

Knowledge Economy Assessment of Tunisia

**Identifying and addressing capability and innovation gaps in the Southern
and Eastern Mediterranean region (SEMED)**



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Over the past 10 years Tunisia's economy has become more complex and export driven, over-performing its regional peers. However, its innovation potential has yet to be fulfilled.

The limitation of traditional horizontal or vertical approaches focusing solely on governance, institutional variables, the regulatory framework or policy seem to have not fully addressed two major drivers of innovation: knowledge networks and capability building.

Based on the concept of 'Economic Complexity' the authors mapped, by type of value chains, innovation opportunities and gaps in Tunisia.

A knowledge development pattern is outlined based on a 10 years' time series where sectors like e-payment, software security, applied electronics and pharmaceuticals are identified as potential knowledge drivers and investment areas. An extensive dataset of export data, thorough market sizing, set of innovation indicators, company and other stakeholders' surveys further support those findings.

Building on the proposed Innovation Investment Index and existing barriers, three types of investments clusters are recommended: 'Venture Capital & Technology Transfer', 'Dominant players' and 'Platform Projects'. Across the three clusters, more than 300 investment projects ranging from 1M€ to 100M€ were reviewed and 100 are proposed for potential consideration.

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Introduction

A diversified and export orientated economy

Tunisia is an upper-middle-income country with a Gross Domestic Product (GDP) growing by 3.5% annually in the pre-revolution period of 2008-2010¹, a GDP per capita of EUR 3,310² in 2011, a fairly sound macroeconomic environment, and a relatively well-diversified and export oriented economy supported by Foreign Direct Investment (FDI). In 2011, exports accounted for 51%³ of the country's GDP. Seven sectors accounted for 80% of goods and service trade: Textile manufacturing, Electronic, Electrical and Mechanical manufacturing, Chemical manufacturing, Agriculture, Tourism and Information and Communication Technologies (ICT)⁴. The service sector accounted in 2011 for more than 45% of GDP⁵, highly represented by ICT⁶. This sector alone represents 10% of the country's GDP⁷ and shows high potential in Tunisia, with an estimated market of 4.8 B€ and a Compounded Annual Growth Rate (CAGR) of 6% in the period from 2007 to 2012⁸. The industrial sectors are also well represented in the economy, with an increased weight of Electronics and Electrical Industries (EEI), amounting to an estimated market of over 2.2 B€ in 2012 growing by 16% in the period of 2005-2010⁹.

Traditionally strong human capital base

The relative strengths of the country's education inputs and outputs are key drivers of the economy. In 2011, the United Nations human development indicators for Tunisia were above the regional average (0.70 for Tunisia versus 0.64 for other countries of the Middle-East and North Africa¹⁰), however still lower than 0.87 for the Organization for Economic Cooperation and Development (OECD)¹¹. In the same year, the level of literacy was at 78% of the population vs. 98% in the OECD¹². Beyond the fundamentals, the secondary schools enrolment ratio is also high, standing at 90%¹³ in 2009. In terms of education outputs, as measured by the OECD

¹ Source: Data World Bank, <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>; Note: GDP in PPP, growth defined as year on year growth from 2007-2012

² Source: Data Bank of the World Bank, <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>, 2011

³ Source :Data World Bank, <http://databank.worldbank.org/ddp/home.do>

⁴ Source: Agency for Promotion of Industry and Innovation (APII) <http://www.tunisianindustry.nat.tn/en/home.asp>

⁵ Source: Institute National of Statistics Tunisia : Note: GDP in PPP in 2012

⁶ Source: OECD Information Technology Outlook 2010

⁷ Source: Foreign Investment Promotion Agency (FIPA),

http://www.investintunisia.tn/site/en/article.php?id_article=779: Note: GDP in PPP

⁸ Source: IDC CEMA Black Book 2011

⁹ Source : Foreign Investment Promotion Agency http://www.investintunisia.tn/site/en/article.php?id_article=774

¹⁰ Note: List of MENA countries: Algeria, Bahrain, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Palestine, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates, Yemen

¹¹ Source : United Nations Development Program <http://hdrstats.undp.org/en/countries/profiles/TUN.html>

¹² Source: UNICEF http://www.unicef.org/infobycountry/Tunisia_statistics.html

¹³ Source: Data World Bank, <http://data.worldbank.org/indicator/SE.SEC.ENRR>

Program for International Student Assessment (PISA)¹⁴ Tunisia has been improving its performance (on the Science scale 401 in 2009 versus 386 in 2006), however still falling behind the OECD average (501 in 2009)¹⁵.

Policies to support innovation in place, yet not coordinated and implemented fully

Policy makers developed several programs to support innovation and develop the Knowledge Economy. The innovation system of the country is based on the ‘triple helix’ model, i.e. the collaboration between universities, research institutes and start-ups. Innovation is concentrated in the specific cities like Tunis and Sfax. The level of Research & Development (R&D) is relatively high compared to the regional peers, spending on R&D standing at 1.1% of GDP in 2010 (versus 0.21% in Egypt, 0.42 in Jordan, 0.08 in Saudi Arabia)¹⁶. Scientific collaboration resulted in the publication of 17,068 articles between 2006 and 2010 with collaboration and co-authorship in the areas of neuroscience (58%), physics & astronomy (64%), materials science (53%) and immunology (55%)¹⁷. However, a number of policy challenges still limit the knowledge economy performance of the country, including a strong role of the State, lack of coordination between government agencies, heavy bureaucracy, decreasing capital inflows and insufficient access to private sector finance and capital, especially post company set-up. The lack of coordination between government agencies and time required to complete funding applications – up to six months to obtain a response according to private sector survey - are leading innovative companies surveyed to gradually reduce formal applications and to turn to the private sector. The number of Venture Capital firms remains limited and existing Capital risk investment companies (SICAR) and bank loans relatively not adapted to seed financing. In terms of capital inflows, FDI in the area of the knowledge economy is lower than in Morocco or MENA countries with FDI inflows decreasing by 9% from 2007 to 2010¹⁸.

The challenge ahead: Unlocking the potential of Tunisia through knowledge centric policies and approaches

Since the January 2011 revolution, the country has been experiencing economic challenges inherent in the transition phase. Major policy barriers still need to be addressed, including the rigidity of the labor market, the inequitable taxation system, lack of adequate competition

¹⁴ Note: PISA(Program for International Student Assessment) is an international study that was launched by the OECD in 1997. It aims to evaluate education systems worldwide every three years by assessing 15-year-olds' competencies in the key subjects: reading, mathematics and science.

¹⁵ OECD, PISA 2006, 2009 <http://www.oecd.org/pisa/46643496.pdf> ,<http://www.oecd.org/pisa/46660259.pdf>

¹⁶Source: World Bank, <http://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>

¹⁷ Source: SCImago. (2007).SJR - SCImago Journal & Country Rank.

¹⁸ Source: World Bank Data, <http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD>

policies and skills gaps - major issues contributing to high unemployment. More specifically, a number of challenges remain to be addressed to develop a comprehensive knowledge centric strategy, including identifying and targeting capability and innovation gaps and highlighting relevant investment targets. The primary question is to define an appropriate framework to both analyze and address those gaps starting with the definition of Knowledge Economy, which is still unclear in the literature. In addition, the limitation of current traditional horizontal or vertical approaches focusing solely on governance, institutional variables, the regulatory framework or policy seem to have failed to fully address the major driver behind economic growth: knowledge.

New and innovative approaches, like Economic Complexity have been put forward by Hausmann and Hidalgo (2011) to unlock the potential of knowledge based economies, yet concrete implications remain to be developed further. The Economic Complexity approach considers an outcome-based measure on the premise that if a pair of products is related because they require similar institutions, capital, infrastructure and technology, they are likely to be produced in tandem. More broadly, *"the complexity of an economy is related to the multiplicity of useful knowledge embedded in it. For a complex society to exist, and to sustain itself, people who know about design, marketing, finance, technology, human resource management, operations and trade law must be able to interact and combine their knowledge to make products. These same products cannot be made in societies that are missing parts of this capability set. Economic complexity, therefore, is expressed in the composition of a country's productive output and reflects the structures that emerge to hold and combine knowledge"*¹⁹.

The Economic Complexity Index (ECI) measures this definition of knowledge. The ECI explains 15% of the contribution to the variance of economic growth across all countries over a period of 12 years, unlike other institutional variables like governance or the regulatory framework that contribute to 1% to 2%²⁰. ECI also has a 0.75 correlation with GDP growth worldwide²¹. For MENA countries, their opportunity to improve their economic performance is significant based on their existing knowledge and capabilities. Figure 1a highlights the opportunities for SEMED countries compared to others worldwide. Their capabilities development path differs widely. For example Tunisia has been developing gradually knowledge based capabilities as Morocco is rather stagnating, even declining until recently²²(See Figure [1b]).

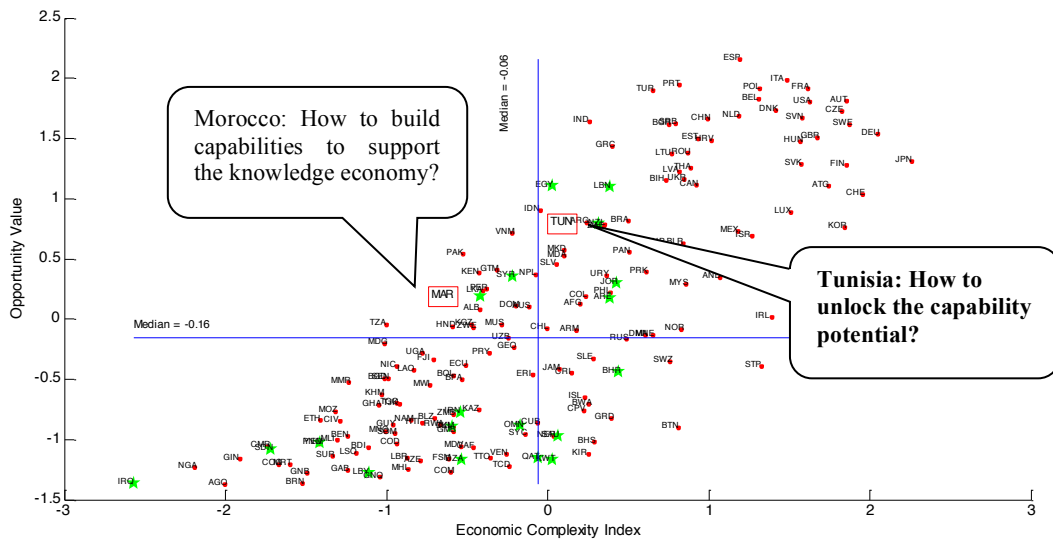
¹⁹ Source: Hausmann, Hidalgo et al. (2011)

²⁰ Source: Hausmann, Hidalgo et al (2011)

²¹Source: Hausmann, Hidalgo et al (2011)

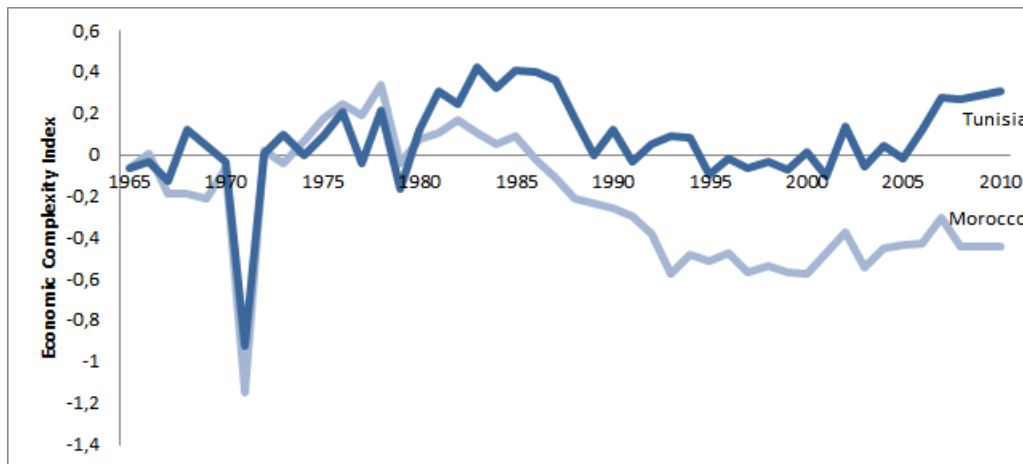
²² Note: ECI score of 0.3 and -0.4 respectively for Tunisia and Morocco in 2010. Note: WHO- Global Health Observatory

Figure [1a]: Economic Complexity and Opportunity value analysis, 2010²³



Note: MENA countries are marked with green pentagons

Figure [1b]: Economic Complexity Index from 1965 to 2007 for Tunisia and Morocco²⁴



The overall question to be addressed is the following: In which sectors and companies can EBRD investments make a difference in boosting innovation, generating job creation, and developing the Knowledge Economy in Tunisia while generating returns?

