tobacco processing, mining (especially phosphate- and potash-related extraction and processing), fertilizers, pharmaceuticals, petroleum products, plastics, garments, and cement are the top sectors. (See Table 2.1 for further information.) Most major manufacturers are concentrated in the Amman and Zarqa areas.

**Table 2.1: Jordan's Leading Industrial Activities by Value Added (2002)**

| Product | Weight in industrial index (%) |
|---|---|
| Food Items | 14.7 |
| Tobacco | 11.0 |
| Cement Lime and Plaster | 9.8 |
| Potash | 7.9 |
| Phosphate | 7.4 |
| Pharmaceuticals | 5.0 |
| Clothes and Textiles | 4.6 |
| Petroleum Products | 3.9 |
| Plastic Products | 3.4 |
| Fertilizer | 3.2 |

Source: Central Bank of Jordan.

Although the engineering industry is the manufacturing sub-sector with the largest number of registered firms, total capital, and employment, its contribution to the economy remains limited since it is characterized by small, family-owned firms. Of the 3,160 engineering industrial firms, few have more than 200 employees, and only three have more than 500 employees. Furthermore, not more than 30 percent of these firms exceed JD1 million in annual sales.[2] Therefore, it is not surprising that the electronics and appliance assembly sub-sector does not figure prominently among Jordan's established manufacturing industries. Nor is it surprising that data about the size and capacity of the sector is generally unavailable. With average annual domestic exports estimated at less than JD60 million, electronics are not included in Jordan's list of top exports in 2002. (See Table 2.2 for further information.)

**Table 2.2: Jordan's Top Exports (2002)**

| Commodity | Value (JD million) | Percentage of total exports (%) |
|---|---|---|
| Textiles and clothes | 374.6 | 24 |
| Pharmaceuticals | 142.7 | 9.2 |
| Potash | 136.7 | 8.8 |
| Phosphate | 96.5 | 6.2 |
| Vegetables | 95.2 | 6.1 |

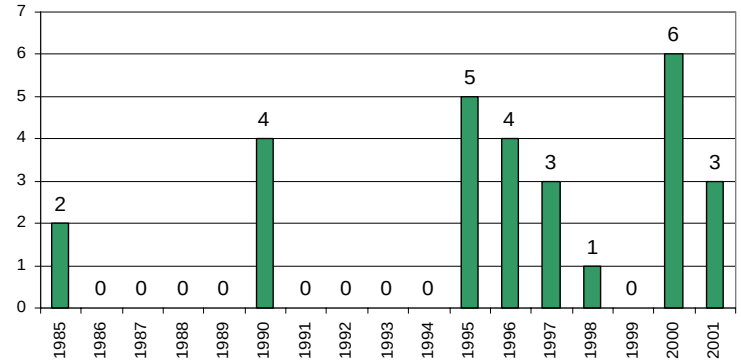
Source: Department of Statistics.

[1] Central Bank of Jordan. "Monthly Statistical Bulletin," August 2003.
[2] Jordan of Chambers of Industry.

Furthermore, manufacturing of electronics ranks 23 among the 25 types of manufacturing activities reported in terms of value added.[3] (See Table 2.1 for the top 10 types of manufacturing activities reported in terms of value added.) Thus, electronics and appliance assembly are not within Jordan's major industrial outputs either in export value or in value added.

Nonetheless, there are concentrations of electronics and appliance manufacturers in such places as Abdullah II ibn Al-Hussein Industrial Estate (i.e., Sahab) near Amman and Al-Hasan Industrial Estate near Irbid.

**Figure 2.1: New Electronics Projects in Jordan**




Source: Jordan Industrial Estates Corporation (JIEC); Al-Tajamouat, Cyber City, and Al Dulayl industrial estates; Zarqa Free Zone.

As can be seen from Figure 2.1, the pattern of electronics and machinery investments in Jordanian industrial estates between 1985 and 2001 has been irregular. Since 1995, however, an annual average of three to five electronics or machinery firms have been set up in the industrial estates. Most of these ventures are Jordanian or have capital from other Middle East countries, except for the LG joint-venture with Korean investors. These projects established themselves in Jordan without benefiting from a targeted promotional campaign.

From the financial crisis of 1989 until Jordan's accession to the World Trade Organization (WTO) in 2000, products in this sector swiftly evolved and gained a considerable share in the domestic market because of the high tariffs that were imposed on imports. Especially in household appliances and consumer electronics, local production and assembly operations have a commanding market share, as demonstrated by Table 2.3. Protectionism, coupled with profitable export activity focused on less-sophisticated, "traditional" export markets such as Iraq, gave few incentives to improve quality and move beyond simple assembly operations. Profits were respectable, and competition was weak.

**Table 2.3: Market Share of Locally Produced/Assembled Electronics (2000)**

| Product | Market share (%) |
|---|---|
| Ovens | 85 |
| Television sets | 80 |
| Refrigerators | 70 |
| Automatic washing machines | 60 |
| Semi-automatic washing machines | 70 |
| Air conditioners | 80 |
| Kerosene heaters | 90 |
| Gas heaters | 90 |
| Personal computers | 70 |

Source: Export and Finance Bank.

[3] Central Bank of Jordan. "Monthly Statistical Bulletin," August 2003.

Accession to the WTO has involved various changes to the manufacturing landscape in Jordan, some of which are particularly relevant to the electronics assembly sector. Although tariffs on imported raw materials will gradually drop, thus lowering the production costs for electronics manufacturers, tariffs will also fall on imported finished goods, thereby increasing competition in the local market. Furthermore, exporting industries will eventually be subjected to income taxes on export revenues. Until now, they have been exempt from paying these taxes, and government has managed to negotiate an extension of this exemption until the end of 2007, with a possibility of renewal. While it is too early to gauge the net effect of these changes on the sector, assembly and production of electrical machinery has been growing in recent years, as demonstrated by Table 2.4.

**Table 2.4: Growth of Electronics Production/Assembly in Jordan**

| | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|
| Growth rate (%) | 3.8 | 3.4 | 8.9 | 6.7 |

Source: Central Bank of Jordan.

Some of this growth is attributed to expansion of the personal computer (PC) market, which increased at an average rate of around 39 percent between 1998 and 2002. However, the PC household penetration rate remains low in Jordan, especially compared to other electronic appliances, as demonstrated by Table 2.5.

**Table 2.5: Selected Electronics in Households**

| Product | Household Penetration Rate (%) |
|---|---|
| Gas ovens | 96.7 |
| Radios | 93.4 |
| Refrigerators | 89.3 |
| Television sets | 88.9 |
| Washing machines | 70.5 |
| Electronic fans | 70.4 |
| Satellite receivers | 29.2 |
| VCRs | 20.2 |
| PCs | 5.0 |
| Air conditioners | 4.9 |

Source: Export and Finance Bank.

While some of these penetration rates are high, Jordan's high population growth rate means that the number of new households in the country is always on the rise, creating continuous market demand.

Despite the fact that many household appliances and consumer electronics are locally manufactured, Jordan has consistently imported over $550 million in electrical and non-electrical machinery since the mid-1990s.[4] Thus while export potential may exist, there is considerable unmet local demand for certain electronics and appliances.

### Firm Structure, Major Players, and Competition

**Middle East Complex for Engineering Industries (MEC)** is by far the largest and most diverse manufacturer of electronics and electrical appliances in Jordan. Its operations include both assembly and manufacturing of a wide range of products, including televisions, refrigerators, washing machines, VCRs, air conditioners, heaters, audio systems, and vacuum cleaners. It uses two approaches: Semi-Knock-Down (SKD) – assembly of semi-assembled parts and components and Complete-Knock-Down (CKD) – assembly of parts and components from scratch. The company manufactures most of its products under the Korean

[4] U.S. Department of Commerce, *2001 Jordan Country Commercial Guide.*

LG brand name. Some refrigerators and washing machines, however, are sold under other brand names, such as Korea's Daewoo or Singapore's Acma. It also has its own brands, MEC and Crown. MEC commands around 72 percent of the Jordanian market for televisions, 64 percent for washing machines, and some 63 percent for refrigerators. It is the second-largest manufacturer of air conditioners, as well as gas and kerosene heaters with around a 30 percent market share in each. Nevertheless, MEC exports approximately 80 percent of its production to regional markets, such as Lebanon, Syria, Iraq, Egypt, and Israel/PNA. In 2002, the company set up a joint-venture with the Chinese Haier Group to build a new factory for household appliances. Currently the company employs 550 people, but this number is poised to increase to around 900 once the new plant is fully operational.

**Abu-Haltam for Electronic and Electric Industries Corporation** (General Delux Electronics) assembles air-conditioners, washing machines, refrigerators, radios, and TVs. It has 10 percent of the local market share for TVs, the second largest after MEC. With 100 employees, it also exports to Lebanon, Iraq, United Arab Emirates (UAE), Saudi Arabia, and Romania.

**The Jordanian Ukrainian Fridge Manufacturing Company** specializes solely in the production and assembly of refrigerators. Despite a small workforce of only 60 employees, it is the second largest local producer of refrigerators, with a market share of some 10 percent

**Petra Engineering Industries Company** dominates the local air conditioning market, with a 45 percent market share. It designs and manufactures the electric boards and control panels that are used in its final products, such as air-conditioners, refrigerators, and related goods, while it imports the electronic components ready for installation from international suppliers. The company sells under its own brand name. Its competitive advantage lies in the production of central air-conditioning units, rather than split units. Petra exports around 70 percent of its production to regional markets, such as Lebanon, Egypt, and Turkey, but is increasingly tapping international markets, such as South Asia, Europe, Australia, and the United States. The company has around 900 employees, mainly in two factories close to Amman.

**Rum/Aladdin Industries Company** is part of the Sayegh Group industrial conglomerate and enjoys close to 50 percent market share in gas and kerosene heaters. The company manufactures a number of household appliances and engineering products.

**Century Electronics** is the most sophisticated electronics manufacturer in the region, outside Israel and Turkey. It uses automatic placement of surface-mounted-technology (SMT) as its primary production method. The company produces a wide range of hi-tech goods, such as HF/VHF communication control units, smart parking units, mobile phone electronic accessories, and car adaptors for radio and mobile communications. Century Electronics is part of Century Investment Group and a certified Motorola subcontractor. All of its production is outsourced and exported, mostly to Israel and the United States, where it enjoys duty- and quota-free access as a QIZ company. Fluctuations of demand in the information technology (IT) market have affected the company's fortunes in recent years.

Interviews and research reveal that related and supporting industries for electronics assembly need to be developed, since they either do not exist or are under-utilized by industry players. These industries include the tools and molds needed to manufacture and assemble electronic products, components, and their plastic bodies, as well as the sheet metal, packaging materials, electrical wires, and integrated circuits and chips required for the operation of electronic equipment. Local manufacturers report that they rely heavily on imports of molds, sheet metal, chips, and even packaging materials, since either the quality of local production

is not up to standards or, as in the case of chips and integrated circuits, nonexistent. This situation makes it harder for local producers to achieve higher local value-added. Furthermore, few linkages exist and little interaction takes place even among market participants.

The above list is not exhaustive. There are many small players in the electronics assembly market. This is especially true of PC assembly, where 250 local producers (mostly small assembly shops) compete intensely, which drives prices and profit margins down substantially. This sub-sector is plagued by a large number of producers, high fragmentation, idle capacity (70 percent on average), low margins, low quality perceptions, disorganization of the market, low penetration, and lack of economies of scale.[5] These tribulations, coupled with the presence of more efficient local and international firms in the regional markets (especially UAE and Saudi Arabia), would render it difficult for JIB to try to attract FDI in this sub-sector, despite the fact that local and regional demand is growing exponentially.

Generally speaking, FDI in the electronics assembly sector is negligible in Jordan with the exception of the $4 million that Haier Group will invest as equity in its joint-venture with MEC. Most of the foreign brands produced in Jordan are manufactured under license without major investments by the licensers.

### Market Access Agreements

Jordan has signed several agreements that might influence Jordan's electronics assembly industry and ability to attract FDI in this sector. These include the QIZ agreement, the Jordan-U.S. FTA (JUSFTA), the Jordan-E.U. Association Agreement, the Arab Free Trade Agreement (AFTA), and several bi-lateral free trade agreements with various Arab countries, such as Egypt, Saudi Arabia, UAE, Syria, and Tunisia.[6]

The QIZ agreement allows duty- and quota-free entry of products made in designated areas to the United States. The agreement is quite lenient in its rules of origin, especially concerning the origin of raw materials and inputs, allowing manufacturers to source components from anywhere in the world, as long as 7 percent of the product value is from Israel, 11.7 percent from Jordan, and a cumulative sum of 35 percent secured from Jordan, Israel, and the PNA along with substantial transformation. However, some manufacturers consider the 7 percent input requirement from Israel a burden on their product cost structure.

JUSFTA also allows eventual entry of Jordanian products to the United States free of duties and quota. The agreed tariff schedule calls for the reduction of duties on Jordanian products on an annual basis ending with zero tariffs on most products ten years from the start of the agreement in October 2001. Generally speaking, the agreement's rules of origin require at least 35 percent local content, substantial transformation, and direct shipment. (Visit http://www.customs.gov/xp/cgov/import/international_agreements/us_jordan_fta/usjfta.xml. icky for further information.)

Since electronics is a sector with many diverse products, access to the U.S. market is governed by other agreements in addition to JUSFTA, namely the General System of Preferences (GSP) and Normal Trade Relations (NTR). Under GSP, products such as air-conditioning split units, electric generators, hair dryers, TVs, VCRs, and electric motors can be exported duty-free from Jordan to the United States. Under NTR, which is a benefit of WTO membership, Jordan can export radios, TVs, VCRs, fax machines, and tape recorders

[5] Based on a study by Abu-Ghazaleh & Co. Consulting (January 2002).
[6] See the web site of the Ministry of Industry & Trade (www.mit.gov.jo) for the text of the AFTA and a list of bilateral free trade agreements with Arab countries.

duty-free to the United States. Both of these programs require 35 percent local content, substantial transformation, and direct shipment.

The Jordan-E.U. Association Agreement allows Jordanian producers to export to E.U. countries duty-free, provided that products meet the requirements of minimum 40 percent value added and substantial transformation. The agreement encourages the use of European inputs by considering E.U. materials used in production as part of the formula to determine country of origin of the product. Under the Aghadir Agreement, it is possible to cumulate rules of origin among countries that have association agreements with the European Union, provided that those countries also have free trade agreements among themselves. Once this agreement comes into effect, Jordanian products aimed for the E..U market would become significantly more competitive in Europe by combining inputs from Turkey, Egypt, or even Israel, as Jordan has recently negotiated successfully with the European Union to cumulate rules of origin with Israel.

AFTA, which came into effect on 1 January 1998 with the aim of creating an Arab Free Trade Area by 2008, offers an alternative to attract investment in this sector. Fourteen Arab countries joined AFTA, and the tariff reductions of 10 percent annually mean that goods traded among AFTA members face duties that are 60% less than those trade with other countries. It is worth noting, however, that AFTA includes a sizeable "exceptions" or a "negative" list. Jordan already exports many electronic products to neighboring countries; duty-free access to those markets will enhance those exports.

Jordan's bilateral market access agreements with various Arab countries offer even greater market access than AFTA. Of these agreements, the ones with Saudi Arabia, Egypt, UAE, Tunisia, and Syria are the most pertinent. These have generally been signed following the signing of AFTA and allow for larger duty reduction than under AFTA, as demonstrated by Table 2.6.

**Table 2.6: Tariff Treatment Under AFTA and Bilateral Arab Free Trade Agreements**

| Commodity | HS Code | Egypt[7] | | | Saudi Arabia | | |
|---|---|---|---|---|---|---|---|
| | | NTR | AFTA | Bilateral | NTR | AFTA | Bilateral |
| Air Conditioners | 841581.21 | 40% | 16% | 4% | 12% | 4.8% | 0% |
| Color TVs | 852812.10 | 30% | 12% | 3% | 5% | 2% | 0% |

Source: Ministry of Industry and Trade

### Factor Conditions

#### Factor Costs and Operational Efficiency

In the production and assembly of electronics, Jordan is at a disadvantage in terms of labor costs and technician wages in comparison with regional producers such as Egypt and international producers such as China. It enjoys an advantage, however, in comparison with Turkey, UAE, Saudi Arabia, and Israel. (See Table 2.7 for further information.)

[7] A 25% sales tax is added over and above the customs duty.

**Table 2.7: Regional Manufacturing Wages and Salaries[8]**

| | Jordan | Egypt | Israel | Saudi Arabia | Turkey | UAE/Dubai |
|---|---|---|---|---|---|---|
| Minimum wage (US$ hourly) | 0.60 | 0.25 | 3.90 | None | | None |
| Average manufacturing wage (US$ hourly) | 1.95 | 0.85 | 11.51 | n/a | | n/a |
| Average wage (US$ monthly) | | | | | | |
| Unskilled | 120 | 70 | | 400 | 300 | 210 |
| Semi-skilled | 141-211 | 140 | 1,000 | 700 | 520 | 400 |
| Highly skilled | 211-352 | | 2,300 | | | 2,000 |
| Supervisors | 281-563 | | 4,000 | | | |
| Social Charges (% of salary) | | | | | | |
| Employer | 10 | 26 | 33-50 | 0 | | 0 |
| Employee | 5 | 14 | 10 | 0 | | 0 |

Source: AMIR Program. "Jordan Investor Targeting Strategy 2003," July 2003.

Jordan's rates for the rental and sale of serviced land and buildings, as charged by JIEC, are competitive with most other countries in the region, with the exception of Saudi industrial estates in terms of land lease. (See Table 2.8 for further information.)

**Table 2.8: Regional Rental and Sale Costs for Land and Buildings**

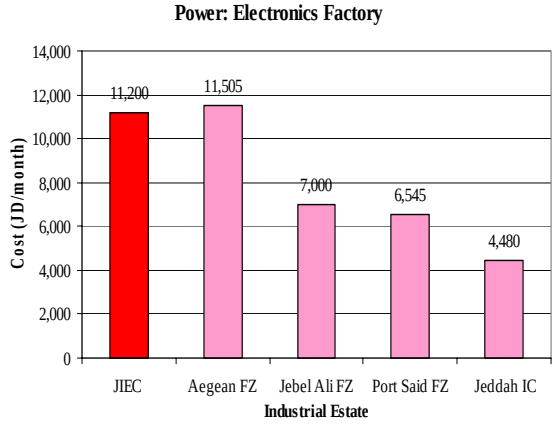
| | Serviced Land | Standard Factory Buildings |
|---|---|---|
| Al Hassan Industrial Estate Irbid, Jordan | Rental: JD2.5/$m^2$/yr | Rental: JD15.4/$m^2$/yr |
| | Sale: JD29.4/$m^2$ | Sale: Not allowed |
| Aegean Free Zone Izmir, Turkey | Rental: JD2.57/$m^2$/yr | Rental: JD42/$m^2$/yr |
| | Sale: Not allowed | Sale: Not allowed |
| Jebel Ali Free Zone Dubai, UAE | Rental: JD2.86/$m^2$/yr | Rental: JD67/$m^2$/yr |
| | Sale: Not allowed | Sale: Not allowed |
| Port Said Public Free Zone Port Said, Egypt | Rental: JD2.49/$m^2$/yr | Not offered |
| | Sale: Not allowed | - |
| Jeddah Industrial City Jeddah, Saudi Arabia | Rental: JD0.014/$m^2$/yr | Not offered |
| | Sale: Not allowed | - |

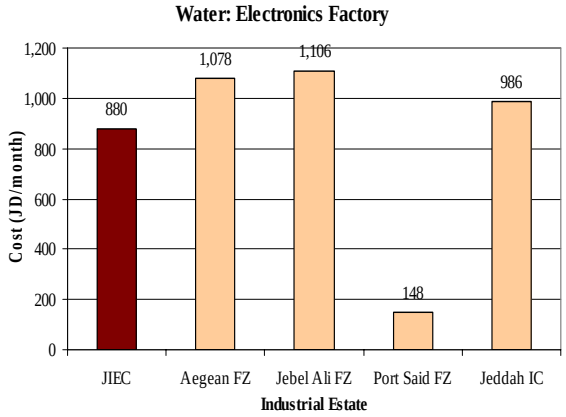
Source: AMIR Program. "JIEC Market Demand Study," April 2002.

With regard to utility costs for a typical electronics and engineering factory, Jordan is more expensive than its rivals within the region (with the exception of Turkey) in terms of electricity costs, but least expensive (with the exception of Egypt) in terms of water charges. (See Figures 2.2 and 2.3 for further information.)

[8] UAE/Dubai and Saudi Arabia impose no compulsory social charges, although many companies pay health insurance and education expenses for employees. Since most employees in UAE/Dubai are expatriates, most employers pay or provide housing, transport, repatriation, and end of service gratuities, which can add up to as much as 100 percent of the base salary.

**Figures 2.2 and 2.3: Regional Power and Water Charges**




Source: AMIR Program. "JIEC Market Demand Study," April 2002.

Finally, transportation costs in Jordan vary in terms of competitiveness. While port-handling charges are fairly competitive within the region, sea freight rates from Aqaba are not very competitive when compared to most of other regional ports. (See Table 2.9 for further information.) Customs inefficiencies, high overland transportation costs, and administrative bottlenecks at Aqaba port also make Jordan less attractive to foreign investors who seek to lower their operational expenses. Therefore, the cost of doing business in Jordan, when taken on its own, cannot be considered a selling point to attract FDI into the country.

**Table 2.9: Sea Freight and Port Handling Charges (JD per 20-foot Container)**

| | Aqaba Port | Port Said | Jeddah Islamic Port | Haifa Port | Aegean Port of Izmir | Jebel Ali Port |
|---|---|---|---|---|---|---|
| Average Sea Freight Rates | | | | | | |
| New York | 1330-2030 | 420-630 | 700-945 | 980-1050 | 1260 | 840-1610 |
| Rotterdam | 385-420 | 280-420 | 315-420 | 280 | 525 | 490-630 |
| Japan | 455 | 840-998 | 315-420 | 665 | N/A | 315-630 |
| Average Port Handling Charges | | | | | | |
| | 59-67 | 46 | 56-72 | 21 | 53 | 77 |

Source: AMIR Program. "JIEC Market Demand Study," April 2002.

## Available Technology and Technical Expertise

There are three levels of technological sophistication in SMT.

- First level: Automatic placement
- Second level: Manual placement
- Third level: Through-hole upgraded (i.e., manual soldering)

While Century Electronics uses first-level technology, the bulk of electronic assembly manufacturers use third-level technology, which is considered of low value-added and labor-intensive relative to other functions in the value chain.

With regard to the labor force, Jordan's workers are technically capable, and there are a large number of engineers in the country. Therefore, Jordan should be able to provide the required local technical expertise to attract investments in this sector. According to the Jordan Engineers' Association, there are approximately 50,000 Jordanian engineers registered in all sub-disciplines. In addition, many Jordanians receive vocational training as technicians and industrial workers. The government-funded Vocational Training Corporation (VTC) has established three Regional Training Directorates with a network of 38 training centers and institutes throughout the Kingdom. Training programs are designed and annually updated to

suit the needs of industries and overall market trends. Close relations and linkages are also kept with more than 4,600 enterprises with a view of implementing training and placing graduates accordingly. However, some companies have noted that the VTC centers do not train students in the latest technology used by the factories. On-the-job retraining is required to meet these deficiencies.

Of Jordan's total labor force of nearly two million, 1.2 percent are estimated to have had some form of vocational technical training or apprenticeship through the VTC. Currently, the total number of registered students at VTC's 38 centers is 14,000, with females representing approximately 15 percent. From the establishment of the first center in 1976, VTC has graduated more than 175,000 trainees. The largest numbers of graduates have studied in the fields of electricity, electrical installation and repair, vehicle and equipment maintenance, mold manufacturing, and air conditioning and sanitary works.

## 2.2 Global Overview

### Market and Investment Trends

#### Market Size and Location

Broadly defined, electronic assembly operations represented a worldwide economic value (at cost) of more than $700 billion in 2002. This figure is expected to grow to nearly $900 billion by 2005.[9] The electronics and appliance industry represents the second largest OEM market in the world for materials, components, equipment, and services. On aggregate, it is estimated that the market consists of some 1.5 billion units worldwide over the past three years.[10] Production began to shift away from the United States and Europe to Japan in the early 1970s and by the 1980s to other middle-income Asian counties. More recently, a new group of (mostly) Southeast Asian countries (including China) has attracted FDI and local capacity in this sector.

#### Principal Market Trend

The trend towards unremitting technological change and innovation has been the prime element in influencing the character of investment in this sector in the following respects.

Over the past half-century, many non-automated processes and machines were transformed into electronic systems. This trend continues, especially with new products related to cooking, such as electric grillers, deep-fryers, steamers, milk bottle warmers, and so on.

Increasingly, the distinction between electronic products and IT applications is blurring. Many electronic items have microprocessors and digital technologies. Recently, many appliances are being fitted with electronic controls (e.g., micro-control units, LCD/LED displays) in place of mechanical switches, allowing users to customize programming. Also, some electronic products are being fitted with technology to interface directly with IT products and the Internet.

The industry's future lies in developing "smart" appliances, designed to make fully automated households a reality using wireless Internet access and networking technology. Smart appliances for security, entertainment, cooking, and environmental control would be operated remotely via the Internet or mobile phones. Initially, sales of such appliances may be lackluster; over the long run, however, they are expected to elicit high demand.

[9] Electronic Trend Publications. "Worldwide Electronics Assembly Market Study," Second Edition.
[10] www.appliancemagazine.com

This technological convergence of the electronics and IT industries is increasingly making the financial fortunes of the former dependent on the latter, since many electrical component manufacturers supply IT companies with inputs. While industrial trends may differ, both markets tend to correspond with the cycles of the world's major consumer economies.

Demand for electronic components is derived from its end-use markets. Over the past decade, computers and communications equipment have been the largest and fastest growing end-use markets for electronic components. The current slowdown in global IT growth has slightly altered this trend. There are signs of a shift in the market whereby the most exciting technological innovations are being developed for the consumers. This is a natural reaction to the fact that in the United States, which is the world's largest market, consumer-tech spending is a stronger force these days than business-tech spending. Consumer spending has proven resilient; it did not experience the slump that affected business investment recently.

The global economic slowdown of the past few years has resulted in lower spending on electronics and price competition, which has squeezed the profit margins of the players in the market and resulted in plant closures and employment cuts. Resources available for FDI in the sector have retrenched. The industry's precarious economic situation has begun to impact foreign investments, even in the usually-stable Southeast Asian production markets, and is making new investment less likely, while simultaneously increasing competition among those who are seeking to attract new investment in production facilities.

### Other Market Trends

Within the market for traditional electronics and appliances, more mundane trends affect the sales growth of various product sub-sectors. In more developed consumer markets, products must compete not only on price and reliability, but also on design and aesthetics. In addition, growing environmental awareness has led to concerns over the environmental impact of electrical products, making the provision of environmentally-friendly products (i.e., those that comply with E.U. or NAFTA eco-labeling and energy-saving schemes) a source for the competitive edge of some companies.

**Regulation.** Many countries have regulatory systems for electronics and appliances, which have impacted global standards. Electrical appliances sold to the United States are examined to ensure that they comply with federal safety standards. Concerning electromagnetic compatibility (EMC), certain products sold to the United States are required to meet the Federal Communications Commission standards. Similarly, products exported to the European Union have to comply with certain directives, including the low-voltage electrical equipment directive, and the EMC directives in order to carry the E.U.'s CE mark. Products exported to Canada have to comply with the safety standards set by the Canadian Standards Agency, while those exported to mainland China have to meet the quality standards of the China Commodity Investigation Bureau.

**Tariff.** The Information Technology Agreement (ITA) was negotiated under the WTO and covers the tariff treatment of many materials and equipment used in electronics assembly. It resulted in a reduction of tariff duties on printed circuit boards (PCB). Attempts to negotiate a second agreement (i.e., ITA-II) whereby raw materials and equipment used for PCBs and the assembly industry would be tariff-free have been stalling.

The United States levies no tariff duties on many electronic appliances and equipment. On those that it does, the duty rates do not exceed 4 percent in most cases.[11] The European

[11] See complete U.S. tariff schedule on www.usembassy-amman.org.jo. Electronic equipment, appliances, and components fall under HS codes 84, 85, 87, 88, and 90.

Union. also has low rates of duties on these products, in contrast to East Asian countries where rates are substantially higher.[12] Table 2.10 lists the major players in the global market, which are the countries with the largest and fastest growing exports of electronics (i.e., likely the most competitive countries in the sector).

[12] www.ipc.org.

**Table 2.10: World Electronics Export Leaders (2002)**[13]

| Country | 716 | 741 | 751 | 752 | 759 | 761 | 762 | 763 | 764 | 771 | 772 | 773 | 775 | 776 | 778 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| China | 10.3 ↑ | | 11.7 ↑ | | 4.5 ↑ | 5.1 ↓ | 34.9 ↑ | 18.0 ↑ | 9.2 ↑ | 19.3 ↑ | 6.1 ↑ | 9.4 ↑ | 22.2 ↑ | | 8.3 ↑ |
| Mexico | 6.7 ↑ | | | | | 22.2 ↑ | 9.5 ↑ | 2.5 ↑ | 4.6 ↑ | 6.4 ↑ | 4.7 ↑ | 16.5 ↑ | 4.1 ↑ | | 3.9 ↑ |
| United States | 14.3 ↓ | 19.8 ↑ | 8.0 ↓ | 18.6 ↓ | 20.6 ↓ | 5.0 ↑ | 4.1 ↑ | 3.0 ↓ | 17.0 ↑ | 13.4 ↑ | 19.9 ↑ | 17.9 ↓ | 7.0 ↓ | 21.4 ↑ | 17.7 ↑ |
| Germany | 10.4 ↓ | | 6.6 ↑ | 4.4 ↓ | 4.1 ↓ | | 2.5 ↑ | 3.0 ↓ | 5.6 ↓ | 6.0 ↓ | 11.4 ↓ | 6.0 ↓ | 12.3 ↓ | 3.3 ↓ | 8.6 ↓ |
| Other Asia | | | 3.2 ↓ | 7.9 ↑ | 9.2 ↑ | | | 1.9 ↑ | | 5.5 ↓ | 6.1 ↑ | 3.0 ↓ | | 8.5 ↑ | 3.9 ↓ |
| Italy | 3.7 ↓ | 10.0 ↓ | | | | | | | | | | | 11.7 ↓ | | |
| Hong Kong | | | 2.9 ↓ | | | | 2.7 ↓ | | | 3.0 ↓ | | | | | |
| France | 4.4 ↓ | 6.5 ↑ | 4.0 ↓ | | | 5.1 ↑ | | | 3.8 ↑ | 2.5 ↓ | 5.1 ↓ | 3.0 ↓ | 5.1 ↓ | | 3.3 ↓ |
| Korea | | 2.1 ↑ | | | 3.9 ↓ | 3.4 ↓ | | 6.0 ↓ | 5.1 ↑ | | | | 5.1 ↑ | 9.0 ↓ | 2.6 ↓ |
| Japan | 11.9 ↓ | | 29.5 ↓ | 14.8 ↓ | 16.7 ↓ | 9.3 ↓ | 7.7 ↓ | 38.3 ↑ | 9.3 ↓ | 8.9 ↓ | 13.9 ↓ | 4.9 ↓ | | 15.2 ↓ | 20.0 ↑ |
| Singapore | | | 3.2 ↓ | | 1.9 ↓ | | 2.5 ↓ | | | | 2.7 ↓ | | | 5.9 ↓ | |
| United Kingdom | 4.4 ↓ | 3.5 ↓ | 6.7 ↑ | 7.4 ↑ | 4.6 ↑ | 5.1 ↓ | | | 5.7 ↑ | 2.4 ↓ | 3.2 ↓ | 2.4 ↓ | 2.5 ↓ | 2.3 ↓ | 4.3 ↓ |
| Ireland | | | | 3.4 ↑ | | | | | | | | | | | |
| Belgium | | | | | | | | | | | | | | | 2.1 ↓ |
| Hungary | | | | | | | | 2.9 ↑ | | | | | | | |
| Canada | | | | | 3.7 ↓ | | | | 5.7 ↑ | | | | | | |
| Spain | | | | | | | | | | | | 2.1 ↓ | 2.9 ↓ | | |
| Portugal | | | | | | | | | | | | 2.3 ↓ | | | |
| Switzerland | | 2.2 ↓ | | | | | | | | | 2.2 ↓ | | | | |
| Netherlands | | 2.1 ↑ | 8.6 ↓ | 4.5 ↑ | | | | | | | | | 2.2 ↓ | | |
| Sweden | | 2.2 ↑ | | | | | | | 6.3 ↑ | | | | | | |
| Denmark | 2.7 ↑ | | | | | | | | | | | | | | |
| Philippines | | | | | | | | | | | | | | 5.3 ↑ | |
| Malaysia | | 2.6↓ | | 4.3 ↑ | 3.7 ↑ | 7.8 ↓ | 13.8 ↓ | 9.4 ↓ | | 2.7 ↓ | | | | 8.4 ↑ | |
| Thailand | 2.7 ↑ | 2.2 ↑ | 3.2 ↓ | 3.6 ↓ | | 4.6 ↓ | | | | | | | | | |
| Indonesia | | | | | | | 3.6 ↑ | 3.0 ↑ | | | | | | | |
| Spain | | | | | | 4.1 ↑ | | | | | | | | | |
| Portugal | | | | | | | 3.6 ↑ | | | | | | | | |
| Special Cat. | | | | | | | | | | | | | | 2.2 ↑ | |

[13] ASEZA. "Investment Marketing Plan, Volume 2," 2002.