To address this question, several sub-questions need to be addressed:

- How can the ‘Opportunity Value’ be realized in Tunisia?

²³ Source: Hausmann, Hidalgo et al.(2011), Whiteshield Analysis

²⁴ Source: Hausmann, Hidalgo et al, (2011), Whiteshield Analysis, African Development Bank, World Bank

- What is driving knowledge based capabilities improvement or holding it up?
- Where are the relevant capability and innovation gaps?
- How are they mapped at the national and sub-national levels?
- What are the gaps by type of value-chains networks?
- How to address them in practice, i.e. which companies or projects to target?

Based on the concept of Economic Complexity, Whiteshield used a comprehensive approach leveraging product export data, sectorial and territorial data including a combination of company and policy barriers surveys by sector, as well as intellectual property and scientific publications trends. The approach uses a combination of three units of analysis: capabilities, value-chains networks and territories. It helps to identify and target capability and innovation gaps leading to practically implementable actions like pro-active investments in specific regions and sectors, including support of specific technologies and firms that have a strong identifiable spill-over effect. The approach taken in this report covers four steps implemented over a period of four months: baseline review, data triangulation, gap analysis and recommendations.

Investment opportunities in Information and Communication Technologies, Electronics and Electrical Industries and Healthcare.

These three sectors account respectively for 4.8B€, 2.2B€ and 398M€ of GDP.

Tunisia occupies a position of regional leadership in ICT sector, and was ranked 1st in Africa and 3rd in the Arab world, according to the international classification network index of the World Economic Forum of Davos for ICT (2008). In 2007-2012 the sector had Compounded Annual Growth Rate (CAGR) of 6%.

The industrial sectors are also well represented in the economy, with the most pronounced being the Electronics and Electrical Industries (EEI) sector, representing a market of 2.2B€, with a growth rate of 16% per year from 2005 to 2010²⁵.

The pharmaceutical sector also shows interesting potential for growth and innovation. The market is estimated at 398 M€ in 2010, growing by 15% in 2004-2009²⁶. In addition, the government has been giving incentives to support the pharmaceutical sector by allowing foreign investors to hold up to 100 % of the capital, guaranteeing the freedom of transfer of capital, the protection of intellectual property, reduction of customs duties for equipment, exemption from

²⁵Source : Foreign Investment Promotion Agency (FIPA Tunisia)
http://www.investintunisia.tn/site/en/article.php?id_article=774

²⁶ Source: Agency for Promotion Industry and Innovation, Chemicals industries Monograph, 2010
http://www.tunisianindustry.nat.tn/FR/download/CEPI/mono_ich.pdf

custom duties for raw materials and articles for packaging, and a preferred rate for VAT of 6%.²⁷ Public health coverage creates additional incentives to pharmaceutical sector development²⁸. The objective is to transform the country into a regional center for medical services by 2016. Supporting this objective, total health expenditures annually accounted for 6.2-6.4% of GDP in 2004-2010, 54% being provided by the government²⁹. In 2005-2010 domestic consumption of pharmaceuticals had been increasing by 16.7% annually and reached 538M€ in 2010. The coverage of market needs in medicines through the local production had increased from 14% in 1990 to 45% in 2010³⁰.

EBRD in Tunisia: Potential diversified approach to investment and advisory services support

Combining capability, value chain gaps and employment potential data, an Innovation Investment Index was developed (The 'Index'). Based on the outlined Index, key knowledge economy sectors were identified for further consideration including Electric and electronic equipment for auto and aircraft manufacturers, Enterprise application software, E-payment and software security, Medical electronic devices and Medicines. The list was extended with several Agribusiness and Textile companies that could potentially upgrade the traditional sectors of Tunisian economy, and several financial and educational firms that could address some of existing barriers to innovation in the country. Within those sectors, more than 300 companies were identified and 100 selected for further consideration by the EBRD including a high-level review of the companies. Those companies are clustered around three types of investments (all quoted investment figures are high level assessments supported by company feedback):

- *Venture Capital & Technology Transfer*: Typically companies and projects that require 1 to 5M€ investment or less and could be consolidated into Venture Capital fund(s) of 30-50M€ with co-financing from the EBRD. Public incubators have been excluded from this scope based on the survey performed, favoring VC funding with active coaching.
- *Dominant Player*: Typically companies that require 5-50M€ investment, holding 20% market share or more in their segment, this is the case for example of IT service integrators, telecom companies and healthcare players.

²⁷The Foreign Investment Promotion Agency, FIPA Tunisia,
http://www.investintunisia.tn/site/en/article.php?id_article=789

²⁸Note: Some segments of the population benefit either from free health care and hospitalization in public facilities or from reduced fees. This is stipulated in the Health Organization Law and detailed in decrees, orders and specific circulars. Source: World Health Organisation "Tunisia: the role of contractual arrangements in improving health sector performance"

²⁹World Health Organization

http://apps.who.int/nha/database/StandardReport.aspx?ID=REP_WEB_MINI_TEMPLATE_WEB_VERSION&COUNTRYKEY=84669

³⁰Source: UNIDO, AU-UNIDO conference on economic diversification and manufacturing in Africa, 2012

- *Platform Projects*: Typically growth platforms for existing companies that require additional investments – in the range of 50-100M€- or collaboration between players e.g. integrators or acquirers in the e-payment or payment processing sectors implying collaboration between a number of local banks and accreditations from e.g. Visa.

Policy makers should also address short-term priority actions including (a) the set-up of a one window for all innovation activities, especially for grant, zero interest loans, techno-park location and other applications that are not currently fully coordinated; (b) set-up of transparent selection criteria for the accreditation of ‘Innovative investments’ that give tax breaks, access public finance, eventually leveraging international independent expertise to assess projects, and reduction of time to process to 2-3 weeks; (c) adapting other type of access to finance like SICAR and bank loans credit assessments criteria to innovation and service requirements and (d) encourage much further private sector Venture Capital formation.

Methodology and framework of analysis

Data identification and selection approach

A top down approach was first used leveraging macro-economic and market research data to quantify market sizes and trends (Secondary research). This approach was validated by triangulation with data collected from interviews, questionnaires and focus groups in a bottom up approach (Primary research).

Primary Research: assessing demand in the field through direct interviews and a written survey

Primary research was conducted through a survey covering 23 questions split into three main areas: (1) assessment of the country's knowledge and capability competitive advantages, (2) assessment of key policy and business barriers faced by the private sector, and (3) perspective on innovation and development of the knowledge economy (see annex 1 for a list of questions and participants). The sample covered in Tunisia included 51 participants, comprising of 75% of private companies and 25% of universities, policy makers, research institute and other public bodies. The survey was conducted from October 15th, 2012 to December 5th, 2012.

Secondary research: Review of existing literature and leverage of recent market research studies

A number of studies were carried out by private consulting firms and international organizations over the past four years in Tunisia. These include: African Development Bank – African Economic Outlook 2012, OECD - Investment Policy Review 2010;Ernst & Young – Baromed Survey 2008;World Bank – Interim Strategy Note 2012; World Economic Forum - Global Competitiveness Report 2011-2012, World Bank International Finance Corporation - Ease of doing business 2012; World Intellectual Property Organisation - The Global Innovation Index 2012; The International Bank for Reconstruction and Development / The World Bank - Tunisia: From Revolutions to Institutions, 2012; European Training Foundation – Women and Work in Tunisia, 2010; World Bank - Are Jordan and Tunisia's Exports Becoming More Technologically Sophisticated, 2012; Research ICT Africa - Tunisia ICT Sector Performance Review 2009/2010; World Economic Forum /The World Bank – The Africa Competitiveness Report 2011.

All point to three major challenges to address: youth unemployment, the over burdened legal framework, corruption and transparency. It also highlights three potential sectors of interest: ICT, EEI and Healthcare sectors. Box [1] provides a brief summary of key insights from selected publications.

**Box 1: Summary of key recent studies on Tunisia
covering sectorial, knowledge and innovation topics fully or partially**

African Development Bank – African Economic Outlook - 2012:

Tunisia is facing the same challenge as its neighbour Morocco in terms of youth unemployment. While general unemployment rose in 2011 to almost 19%, youth unemployment was at 30% for young university graduates. Several incentives and programmes were implemented such as wage subsidies, covering 50% of the wages of young university graduates, training programmes to bring young graduates to an operational level after university and before their first employment. These initiatives have helped over 85,000 graduates from 2004 to 2010. However more than such public policies or programmes, Tunisia needs to reduce the mismatch between private sector needs and higher educational offer through increased collaboration. Despite new measures taken, the unequal tax system has divided the Tunisian economy into offshore and onshore sectors. In 2011, the ‘advantaged’ offshore sector rose by 19%, while a heavily taxed onshore sector fell by 5%.

The World Bank - Interim Strategy Note- 2012:

Despite sound socioeconomic improvement in the last few years, the development of the country is still tarnished by corruption and political interference. While the private sector was disadvantaged by poorly adapted regulations and government corruption, the offshore sector received important incentives, including simplified investment procedures and competitive salaries. Many national economic sectors were closed for export through quotas and tariff barriers. The labour market was affected by employers recruiting only through short-term flexible contracts, granting limited job security to their employees. This orientation towards offshoring contributed to the creation of a socioeconomic disparities throughout the country. While coastal cities account for up to 85% of Tunisia's GDP, inland regions are gradually getting poorer.

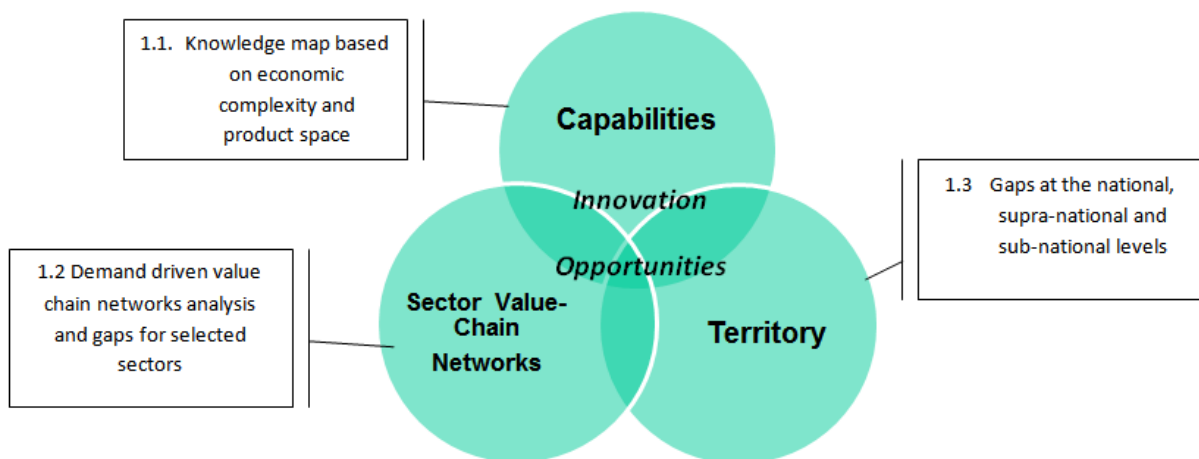
Ernst & Young Baromed Survey - 2008:

Like its Moroccan peer, Tunisia is considered as one of the best destinations for offshoring in the region and targeting the European Union market. The cost of doing business is relatively low and offshore firms benefit from a wide range of advantages such as tax exemption, VAT exemption. However, the country is facing a lack of highly skilled labour.

OECD Investment Policy Review – 2012 (October): Starting from the recent turmoil following the 2011 revolution, Tunisia has begun its transition period but is facing serious socioeconomic challenges, including youth unemployment, social disparities, reduced growth, decreased competitiveness, and thus reduced investment. Yet many reforms and development plans were implemented to support the policy framework in place. This effort needs to be pursued in a more coherent and collaborative way between public and private sectors, and amongst institutions, in order to reassure domestic and foreign investors as well as to address the issue of youth unemployment. Foreign Direct Investment (FDI) is key for Tunisia with inflows averaging 1.5 B€ a year from 2005 to 2010. The Euro crisis, however, had a dramatic impact on FDI directed towards Tunisia, with a 26% drop in 2011. There is a need to diversify FDI partners; to increase competitiveness in traditional sectors (textile, agriculture) and to attract inflows to higher value added sectors. Several measures were taken to improve the investment climate in Tunisia, including the revision of the complex legal framework and the simplification of procedures. Thanks to these measures Tunisia was ranked 40th in the Global Competitiveness Report 2011-2012 of the World Economic Forum, and 46th in the 2012 Doing Business report of the World Bank, faring much better than its peers. However as highlighted by the transition government, the *“Private initiative is being hindered and the profitability of investment projects severely compromised by arbitrary practices, corruption, unequal treatment of investors and disregard of regulations”* (Economic and social Development Strategy 2012-16)

Whiteshield tripartite approach to mapping Innovation and the Knowledge Economy

The approach to identify and address capability and innovation gaps in Tunisia is based on three fundamental principles: capability mapping, sector and territory based innovation analysis.



1. Assessing capability gaps through Economic Complexity Indicators and Product Space

The Economic Complexity approach, applied in this report, considers an outcome-based measure on the premise that if a pair of products is related because they require similar institutions, capital, infrastructure and technology, they are likely to be produced in tandem. *Thus, economic complexity approach aims at determining existing capabilities and productive knowledge of the country.* Capabilities are defined here as institutions, knowledge, capital, infrastructure and technology required to produce, and successfully export certain products. Quantitative indicators of Economic Complexity approach are given in Definition box 2.

This approach helps to quantify and predict the likelihood of a country to develop advanced manufacturing capabilities and greater national prosperity. The network node map of a country's economy is referred to as the Product Space Network Visualisation. In this report, the Product Space is a visualisation of world trade (services excluded), expressed in terms of global exports, structured according to the similarity of capabilities required to produce products. Beyond Manufacturing, the approach was complemented by a service-based analysis using off-shore data.

2. Identifying innovation gaps through a sectorial approach

The second key unit of analysis is represented by 'value-chain networks'. A review of key global and local value-chains and sectors identified as part of the capability and knowledge mapping is performed to map key gaps. The main principle behind this approach is that innovation development is mainly driven by sectorial demand and competition, not just by national level horizontal drivers or policy. The value chain networks analysis focuses essentially on capturing knowledge spill overs, trends and demand in the sector based on interviews and focus groups, existing innovation and potential opportunities and gaps at every step of the value chain based on detailed surveys. Its objective is also to identify how Tunisia could integrate further into Global Value Chains.

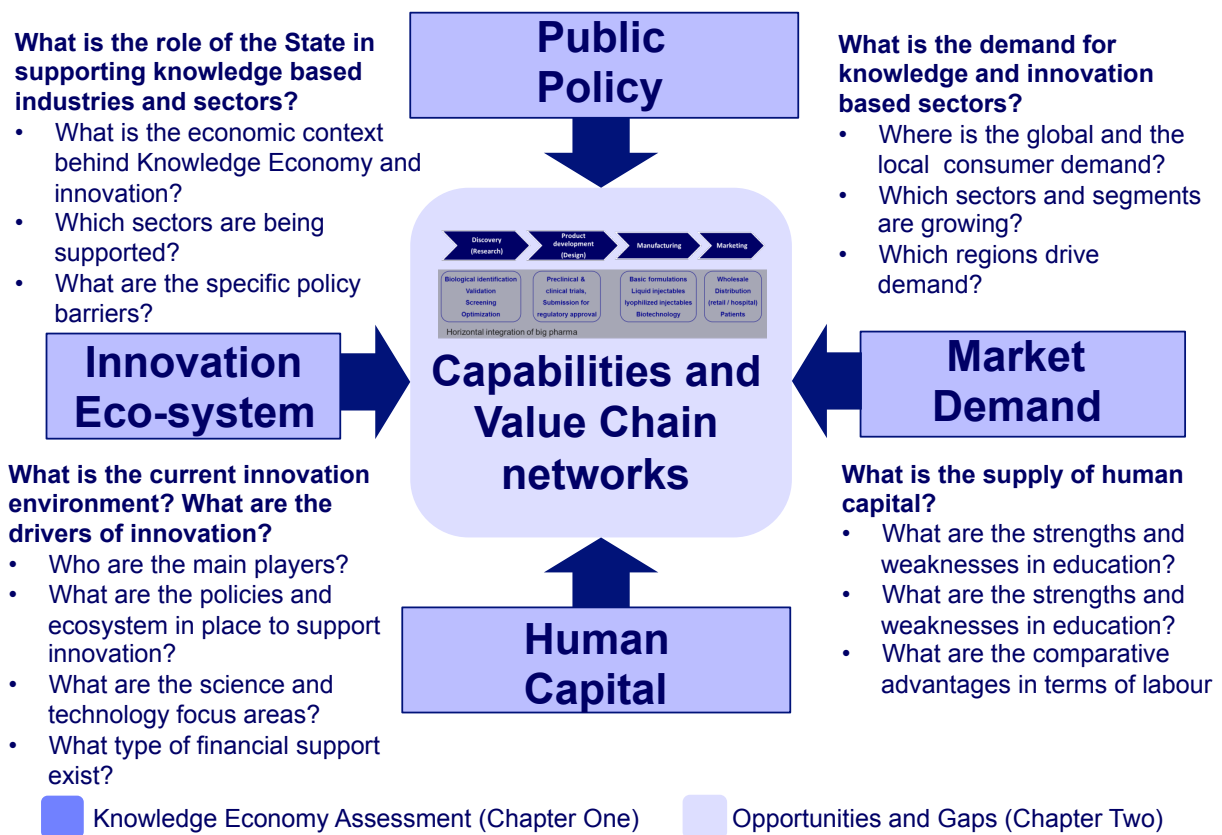
3. Analyzing territory based capabilities and innovation

The third component of the analysis is to map selected territory innovation advantages and gaps. The mapping is made based on the fact that innovation (a) only happens in specific regions/areas of a country and (b) is almost always associated with other countries.

Knowledge and capability Development Framework

The Framework based on the tripartite approach, described above, includes five areas: Four macro-environment areas address (1) Policy that is essential to assess in Tunisia based on the historical role of the State in driving policies, (2) Private sector demand and market dynamics to capture companies and end-user requirements, (3) Innovation Eco-system to identify its level of current performance and (4) Supply in terms of education and labor economics in Tunisia. The fifth criterion is directly related to promising Capabilities and Value chain networks. Based on the external environment and internal capabilities and value-chain networks, gaps and opportunities are identified.

Figure [1]: Five pillars of the framework of analysis³¹



³¹Whiteshield analysis

Box 2: Key definitions

Knowledge economy – According to the OECD, “The knowledge based economy” is an expression coined to describe trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors. In this report, the knowledge economy is rather defined based on the principle of economic complexity: *“the complexity of an economy is related to the multiplicity of useful knowledge embedded in it. For a complex society to exist, and to sustain itself, people who know about design, marketing, finance, technology, human resource management, operations and trade law must be able to interact and combine their knowledge to make products. These same products cannot be made in societies that are missing parts of this capability set. **Economic complexity, therefore, is expressed in the composition of a country’s productive output and reflects the structures that emerge to hold and combine knowledge.**”*

Innovation – Innovation is defined in this report based on the OECD Oslo Charter, i.e.:

- *Process* - Process innovation involves a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.
- *Marketing* - Marketing innovation involves a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.
- *Organization* -Organizational innovation involves introducing a new organizational method in the firm’s business practices, workplace organization or external relations.
- *Product* - This involves a good or service that is new or significantly improved. This includes considerable improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.

Competitiveness –This concept has more than 15 definitions in the literature. In this report, it is defined as *“the **ability** of companies, industries and regions, nations or supranational regions to **generate** while being and remaining exposed to international competition, relatively **high factor income** and **factor employment** levels on a sustainable basis”* (Source: Industrial Competitiveness: Benchmarking business environments in the global economy, OECD (1996); European Industrial Policy (Pelkmans 2006))

Revealed Comparative Advantage (RCA) - The revealed comparative advantage is an index that shows whether the share of a certain good or service in the country’s export is higher than the share of this good or service in the overall world trade.

Diversity and Ubiquity stand for the number of products exported by each country and the number of countries, which export each product respectively. A key principle behind the concept of economic complexity is to view exports structure as an indicator of knowledge possessed by a country. A country is

considered to have a complex economy, if it produces and exports many products which can be only produced and exported by few other countries. In this way *diversity and ubiquity* are recursively corrected by one another until the process converges. As a result we obtain two interconnected sub-indices: *The Index of Economic Complexity (ECI) and the Product Complexity Index (PCI)*. According to these indicators a country is considered to have a complex economic structure, if it produces many complex products. A product is complex, if it is manufactured mainly by complex economies.

Proximity is a quantitative measure of similarity among products; it is expressed by conditional probability of two products being exported in tandem. This indicator is used for construction of *Product space*. The Product Space is a visualization of world trade, expressed in terms of global exports, structured according to the similarity of capabilities required to produce products. There are a number of factors that can describe the relatedness between a pair of products: the amount of capital required for production, technological sophistication, or inputs and outputs in a product's value chain.

Opportunity Value represents the current position of the country on the Product Space, capturing both the average proximity of country's export suite to all products, in which it does not have RCA, and average complexity of these products. The Opportunity Value of a country will be high if it has many products to build upon to diversify its economy. The latter also means that the country can easily start production of many new products, represented in the Product Space.

Opportunity Gain of a certain new product is an increase in Opportunity Value of a country, if it develops RCA in this product.

The concept of *Missing products*, introduced in this research, is based on the Opportunity Gain and Product Complexity measures of the products, in which the country does not have a comparative advantage. Missing products are those products that can contribute most to the improvement of the country's positions on the Product Space. Thus, these products should be viewed as a long-term priority for improvement of country's economic performance.

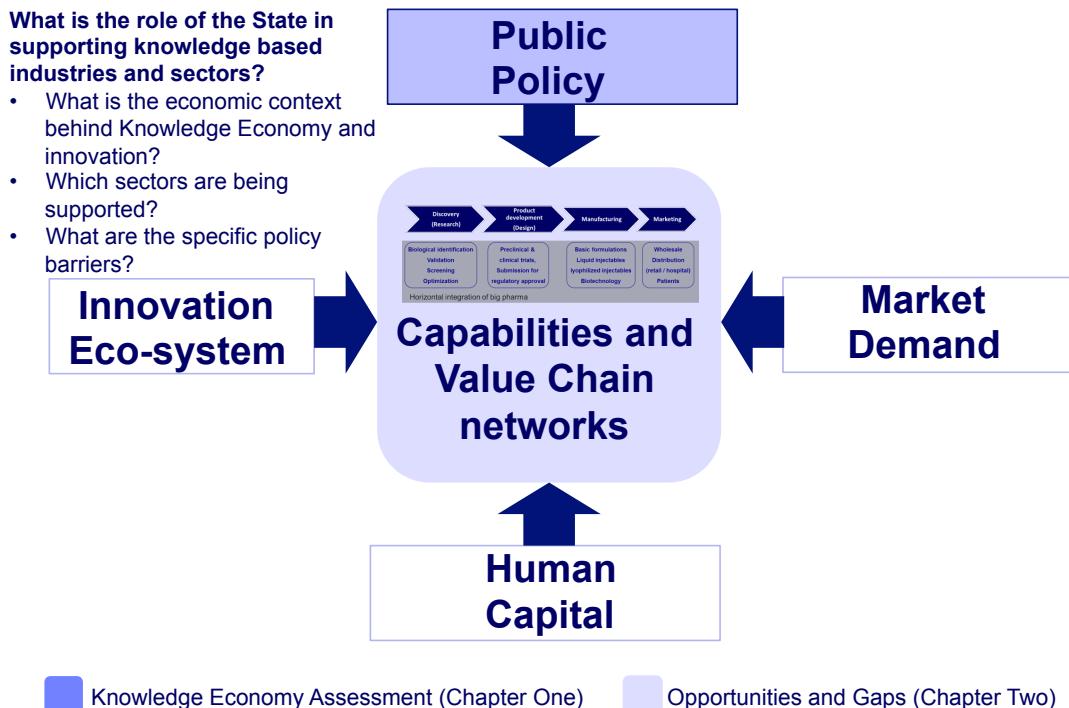
Alternative concept – *Proximity products* – is based on the idea that a country is most likely to move to the new products, if it already has capabilities needed to produce them. Thus, products with the highest proximity to the current export suite of the country can be viewed as the most appropriate candidates for further development of RCA.