Notes

↑ indicates rising world export market share between 1995 and 2000. ↓ indicates falling world market share.
The numbers indicate the percentage change in a country's world export market share between 1995 and 2000.

Key

| | |
|---|---|
| 716 | Rotating electric plant (motors) and part |
| 741 | Heating and cooling equipment |
| 751 | Office machines (cash registers, copiers, typewriters, etc.) |
| 752 | Automatic data processing machines (computers) |
| 759 | Parts for office machines and computers |
| 761 | Television receivers |
| 762 | Radio broadcast receivers |
| 763 | Sound equipment, dictating machines, etc. |
| 764 | Telecommunication equipment |
| 771 | Electric power machinery, other than motors |
| 772 | Electrical appliances for making/breaking electric circuits |
| 773 | Equipment for distributing electricity |
| 775 | Household electrical equipment |
| 776 | Thermionic valves, tubes, and semiconductors |
| 778 | Electric machinery and appliances (batteries, lamps, tools) |

## Market Trends by Region

**United States.** Many American manufacturers have sought to outsource the more labor-intensive aspects of their production in order to remain globally competitive, especially against an increasingly-large volume of cheaper products emanating from Asia. Today, some 60 percent of electronics are imported, up from 40 percent only 10 years ago.[14] Even the export market share of U.S. manufacturers may also begin to erode as a result of the Mexico-European Union Free Trade Agreement, which contains special provisions for liberalizing trade in automobiles and components.

During the boom years of the 1990s, demand for electronics in the United States remained strong and stable. However, the economic slowdown of the past few years has resulted in the following developments.

With low interest rates and favorable financing terms, demand for durable goods (e.g., washing machines, refrigerators) and automobiles has been somewhat solid.

Spending on consumer electronics has outperformed business electronics (i.e., IT hardware) spending. In dollar terms, total consumer electronics sales grew by 3.7 percent in 2002 (to $96.2 billion) and are expected to increase by 3.5 percent in 2003 (to $99.5 billion). This is less than the 6 percent long-term growth rate of the industry but much better than the growth forecasts of technology sales to business, which are close to zero for 2003.[15]

Industry profit margins remain quite low in all sub-sectors as the industry remains plagued with price deflation.

Thus, the component makers and suppliers for the consumer electronics and durables sub-sectors have fared relatively better than those supplying the PC and IT hardware manufacturers.

**Europe.** After experiencing a slowdown in 2002, the European contract electronic assembly market was valued at $22.8 billion. The market is expected to rebound in 2003, and achieve a growth rate of 9.3 percent. Growth is forecast to accelerate in 2004, and the market is expected to more than double in value to around $55 billion by 2007.[16] This growth is expected as outsourcing becomes increasingly common due to underlying market trends that include restructuring, increased competition, search for export markets, and the shift to low-cost manufacturing.

In response to increased competition and wage pressure at home, many large European companies have decreased the amount of actual manufacturing occurring in the European Union and transferred the most labor-intensive operations overseas. Eastern Europe and Asia have received a large amount of outsourcing, but the Middle East, Latin America, and (to a lesser degree) Africa have also benefited from European FDI. In the Middle East, preliminary data suggests that UAE, Israel, and Turkey have captured the bulk of European FDI in the non-energy related electronics and appliance assembly sector.

Thus, while the European electronics market has suffered (with consumer electronics demand shrinking due to lackluster economic growth, high unemployment, market saturation, and stifled demand), the contract electronics assembly sub-sector is poised to experience substantial growth.

[14] BusinessWeek. “Home is where the Tech is,” 22 January 2003.
[15] Reed Electronics Research. “The European CEM Assembly Industry 2002-2007.”
[16] BusinessWeek. “Home is where the Tech is,” 22 January 2003. Projections of Consumer Electronics Association.

**Asia Pacific and Other Emerging Markets.** Some of the industry's major players have invested in production facilities in emerging markets like Brazil, India, Mexico, and Russia. However, the general trend has been for the major Southeast Asian electronics manufacturers to establish production facilities in the lower-wage countries of the Asia Pacific region, including China, Indonesia, Malaysia, Philippines, Thailand, and Vietnam.

The electronics industry in the Asia Pacific region has been negatively affected by the global economic slowdown of the past few years, as well as by the chronic stagnation of the Japanese economy. This economy, which has been plagued by sluggish growth and flat consumer spending, would otherwise have been a large and lucrative market for many producers. This phenomenon has reduced demand, profits, and squeezed prices, forcing many Japanese producers to slash jobs and close plants. It has also eroded the amount of capital for FDI available among Japanese producers, which according to some estimates declined by 36 percent from 1990 to 2000.[17] Similar corporate problems have beset some South Korean firms.

China has emerged as a major player in the electronics and appliance industry. Most MNCs' corporate offices (where management, marketing, product development and quality control take place) are located in Hong Kong, while the actual manufacturing and production facilities are located on the mainland where labor and land are cheaper. The United States and the European Union accounted for the bulk of China's exports in this sector.

China's exporters have been well adapted to the European Union's stringent technical requirements. Given the improvement in mainland household incomes, spending on household electrical appliances is on the rise, and the Chinese domestic market is itself becoming increasingly lucrative. Recently, Philips moved its Asia Pacific Headquarters from Singapore to Hong Kong in the belief that electronics-sector initiatives will largely come out of China in the future. China's accession to the WTO brought greater respect of intellectual property rights on the part of the Chinese authorities, adding to China's attraction and advantages as a center for both the development and manufacturing of software, consumer electronics, semiconductors, and components.

### Structure of the Sector

Over the past few years, there has been significant structural change in the industry with acquisitions by major players leading to considerable consolidation. As a result, a group of large multinational corporations and an expansive network of suppliers, subcontractors, and subsidiaries dominate the electronics assembly industry. Indeed, some of the world's largest MNCs are electronics manufacturers. Contract electronic manufacturers (CEM) have become very important in the sector as OEMs divest manufacturing operations to concentrate on design and marketing.

Among the ten largest companies in almost any sub-sector of the electronics assembly industry, more than half are U.S.-based. Europe as a whole would be ahead of Asia in the number of top ten firms, but Japan stands out as the individual country with the second highest number of individual segment leaders after the United States. Individually, European countries do not have as many major corporations in the sector as the United States and Japan. However, Germany, the Netherlands, Denmark, France, Italy, and the Untied Kingdowm have produced several internationally recognized brand names.

In the 1980s, in part due to Japanese, U.S., and European manufacturers investing in countries with lower labor costs, competitive industries began to emerge in newly

[17] *The New York Times,* "Japan's Electronics Slump Takes a Toll on Southeast Asia," 1 September 2001.

industrialized Asian economies like South Korea, Taiwan, and Singapore, and today these countries are home to some major corporations within the sector. In the 1990s, the pattern of outsourcing less sophisticated production abroad while increasing the value-added to domestic manufacturing has been repeated by some of major Korean and Taiwanese companies in low-wage Southeast Asian countries. Table 2.11 below lists some of the top electronics multinational in the world by value of sales.

**Table 2.11: Top Global Electronics Companies**

| | Company name | Origin |
|---|---|---|
| 1 | General Electric | USA |
| 2 | Whirlpool | USA |
| 3 | Phillips | Netherlands |
| 4 | Siemens | Germany |
| 5 | Bosch | Germany |
| 6 | Rowenta | Germany |
| 7 | Sony Corp | Japan |
| 8 | NEC | Japan |
| 9 | Lucky Goldstar (LG) | South Korea |
| 10 | Samsung | South Korea |

Source: "Appliance" magazine[18] and Electronic Trend Publications[19]

Establishment of electronic components industries in emerging markets is difficult due to the higher start-up costs, sophisticated engineering involved, high quality standards, and dependence on established client markets. Therefore, many manufacturers of household electrical appliances from developing countries, including China, Brazil, and Malaysia, mostly produce on an OEM and ODM basis. OEM and ODM producers make products under subcontract for reputable brand names, such as General Electric and Whirlpool of the United States, Philips and Bosch of Europe, and Sony and NEC of Japan.

## 2.3 Regional Overview

Economic growth in the Middle East, especially the Gulf countries, has fared better than the rest of the world in recent years, primarily due to higher oil and natural gas prices. Consumer and business demand and confidence suffered in the first few months of 2003 (due to the Iraqi Crisis), but has picked up substantially since then. The Economist Intelligence Unit estimates that the MENA region's GDP growth rate will rise to 4 percent in 2004.

While the overall outlook for the electronics industry is promising, the Middle East market is small compared to established markets like the United States, Europe, and Asia. However, economic liberalization, coupled with an ever-increasing number of households, is sure to create substantial demand over the long term. In the short term, a functional and fully-fledged pan-Arab free trade zone, which is slated to come into existence by 2008, might mitigate part of the size problems of individual markets in the region.

Over the past two decades, the region has witnessed a number of trends that have had (and will continue to have) implications for domestic demand and consumption, including demand for consumer electronics. Over the past few years, the region's population growth rate of 2.3 percent has been consistently higher than the world's average of 1.4 percent. The region's average fertility rate of 3.5 in 1998 was also higher than the world average of 2.7, but was much less than the 1980 average of 6.1. This has resulted in changes to the region's age structure, whereby the percentage of children has been decreasing, while the percentage of

[18] www.appliancemagazine.com.
[19] Electronic Trend Publications. "Worldwide Electronics Assembly Market Study," Second Edition.

young couples starting new households has been increasing.[20] In addition, the MENA region has experienced increasing urbanization. In 1960, the share of the region's urban population was 28 percent (compared to 16 percent for East Asia). By 1997, that share increased to 58 percent (compared to 33 percent in East Asia) and is expected to continue on increasing in the future (very rapidly in the case of the Arab Gulf countries).[21] Urban households typically have more sophisticated spending patterns and consume more durables and electronics.

The implications for electronics penetration rates have been substantial. The region's mobile telephone penetration rate, which skyrocketed from 5 percent in 1998 to 20 percent in 2003, is expected to reach 30 percent by 2007.[22] In Egypt, demand for TVs has grown at an average rate of 7percent per year between 1997 and 2001, while demand for ACs has increased by a staggering 10.5 percent over the same period.[23] The trend is similar in Saudi Arabia, where the country's consumption of air-conditioned refrigeration was expected to top the $1.1 billion mark in 2003, a 10 percent increase over the previous year.[24]

### Major Players

Most of the electronics manufacturing activity that takes place in the region revolves around assembly operations. Only in Israel do research and development (R&D) and niche manufacturing activities take place. While European corporations are prominent in Turkey's electronics assembly sector (e.g., Thorn-EMI, Bosch Siemens, Electrolux), American companies dominate such investments in Israel (e.g., IBM, Intel, Motorola, National Semiconductors). Several of the major Asian producers of electronics have been active in the Middle East for some time. Japanese firms, such as Osaka-based Sharp Inc., have distribution offices and manufacturing plants in Saudi Arabia and UAE, while Tokyo-based Sony Corp. has achieved significant market penetration in the Middle East and has a TV assembly operation in UAE. Taiwan's Acer also has a PC assembly operation in Dubai. Hong Kong's Advanced Industrial Company has a well-established niche in sales of television components in the region, including antennas. Korean titans, Samsung and Lucky Goldstar (LG), have had a marked presence in the region since the early 1990s. European consumer electronics firms are beginning to gain ground lost to Japanese brands in Gulf markets, but other Asian producers and U.S. brands are also popular in the region.

### Major Markets

Israel, Turkey, UAE, and Egypt are the most developed regional markets for electronics and appliance assembly manufacturing, while Saudi Arabia, Kuwait, UAE, and other Gulf States are the biggest, wealthiest, and fastest-growing consumers of electronics. The lifting of United Nations sanctions and the reconstruction of Iraq are expected to generate a large demand for electronics (estimated at $3.5 billion) and new market opportunities in the region.[25]

#### Israel

Israel's electronics sector is well developed and has its greatest strength in research-intensive, leading-edge markets for telecommunications and medical diagnostic equipment. It is dominated by local players, while U.S. companies (e.g., Intel, Motorola, National Semiconductors, IBM, Cisco, and Digital) account for the bulk of FDI in the sector. Capital-

[20] United Nations Development Programme. "Arab Human Development Report 2002," pp. 35-40.
[21] Isfahani, Djavad. "Microeconomics of Growth in MENA – The Role of households," May 2000.
[22] Braude, Jospeh. "Substitution: The MENA view," NetAcademy on Electronic Markets.
[23] Egypt Business and Investment Guide, August 2001. (http://egypt.kiwano.net)
[24] Economist Intelligence Unit. "Saudi Arabia Country Report 2003."
[25] The Gulf News, 17 April 2003.

intensive fabrication of electronic components and the R&D that precedes it dominate the industry, rather than the more labor-intensive assembly and testing operations.

While the global IT slump of the past few years has affected the Israeli electronics sector (exports have fallen from their peak of around $7 billion in 1999), its long-run prospects are good since it is seen as a "development center" in the global electronics market and the products it churns out rank high on the electronics value-chain. This is primarily due to the high levels of public support for R&D (both civilian and military) and the availability of highly-skilled labor. Therefore, attracting FDI from Israel into Jordan seems to be logical since it is much more cost effective for Israeli producers to outsource the labor-intensive assembly and testing operations to Jordanian firms (which do possess the technical expertise), while focusing on R&D and capital-intensive fabrication. Barring the sensitivities of the political situation and the IT market meltdown, which hit Israeli firms quite hard, Jordan and Israel could be a well-suited strategic fit in electronics.

### Turkey

Electronics is a major market in Turkey. The share of local production is considerable. Turkey produces a full range of consumer electronics and household appliances. In addition, communications equipment, industrial electronics (e.g., motor control systems), components (e.g., PCBs, coils, semiconductors), and defense electronics are also manufactured locally. Consumer electronics constitute the bulk of Turkey's electronics exports, while components make up the majority of its imports in this sector. Brown goods (e.g., CD players, VCRs, microwave ovens, stereo equipment) are produced under license from MNCs like Thorn-EMI and Akai. However, local brands such as Arcelik, Beko and Vestel hold a dominant share of the market. In the white goods market, Bosch Siemens and Electrolux have recently invested in local producers of household appliances. The Turkish government and military are big players in the communications and defense equipment sub-sector both as end-users and producers (through involvement in Aselsan and Turk Telekom).