Chapter One

Knowledge Economy Review: High potential to develop a knowledge-based economy

1.1. Policies: Comprehensive policies, yet inconsistent implementation.

Figure [2]: Knowledge and Capability Development Framework - Focus on Policy



Economic context behind Knowledge Economy and Innovation: An export oriented and diversified economy with strong links to the European 'high-price' market and developing innovative sectors.

Tunisia has a GDP of 36 B€³² in 2011, growing by 3.5% annually in the pre-revolution period of 2008-2010³³, a trade deficit of 685 M€³⁴ and a population of more than 10M³⁵. Being ranked by the World Economic Forum 40th out of 142 countries in the Global competitiveness ranking, Tunisia's economy remains exposed to international competition with a mainly exports oriented economy and high dependence on FDI.

One of Tunisia key competitive advantage is its solid and close partnership with the European Union, its main export destination and main supplier. Export to GDP ratio stands at 51%³⁶, and

³² Source: Data World Bank, <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD>

³³ Source: Data World Bank, <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG> Note: annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are in constant 2000 U.S. dollars.

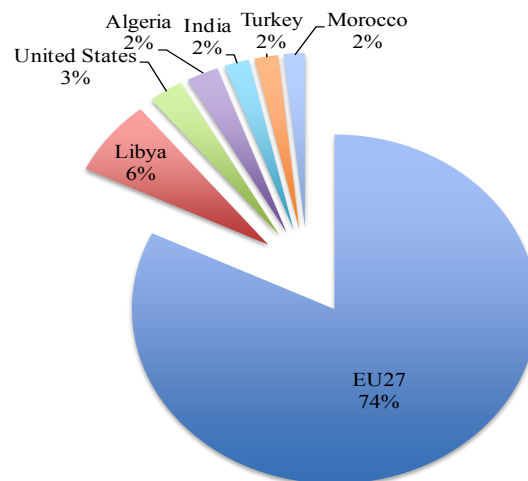
³⁴ Source: National Institute of Statistics Tunisia, www.tradingeconomics.com

³⁵ Source: Data World Bank, <http://data.worldbank.org/country/tunisia>

³⁶ Source: European Commission, Trade Office, 2012 - http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_122002.pdf

74% of exports go to the European Union (Figure [3]). FDI stands at 3.2% of GDP in 2010 (versus 2.3% in North Africa and 1.6% in Morocco).³⁷ According to the Agency for the Promotion of Industry and Innovation (APII)³⁸, on January 2013 the total number of enterprises with foreign participation was 1895 (with 40% being French and 28% Italian), 1171 are 100% foreign owned, 1604 are totally exporting enterprises. Regarding two major capabilities, skills and infrastructure, the country is also relatively well endowed. The labour force is young and qualified: Tunisia has a 90% secondary school enrolment rate³⁹, adult literacy stands at the level of 78%; over 20% of Tunisians have been educated beyond high school⁴⁰. The airport, port, road and telecommunication infrastructure in Tunisia is considered among the most modern in the southern shore of the Mediterranean and in Africa. With 8 major airports, 6 major seaports, 2,000 km of rail, it also has a competitive advantage in export infrastructure: cost of exporting per container is €602 (35th cheapest globally)⁴¹.

Figure [3]: Destination of exports from Tunisia in 2010⁴²



Regarding private sector development, according to the World Bank/IFC Doing Business report (2010), Tunisia is ranked 30th in the list of 183 countries in terms of “Trading across borders”. Most export-oriented companies enjoy better access to credit and insulation from tax- and labour-cost enforcement. Trade regulation favours trade and companies working on export. The country has signed an association agreement with the European Union that led to a number of

³⁷ Source: Data World Bank, <http://data.worldbank.org/indicator/BM.KLT.DINV.GD.ZS>

³⁸ Source: APII <http://www.tunisianindustry.nat.tn/en/tissu.asp#Employment>

³⁹ Source: Data World Bank, <http://data.worldbank.org/indicator/SE.SEC.ENRR>

⁴⁰ Source: UNICEF http://www.unicef.org/infobycountry/Tunisia_statistics.html

⁴¹ Source: Pickard, Schweitzer – *Overcoming the Binding Constraint to Economic Growth in Post-Revolution Tunisia*- Harvard University- 2012

⁴² European Commission, Trade Office http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_122002.pdf

initiatives including: free trade area since January 2008, preferential trade agreements with North African and Middle-East countries, bilateral agreements establishing a free trade zone with Turkey, Egypt, Morocco, Jordan, Iraq and Libya and the Agadir free trade agreement between Jordan, Egypt, Morocco and Tunisia⁴³.

Box [3]: Trade agreements well in place⁴⁴

Geographically part of Africa but culturally more Mediterranean and Middle Eastern, Tunisia has extremely close ties with Europe. These ties have been reinforced by Tunisia's Association Agreement with the European Union (EU), leading to the creation a free trade zone for industrial products in January 2008.

A founding member of the WTO: Tunisia has concluded trade agreements with 60 countries, some of which provide for preferential trade arrangements, including bilateral Agreement with the EU, bilateral and multilateral agreements with the members of the Arab League, and an agreement with Turkey.

Greater Arab Free Trade Area (GAFTA): The executive program of the Convention on the Facilitation and Development of Inter-Arab Trade entered into force in January 1998; it is currently being applied by 17 of the 22 members of the League of Arab States. Consequently, Tunisia has granted duty-free access to all products originating from these 17 countries.

Arab-Mediterranean Free Trade Agreement ("Agadir Agreement"): On 25 February 2004, Tunisia, together with Egypt, Jordan and Morocco, signed a free trade agreement known as the Arab-Mediterranean Free Trade Agreement (or "Agadir Agreement"). Like GAFTA, the Agreement provides for the elimination of almost all customs duties and charges having an equivalent effect on the bilateral trade between parties.

Free Trade Agreement with EFTA: In December 2004, Tunisia signed bilateral free trade agreements on trade in non-agricultural products with the Member States of the European Free Trade Association (EFTA). Bilateral protocols of agreement with each of these countries on agriculture, fish farming and agri-food are annexed to these agreements.

Generalized System of Preferences (GSP): Tunisia benefits, on a non-reciprocal basis, from concessions granted by countries such as Australia, Belarus, Bulgaria, Canada, the Czech and Slovak

⁴³ Source: FIPA Tunisia http://www.investintunisia.tn/site/en/article.php?id_article=784

⁴⁴ Source: WTO, USA Department of Commerce (Doing Business in Tunisia 2012)

Republics, the European Union, Hungary, Japan, New Zealand, Poland, Russia, Switzerland, and the United States. In these countries, Tunisian exports are granted exemption from customs duties.

Many international donors are today present in Tunisia, with increasing activities in the last two years i.e. from 2010 to 2012 due to an openness of the government to political reform and economic liberalization. Main international donors are the World Bank, European Commission, UNDP, the African Development Bank and bilateral donors.

Box [4]: The Donor community in Tunisia

In 2011, Tunisia received 505 M€ net ODA (Official Development Assistance)⁴⁵ vs. 951M€ for Morocco and 160 M€ for Algeria. ODA is defined as « *Flows of official financing administered with the promotion of the economic development and welfare of the developing countries as the main objective, and which are concessional in character with a grant element of at least 25 percent (using a fixed 10 percent rate of discount). By convention, ODA flows comprise contributions of donor government agencies, at all levels, to developing countries (“bilateral ODA”) and to multilateral institutions. ODA receipts comprise disbursements by bilateral donors and multilateral institutions* ». ⁴⁶ However, despite the high amount of ODA received Tunisia is not considered as aid dependent, with net ODA received accounting for only 1.3% of GNI in 2010 vs. 4.2% in Sub-Saharan Africa region and 13.2% in Central African Republic ⁴⁷. It remains higher than MENA countries – 0.5% of GNI ⁴⁸ - but this difference needs to be reduced since other countries in MENA region, except from Morocco – 1.1% of GNI in 2010⁴⁹ - are not considered as safe and thus don't attract foreign donors.

The European Union promotes democracy in the country mainly through the bilateral European Neighborhood Policy (ENP) action plans. France is the largest bilateral donor in Tunisia with 230 M€ of gross ODA for 2010-2011 average, followed by EU institutions with 105 M€, Spain with 96 M€, Japan with 87M€, the AFESD (Arab Fund for Economic and Social Development) with 73 M€⁵⁰. Leading areas of interest for the donor community in Tunisia are infrastructure and services (almost 30%), multisector (26%) and education (20%)⁵¹.

The Tunisian government has also joined the Paris Declaration on Aid Effectiveness (2005) aimed at laying out a “*practical action-oriented roadmap to improve the quality of aid and its impact on development [by putting in place] a series of specific implementation measures and [establishing] a*

⁴⁵ Source : OECD Aid Statistics « Development Aid At A Glance – Statistics by Region »,2012 <http://www.oecd.org/dac/aidstatistics/1882353.gif>

⁴⁶ Source : OECD - *Glossary of Statistical Terms* - ODA

⁴⁷ Source : <http://data.worldbank.org/indicator/DT.ODA.ODAT.GN.ZS>, <http://datamarket.com/data/set/143q/net-oda-received-of-gni#!display=line&ds=143q!g4w=q.51.56.41&s=apj>

⁴⁸ Source : <http://data.worldbank.org/indicator/DT.ODA.ODAT.GN.ZS>

⁴⁹ Source : <http://data.worldbank.org/indicator/DT.ODA.ODAT.GN.ZS>

⁵⁰ Source : <http://www.oecd.org/dac/aidstatistics/1883155.gif>

⁵¹ Source : <http://www.oecd.org/dac/aidstatistics/1883155.gif>

*monitoring system to assess progress and ensure that donors and recipients hold each other accountable for their commitments”.*⁵²

Several foreign initiatives promote innovation in Tunisia. One of the most relevant being the Souk At-tanmia, an innovative pilot partnership between the African Development Bank, the British council, the United States of America and the public and private sectors and associations⁵³. The main objective is to foster innovative projects of young entrepreneurs.

The European Investment Bank (EIB) is one of the oldest and largest actors of the donor community in Tunisia. The Bank works closely with the public sector, which has a strong weight in the Tunisian economy. EIB invests mainly in large infrastructure and logistics projects (roads, railways, ports, transport, electricity production, transmission, downstream transmission of water and gas) but also in knowledge economy infrastructure projects. The Bank participated in recent knowledge economy projects, such as support in the construction of technoparks (including planning, strategic approach to construction, financing with lines of credit to Tunisian banks to finance loans to companies active in the construction of technoparks). EIB also provides funds to banks and leasing companies. The bank also provides technical assistance for projects that they finance. It is mostly limited to training and coaching, and is always project-related.