The financial and economic crises that hit the country in November 2000 and February 2001 have dented the local demand as purchasing power suffered from the Lira's devaluation. However, with the EU-Turkey customs union of 1996 helping the electronics sector weather the crisis, and its geographical proximity to Europe, Turkey is an attractive FDI destination for European multinationals. Attracting FDI from Turkey into Jordan's electronic assembly sector does not seem to be feasible. Turkey's electronics industry is more developed than Jordan's, but competes on the same terms (i.e., cheap labor-intensive assembly operations) and targets the E.U. market, where is has a geographical advantage compared to Jordan.

### UAE

UAE has emerged as a major trading and manufacturing center for the region, particularly in computers and accessories, as well as audio and video consumer goods. Its annual Dubai Shopping Festivals have attracted large crowds from the region and created a big market for trade in electronics. Total turnover of consumer electronics in 2000 was around $1.36 billion, much of which was sold to buyers from the neighboring Gulf states, the Commonwealth of Independent States (CIS) (i.e., former Soviet republics), and East Africa. Dubai has attracted substantial FDI in electronics (especially from Hong Kong, Taiwan, and Japan) and is considered a regional retail hub for the sector. National-Panasonic, Acer, Sony (for TV assembly), Hitachi, Aiwa, Citizen, LG, Sharp, Akai, Kenwood, and Brother are some of the big companies that have already established assembly facilities in Dubai to further boost the distribution of their products to African, CIS, and Middle Eastern markets.

Dubai's success in this sector resulted from the implementation of several national-level strategies over a number of years. The government strived to secure easy access to quality manufacturing, retail, and warehousing space to attract new investments. It put in place an efficient transport, logistics, and warehousing system and implemented trade- and investment-friendly policies, such as easy customs clearance and low tariffs, especially in the Jebal Ali free zone. It also attracted an international customer base through collaborating with private event promoters and tourism companies to ensure the success the Dubai Shopping Festival. However, the market for new entrants is becoming very competitive, which might limit the future growth of FDI in the sector.

### Egypt

Starting in the 1980s, Egypt's electronics assembly sector emerged from the shadow of state-owned enterprises and saw an influx of new private investments. Currently, there are around 100 industrial companies with an annual production of household electrical appliances valued at $0.3 billion and representing a respectable, but unsophisticated industrial base. The sector's operations include assembly of TVs, air conditioners, washing machines, industrial electric equipment, PCs, medical equipment, and automotives. Local manufacturers have a big market share in many of these industries, especially Al-Araby (TVs) and International Electronics (TVs and medical equipment). However, foreign firms are active in the sector either through licensing or actual presence, such as Carrier USA (assembly of air conditioners), ABB and Bechtel (industrial electric goods production), and GM, Daewoo, Daimler Chrysler, and Peugeot (automotives). Toshiba, Grunding, LG, and Philips TV sets are also assembled in Egypt. Consumption of PCs, air-conditioners, TVs, and other appliances is on the rise and expected to grow substantially over the long term. Indeed, total demand for electrical appliances is expected to reach $10 billion in 2015.[26]

A 1990 World Bank study showed that Egypt enjoys a competitive edge and big export potential due in consumer durables due to highly competitive prices. It derives its comparative advantage from the labor and managerial intensity of manufacturing, which are cheaply abundant in the country, as well as the potential for economies of scale due to the big and expanding size of the local market. Many local firms are also producing their own components, thus moving away from simple assembly to manufacturing (i.e., vertical integration) and acquiring an additional cost advantage. These factors, coupled with WTO accession, promises great potential for export and investment.

### Saudi Arabia

The electronics assembly sector in Saudi Arabia includes assembly production of air conditioning and refrigeration equipment; auto parts and service equipment; and PCs. Together with petrochemicals, plastics, and metal goods, electrical appliances presently top the list of items that Saudi Arabia export to some 90 countries. Big market size, substantial purchasing power, cheap expatriate labor, low energy costs and good infrastructure attract firms into the Saudi market. For example, Sharp Inc. of Japan has distribution and manufacturing presence in Saudi Arabia. However, since demand for serviced land in Saudi industrial estates outstrips supply, foreign investors are forced to look elsewhere for places to locate their operations.

In 2001, 36 percent of the PC hardware sold in Saudi Arabia was locally assembled. The rapidly expanding Internet services are creating a subsidiary market for software and hardware. Indicators reveal that the estimated size of the Kingdom's ICT market in 2002 was

[26] Egyptian Ministry of Industry and Foreign Trade, January 2000.

$3.7 billion (i.e., computer equipment $850 million, software $1 billion, IT services $1.3 billion, and data communications $550 million).

To conclude the analysis of the regional market, Table 2.12 summarizes some of the main determinants of FDI attraction in the electronics assembly industry in regional markets.

**Table 2.12: Determinants of FDI Attraction in Regional Electronics Assembly Industry**

| Country | Market size | Labor costs | Skilled labor availability | Facilitation services | Infrastructure and transportation | Developed cluster | Presence of FDI |
|---|---|---|---|---|---|---|---|
| Israel | Medium | High | Insufficient | Good | Good | Yes | High |
| Turkey | Large | Low | Sufficient | Fair | Fair | Yes | High |
| UAE | Small | Medium | Insufficient | Good | Very Good | Medium | Medium |
| Egypt | Large | Very Low | Sufficient | Fair | Low | No | Low |
| Saudi Arabia | Large | Medium | Insufficient | Fair | Good | No | Low |

# CHAPTER 3: SECTOR ANALYSIS

## 3.1 Investment Location Criteria

Investors make decisions to relocate their factories or expand their businesses in new locations for a variety of reasons related to achieving certain company objectives. Competition has increased the quality and life span of traditional electronics products, thus decreasing the velocity of sales over the past thirty years. Also, higher quality standards and miniaturization are requiring workers in the industry to upgrade their skills and production methods.

Therefore, the ability to deliver products that meet current market requirements is becoming the basis for competition in electronics manufacturing. These market requirements necessitate strict adherence to a set of technical criteria, which go a long way to determining whether an investment in an assembly operation (or out-sourcing to an existing firm) in a certain country will materialize or not. See Box 3.1 for further information.

**Box 3.1: Technical Investment Location Criteria**

- Technical skills and capabilities of workforce
- Sophistication of production methods
- Cost of final product (i.e., low-cost assembly and local component sourcing)
- Shape of product (i.e., complex assembly using flexible or hard circuit boards to fit complex geometries), ergonomics, and aesthetics (i.e., use of precision plastics)
- Compliance with proper size and weight dimensions of components and final products
- Functionality and performance levels (i.e., number of functions, capacity and speed of operation, and energy consumption)

Whereas the most critical criteria are the technical, firm-and industry- specific; there are also various important country-specific criteria that investors in the electronics assembly sector take into consideration when deciding on a location for setting-up shop.[27] See Box 3.2 for further information.

**Box 3.2: General Investment Location Criteria**

- Political and economic stability
- Economic openness and liberalization
- Transparency and reliability of legal and financial institutions
- Adequate infrastructure (e.g., roads, power) and reasonable transportation and utility costs
- Sufficient supply of professional and technical human resources
- Low wage costs and an un-unionized workforce
- Reasonable cost structure in terms of overheads, taxation, tariffs, and customs fees
- Ease of capital repatriation
- Logistics and reduction of manufacturing lead-time
- Diversification of geographic locations of firm's existing production facilities
- Fast-track permit process for setting-up operation
- Access to local and regional markets
- Availability of preferential agreements in quotas and tariffs

The criteria listed in Box 3.2 are general and apply to both big and small economies. In many cases market size, purchasing power, and the strength of the local cluster also play a major part in attracting FDI in this sector. However, the aforementioned 14 points apply to countries of all sizes. As the cases of Ireland, Israel, and Cost Rica demonstrate, conformity to these criteria in many cases compensates for the small size of the country.

[27] World Bank Foreign Investment Advisory Service (FIAS). "Attracting High Technology Investment: Intel's Costa Rican Plant," Occasional Paper No.11, April 1998.

Electronics assembly operations require efficient logistics to manage the large number of inputs, ensure proper inventory levels, and schedule accurate "just-in-time" deliveries. They also require proper warehousing infrastructure. Therefore, a location is particularly attractive if it has large logistics companies that can manage the entire flow of goods, from input supply to product distribution. Access to OEM customers with long-standing vendor relationships is also a key entry barrier for new entrants in the appliance and component assembly businesses.

## 3.2 SWOT Analysis

The tables and discussion on the following pages detail the strengths, weaknesses, opportunities, and threats of the electronics assembly industry in Jordan, and how they influence the criteria for investment identified above.

SWOT analysis is a tool for strategic analysis that is commonly used to help organizations and companies understand their competitiveness in a dynamic business environment. It examines internal forces (i.e., strengths and weaknesses), as well as external forces (i.e., opportunities and threats) as they exist in the business environment.

This section identifies both the internal factors (i.e., strengths and weaknesses) that affect Jordan's attractiveness as a destination for FDI, as well as the external factors (i.e., opportunities and threats) that may affect the growth of the electronics assembly industry in Jordan and enhance or reduce the country's ability to attract DDI or FDI.

**Table 3.1: Strengths of Jordan's Electronics Assembly Sector**

| Factor | Comment |
|---|---|
| Proximity and access to growing local and regional market | Allowing export opportunities to a regional market that is experiencing an increase in the number of new households and high growth rates of demand for consumer electronics |
| Available and skilled workforce | Availability of a large number of skilled laborers and technicians, in addition to approximately 50,000 engineers |
| Relatively low overall labor costs compared to regional competitors | Adding to Jordan's regional competitiveness, since Jordan's manufacturing labor costs are lower than all regional competitors, except Egypt |
| Flexibility and timing | Manufacturing in Jordan offers MNCs flexible production and faster delivery for sale in the regional market, rather than shipping from distant factories in home country. |
| Specially-negotiated WTO status with regard to tax on export revenue | Allows zero tax on export earnings until end of 2007, which may be extended based on negotiations between Jordan and WTO[28] |
| Preferential access agreements to U.S., E.U., and Arab markets | Allowing duty- and quota-free entry of selected products to the world's largest markets and to regional markets |
| World-class investment law and regulations | Grants full repatriation of profits and other investor protections |
| High-quality infrastructure | Provides a reliable network of roads, electricity, and communications |
| Possibility of using relatively sophisticated technology | Demonstrated by existence of certain technically sophisticated niches of excellence (e.g., Century Electronics) |
| Good quality production and reputation in consumer electronics | Some Jordanian exports enjoy reputation for good quality, reliability, and performance, coupled with good service in Arab markets and increasingly in South Asia. |

[28] This is based on the decision of the WTO's Committee on Subsidies and Countervailing Measures dated 22 November 2002.

**Table 3.2: Weaknesses of Jordan's Electronics Assembly Sector**

| Factor | Comment |
|---|---|
| Small electronics market because of small population (5.2 million) possessing limited purchasing power | Limits Jordan's attraction potential as a stand-alone destination for electronics assembly investors |
| Expensive production machines and equipment | Requires major financial investments, increasing operating costs and raising barriers to entry |
| Relatively high overall labor costs compared to global competitors, such as China | Lowers cost competitiveness of Jordanian products in comparison with low-cost producers |
| High utility costs, especially power | Increases cost of final product |
| Tariffs on raw materials (i.e., most raw materials incur customs duties, whereas competing imported final products do not) | Raises cost/price of final product and makes local production for local market less competitive |
| Lack of backward and forward linkages | Makes overall cost of final product higher since all components and raw materials have to be imported |
| Lack of design capabilities | Prevents factories from integrating vertically, hence improving lead times and controlling cost |
| Relatively slow logistics and customs transactions, especially at Aqaba port | Increases operating costs, delays deliveries to customers, and prevents catering to market segments requiring quick response |
| Lack of track record of existing companies | Except for Haier/LG, no FDI exists in market |
| High transportation costs from Amman to Aqaba (i.e., truck transport costs half as much per container as shipping from Aqaba to New York) | Raises price of final product and lowering competitiveness |

**Table 3.3: Opportunities for Jordan's Electronics Assembly Sector**

| Factor | Impact on Jordan |
|---|---|
| Growing global trend towards outsourcing to lower cost producers | Jordanian manufacturers can become subcontractors of firms looking to outsource to serve the Middle East market. |
| To remain competitive and reduce costs, companies in Western Europe and Far East restructuring and looking to relocate | Jordan can try to attract some of these relocated operations, especially given its lower costs and proximity to Europe. |
| Growing local and regional market (i.e., demand in Jordan and the MENA market is growing and is expected to continue growing, especially in appliances) | Electronics companies will continue to target the region. Therefore, Jordan should be able to capitalize on this and attract its share of investment and trade in this sector. |
| Opening of Iraqi market | Jordan's historic ties and proximity to Iraq should allow it to compete better in that market, thus inducing investments in Jordan. |
| Currently expensive rental in Dubai | Many companies that are considering investing in Dubai but facing high rental costs could be attracted by Jordan's lower rental costs and comparable infrastructure. |
| Increasingly competitive market in Dubai, deterring new entrants | Electronics companies that have not yet established operations in Dubai (e.g., many from China and Europe) might prefer another port of entry to the Middle East, such as Jordan. |
| Current lack of serviced land in Saudi industrial estates because demand outstrips supply | This is forcing companies either to locate in another country or expand operations in another country. In both cases, Jordan (especially Aqaba) could be the choice for new investment. |
| Growing trend in Europe to produce under department store brand names (e.g., electronics under Harrods or Carrefour brand name) | Since this niche market does not require as much diligence as big brand names and is cost sensitive, Jordan can tap into outsourcing from these department stores. |

**Table 3.4: Threats to Jordan's Electronics Assembly Sector**

| Factor | Impact on Jordan |
|---|---|
| Price competition and sustained low profit margins plaguing entire industry, locally and globally | During these difficult times, investment flows are lower and less capital is available for FDI, meaning that Jordan will attract less FDI than it might normally.<br>Solution: This situation is not expected to persist as the global economy picks up. As a low-cost, efficient manufacturer, Jordan should attract companies seeking to increase their profit margins. |
| Increase in local operating costs (e.g., minimum wage, electricity, water) | Increases in operating costs would drive Jordan out of the market, especially as other countries improve their productivity. This is always a threat given that Jordan is water- and energy-poor.<br>Solution: Keep labor costs in check and secure preferential deals for energy prices. |
| Strict and differing standards and regulations by U.S. and E.U., as well as Saudi and other regional markets | The differing standards for electrical components across Jordan's potential export markets means increased costs.<br>Solution: Adopt best practices and focus on the more profitable markets instead of tapping each available one. |
| Continuously-changing production technology makes production equipment outdated quite rapidly and necessitates greater financial resources to invest in state-of-the-art equipment | For a country that imports its production machinery like Jordan, financial outlays for production equipment are always required, constraining the ability of the local producers to make profits and increase their market outreach.<br>Solution: Develop a cluster with sufficient linkages to minimize the costs of certain inputs and possibly produce some of the machinery required. |
| Global IT meltdown | This has resulted in fewer resources available for FDI by companies active in this sector and has constrained Jordan's ability to attract investment in assembly of telecommunication equipment.<br>Solution: The global IT market is picking up and is experiencing increased investment for the first time in three years. |

JIB can use such an analysis of opportunities and threats to determine target markets and marketing messages for its promotional plans, as demonstrated in Chapter 5. In addition, it is important that JIB monitors local and international developments with regard to such opportunities and threats, and adapts its promotional plans accordingly.

## 3.3 Competitive Bechmarking

Based on this SWOT analysis of Jordan's electronics assembly industry, the authors have compared this industry to those found in other countries, which fall into two categories: (1) global competitors, such as China and (2) regional competitors, such as Egypt, Turkey, UAE, and Saudi Arabia. This comparison was made on the basis of factors that have been identified as important to electronics manufacturers when considering outsourcing to new investment locations. It grades the degree to which each country satisfies each criterion, with a grade of A indicating the highest level of satisfaction. The results of this comparison are contained in Table 3.5.

**Table 3.5: Competitiveness of Jordan's Electronics Assembly Sector**

| | Jordan | China | UAE | Saudi Arabia | Egypt | Turkey |
|---|---|---|---|---|---|---|
| Local market size | C | A | C | B | B | A |
| Local workers | | | | | | |
| Availability | A | A | C | C | A | A |
| Cost | B | A | C | C | A | B |
| Technical skills | A | B | B | B | B | A |
| Operating cost efficiency (a) | B | A | B | B | A | B |
| Customs procedures | B | C | A | A | B | B |
| Logistics and transportation | B | B | A | A | B | A |
| Warehousing costs/facilities | C | A | B | B | B | B |
| Infrastructure (b) | A | B | A | A | B | A |
| Tax/profit repatriation regulation | A | B | A | A | A | A |
| Speed of setting up operation | C | B | A | B | C | B |
| Perceived country stability | B | B | A | B | B | B |
| Duty-free access | | | | | | |
| Regional markets | A | N/R | A | B | B | N/R |
| United States | A | C | C | C | C | C |
| European Union | A | C | C | C | B | A |

(a) Includes minimum wage and fringe benefits for workers, utility costs, and rental costs based on analysis in section 3.1.

(b) Includes transportation (i.e., road quality and extent, port efficiency), telecommunications (i.e., quality), and electricity (i.e., reliability). As such factors are difficult to measure quantitatively, qualitative information in the form of testimonials from manufacturers can be used as indicators.

Observations pertaining to investment promotion that may be made from this comparison are as follows.

- Jordan can market itself strongly for the availability of a skilled workforce, which includes many technicians and engineers.
- Jordan can also market itself for proximity and market access to a growing regional market.
- In terms of labor costs, Jordan is less expensive than such players as UAE, Turkey, and Saudi Arabia, but more expensive than Egypt and China. This could become a disadvantage for Jordan in the future as other countries strive to improve the competitiveness of their electronics sector.
- In terms of operating cost efficiency, Jordan is currently more or less as competitive as most other countries, except for Egypt and China.
- In terms of logistics and facilitation efficiency, Jordan is generally competitive with China, but generally less competitive than other countries in the region.
- In terms of infrastructure, Jordan is as competitive or more competitive than any country in the comparison. This could be used as a selling point, although it is taken as a given in today's business environment.
- In terms of perceived country stability, Jordan is perceived as relatively unstable, as it is located between Iraq and Israel/PNA. Many other developing countries in the table are also perceived as relatively unstable. With proper promotion, investment promotion officers can dispel this misconception.
- Jordan's main weakness is its small electronics market, characterized by relatively weak purchasing power and an underdeveloped cluster. The main implication of this is that Jordan's attraction as stand-alone investment location is limited, especially when factoring in the higher operating costs and less favorable logistics and facilitation services.

### Addressing Perceived Weaknesses

As a part of its promotional effort, JIB needs to emphasize Jordan's strengths and counter inaccurate perceptions about its weaknesses. In order to make such arguments for each strength and weakness, JIB should use a variety of points, all of which must be supported by current and specific evidence from appropriate data sources.

Using two of Jordan's main weaknesses as examples – (1) perceived country instability and (2) small electronics market and undeveloped cluster – the following table demonstrates how this can be done by JIB promotion officers for all strengths and weaknesses. It includes generic points that can be used to support arguments emphasizing strengths or countering weaknesses, data sources for evidence to support such points, and specific examples of such points. JIB should continuously explore points that it might make, as well as the data sources that provide evidence to support such points.

**Table 3.6: Supporting Strengths and Countering Weaknesses**

| 1. | Weakness | Perceived country stability |
|---|---|---|
| 1.1 | Generic Point | Actual electronics assembly investment in Jordan, which demonstrates confidence of other investors in the stability of the country |
| | Data Source(s) | Industry analysis and JIB investment statistics |
| | Specific Example | LG has been operating for a decade, and Haier Group built a new joint venture recently worth more than $4 million. |
| 1.2 | Generic Point | Real economic growth, which is an indicator of country stability |
| | Data Source(s) | Central Bank Monthly Bulletin |
| | Specific Example | The economy has been growing at the rate of 4.7% and 5.0% in real GDP terms in 2001 and 2002 respectively, despite the turmoil in neighboring countries. |
| 1.3 | Generic Point | Progressive national leadership and good governance, which is an guarantee of future country stability. |
| | Data Source(s) | Speeches made by His Majesty King Abdullah II, especially in recognized, international venues (Found on government Web sites)<br>Articles written about Jordan, especially in recognized, international periodicals (Found in international press) |
| | Specific Example | His Majesty King Abdullah II is keen on pursuing actions that consolidate stability and economic growth, as demonstrated by the following quotations from a speech he delivered at Columbia University in September 2000: "We pioneered a democratic experience that is built on solid institutions of law, accountability and justice. We have also provided an example for making peace with our neighbors, a peace that upholds justice and provides security, a peace that creates effective frameworks for regional cooperation in resource allocation."[29] |
| 2. | Weakness | Small Electronics Market Size |
| 2.1 | Generic Point | To overcome this hurdle, Jordan has signed bilateral market access agreements with neighboring Arab countries and acceded to AFTA. |
| | Data Source(s) | Ministry of Industry and Trade |
| | Specific Example | Many Jordanian products can now enter the Saudi market duty-free due to the Jordan-Saudi Arabia bilateral agreement, whereas they have to pay 12 percent duties otherwise. |
| 2.2 | Generic Point | Electronics demand is growing in the local and regional markets. |
| | Data Source(s) | Central Bank of Jordan, Ministry of Industry and Trade of Egypt, and so on |
| | Specific Example | Demand for electronics grew by 7 percent in Jordan in 2002, while demand for TV's has recently been growing at 7 percent per year in Egypt. |

[29] http://www.jordanembassyus.org/09102000001.htm

# CHAPTER 4: RECOMMENDATIONS

## 4.1 Sub-sector and Niches

The electronics assembly sector comprises a multitude of sub-sectors. The report has broadly defined the sub-sectors based on the end-uses/products of the assembly operations. In the previous sections, the following sub-sectors were considered.

- Consumer electronics or "brown goods" (e.g., TVs, VCRs, radios, stereos)
- Household appliances or "white goods" (e.g., washing machines, refrigerators)
- Small appliances (e.g., hair dryers, blenders, toasters)
- Computer hardware (e.g., PC assembly)
- Telecommunications components

Table 4.1 grades the complexity of the manufacturing processes of selected electronics sub-sectors. Jordan's SWOT analysis reveals that it will initially be competitive in those sectors that require low- to medium-complexity technological inputs and skills.

**Table 4.1: Consumer Electronics Complexity**

| Product | Skill Intensity | Production Scale | Technical Sophistication | Technological Change Rate |
|---|---|---|---|---|
| Consumer electronics | | | | |
| Color televisions | Medium | High | Medium | Medium |
| Black & white televisions | Medium | Medium | Low | Low |
| Cellular phones | Medium | High | Medium | Medium |
| Fixed disk drives | Medium | High | Medium | Medium |
| Radios | Medium | Medium | Low | Low |
| Desktop computers | Medium | Medium | Low | High |
| Laptop computers | High | Medium | High | High |
| Precision assembly | | | | |
| Watches | Medium | High | Medium | Medium |
| Calculators | Medium | High | Medium | Medium |
| Semiconductors | Medium | High | Medium | Medium |
| Electronic components | | | | |
| Personal computer boards | Medium | Medium | Low | Low |
| Inductors | Medium | Medium | Low | Low |
| Relays & switches | Medium | Medium | Low | Low |
| Transformers | Medium | Medium | Low | Low |
| Capacitors | Medium | High | Low | Low |
| Resistors | Medium | High | Low | Low |
| Power supplies | Low | High | Low | Low |
| Electronic tuners | Medium | Medium | Medium | Medium |
| Magnetic heads | Medium | High | Medium | Medium |
| Speakers | Medium | Medium | Medium | Medium |
| Magnetic tapes | Low | High | Medium | Medium |
| LCD/LED readouts | Medium | Medium | Medium | Medium |
| Micromotors | Medium | High | Medium | High |

Source: ASEZA. "Investment Marketing Plan, Volume 2" and original research.

To be competitive, electronics assembly operations require efficient logistics, proper warehousing facilities, and access to OEM customers with long-standing vendor relationships. Otherwise, thin margins will result. To compensate for Jordan's relative weakness in these areas, competition should be based on improved designs (a function of labor-force skills ), low start-up costs, or a growing consumer and export base.

In terms of efficiency and the cost of logistics and facilitation services by government agencies, Jordan's ability to compete is improving. Nevertheless, it is not yet comparable to regional leaders like Dubai. Operating costs are a handicap for Jordan's electronics assembly industry in comparison with low-cost producers that cater to mass-consumer markets. In addition, links to OEMs are not common.

However, Jordan is equipped with a large and relatively-skilled workforce. In addition, analysis of Jordan's electronics assembly industry reveals that Jordan has been able to compete on a technical basis in basic consumer electronics and appliances in local and regional markets, as well increasingly in international markets. Jordan is increasingly competitive in certain electronics sub-sectors where it has been able to export at least $900,000 worth of products in 2000 and 2001. (See Table 5.2 for further information.) Most of the sectors, such as air conditioners and televisions, have a large presence in the domestic market as well. In one case, Jordan has even been able to compete in hi-tech telecommunications components (i.e., Century Electronics).

**Table 4.2: Electronics Sub-Sectors of Increasing Competitive Strength**

| Sector/Market | North America | Western Europe | Other industrial | Developed Asia |
|---|---|---|---|---|
| Air conditioning machines | A | | A | |
| Color televisions | | | A | |
| Sound and video recorders | | A | | |
| Radio and television transmission apparatus | | A | | |
| Telecommunications parts | | C | | |
| Electrical transformers | | B | | |
| Insulated electric wire and cable | | | | C |
| Electro-medical apparatus (excluding X-ray) | | A | | |
| Electrical measuring, checking, and analyzing instruments | | A | | |

Source: ASEZA. "Investment Marketing Plan, Volume 2" and original research.

Key

| | |
|---|---|
| X* | "Rising star" (i.e., growing market and growing Jordanian export market share) |
| X | "Falling star" (i.e., shrinking market and growing Jordanian export market share) |
| * | "Missed opportunity" (i.e., growing market, shrinking Jordanian export market share |

Notes

"Other Industrial" collectively refers to Japan, Israel, New Zealand, and Australia.

The growing success of these electronics sub-sectors in Jordan suggests that the JIB could attract a small number of low-end assembly investments, especially since start-up costs and barriers to entry are relatively low in the small household appliances sub-sector and the sector requires large numbers of semi-skilled workers.

Therefore, in order for Jordan to compete in the electronics assembly sector, it should differentiate itself by carving a niche in the production of good-quality, reliable, and well-performing low-end electronics, for which there is ample local and regional demand, while catering for timing, service, and delivery. Given Jordan's strengths (especially in skilled labor, flexibility, quality, good infrastructure, and market access), the country's existing industrial base in electronics, and its consumption and export patterns, Jordan has the potential to become competitive in household appliance and electrical component assembly. Therefore, JIB should initially target the increasingly-competitive electronics sub-sectors, listed in Table 5.3 and classified according to the Standard Industrial Classification (SIC) code. (See Annex 6 for an exhaustive list of the classifications.)

**Table 4.3: Recommended Electronics Sub-Sectors for Targeting**

| Short-term Target Electronics Sub-Sectors | SIC Code |
|---|---|
| Household electrical equipment | 363 |
| Refrigeration and heating equipment | 3585 |
| Calculating and accounting machines | 3578 |
| House-ware and fans (incl. heaters/cookers, etc.) | 3634 |
| **Medium-term Target Electronics Sub-Sectors** | **SIC Code** |
| Electro-medical and therapeutic apparatus | 3845 |
| Semi-conductors and telecom devices | 3674 |

In addition, while basic consumer electronics have the biggest potential to attract FDI, Jordan's existing pharmaceutical base, quality hospitals, and other strengths in the healthcare sector may have spillover effects that can enable the country to carve out a niche in attracting investment in the electro-medical devices market over the medium term. In addition, the availability of engineers and technicians, as well as the increased emphasis on ICT mean that there is potential to develop the semi-conductors and hi-tech communications assembly sub-sector of the industry over the medium term.

The Jordan-U.S. Free Trade Agreement, QIZ scheme, and E.U. Association Agreement might induce some foreign electronics companies to use Jordan as a platform from which to supply U.S. and E.U. markets. However, the electronics industry in Jordan cannot compete in these consumer markets due to the strict quality requirements, the existence of cheaper alternatives from China and East Asia, and the fact that these agreements do not offer a big advantage, since tariffs in these countries are not very high on most consumer electronics.

Thus, Jordan's biggest chances are either in niche exports to those markets or in exporting to the regional markets. In the case of the former, instead of having to incur the prohibitive costs of shipping white goods to the European Union or the United States, a niche exports market could be found in unit replacement and custom-designed products. In the case of the latter, proximity and market access (offering substantial tariff advantage, especially in the case of bilateral agreements with Saudi Arabia, Egypt, and potentially Syria) offer Jordan a competitive advantage.

## 4.2 Outlook for Future Investment and Trade

To be able to make a reasonable forecast of future FDI into Jordan, a number of issues need to be taken into consideration, including past trends, Jordan's strengths and weaknesses, and opportunities that arise from the changing environment in which the global electronics assembly industry operates.

A review of investment trends in Jordan shows that most of the capital for electronics assembly ventures in Jordan has been local, except for the Haier/LG investment and some minor investments from other Arab countries.

Looking at the comparative advantages of Jordan based on the SWOT analysis discussed in Chapter 3, one would expect that future investments would come in the following forms.

- Appliance manufacturers wishing to establish a presence in the Middle East in order to increase sales to the local and regional market, often for the first time
- Companies (especially from Korea, Hong Kong, and Taiwan) wishing to establish a presence in the Middle East as a production platform from which to export to Europe
- Companies (especially from East Asia) relocating from Dubai or disinclined to locate there due to the high rental costs and intense competition in that market

- Some investment expansions from factories operating in Saudi Arabia's industrial estates, where the capacity for expansion is extremely limited
- Southeast Asian electronics OEMs or their subcontracting manufacturers
- European companies (especially German companies which suffer from high labor costs) wishing to outsource operations to low-cost producers
- Israeli companies wishing to outsource assembly operations to technically-capable, but low-cost Jordanian producers
- Companies wishing to produce simple components for final product assembly elsewhere in the region

An examination of the global market share of countries that fit the above-mentioned criteria shows that the United States, Japan, Taiwan, Korea, Germany, Hong Kong, Malaysia, and China have leading positions in world exports. Hence, there would be a bigger potential to secure investments from those countries , in theory. In practice, however, combining all of the above arguments and considering Jordan's attractiveness, it appears that the opportunities for Jordan to attract investments are from markets such as South Korea, Taiwan, Germany, China, and Hong Kong. In addition, Saudi Arabia and Israel offer interesting prospects. Japan has been excluded initially due to a combination of fewer resources available for investment, more sophisticated production, and an existing production presence in the Middle East. Depending on the promotional efforts that JIB decides to undertake in the next three years, the list of target markets can be narrowed or expanded, and FDI inflow will vary accordingly. A forecast of future investment based on a suggested promotional plan is provided in Section 5.5.

# CHAPTER 5: THREE-YEAR PROMOTIONAL STRATEGY

## 5.1 Core Messages

The most powerful elements of Jordan's comparative advantages are skilled labor, a growing local and regional market, production quality and design, and investment incentives. The following statement is one version of core promotional message that JIB can build on to articulate its final core message.