The World Bank and the African Development Bank are also main donors in the country. For instance, the World Bank has 401 M€ financed activities in 148 mapped locations, mainly in water, sanitation and flood protection (35%), agriculture and forestry (15%), public administration and justice (14%), energy (12%), finance (10%) and education (8%), the other 6% accounting for industry and trade, transportation and health (see figure [4])⁵⁴. The African Development Bank invested between 307 M€ and 770 M€ between 2009 and 2011 in Tunisia (see Figure [5]).⁵⁵

Whiteshield interviews with the donor community highlighted a series of stated obstacles to doing business in Tunisia, including:

- Lack of Venture Capital and lack of liquidity in the banking sector, which are both mainly the results of the "Ben Ali's era"
- Poor regulatory and legal framework to protect investors
- Challenging risk perception in the short term due to the Transition phase;

⁵² Source :<http://www.oecd.org/dac/aideffectiveness/parisdeclarationandaccraagendaforaction.htm>

⁵³ Source : <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Souk%20At-Tanmia%20Partnership.pdf>

⁵⁴ Source : The World Bank, Map of Development Projects in Tunisia , <http://maps.worldbank.org/mena/tunisia>

⁵⁵ Source :<http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/ADER%202012%20%28En%29.pdf>

- Governance challenges leading for companies to accept with apprehension funding from VCs and concerns over losing control of their companies.

- Historical experience with the SICARS has been unsatisfactory, however improving the ‘Fonds Commun de Placements à Risques.’

According to most donor community stakeholders in Tunisia, 2013 should be the year to launch Technical assistance and other BAS type activities to prepare the ground for wider private sector development investments.

Figure [4]: World Bank Projects in Tunisia, 2012 ⁵⁶

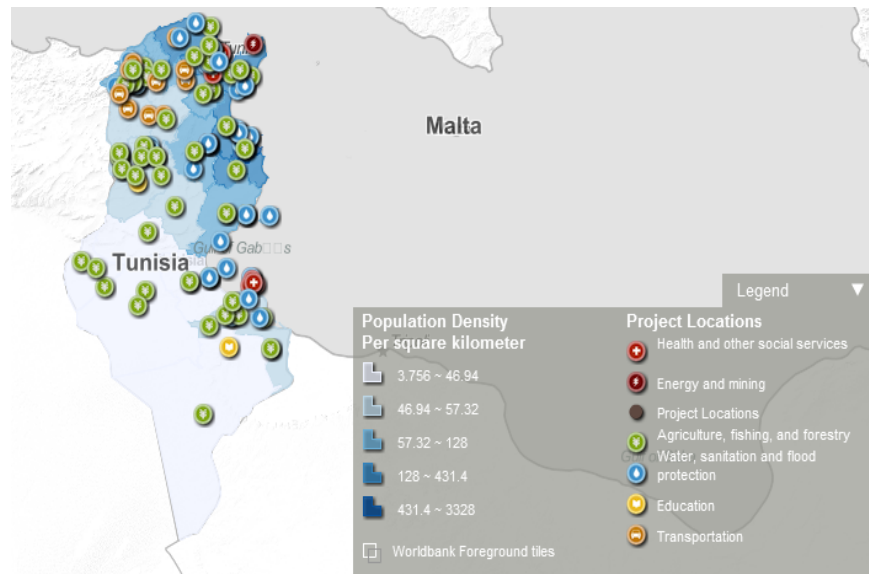
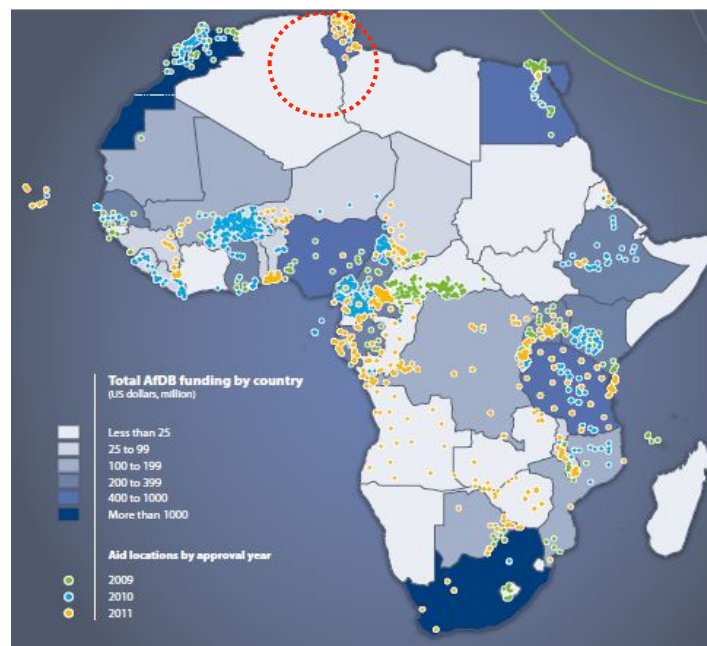


Figure [5]: African Development Projects in Tunisia vs. Africa, 2011 ⁵⁷



⁵⁶ Source : The World Bank : Map of Development Projects in Tunisia , <http://maps.worldbank.org/mena/tunisia>

⁵⁷Source : African Development Bank Group

www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-operations/ADER%202012%20%28En%29.pdf

The Government has increased its focus on innovation driven sectors: ICT, Electric and mechanic industry and Chemicals, supporting both on-shoring and off-shoring businesses.

According to the *Strategic Social and Economic Development Plan 2012-2016* (Box [5]) the economic strategy of the country is aimed at upgrading its historical industrial sectors, such as textiles and agro-business, and promoting the development of new sectors such as electronics, automotive, aeronautics, pharmaceuticals and ICT.

Box [5]: Strategic Social and Economic Development Plan of Tunisia 2012-2016:

Key areas of focus to support innovation⁵⁸

According to the above plan, the following areas are a priority for the country to support innovation: *“The reforms will be directed towards development of the national innovation system through the integration of innovation factor in the production process, which requires intensive use of technology and investment in human capital and the development of research and development system through the creation of clusters in promising sectors and the development of partnerships between universities, companies and research centers. In addition, creating technologic zones to attract investment in high technological value activities such as biotechnology, ICT, electronics industry, aircraft components and renewable energy.”*

Tunisian export-oriented industries, such as Textile or Electric and Electronic Industries (EEI), are facing strong competition from low labour cost countries such as China, India or Eastern European countries. To raise the competitiveness of national producers and boost innovation the State has introduced several measures, including the “Horizon 2016 plan” aimed at supporting the private sector efforts in three areas: R&D development policy, innovation incentives and creation of new technopoles. In 2010, framework for knowledge economy development was characterized by:

- *Developing R&D infrastructure:* 30 research centers, more than 139 laboratories and more than 638 research units in which almost 16,000 researchers are employed; Numerous incentives such as the Federated Research Programs or the young researcher incentive programs.

⁵⁸Source: Ministry of Finance Tunisia “Social and Economic program”, 2011

- *Increasing cooperation between private sector and research centers through incentives to stimulate innovation:* National Program of Research and Innovation; Valorization of Research Results; National modernization program for industry; PIRD (Premium of Investment for R&D); PTI (Priority Technological Investment).
- *Creating several competitive clusters* dedicated to the main traditional sectors (agriculture cluster in Bizerte, textile cluster in Monastir) and emerging sectors (ICT in Elgazala Technopark, EEI sector in Sousse).

Beyond horizontal strategies, the following sectors are actively supported by the State through different policies:

The ICT sector is positioned at the heart of the national development plan. Being ranked 50th in the *Global Information Technology Report 2012 (World Economic Forum)* with a 4.12 score (versus 91th place for Morocco and 118th place for Algeria), Tunisia leads the rankings in North Africa. The ICT sector development in the country is being led by a strong commitment of the government to boost the growth of this sector. According to the transition government: *“The development of services sector is a high priority that requires the need to accelerate the sector rehabilitation, liberalization of service activities and support services in promising areas of ICT and offshoring activities”*.⁵⁹

In order to develop the sector, a number of reforms were put in place including: modernisation of the digital infrastructure, support of the private sector, development of human capital through education reforms and Continuous Education and Training in the area of ICT.

“Infant industries” – Pharmaceutical and Automotive sectors – are relatively protected from international competition. Passenger cars and pharmaceuticals are the major categories affected by import restrictions. Importers have to request an allotment from the Government of Tunisia in order to receive an import license. Although there were announcements in 2011, that the quota would be abolished, the Tunisian government has not yet done so officially. Tunisia also continues to protect its domestic pharmaceutical industry. The Pharmacy Centre, a government entity, controls all pharmaceutical imports and applies the "correlation" system under which, upon request from a Tunisian pharmaceutical manufacturer, the import of a foreign drug similar to the one produced locally could be banned. The Government of Tunisia issued a decree officially dismissing the "correlation" system on December 31st, 2006. However, this decree is

⁵⁹ Source: Ministry of Finance Tunisia “Social and Economic program”, 2011

not retroactive; therefore pharmaceutical products on the correlation list prior to December 31st, 2006 are still banned for imports. In addition, imported goods in Tunisia are also subject to value added tax (VAT).⁶⁰

The Tunisian Association of Aerospace and Aviation Industries (GITAS) supports manufacturers and investors in the *Aerospace* branch. There were 33 member companies in 2012 (compared to 19 in 2009). GITAS is very active and present at all levels; its objective is three fold: (a) to promote exchanges and cooperation between companies of the aviation and aerospace sector located in Tunisia, (b) to develop a logistics network and an enabling environment (c) and encourage the establishment of new companies in the field⁶¹.

In order to develop the *Chemical sector*, several measures were implemented, such as incentives and increased collaboration between foreign and domestic laboratories, establishing clusters and developing infrastructures. Several foreign companies are investing in Tunisia – the Algerian company KIMIAL, the Saudi company AL Zamel Group, Indian companies GFCL and GSFC.

The government is stimulating *Offshoring*.⁶² With the promulgation of the Investment Incentives Code in 1993, strengthening the offshore regime, firms engaged wholly in export were eligible for numerous advantages, including:

- *Advantageous taxation*: no VAT for payments received from abroad, no tax on income, tax exemption for profits derived from export during the first 10 years, banking secrecy;
- *Ease of capital movement* with guarantee for transferring dividends in full (no tax on income is requested from the country of origin under the principle of Double Taxation). The taxation agreement has been signed with several countries in Europe - France, Belgium, Germany, Austria, Norway, Italy, Denmark, Sweden, Spain, UK, Poland, Switzerland, Netherlands and Malta-, with Arab countries – Morocco, Libya, Algeria, UMA, Egypt, UAE, Jordan, Iraq, Kuwait – and with Canada, Senegal, USA, Korea, South African, Iran and Mali⁶³;
- *Ease of doing business*: only one person needed to incorporate a company and registration in only 72 hours;

⁶⁰ Note: Tunisia's basic VAT rates are 18%, 12%, and 6%, with the majority of goods covered by the 18% rate. Source: WTO, USA Department of Commerce (Doing Business in Tunisia 2012)

⁶¹ Source: FIPA Tunisia: a performing aerospace supply chain <http://www.investintunisia.tn/document/573.ang.pdf>

⁶² Source : Foreign Investment Promotion Agency (FIPA)
http://www.investintunisia.tn/site/en/article.php?id_article=789

⁶³ Source : International Labour Organization 2011

- *Minimum requirements for opening business*: a minimum capital of only €500 to incorporate a business.

According to African Development Bank 2012⁶⁴, offshoring represented more than 48% of the manufacturing sector in 2011. The textile industry is largely dominated by the offshore sector (84% of textile companies); followed by electronics and electrics industry (65% of electronics and electrics-related companies). The offshore regime has successfully attracted FDI and contributed to developing a competitive manufacturing industry; 85% of companies' foreign participation are in the offshore regime, and 61% of them are wholly owned by foreigners. Most FDI inflows are under the offshore regime, while the onshore regime is relatively neglected.

Specific policy barriers need to be addressed much further including an opaque financial system and tax environment, low access to credit, lack of legal regulation (including property right, intellectual right, investment regulation), significant mismatch between higher education offer and private sector needs, inefficient offshoring strategy and State strategy yet to be developed and implemented further⁶⁵.

Policy barriers were first identified through primary research then validated with secondary research. Primary research conducted among Tunisian private and public stakeholders reveals the following:

A policy strategy potentially lacking vision in a transition context- “Macroeconomic instability” was the most cited barrier, by both public and private stakeholders. High scores given by private interviewees relate to instability due to the government transition phase, with corruption, crime, theft, disorder and economic and regulatory policy uncertainty singled out (as shown in figures [6] and [7] below). Public institutions which were interviewed tend to make reference to the general context of the recession and Eurozone crisis when mentioning macroeconomic instability as major barrier.