*Jordan's regional market access agreements, skilled labor, and its investment incentives enable investors to locate relatively inexpensively in a growing local and regional market. Profits derived from export operations are exempt from income tax and may be fully repatriated out of the country.*

*Jordan's exports in this sector already enjoy a reputation for good quality, reliability, performance, and flexibility in service and delivery.*

## 5.2 Principal Selling Points

Based on the SWOT analysis in Chapter 3, the elements that differentiate Jordan from competing locations can be summarized as follows.

- Political and economic stability
- Duty-free access to Arab markets, as well as the United States and the Eurpean Union
- Growing local market
- Proximity to large and growing regional markets (i.e., Saudi Arabia, Syria, Egypt, Iraq)
- Favorable investment and tax regulations (i.e., zero income tax on exports and full repatriation of profits)
- Skilled workforce
- Flexibility, service, and reliability
- Developed infrastructure for industry (i.e., roads, electricity, communication)
- Favorable perception of Jordanian product quality
- Jordan has already attracted investment from leading electronics assembly firms, such as Motorola and Haier

Other selling points that are dependant on target markets are as follows.

- Proximity to the United States and Europe, relative to the Far East
- Availability of serviced industrial land, relative to Saudi Arabia
- Low operating costs, relative to Korea, Taiwan, Hong Kong, and Israel
- Good logistics and facilitation services, relative to China

The relative importance of the aforementioned points depends on the target market under consideration for a specific investment promotion event. Thus, if an outward mission to Germany is planned, highlighting quality of production, labor skills, cost savings, and infrastructure is essential. However, for Korean and Taiwanese investors, Jordan's attraction compared to China lies in its proximity to the European Union and access to regional markets.

## 5.3 Target Markets

In the Section 4.2, a number of markets were identified as potential targets for FDI attraction into Jordan's electronics assembly sector. These countries are listed in Table 5.1, along with their level of priority for investment promotion. The table is followed by the rationale used to

arrive at the priority level for each country. The United States is included since American companies are the world's biggest producers of electronics.

**Table 5.1 Potential FDI Target Markets**

| Country | Priority Level |
|---|---|
| South Korea | A |
| Taiwan | A |
| Germany | A |
| Saudi Arabia | B |
| China | B |
| Hong Kong | B |
| Israel | B |
| United States | C |

South Korean electronics manufacturers, many of whom tend to be diversified conglomerates such as Lucky Goldstar, Samsung, Hyundai, and Daewoo, are particularly known for electro-mechanical devices and office equipment. Such electronics firms or their subsidiaries would be likely to invest in the Middle East in order to establish a presence in the region to increase regional sales or a production platform from which to export to Europe.

Taiwanese companies have become leaders in the electronics industry, particularly in computer electronics and household appliances. To escape rising wages in Taiwan, many of them have opened low-end assembly plants throughout Southeast Asia and China and are always looking to improve their market penetration in Europe and the Middle East.

In Europe, especially Germany, decreasing corporate profits and a shrinking market have induced electronics firms to look for growth areas in Asia and elsewhere, putting pressure on firms to find less expensive ways to produce goods. Increased competition and rising wages have decreased the amount of actual electronics manufacturing done in the European Union and transferred the most labor-intensive operations overseas. Eastern Europe and Asia have received a large amount of this outsourcing, but the Middle East, Latin America, and (to a lesser degree) Africa, have also benefited from European FDI in the electronics sector. In the Middle East, this is particularly the case with Turkey and Israel.

China has emerged as a major player in the electronics and appliance industry, with most of its larger MNCs headquartered in Hong Kong. Manufacturers of small household appliances dominate the industry, with a few companies producing large items such as air conditioners and space heaters. In China itself, many electronics assemblers are located in the Guangzhou area and are increasingly gaining strength, looking for markets and investment opportunities worldwide.

Investment expansions from factories operating in Saudi Arabia's industrial estates – where the capacity for expansion is extremely limited – offers an interesting prospect. Finally, Israeli companies wishing to outsource assembly operations to technically-capable, but low-cost Jordanian producers should be a potential investment target once the IT market picks up steam and the political situation allows it.

Players in Taiwan, South Korea, and Germany are keenly considering re-locating their operations to reliable, lower-cost producers. Therefore, they seem to be the markets where JIB should initially focus its promotional effort. Saudi Arabia, China, Hong Kong, and Israel are the next targets with equal chances of success, bearing in mind the current status of the industry and world trends.

In other words, the first year of promotion based on this strategy should include overseas missions to Taiwan, South Korea, and Germany. The second and third years should be add

Hong Kong, China (Guangzhou), Saudi Arabia, and Israel. A trip to the United States is a possibility in the third year, if the promotional efforts of the previous two years bear fruit and the beginnings of a cluster develop.

## 5.4 Target Investors

The target investors in the electronics assembly sector are the large electronics multi-nationals and OEMs, primarily from Southeast Asia and secondarily from Europe. Large companies make long-term investment decisions and have a strategic vision. For the promotional officer, it would be an easier task to convince a company that has experienced relocation in the past to relocate or expand in Jordan. Therefore, it would be wise to focus JIB staff attention to larger companies.

The targeted average investment size should be $7 million on average, based on a review of existing producers that are engaging in export activity (i.e., Haier/MEC joint-venture). Average employment per plant could be around 400 to 500 employees, immediately making the new investor a major player in the market. A brief profile of companies that would be potential targets for FDI attraction is presented in Table 5.2.

**Table 5.2: Profile of Target Investors**

| | |
|---|---|
| Project size (including buildings) | > $7 million |
| Employment | 400-500 workers |
| Markets | > 60% of exports to regional markets |
| Typical product categories | Household electronics and appliances, such as TVs, VCRs, radios, and air conditioners or telecom parts and measuring devices |

## 5.5 Annual Investment Targets

Annual investments are expected to increase as stated in Table 5.3. Assumptions made to reach the listed figures are as follows.

- Given that the industry is nascent in terms of FDI attraction and that there will likely be no more than one investment promotion officer dedicated to this sector, it is fair to expect no more than two new investments in the first two years, followed by three new investments in the third year as the industry grows and momentum starts to build.
- Size per project is expected to increase by 5 percent every year.
- Employment per project is expected to increase by 10 percent every year.
- The investment promotion officer undertakes an outward mission every two months (i.e., six trips per year).

**Table 5.3:Annual Investment Targets**

| | Year 1 | Year 2 | Year 3 |
|---|---|---|---|
| Cumulative number of projects | 2 | 4 | 7 |
| Employment per project | 400 | 450 | 500 |
| Total employment | 800 | 1800 | 3,500 |
| Investment per project ($) | 7,000,000 | 7,350,000 | 7,717,500 |
| Total investment ($) | 14,000,000 | 29,400,000 | 54,022,500 |

## 5.6 Resource Requirements

To achieve the aforementioned targets JIB needs to allocate the following resources.

### Personnel

The following staff is required to undertake the investment promotion effort recommended by this strategy.

- One full-time promotional officer dedicated to the electronics assembly sector
- One part-time promotional officer to serve as backup when the full-time office is on outward missions or hosting potential investors in Jordan
- One part-time researcher to identify potential investors

### Research Tools

An electronics assembly industry database that provides information on trends, agreements, and latest developments in the sector, as well as general information on public companies is required.

Databases on selected regions with more specific information about associations and companies, as well as technical and market trend-related articles are also helpful. However, these are usually obtained through monthly subscriptions.

### Financial Resources

A set annual budget for electronics assembly promotion activities and expenses is required. The budget should cover tickets and costs associated with six outward missions, subscriptions to databases, investor site visit expenses, and communication costs. Table 5.4 provides budget estimates, broken down by function.

**Table 5.4: Annual Promotion Budget**

| Function | Unit | Cost ($) | |
|---|---|---|---|
| | | Per Unit | Total |
| Outward missions | | | |
| Tickets | 1 | 1,000 | 1,000 |
| Accommodation and travel expenses per day | 7 | 300 | 2,100 |
| Other (e.g., presentation material, equipment rental, seminar hall and restaurant expenses) | 1 | 2,000 | 2,000 |
| Subtotal | | | 5,100 |
| Total number of outward missions | | | 6 |
| Total outward mission costs | | | 30,600 |
| Databases | | | 6,000 |
| Magazine and site subscriptions | | | 500 |
| International communication expenses | | | 2,000 |
| Site visit expenses in Jordan (e.g., logistics) | | | 1,500 |
| Total annual expenses | | | 40,600 |

## 5.7 Knowledge Requirements

Finally, JIB promotion staff should continually upgrade their skills, in order to be able to compete with investment promotion officers from investment promotions agencies around the world, all of which are trying to reach and attract a similar group of investors in each sector. Areas in which the investment promotion officers need to be competent are industry expertise, research and investor identification, targeting, effective communication with investors, presentation, and preparation for and execution of promotion missions. See Annex 5 for a list of relevant information sources that can help investment promotion officers to fulfill these knowledge requirements.

## 5.8 Promotional Approaches

The ultimate goal of promotion is investor site visits. Site visits offer maximum opportunity to persuade the “right” investors of the comparative advantages Jordan has to offer. Identifying the right markets and the profiles of investors likely to be interested in Jordan as

discussed above, is the first step in a focused promotional process, known in the industry as targeting. The rest of the steps are as follows.

### Research and Profiling

The investment officer should use industry, market, and region-specific databases, free and for-pay websites, and contacts with relevant industry organizations to generate leads about potential investors.

Leads is a critical term to understand, as the objective at this in initial stage is to start collecting as much information on different investors in selected markets and regions as possible, regardless of how sketchy this information may seem to be at first.

Other sources of information to generate or build on leads obtained from initial research are commercial attachés in target countries, chambers of industry, industry-specific associations, and personal contacts with investors from target countries who are already operating in Jordan.

JIB investment promotion officers responsible for the electronics assembly sector should begin to familiarize themselves with the electronics industry value chain, including relationships between OEMs and their contract manufacturers. They might visit existing electronics manufacturing companies in Amman and Irbid, as well as component suppliers. They might also read electronics industry articles and learn about electronics industry associations in each target market. Annex 4 contains a list of various electronics web sites and industry associations, all of which may provide valuable information.

While trade shows constitute only a minor portion of this strategy, participation in at least one electronics trade show each year is suggested for purposes of learning and networking, as well as promotion. JIB should staff participation in such trade shows with two officers, who can simultaneously entertain inquiries from interested individuals and network with other show participants.

### Correspondence

The next step is to contact potential investors by sending introductory letters, introduction through industry associations, and invitations to attend functions hosted by the investment officer in the target country. A combination of these approaches may take place in parallel.

Introductory letters must show credibility, highlight Jordan's advantages, address investors' potential concerns, and be concise – investors have little patience to read general mail and constantly receive mail from similar agencies in other countries.

Whenever possible, it is beneficial to mention the name of person or agency that furnished the investor's name to the investment officer.

- The name of the source through whom the contact was made and the officer's relationship to that person
- The benefits the contacted company will gain by setting up operations in Jordan. The benefits should include, at least, the main selling points relevant to the recipient's country of operation.
- More effective letters include remedies by moving to Jordan that address problems that are specific to the recipient – an opportunity to overcome market access constraints, high operating costs, low profit margins, and so on. Awareness of such customer-specific constraints comes from research, such as consulting databases and other sources.
- Mention of other companies in the same market who have already invested in Jordan
- Introduction to JIB and its role as a facilitator in the setup process

- An indication of follow-up steps, such as a call from a JIB officer, an invitation to an event planned by JIB, and so on
- An attachment enclosing JIB's sector brochure

By this stage in the process, the investment officer is trying to build a relationship with the investor. Therefore, any reply from the investor in any form must be responded to without delay, in order to build on the interest generated by the introductory letter.

On most occasions, investors do not reply to unsolicited introductory letters, and the officer must make follow-up letters or phone calls in the hopes of prompting a reaction.

Follow-up letters could be about developments in the electronics assembly industry affecting Jordan or the investor, or about events planned in Jordan, the region, or in investors' markets. Suggestions for topics to be used in follow-up communications are as follows.

- Developments on market access to regional countries
- Success stories of selected electronics companies operating in Jordan (e.g., Century Electronics/Motorola, MEC/LG)
- Stories of companies/investments who have recently located to Jordan (e.g., Haier)
- Actions by Jordanian government to improve the investment environment in Jordan
- Events planned by JIB in Jordan or target market
- Developments in the performance of the specific company (if available)

Once a number of investors in a certain market have been identified and contacted, or relationships have been built with associations in that market, the time is ripe to execute promotional missions.

### Missions

#### Scoping Missions

This strategy calls for a scoping mission to each target country during the first year of market penetration. These missions allow JIB promotion officers to familiarize themselves with industry associations and dynamics of the electronics assembly sector in each market.

The first electronics scoping mission is suggested for Taiwan and Korea, followed by one to Germany. These trips will require about one month planning and preparation. It is suggested that JIB use these scoping missions to secure assistance from electronics associations or other organizations such as chambers of commerce and industry.

#### Promotional Missions

A promotion mission should take place approximately four to six weeks after each scoping mission. In year one, two promotion missions are suggested: one to Taiwan and Korea, the other to Germany.

Outward promotion missions work well in countries with active and centralized electronics industry associations, especially where members are within relatively close proximity to the association location. For this reason, these types of missions are typically easier to organize in East Asian markets than in European or American markets. In those markets, it might be more advisable for JIB to focus on one-on-one presentations with electronics company executives.

In Saudi Arabia, the electronics assembly sector should be promoted with electronics distributors. A few multinational OEMs and their subcontractors use Saudi Arabia as an electronics distribution and/or assembly base for the Middle East. With Saudi industrial cities nearly filled to capacity, however, there is little room to expand operations inside Saudi

Arabia. Promotion in Saudi Arabia, therefore, should be geared toward marketing Jordan (especially Aqaba) as an inexpensive and attractive assembly or distribution alternative.

First-time missions include sector-specific seminars, conducted by the investment officer, possibly with an industry expert for support, followed by introductions to the audience and exchange of business information. This typically takes place over a dinner hosted by the promotion agency.

One-to-one meetings are then planned for the days that follow the seminar in which the promotion officer has the first real chance to meet with investors and convince them of the details of the benefits Jordan has to offer. This is a very critical stage in the process. Therefore, the promotion officer must acquire the necessary persuasion and presentation skills to channel the investor into finding real value in the option to locate in Jordan.

Follow-up missions might be required before any of the investors met on the first trip are convinced to visit Jordan.

### Site Visits and Aftercare

When an investor decides to visit Jordan, little must be left to chance. The promotion officer needs to accompany him or her throughout the trip, to make sure all questions and concerns are answered, and a positive impression of Jordan is given. Not every investor who visits will ultimately invest, but this should be the goal of every promotion officer and visit.

The relationship between the investor and the officer continues even during the setup stage of the project, when the officer acts as facilitator to expedite the processing of all requirements on behalf of the investor. In selected industrial estates, a representative of the zone manager performs all registration and permitting functions on behalf of the investor to ensure there are no difficulties in the process.

# ANNEX 1: SCOPE OF WORK

## I. Specific Challenges Addressed by this Consultancy

In June 1998, the AMIR Program developed Jordan's first investor targeting strategy, entitled the "Investor Promotion Strategic Plan," to identify those sectors and industries most appropriate for promotion by the Jordan Investment Board (JIB). This plan recommended that Jordan focus on attracting inward direct investment in six principal sectors: downstream potash and phosphates, textiles and apparel, Dead Sea cosmetics, information technology, tourism, and pharmaceuticals. This selection was based on an evaluation of Jordan's economic structure and existing trade and industrial profile, and involved a comparison of these elements with similar measures in other countries in the Middle East and North Africa with which Jordan might compete to attract foreign direct investment. The "Investor Promotion Strategic Plan" has been the basis for the JIB's promotional effort since its publication.