⁶⁴ Source: Tunisia Interim Country Strategy Paper 2012–2013 www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Catalogue%20Interim%20strategy%20Paper%20Anglais_Mise%20en%20page%201.pdf

⁶⁵ Source: Horizon 2016, FIPA, World Economic Forum, Ernst & Young

Figure [6]: Capability Survey 2012: Answers to the question related to barriers to the development of the knowledge economy. Question: What are the Barriers to innovation in Tunisia?⁶⁶

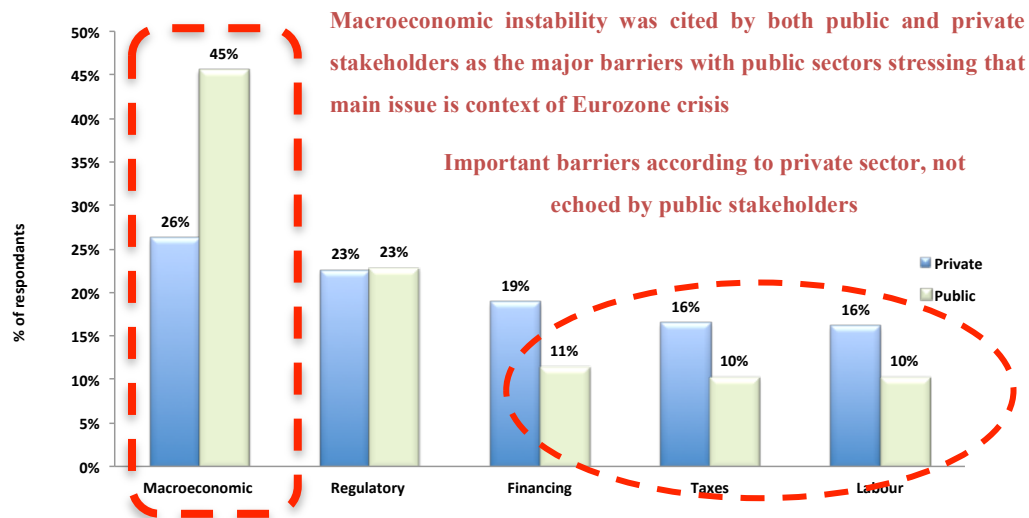
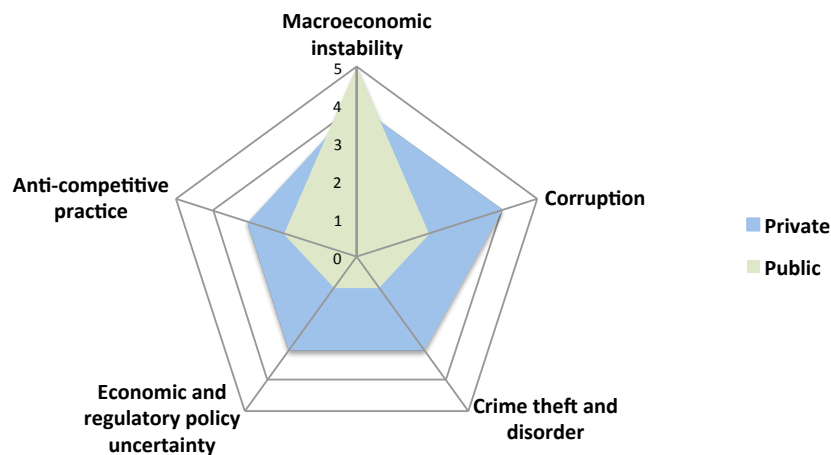


Figure [7]: Capability survey 2012 : Rating of major political environment barriers related to the development of the knowledge economy in Tunisia(1: not major barrier, 5: major barrier).⁶⁷



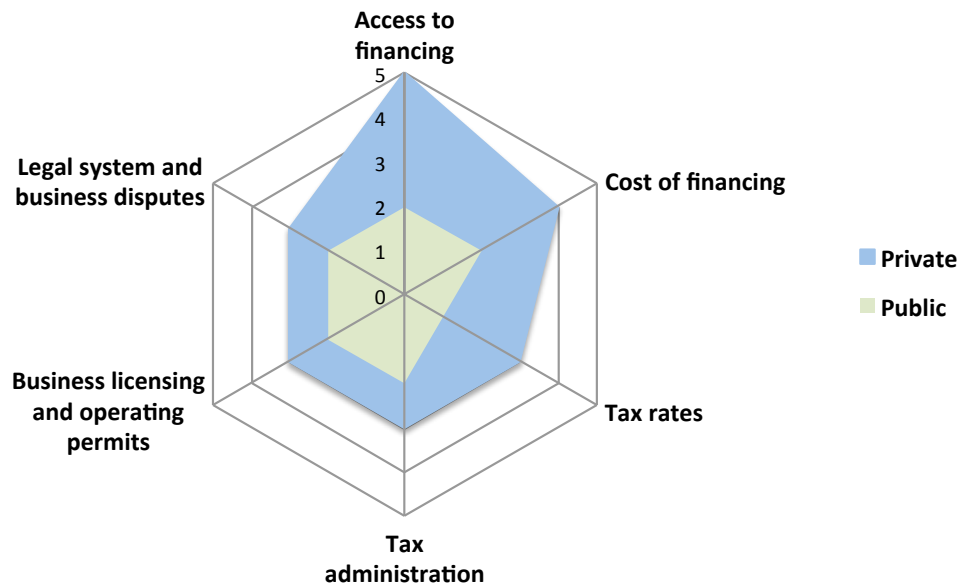
Difficult policy implementation: Both public and private sector interviewees agree on the fact that the regulatory environment still poses barriers for the development of the knowledge economy. Legislation needs to be updated to approach more closely international standards in

⁶⁶ Source :Capability survey 2012, Primary Interviews, Whiteshield Analysis

⁶⁷ Source :Capability survey 2012, Primary Interviews Whiteshield analysis

terms of trade policy, access to finance for innovative enterprises, intellectual property rights, and anti-competitive behavior.

Figure [8]: Capability survey 2012: Rating of major business barriers related to the development of the Knowledge Economy in Tunisia (1: not major barrier, 5: major barrier)⁶⁸



Access to finance is an important concern for the private sector. Financial barriers refer mainly to malfunctioning SICAR (Sociétés d’Investissement en Capital Risque). model that is blocking innovation instead of promoting it The majority of the Tunisian economy relies mainly on credit banking. Its limited capacity is a challenge, as credit loans are mainly provided to large projects rather than to entrepreneurship, and even less so to services. More specifically, financing after company creation seems to be a major challenge quoted by Venture Capital firms and start-ups.

Fiscal system needs to be harmonized and simplified to support innovation further: Tunisia made significant progress in this area by reducing its VAT and corporate tax rates (onshore corporate tax is 35% in 2012), nevertheless there is still room for improvement. Interviews and surveys conducted highlight that private sector interviewees consider the tax system in Tunisia as being a major barrier to innovation. Fiscal advantages to companies other than those specialized in

⁶⁸ Source :Capability survey 2012, Primary Interviews Whiteshield analysis,

offshoring need to be implemented to harmonize fiscal treatment between onshore and offshore, and lead companies to exit the “informal economy”.

Primary research findings were validated by the *secondary research* of existing literature, which reveals numerous barriers including *restrictive labour regulation, opaque commercial tax environment and banking sector inherited from the previous ‘regime’*.

Inefficient labour regulation remains a serious and limiting constraint to human capital development. There is a significant mismatch between the higher educational offer and market demands in terms of skills. Unemployment among tertiary educated people is more than fourfold higher than in OECD countries (23% versus 5%)⁶⁹.

The Global Competitiveness Report 2011-2012 reveals that firms in the country are dissatisfied with the soundness of banks (solvency and soundness of balance sheets). Tunisia is indeed ranked 84th out of 142 countries on this dimension. Moreover, high taxes disadvantage small and domestic oriented firms, while offshore and export oriented companies enjoy reduced taxes⁷⁰. The non-convertibility of the local currency can also disadvantage export driven companies.

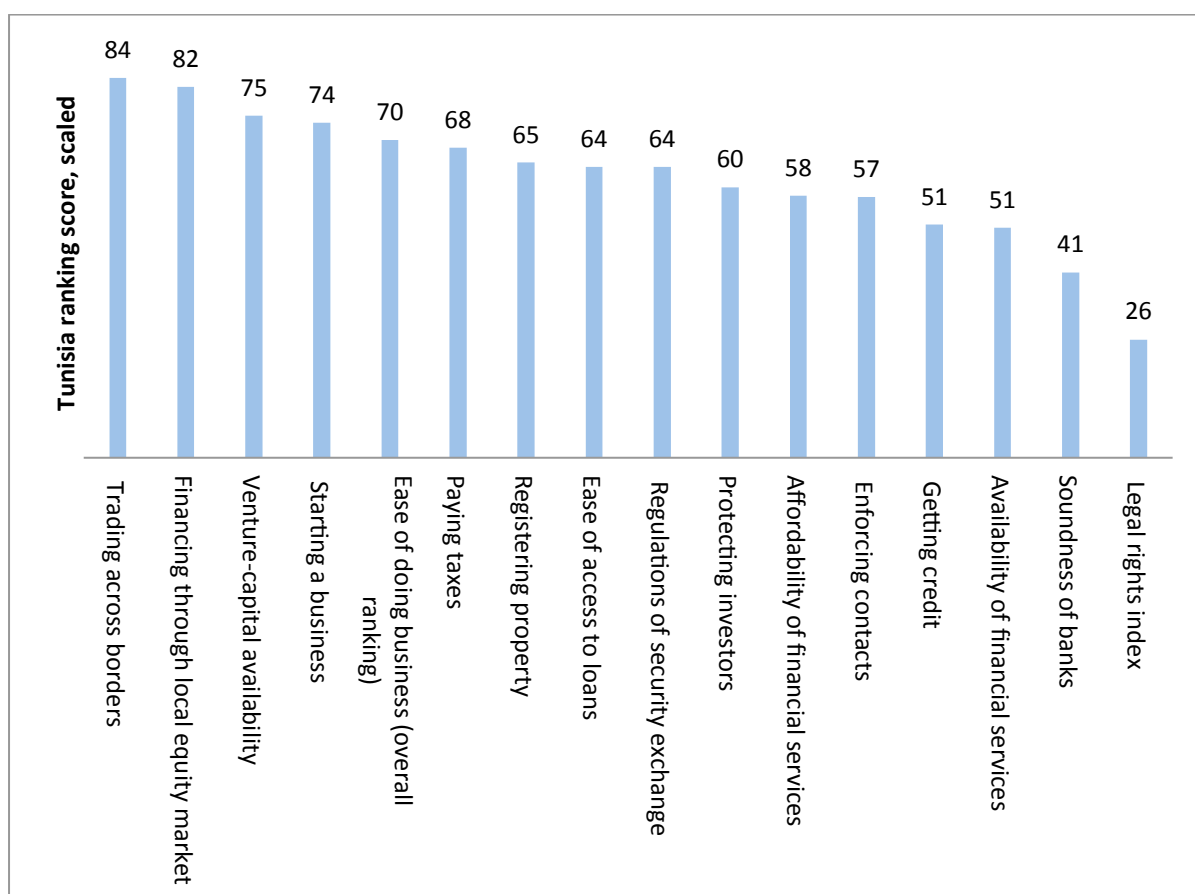
Large informal economy and anti-competitive behaviour: According to Pickard and Schweitzer, [2012], the informal economy represents an estimated 38% of Gross National Products (GNP) and 28% of GDP. The productive sector is largely controlled by the state. The World Economic Forum ranked Tunisia 105th among 142 countries by Legal rights Index⁷¹.

⁶⁹ Source: Economic research forum, Pickard Schweitzer – Overcoming the Binding Constraint to Economic Growth in Post-Revolution Tunisia , March 2012 – Harvard University, OECD Database, World Bank

⁷⁰ Source: Pickard, Schweitzer – Overcoming the Binding Constraint to Economic Growth in Post-Revolution Tunisia- Harvard University- 2012

⁷¹ Source: World Economic Forum, Global Competitiveness Report, 2011-2012 <http://www.weforum.org/>

Figure [9]: Key policy barriers in Tunisia in 2012 (100- the best position in the global ranking, 1 – the worst position)⁷²



Offshoring in the country, though supported by the State, is still focused on the low-end of the value chain. Offshoring companies rely mainly on a low-cost labour with limited skills. This approach is showing its limitations with the emergence of a new, educated and skilled generation of workers in the labour market. The impact of the special status granted to the offshore sector has been modest in terms of job creation and the quality of jobs (77,000 new jobs, most of them low-skilled, were created between 2004 and 2007, whereas 190,000 university graduates were entering the labour market for the first time)⁷³. The overall focus on offshoring has attracted attention of the policymakers in the post-revolution period. According to the 2012-2013 Government Interim Country Strategy Paper, the 2011 Arab revolution “served to expose the structural weaknesses of the Tunisian economy which continues to be characterized by a heavy

⁷² Source: World Economic Forum, Global Competitiveness Report 2011-2012 <http://www.weforum.org/>; Ease of doing business; World Bank/IFC Doing Business Project. <http://www.doingbusiness.org/>

Note : All indicators are scaled to [0 100] scale (100 - maximum)

⁷³ Source: Ministry of Higher Education Tunisia

dependence on traditional sectors of low added value and a sharp polarization between the offshore and onshore sectors”⁷⁴.

Investment policy getting much closer to the world standards: The government is applying to join the OECD Declaration on International Investments and Multinational Enterprises highlighting its willingness to engage serious reforms. However, obstacles remain to be addressed. For example, the first article of the Tunisian investment Code highlights the freedom to invest both for Tunisians and for foreigners. However, the code remains complex and provides a lack of transparency for investors. Another example relates to the real estate regime that presents a number of obstacles, particularly in administrative terms, and imposes restrictions on foreigners (e.g. access to land ownership for the agricultural sector). There is a need for increased transparency and regulation to support the knowledge economy.

Box [6]: Financial markets and access to finance: Developing a framework for innovation⁷⁵

The *Tunisian financial market had* only 58 enterprises listed by the end of 2012, most of them in the banking sector, which accounts for 70% of market capitalization. Total market capitalization reached 24% of GDP, with an average daily transaction volume of TND 10.7 million (compared with TND 7.2 million in 2009).

According to IMF 2012 “Tunisia: Financial System Stability Assessment”, *as of April 2012, there were 21 onshore banks, including three large state-owned banks with 37 percent of banking sector assets; three large private domestic banks with 28 percent of total assets; and six foreign-owned private banks with a 28 percent share. Of these, four large foreign banks (from France, Jordan, and Morocco), three are former state-owned banks, only one of which appears to have completed its restructuring. There are five small development banks, established partially with funds from the Gulf States, and enjoying universal banking licenses.*

The non-bank financial sector accounts for about 20 percent of all financial system assets in 2011. Tunisia has a small insurance sector, with 19 companies primarily focused on nonlife activities (85 percent of premiums) and annual premiums to GDP of about 2 percent. The equity and fixed-income

⁷⁴ Source: 2012-2013 Interim Country Strategy Paper, African Development Bank, 2011

⁷⁵ Source: WTO, OECD, Whiteshield interviews and analysis

*markets are still small, with a market capitalization equal to 24 percent of GDP, lower than in regional peer countries such as Jordan (112 percent)*⁷⁶

Foreign investors are allowed to invest in the Tunisian stock exchange: at the end of 2010 they held more than 20% of the total market capitalization. Tunisia has signed 53 bilateral agreements to promote and protect investment (33 of which are in force) that guarantee access to international arbitration for foreign investors. However, little attention has been paid to the mechanisms of interaction between local SMEs and foreign investors. There is a need for local supplier capacity-building with the help of the public authorities or the private sector and the publication of a database of enterprises to facilitate links between local and foreign enterprises.

Investment capital (or private equity) and Venture capital were introduced in Tunisia through regulations governing "fixed-capital investment companies" (SICAFs). This framework was reinforced in 1993 with the creation of "risk-capital investment companies" (SICARs). The sector now has more than 40 SICARs, 20 venture capital funds (*fonds communs de placement à risque, FCPRs*), and two start-up funds (*fonds d'amorçage*).

The Economic and Social Development Strategy 2012-2016 emphasizes the revitalization of the *Risk capital industry* in all segments (seed/venture capital, expansion capital, transfer/buyout and turnaround/mezzanine funds), and proposes an amendment to the investment capital law. That amendment would broaden and diversify the catalogue of investments, it would lower the tax burden, and it would prolong the term of investments.

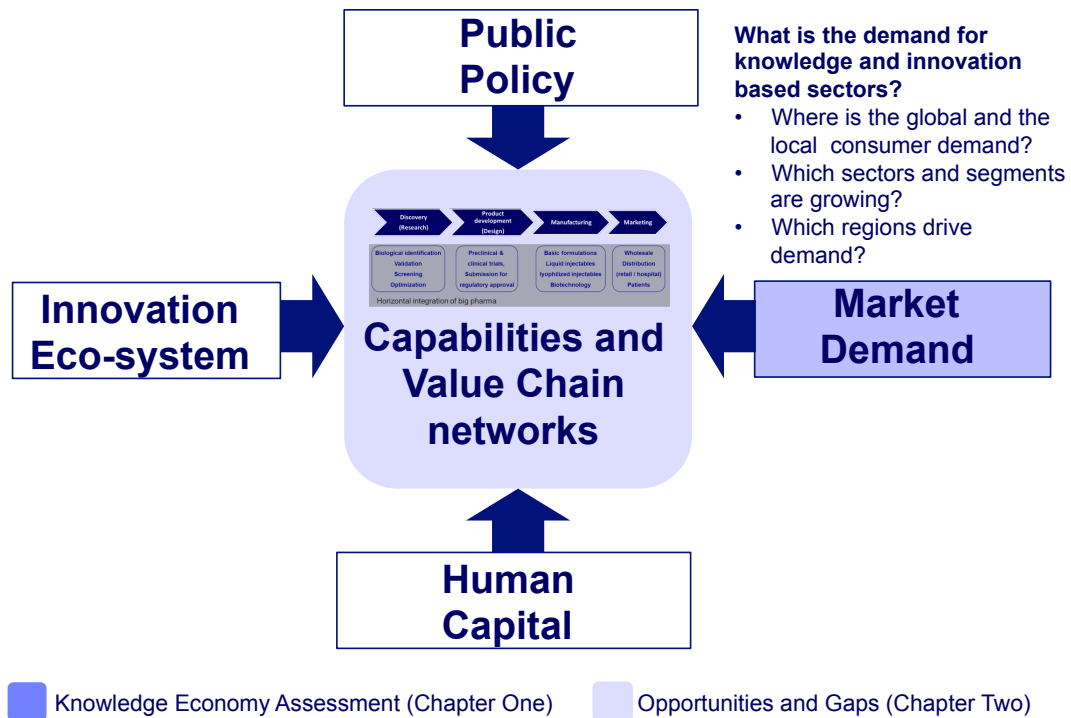
The first *Business Angels association* was created in June 2011.

Tax system includes a single tax on individual income and on corporate profits. Corporation tax is at 30% as a rule, 10% for companies operating in agriculture, handicrafts and small trades and 35% for a few limited number of sectors. Value added tax has a key rate of 18%, two reduced rates of 6% for critical products and 12% for some capital goods and services.

⁷⁶ IMF 2012 Tunisia: Financial System Stability Assessment
<http://www.imf.org/external/pubs/ft/scr/2012/cr12241.pdf>

1.2. Market demand: Growth in ICT, Electronics and pharmaceuticals sectors

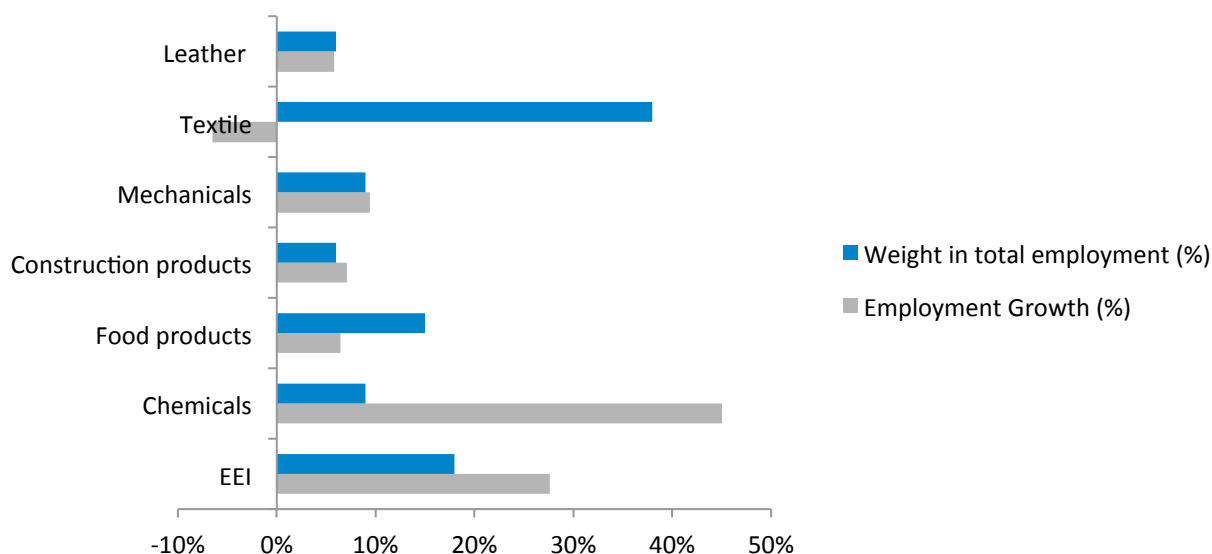
Figure [10]: Knowledge and Capability Development Framework - Focus on Market demand



Changes in the economic structure of the country reflect growing demand for knowledge-intensive and innovation driven production from both local and global consumers.

Traditional sectors are still leading in terms of employment: textile and food industries alone employ more than 50% of the working population in the country in 2012. However, the role of these sectors is decreasing. The *EEI and Chemical* sectors are taking the lead in terms of job creation: in the period 2007-2012 employment in Textile decreased by 6.5%, while employment in the chemical and EEI sectors increased by 45% and 28% respectively (Figure [11]). The *EEI sector* now is the second in terms of employment with a share of 18%, just behind the Textile sector.

Figure [11]: Dispatch of employment by industrial sectors in 2012 and evolution of employment over 2009-2012 ⁷⁷



Focusing on the knowledge intensive sectors, over 1997-2005 the Knowledge Economy Index for Tunisia⁷⁸ registered an average growth rate of 4.3% per year, ranked 80 in 2012 (+9 rank since 2011). Economic growth is driven by innovative and knowledge-intensive sectors, such as ICT, Electric, Electronic, Mechanic industries and Chemicals. Average monthly production of Mechanical and electrical industries in fixed prices in 2012 was 226% higher than that in 2000, while production of mining had decreased by 66%⁷⁹.

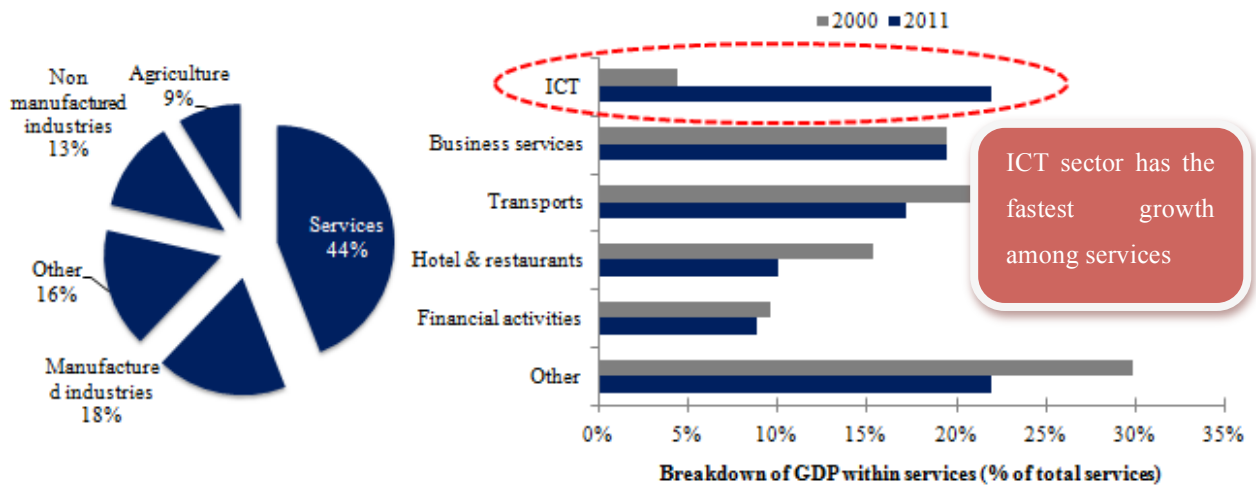
With services accounting for 45% of GDP, Tunisia is developing its information society. The *ICT sector* is the main ‘winner’ in terms of market growth. Over 2000-2011, the ICT sector's share in services has risen from 5 to 22%. . The *Global Information Technology Report* of 2010-2011 awarded Tunisia the label of “*The most competitive African country in the ICT and innovation domains*”.