In early 2003, the AMIR Program worked together with the JIB to update the "Investor Promotion Strategic Plan" for two reasons. First, international best practices generally call for updating investor targeting strategies every three years, suggesting that an update of Jordan's strategy was in fact overdue. Second, the five years since the previous strategy was developed have seen major changes in the global trading environment and in Jordan's position in that environment. Among the most important developments have been Jordan's accession to the World Trade Organization; launch of the U.S.-Jordan-Israel Qualified Industrial Zones program; and signing and implementation of a U.S.-Jordan Free Trade Agreement and an E.U.-Jordan Association Agreement.

This updated investor targeting strategy, entitled "Jordan Investor Targeting Strategy 2003," was finalized and published in July 2003. It takes into account recent trends in FDI into Jordan and other countries in the region. It also examines some of the more important worldwide trends in different industries, particularly with respect to market growth, investment patterns, market saturation and over- or under-capacity. This examination takes place in the context of a cluster-based approach, which seeks to identify complementarities among industries and to recommend investor targeting approaches that can contribute to the development of overlapping industries and sectors in ways that potentially have a much greater economic impact than focusing on sectors *per se*.

The "Jordan Investor Targeting Strategy 2003" recommends targeting a number of areas for investment promotion. With appropriate areas for investment promotion having been recommended by the "Jordan Investor Targeting Strategy 2003," the AMIR Program is currently working with the JIB and other relevant stakeholders to develop detailed, three-year investment promotion strategies for such areas. It has already completed strategies for the garment and pharmaceutical sectors, and it hopes to complete strategies for other priority sectors in the coming months.

## II. Objective of this Consultancy

The primary objective of this consultancy is to work together with JIB and other relevant stakeholders to evaluate Jordan's competitive position in the electronics assembly sector and develop appropriate three-year inward investment promotion strategies for that sector.

## III. Specific Tasks of the Consultant

Under this Scope of Work, the Consultant(s) shall perform, but not be limited to, the tasks specified under the following categories:

### A. Background Reading Related to Understanding the Work and Its Context

Consultant shall read, but is not limited to, relevant sections of the following materials to fully understand the work specified under this consultancy:

- AMIR Program. "Investment Promotion Sector Strategy: Garments" (August 2003)
- AMIR Program. "Jordan Investor Targeting Strategy 2003" (May 2003)
- AMIR Program. "Investor Promotion Strategic Plan" (June 1998)
- AMIR Program. "A Sustainable Institutional Framework for Investment Promotion and Enterprise Development in Jordan" (June 2002)
- AMIR Program. "A Sustainable Trade and Investment Strategy for Jordan" (May 2002)
- Investment Task Force. Relevant sector studies. (January 2002)
- AMIR Program. "The Jordan Pharmaceutical Cluster: Analysis and Recommendations" (July 2002)
- AMIR Program. "JIEC Market Demand Study for Serviced Industrial Estates (April 2002)
- AMIR Program. "The 2002 Investor Roadmap of Jordan" (October 2002)
- AMIR Program. "AMIR 2.0 Technical Proposal"

### B. Background Interviews Related to Understanding the Work and Its Context

The Consultant shall contact personally, by e-mail, or by telephone the following individuals in order to fully understand the work specified under this consultancy:

- Greta Boye, PSPI Team Leader, AMIR Program
- Barry O'Connell, Investment Promotion Advisor, AMIR Program
- Brad Fusco, Investment Promotion Advisor, AMIR Program
- Reem Badran, Director General, Jordan Investment Board
- Relevant promotion officer(s), Jordan Investment Board
- Naseem Rahahla, Director of the Competitiveness Unit, Ministry of Planning
- José Ceron, Investment Promotion Advisor, ATASP
- Representative foreign and domestic investors in target sectors
- Representatives of public and private sector entities relevant to target sectors and their clusters
- Relevant public and private industrial estate and free zone operators
- Jamal Al-Jabiri, Project Management Specialist, USAID

### C. Tasks Related to Achieving the Consultancy's Objectives

The Consultant shall use his education, considerable experience, and additional understanding gleaned from the tasks specified in A. and B. above to achieve the following for each of the five target sectors.

#### 1. Establish Context

Assess (1) Jordanian sector, (2) Jordanian cluster, (3) leading competitors with Jordan in sector, and (4) global industry and trade in sector.

Assessment of Jordanian sector should include a detailed review of existing investment and trade and an outlook for future investment and trade. It should also include consideration of

relevant market access agreements, factor costs, available technology, and technical capabilities.

Assessment of Jordanian cluster should include a brief overview of the cluster in which the firms that comprise the sector participate, as it relates to the promotion of investment. This overview should be organized according to Porter's "five forces," namely (1) firm strategy and rivalry, (2) demand conditions, (3) supporting firms and institutions, (4) factor or supply conditions, and (5) government.

Assessment of leading competitors with Jordan in sector should include a similar review of existing investment and trade and an outlook for future investment and trade, as well as consideration of relevant market access agreements, factor costs, available technology, and technical capabilities, in leading competitor countries.

Assessment of global industry and trade in sector should include consideration of market and investment trends, the structure of the sector, and what the sector looks for in an investment location.

### 1.1 Collect and review current literature

Literature should include available sectoral and feasibility studies. Sources should be both Jordanian (e.g., MOP Competitiveness Unit, local private investors) and international (e.g., World Bank, World Trade Organization). Relevant information from the literature should be substantiated and updated as necessary.

### 1.2 Identify and interview players in Jordanian cluster

Players should include existing investors (local and foreign), as well as appropriate representatives from relevant private entities (e.g., business associations, accounting firms, financial service firms), public entities (e.g., JIB, ASEZA, MOP Competitiveness Unit), and donor programs (e.g., AMIR Program, ATASP, EJADA).

## 2. Identify Jordan's Unique Selling Proposition

### 2.1 Perform SWOT analysis

In light of the previous assessment, evaluate the following.

- Jordan's strengths and weaknesses in competing for investment in sector
- Jordan's opportunities and threats in competing for investment in sector

### 2.2 Identify sub-sectors and niches

Based on the strengths and opportunities identified, determine the specific areas within the sector in which Jordan may have the greatest competitive advantage in the future. This determination should take into consideration issues of global and regional integration of processes, as well as industry clustering.

### 2.3 Identify constraints and suggest remedies

Based on the weaknesses and threats identified, determine the leading constraints to investment in the sector and suggest what measures Jordan might take to alleviate such constraints.

## 3. Develop Three-year Promotional Strategy

### 3.1 Assess JIB Capabilities

Evaluate JIB's existing promotional programs and available resources (e.g., promotional budget, staff capabilities) for targeting and attracting investors, with specific reference to identified sub-sectors. Take this evaluation into consideration when developing strategy.

### 3.2 Create Promotional Strategy

Produce a specific marketing plan for attracting investment in target sectors over the next three years. This strategy should include the following.

- Annual investment targets (i.e., number and value of projects per year, for the next three years)
- Core messages
- Principal selling points, including list of relevant current investors for reference selling
- Target markets and investors (i.e., those markets and investors that can benefit most from using Jordan as a production and/or distribution base for identified sub-sectors. Target investors should be identified in terms of a general profile based on relevant factors, such as sales, company size, and relocation history.)
- Promotional approaches
- Resource requirements (i.e., promotional budget and staff)
- Relevant learning required by JIB promotional staff to implement promotional strategy (e.g., competitor countries, local sector), as well as the sources of information or other means that should be used to acquire that learning (e.g., leading industry journals, company databases, business association participation)

### 3.3 Create Brochure

Create two-page draft brochure to be used by JIB in the course of implementing promotional strategy. This brochure should take the perspective of potential investors, delivering the core messages, principal selling points, and other information necessary to generate their interest in locating in Jordan. It should focus only on content, not style or formatting.

### 3.4 Compose Press Release

Compose draft press release to announce the formulation of this promotional strategy. It should provide background on investment and trade in the food processing and electronics assembly sectors (in Jordan and worldwide), describe the threat to Jordan's recent investment in the sectors due to the changing competitive landscape, offer details of the promotional strategy itself, and set this particular strategy in the larger context of the JIB 2003 Investor Targeting Strategy. This release should focus on content, rather than style.

## 4. Build Technical Capacity for Sustainability

### 4.1 Provide written record

Provide an annex that describes in detail the way in which the preceding tasks were accomplished, so that this work may be replicated or updated in the future by a member of Jordan's investment promotion effort. This applies to those tasks whose method is not obvious from the deliverable report.

### 4.2 Involve JIB directly

Demonstrate to selected member(s) of Jordan's investment promotion effort the way in which the preceding tasks were accomplished, so that they may replicate or update this work in the future. If possible, this should be accomplished by working together with those individuals. Otherwise, this should be accomplished through a presentation or training session.

## 5. Identify Follow-on Tasks

If appropriate, identify follow-on tasks that require attention from JIB or the AMIR Program. Provide the background and rationale for these tasks.

# ANNEX 2: PERSONS INTERVIEWED

**AMIR Program**

Barry O'Connel, Investment Promotion Advisor

Brad Fusco, Investment Promotion Advisor

**Ministry of Industry and Trade**

Amer Hadidi, Director, Industrial Development Directorate

Gina Faraj, Consultant

**Ministry of Planning**

Naseem M. Rahahleh, Director, Competitiveness Unit

**Jordan Technology Group**

Laith Al-Qasem, General Manager

**Jordan Investment Board**

Issa Gammoh, Investment Promotion Officer

**Investors**

Ghazi Faraj, Assistant General Manager for Marketing and Exports, Middle East Complex for Engineering Industries

Agil Baidoun, General Manager, Century Electronics

Omar Abu-Wishah, Owner and General Manager, Petra Engineering Co.

# ANNEX 3: SECTOR CONSTRAINTS AND REMEDIES

Interviews with players in the market, as well as meetings with relevant staff in line ministries and conclusions arrived at from the SWOT analysis revealed a set of constraints that affect or may affect the growth of the electronics assembly industry in Jordan, as well as its ability to attract FDI into the sector.

The main constraints identified are listed below along with their perceived level of impact on the industry, based on statements made by interviewees and the relevance of each constraint to the relocation motives listed in Section 3.1. Impact levels are divided into three categories – A, B, and C, with A denoting high impact on the growth of the industry.

**Table A.1: Electronics Assembly Industry Growth Constraints**

| Constraint | Level of Impact |
|---|---|
| Limited electronics market size | A |
| Nonexistence of forward and backward linkages | A |
| Nonexistence of links to OEMs | A |
| Inefficiency in Customs Department procedures | A |
| Inefficiency of facilitation services | B |
| Port delays | B |
| Changing production technology | B |
| Expensive machinery and equipment | B |
| High labor costs compared to Egypt and China | B |
| Expensive utility costs | B |
| High transportation costs | B |
| Competition from regional countries | B |
| Tariffs on raw materials | C |
| Lack of design capabilities | C |

Within Category A, factors can be divided into three groups:

- Market size
- External (OEM) and internal linkages (backward and forward)

Factors under Category B can be divided into four groups:

- Port issues
- Operating cost issues
- Investor service issues
- Competition from other countries
- Technology and machinery issues

Category C includes (1) tariffs and (2) design issues.

**Market size.** The government has embarked on a serious effort to address limitations associated with Jordan's small market size by signing market access agreements with key markets.

**Linkages.** The lack of a cluster (forward and backward linkages) or links to OEMs is the most pressing and potentially detrimental constraint. It is recommended that industry and supporting industry participants meet, deal, and trade together and organize themselves. The Jordan Authority for Economic Development (JAED) can spearhead such an effort.

**Investor service issues.** The main complaint about investor services is a lack of efficiency and transparency in processing applications. In response, we recommend that the JAED Initiative be implemented as soon as possible, as the rationalization of public investment institutions will improve efficiency and reduce overlap in the jurisdiction of each institution.

**Technology and machinery issues.** Changing production technology coupled with expensive machinery and equipment have the potential to restrict investment into electronics assembly in Jordan. As a result, the government has exempted production inputs from tariffs. However, this might not be sufficient on its own. The solution would be to encourage specialization and the development of a cluster so that producers do not have to undertake the whole production process, either in-house of through importing components. JAED could help as mentioned in point one above.

**Port delay issues.** Investors reported delays in recent months, which are attributable to the increased traffic to Iraq through Aqaba port. Solutions to this issue require investment in infrastructure to increase capacity, as well as improvement in operations management at the Aqaba port to increase efficiency. The government, through ASEZA, has taken steps to address these issues, including leasing of loading/unloading equipment to increase port capacity and commissioning a reputable, private, international firm to manage the port.

**Operating cost issues.** These include labor minimum wage, utility charges, and transportation fees. We recommend that JIB lobby government regarding the risks of losing FDI due to increased operating costs. This can be achieved by comparing costs with competing regional countries and demonstrating that further increases would tip the balance in favor of regional countries in terms of attractiveness as an investment location.

**Competition from other countries.** Competition, from those regional countries that are either established in electronics assembly markets (e.g., Egypt, UAE) or those that are working on upgrading on their technical skills, threatens Jordan's electronics assembly industry. These threats emphasize the need to implement remedial actions to improve Jordan's chances in attracting FDI, as discussed in Section 4.2.

# ANNEX 4: RELEVANT INFORMATION SOURCES

Table A.2 provides a list of information sources related to electronics assembly.

**Table A.2: Electronics Assembly Information Sources**

| Organization | URL | Description |
|---|---|---|
| General | | |
| International Trade Center (ITC) | http://www.intracen.org/ | The ITC (UNCTAD/WTO) is the focal point in the United Nations system for technical cooperation with developing countries in trade promotion. ITC produces and disseminates market research and trade analysis for exporters, importers and trade-support institutions in developing countries and transition economies.<br>Market analysis activities provide in-depth analyses of international trade flows ("TradeMap program") and the development of analytical tools for market analysis and trade promotion accessible through 2 Market Analysis Portals: Country and Product MAPs). |
| The Economist: country briefings | http://www.economist.com/countries/ | News, country profiles, forecasts, statistics and more on over 60 countries, from the online version of *The Economist* magazine, a leading independent global economic and political news and analysis source |
| The Economist Intelligence Unit | http://www.eiu.com/ | A Database of over 3,000 publications provides economic and political analysis and forecasts for 200 countries and regions. Key titles include country reports, profiles and forecasts. |
| E.U. Statistical Office (EUROSTAT) | http://europa.eu.int/comm/eurostat/Public/datashop/print-catalogue/EN?catalogue=Eurostat | Statistical research and market and data analysis from the European Union |
| World Bank | http://www.worldbank.org/ | Country- specific and regional data, reports (projects, policies and strategies) |
| U.S. Government Export Portal | http://www.export.gov/cntryind.html | Country information, industry market research (country commercial guides, industry sector analysis, international market insight, etc), tariff/ tax information, trade agreements, country contact information, etc. |
| Trade Partners UK | http://www.tradepartners.gov.uk/ | Government organization helping companies in the UK reach their export potential. Provides market and country analyses. |
| Economic Research Institute | http://www.erieri.com/ | Reports and software reports and software database products on Human Resource and Capital (including wage and salary survey data, prevailing wage, cost of living, employee benefit data, etc) research the form of published reports and software database products. |
| Egypt | | |
| Export from Egypt | http://www.exportfromegypt.com | Database of over 220 Egyptian exporting companies across several sectors including: Apparel & Textiles, Automotive, Food, Furniture, Leather and Software |
| Egypt State Information Service | http://www.sis.gov.eg/ | Portal for several government sites, providing access to web links on politics, the economy, news, tourism, chambers of industry and commerce, etc |
| Hong Kong | | |
| Doing Business in HK | http://www.business.gov.hk/ | Portal for several sites related with doing business in Hong Kong |
| HK Trade Development Council | http://www.tdctrade.com/ | Promotional body for external trade in goods and services, and for promoting HK's advantages as a global platform and partner for international business. Industry portals within, including garments manufacturing. |

| | | |
|---|---|---|
| Taiwan | | |
| Industrial Development & Investment Center | http://investintaiwan.nat.gov.tw/ | Promotes investment related activities, under the Ministry of Economic Affairs. Also houses Technology Transfer Center, which helps manufacturers & upgrading domestic industries. |
| Taiwan Headlines | http://www.taiwanresearch.com/ | Government- sponsored portal, with links to Government announcements, as well as various business and news features. |
| Taiwan Research Institute | http://www.dsis.org.tw/ | Under the umbrella of the Division of Strategic & International Studies on Taiwan foreign affairs, including trade agreements. |
| Chinese International Economic Cooperation Association | http://www.cieca-statistics.org.tw/page/about-1.htm | Oversees the promotion of bilateral economic ties with European countries, in addition to other countries. |
| TaiwanTrade | http://www.taiwantrade.com.tw/ | Global online trading hub designed to stimulate immediate access to B2B e-commerce for SMEs. Sponsored by Board of Foreign Trade/ Ministry of Economic Affairs. It is also administered by the China External Trade Development Council, |
| UAE | | |
| Trade in the UAE | http://www.uae.gov.ae/Government/trade.htm | Government portal offering info on trade, including export statistics& customs details. |
| Business in the UAE | http://www.uae.gov.ae/Government/business.htm | Government portal offering info on business, including UAE free zones, procedures, chambers of industry & commerce, etc. |
| Emirates Center for Strategic Studies & Research | http://www.ecssr.ac.ae/ | General information, government, foreign affairs, industry, economy, publications/ position papers, tourism, etc. |
| Zawya | http://www.zawya.com/countries/ae/ | Arabian portal, with a UAE country-focus, offering latest news, industry briefs, miscellaneous information& co. directories |
| TradeArabia | http://www.tradearabia.com | Arabian portal offering total business information services on several countries, including UAE. |
| International | | |
| All Action Trade | http://www.allactiontrade.com/ | International portal, offering export-import trade leads, business opportunities, co. directories, industry news, with country-specific data |

# ANNEX 5: RELEVANT DATABASES

Following is a list of specialized for-pay databases that may be useful to JIB investment officers as they gather market- and company-specific information on electronics assembly.

The first two listed here are based on annual subscriptions, while the last one is billed on monthly basis. It is recommended that the promotion officer request a free trial period to try out the modules in each the first two databases to determine which one is more useful to JIB's promotional needs.

### Business Browser

"Business Browser" from OneSource Information Services, Inc. is a web-based information tool that integrates comprehensive and up-to-date business and financial information on over one million public and private companies from more than 25 information providers drawing on over 2,500 sources of content. These sources include both textual information, such as news, trade press, executive biographies and analyst reports, and numeric information such as company financial results, stock quotes and industry statistics. This database is available in a global edition, as well as specialized versions for the U.S. and Canada, the United Kingdom, Europe and Asia Pacific, and with varying degrees of company and executive coverage in each package.

The annual subscription fee for this database is $20,000 for the European edition, which includes ample information on European, Middle Eastern and Asian companies.

More details and sample screens from this service can be found at the following web address.

http://www.onesource.com/products/content_107.asp

### InSite

"InSite" offers the latest news and in-depth analyses reported in the trade, business and popular press: competitive intelligence that helps make key business decisions. There are several modules within this family of products, including Business InSite, Market InSite, Consumer InSite and Company InSite, each offering a different focus on a breadth of indicators and analyses.

The annual subscription fee for this database is $5,200.

Further details on this service can be found at the following web address.

http://www.iac-insite.com/about.htm

### World Market Watch, Inc.

"World Market Watch, Inc." is a software tool designed to simplify business intelligence gathering and houses information on over one million companies, with up to 33 different types of business information on each company. It contains access to industry-specific products as well as country-specific reports.

Subscription rates are currently at US$29.95 per thirty days.

# ANNEX 6: RELEVANT SIC CODES

### 3556: Food Products Machinery

Establishments classified under SIC code 3556 are primarily engaged in manufacturing machinery for use by the food products and beverage manufacturing industries and similar machinery for use in manufacturing animal foods. Establishments primarily engaged in manufacturing food-packaging machinery are classified under SIC code 3565, and those manufacturing industrial refrigeration machinery are classified under SIC code 358.

Typical products include the following.

- Bakery machinery
- Biscuit cutters (machines)
- Bread slicing machines
- Brewers' and maltsers' machinery
- Butter making and butter working machinery
- Cheese making machinery
- Chewing gum machinery
- Chocolate processing machinery
- Choppers, food: commercial types
- Cider presses
- Coffee roasting and grinding machines
- Condensed and evaporated milk machinery
- Confectionery machinery
- Corn popping machines, industrial type
- Cracker making machines
- Cream separators, industrial
- Cutters, biscuit (machines)
- Dairy products machinery and equipment
- Dehydrating equipment, food processing
- Dies, biscuit cutting
- Distillery machinery
- Dough mixing machinery
- Dry milk processing machinery
- Fish and shellfish processing machinery
- Flour mill machinery
- Food choppers, grinders, mixers, and slicers: commercial type
- Grain mill machinery
- Grinders, food: commercial types
- Homogenizing machinery: dairy, fruit, vegetable, and other foods
- Ice cream manufacturing machinery
- Juice extractors, fruit and vegetable: commercial type
- Macaroni machinery: for making macaroni, spaghetti, and noodles
- Malt mills
- Meat and poultry processing machinery
- Meat grinders
- Milk processing machinery
- Mills and presses: beet, cider, and sugarcane
- Mixers and whippers: for food manufacturing industries
- Mixers, feed: except agricultural machinery
- Mixers, food: commercial types

- Oilseed crushing and extracting machinery
- Ovens, bakery
- Pasteurizing equipment, dairy and other food
- Peanut roasting machines
- Potato peelers
- Presses: cheese, beet, cider, and sugarcane
- Sifting machines, food
- Slicing machines, fruit and vegetable: commercial types
- Stuffers, sausage
- Sugar plant machinery
- Vegetable oil processing machinery

### 3578: Calculating and Accounting Machines, Except Electronic Computers

Establishments classified under SIC code 3578 are primarily engaged in manufacturing point-of-sale devices, funds-transfer devices, and other calculating and accounting machines, except electronic computers. Included in this sector are electronic calculating and accounting machines that must be paced by operator intervention, even when augmented by attachments. These machines may include program control or have input/output capabilities.

Typical products include the following.

- Accounting machines, operator paced
- Adding machines
- Automatic teller machines (ATM)
- Billing machines
- Bookkeeping machines
- Calculating machines, operator paced
- Cash registers, including adding machines with cash drawers
- Change making machines
- Coin counters
- Funds transfer devices
- Point-of-sale devices
- Registers, credit account

### 3585: Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment

Establishments classified under SIC code 3585 are primarily engaged in manufacturing refrigeration equipment and systems, as well as similar equipment for commercial and industrial use; complete air-conditioning units for domestic, commercial, and industrial use; and warm air furnaces. Establishments primarily engaged in manufacturing soda fountains and beer dispensing equipment, as well as humidifiers and dehumidifiers (except portable) are also classified in this industry. Establishments primarily engaged in manufacturing household refrigerators and home and farm freezers are classified under SIC code 3632, and those manufacturing electric airspace heaters and portable humidifiers and dehumidifiers are classified under SIC code 3634.

Typical products include the following.

- Air-conditioners, motor vehicle
- Air-conditioning and heating combination units
- Air-conditioning compressors
- Air-conditioning condensers and condensing units
- Air-conditioning units, complete: domestic and industrial
- Beer dispensing equipment

- Cabinets, show and display: refrigerated
- Cases, show and display: refrigerated
- Cold drink dispensing equipment, except coin-operated
- Compressors for refrigeration and air-conditioning
- Condensers and condensing units: refrigeration and air-conditioning
- Coolers, milk and water: electric
- Counters and counter display cases, refrigerated
- Dehumidifiers, except portable: electric
- Electric warm air furnaces
- Evaporative condensers (heat transfer equipment)
- Fountains, drinking: mechanically refrigerated
- Furnaces: gravity air flow
- Heat pumps, electric
- Humidifying equipment, except portable
- Ice boxes, industrial
- Ice making machinery
- Lockers, refrigerated
- Refrigeration compressors
- Refrigeration machinery and equipment, industrial
- Room coolers, portable
- Showcases, refrigerated
- Siphons, soda water
- Snow making machinery
- Soda fountains, parts, and accessories
- Tanks, soda water

### 3634: Housewares and Fans

Establishments classified under SIC code 3634 are primarily engaged in manufacturing electric house wares for heating, cooking, and other purposes; and electric household fans, except attic fans. Important products of this industry include household-type ventilation and exhaust fans; portable household cooking appliances, except convection and microwave ovens; electric space heaters; electrically heated bed coverings; scissors; and portable humidifiers and dehumidifiers. Establishments primarily engaged in manufacturing attic fans and industrial and commercial exhaust and ventilation fans are classified under SIC code 3564, and those manufacturing room air-conditioners and humidifying and dehumidifying equipment (except portable) are classified in SIC code 3585.

Typical products include the following.

- Air purifiers, portable
- Bed coverings
- Blankets
- Blenders
- Blowers, portable
- Bottle warmers, household
- Broilers
- Can openers
- Casseroles
- Chafing dishes
- Cigar lighters
- Cigarette lighters
- Coffee makers, household

- Cooking appliances, household, except convection and microwave ovens
- Crock pots
- Curling irons
- Deep fat fryers, household
- Dehumidifiers
- Desk fans
- Dry shavers (electric razors)
- Dryers: hand, face, and hair-electric
- Egg cookers
- Fans, household, except attic fans
- Floor fans
- Food mixers, household
- Fryers, household
- Griddles and grills, household
- Hair curlers
- Hair dryers: except equipment designed for beauty parlor use
- Hassock fans
- Heaters, immersion: household-electric
- Heaters, space
- Heaters, tape
- Heating pads
- Heating units for electric appliances
- Heating units, baseboard or wall (radiant heating element)
- Hotplates
- Humidifiers: portable
- Ice crushers
- Irons, domestic
- Juice extractors
- Knives
- Massage machines: except designed for beauty and barber shop
- Ovens, household: portable: except microwave and convection ovens
- Percolators
- Popcorn poppers for home use
- Propeller fans, window-type (household)
- Radiators
- Razors
- Roasters
- Sandwich toasters and grills, household
- Sauna heaters
- Scissors
- Shoe polishers
- Tea kettles
- Toasters, household
- Toothbrushes
- Trays, warming
- Trouser pressers
- Unit heaters, household
- Urns: household
- Vaporizers: household
- Electric ventilating fans

- Waffle irons
- Wall heaters, household
- Water pulsating devices
- Whippers, household

### 3674: Semiconductors and Related Devices

Establishments classified under SIC code 3674 are primarily engaged in manufacturing semiconductors and related solid-state devices. Important products of this industry are semiconductor diodes and stacks, including rectifiers, integrated microcircuits (semiconductor networks), transistors, solar cells, and light-sensing and -emitting semiconductor (solid-state) devices.

Typical products include the following.

- Computer logic modules
- Controlled rectifiers, solid-state
- Diodes, solid-state (germanium, silicon, etc.)
- Fuel cells, solid-state
- Gunn effect devices
- Hall effect devices
- Hybrid integrated circuits
- Infrared sensors, solid-state
- Laser diodes
- Light emitting diodes
- Light sensitive devices, solid-state
- Magnetic bubble memory device
- Magnetohydrodynamic (MHD) devices
- Memories, solid-state
- Metal oxide silicon (MOS) devices
- Microcircuits, integrated (semiconductor)
- Microprocessors
- Modules, solid-state
- Molecular devices, solid-state
- Monolithic integrated circuits (solid-state)
- Optical isolators
- Parametric diodes
- Photoconductive cells
- Photoelectric cells, solid-state (electronic eye)
- Photoelectric magnetic devices
- Photovoltaic devices, solid-state
- Random access memories (RAMS)
- Read only memories (ROMS)
- Rectifiers, solid-state
- Schottky diodes
- Semiconductor circuit networks (solid-state integrated circuits)
- Semiconductor devices
- Silicon wafers, chemically doped
- Solar cells
- Solid-state electronic devices
- Strain gages, solid-state
- Stud bases or mounts for semiconductor devices
- Switches, silicon control

- Thermionic devices, solid-state
- Thermoelectric devices, solid-state
- Thin film circuits
- Thyristors
- Transistors
- Tunnel diodes
- Ultraviolet sensors, solid-state
- Variable capacitance diodes
- Wafers (semiconductor devices)
- Zener diodes

### 3679: Electronic Components, Not Elsewhere Classified

Establishments classified under SIC code 3679 are primarily engaged in manufacturing electronic components, not elsewhere classified, such as receiving antennas, switches, and waveguides. Establishments primarily engaged in manufacturing radio and television-transmitting antennas are classified under SIC code 3663.

Typical products include the following.

- Antennas, receiving (automobile, home, and portable)
- Antennas, satellite (home type)
- Attenuators
- Electronic commutators,
- Cores, magnetic
- Cryogenic cooling devices (e.g., cryostats) for infrared detectors and masers
- Crystals and crystal assemblies, radio
- Delay lines
- Harness assemblies for electronic use: wire and cable
- Headphones, radio
- Heads, recording for speech and musical equipment
- Hermetic seals for electronic equipment
- Impedance conversion units, high frequency
- Liquid crystal displays
- Loads, electronic
- Microwave components
- Oscillators, except laboratory type
- Parametric amplifiers
- Passive repeaters
- Phonograph needle cartridges
- Phonograph needles
- Piezoelectric crystals
- Power supplies, static, and variable frequency
- Pulse forming networks
- Quartz crystals for electronic application
- Recording and playback heads, magnetic
- Recording heads for speech and musical equipment
- Rectifiers, electronic: except solid-state
- Resonant reed devices, electronic
- Rheostats, electronic
- Sockets, electronic tube
- Solenoids for electronic applications
- Static power supply converters for electronic applications

- Step positioners for transmitting equipment
- Styli, phonograph record cutting
- Switches, electronic
- Switches, stepping
- Transducers for use in measuring and testing instruments and equipments
- Tube retainers, electronic
- Tube spacers, mica
- Tube transformer assemblies used in firing electronic tubes
- Video triggers, except remote control television devices
- Voice controls
- Waveguides and fittings

### 3845: Electromedical and Electrotherapeutic Apparatus

Establishments classified under SIC code 3845 are primarily engaged in manufacturing various specialize electrical devices to serve the medical instrument industry. Establishments primarily engaged in manufacturing electrotherapeutic lamp units for ultraviolet and infrared radiation classified under SIC code 3641.

Typical products include the following.

- Arc lamp units, electrotherapeutic: except infrared and ultraviolet
- Audiological equipment, electromedical
- Automated blood and body fluid analyzers, except laboratory
- Bronchoscopes, electromedical
- Cardiographs
- Colonscopes, electromedical
- Computerized axial tomography (CT/CAT scanner) apparatus
- Cystoscopes, electromedical
- Defibrilators
- Dialyzers, electromedical
- Diathermy apparatus, electromedical
- Electrocardiographs
- Electroencephalographs
- Electromedical apparatus
- Electromyographs
- Endoscopic equipment, electromedical: e.g., bronchoscopes, cystoscopes, and colonoscopes
- Gastroscopes, electromedical
- Laser systems and equipment, medical
- Lithotripters
- Magnetic resonance imaging device (diagnostic), nuclear
- Medical cleaning equipment, ultrasonic
- Otoscopes, electromedical
- Pacemakers
- Patient monitoring equipment: intensive care/coronary care unit
- Phonocardiographs
- Position emission tomography (PET scanner)
- Respiratory analysis equipment, electromedical
- Retinoscopes, electromedical
- Surgical support systems: heart-lung machines, except iron lungs and blood flow systems
- Transcutaneous electrical nerve stimulators (TENS)

- Ultrasonic medical equipment, except cleaning
- Ultrasonic scanning devices, medical