⁷⁷ Source: APII, Sectoral Monographs – Chemical industries, EEI industries, Textile, Construction, Agri-food products – 2010: <http://www.tunisieindustrie.nat.tn/ft/doc.asp?mcat=4&mrub=81&msrub=216&dev=true>, Whiteshield Analysis

⁷⁸ Source: World Bank, http://info.worldbank.org/etools/kam2/KAM_page5.asp

⁷⁹ Source: National Institute of Statistics <http://www.ins.nat.tn/indexen.php>

Figure [12]: (left) Breakdown of GDP (current USD) in 2011 and (right) Breakdown of GDP in services in 2000 and 2011 ⁸⁰



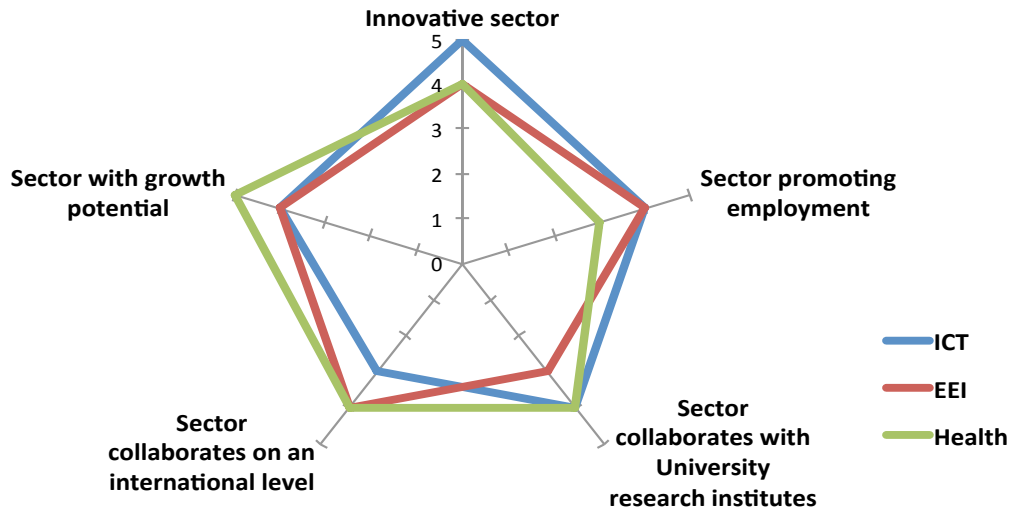
Based on Whiteshield primary research, which included the survey of private and public stakeholders in Tunisia, the ICT sector is also mentioned as the most innovative sector in the Tunisian economy. Furthermore, the sector is quoted as promoting employment and actively collaborating with universities and research institutes.

The EEI sector is also quoted as promoting employment and collaborating on the international level. However its innovative and growth potential is not considered to be significant.

The Healthcare sector is associated with the highest growth potential and characterized by strong collaboration in R&D on the local and international level.

⁸⁰ Source: INS Tunisia, Whiteshield Analysis

Figure [13]: Capability survey 2012 : Knowledge Economy Sector characteristics (1: the worst grade, 5: the best grade)⁸¹.



ICT on the top of the list, including security software, e-payment and telecom

Global demand in ICT products is characterized by falling prices, growing role of services and overall usage of Internet and Wireless.

The global ICT market has reached 2,238 B€ in 2007 and is increasing by more than 5% annually. The size of the EU’s ICT market was 739.3 B€ in 2007, making it the largest in the world⁸². The OECD Internet Economy Outlook 2012⁸³ reveals the following demand trends in the ICT sector:

- Wireless connections are the key source of recent Internet expansion, overtaking fixed broadband subscriptions in 2009. As of December 2011, the estimated number of wireless broadband connections in the OECD (667 million) was more than double that of fixed broadband subscriptions (315 million) and the growth rate for wireless subscriptions continues to increase.
- Broadband speed has improved while prices have fallen. Advertised speeds of DSL and cable broadband increased annually by 32% and 31% respectively in OECD countries over 2008-11, while prices declined by 3% and 4% respectively.

⁸¹ Source: Capability survey 2012, Primary Interviews, Whiteshield analysis

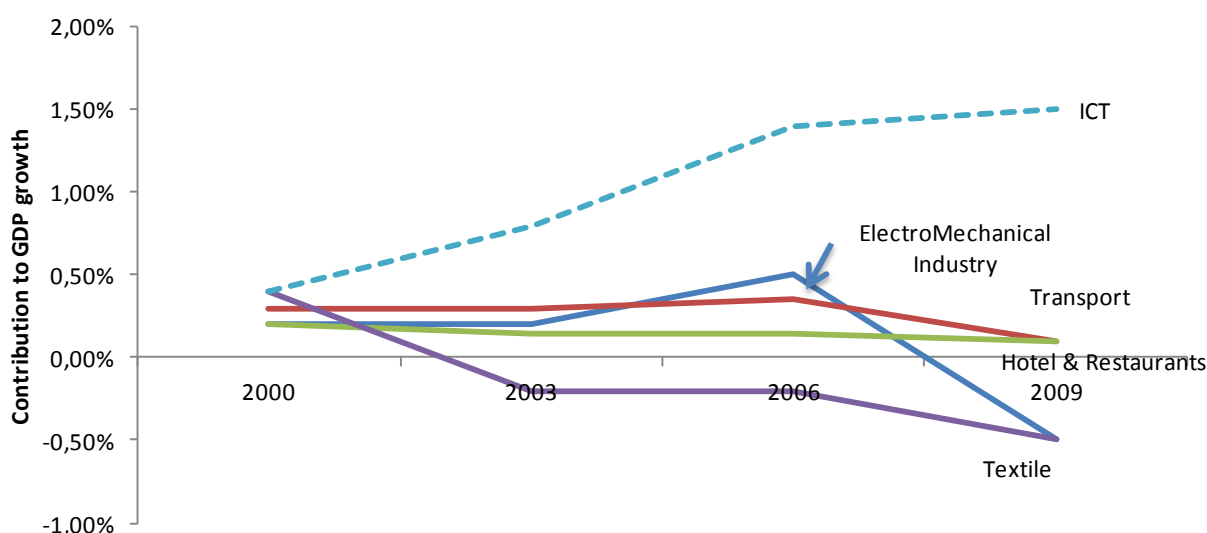
⁸² Source: European Information Technology Observatory, 2008

⁸³ Source: OECD Internet Economy Outlook 2012, <http://www.oecd.org/sti/interneteconomy/internet-economy-outlook-2012-highlights.pdf>

- The number of mobile phone subscriptions worldwide has more than doubled since 2005 and tripled in non-OECD countries. Tablet PCs and smartphones are making computers ubiquitous while cloud services and mobile Internet are enabling “everything/everywhere” data access, thus paving the way for new services and applications.
- In 2003, less than four out of ten companies had broadband access in the EU15; by 2009, this proportion had increased to nine firms out of ten. At the end of 2011, nearly all companies in the OECD countries were connected to the Internet. In two-thirds of the OECD countries, more than 95% of the companies use the Internet, with only a small proportion of the smallest businesses not yet connected; in 2010, only 5.7% of small firms (10-49 employees) in the EU25 were not accessing the Internet.
- The Internet has also become a vital tool to help match available workers with jobs: in 2010, an average of 17% of Internet users reported using the Internet in a job search.

Tunisian ICT sector growing in line with the increased local and global demand. The ICT’s sector share of the country’s GDP rose from less than 3% in 1997 to 10% in 2011, outperforming all other sectors by contribution to economic growth (Figure [14]). Its share in total employment has increased from 8% to 12% over 2006-2011⁸⁴.

Figure [14]: ICT contribution to economic growth in 2000-2009, Tunisia⁸⁵



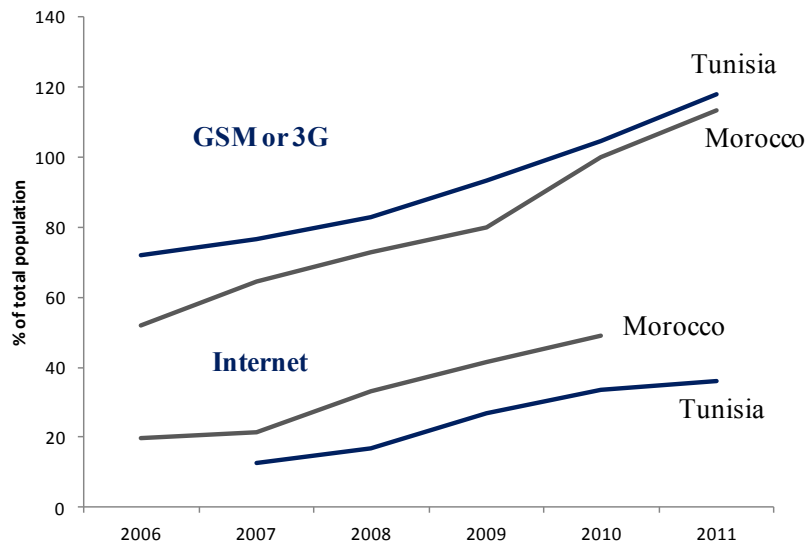
Growing local demand for ICT sector products is supported by the increased percentage of population having GSM, PC and using Internet (see Figure [15] below). Telephone density has

⁸⁴ Source: IDC CEMA Black Book 2011,

⁸⁵ Source: 2012-2013 Interim Country Strategy Paper, African Development Bank, 2011

also increased from 84.5% in 2006 to 127.4% in 2011⁸⁶, PC penetration rate has increased from 7.9% in 2006 to 30% in 2011⁸⁷ and the population using Internet has increased from 410 thousand in 2004 to 3.6 million people in 2010⁸⁸.

Figure [15]: Evolution of GSM, 3G and Internet penetration among Tunisian and Moroccan population.⁸⁹



The ICT sector in Tunisia includes companies active in software development, hardware reselling and integration, cross-functional service providers and telecom operators. Demand from European markets has also led to the development of an important Information Technology Outsourcing (ITO) market.

Figure [16]: ICT Sector overview⁹⁰

Market Size	Employment	Key players	ISO Certification
Total size: 4.8 B€(2011)	50.000 (2011)	3 Telecom Companies. 84 IT companies in (Elgazala) 9 IT companies in the Get'IT offshoring association 11 IT companies in the TACT association	In line with the national average of 25%. ⁹¹

⁸⁶ Source: Ministry of Information and Communication Technologies Tunisia (Mincom)

⁸⁷ Source: MincomTunisia, 2012

⁸⁸ Source: Internet World Stats <http://www.internetworldstats.com/africa.htm#tz>

⁸⁹ Source: MincomTunisia

⁹⁰ Source: Whiteshieldprimary research, WTO, data triangulation. Note: Divona Orange was granted license in 2009 and with this new competitor; the telecommunication sector will undergo changes that will affect its price and quality strategy.

⁹¹ Source: Résultats de la septième enquête sur le Programme de Mise à Niveau: http://www.pmn.nat.tn/resultats-septieme-enquete-pmn_296

The Telecom segment (Fixed Voice and Data, Wireless Voice and Data) represents 66% of the Tunisian ICT sector, another 24% account for Hardware (mainly, reselling of servers, PC, tablets and monitors). Software, services and ITO are rather small compared to the former two segments.

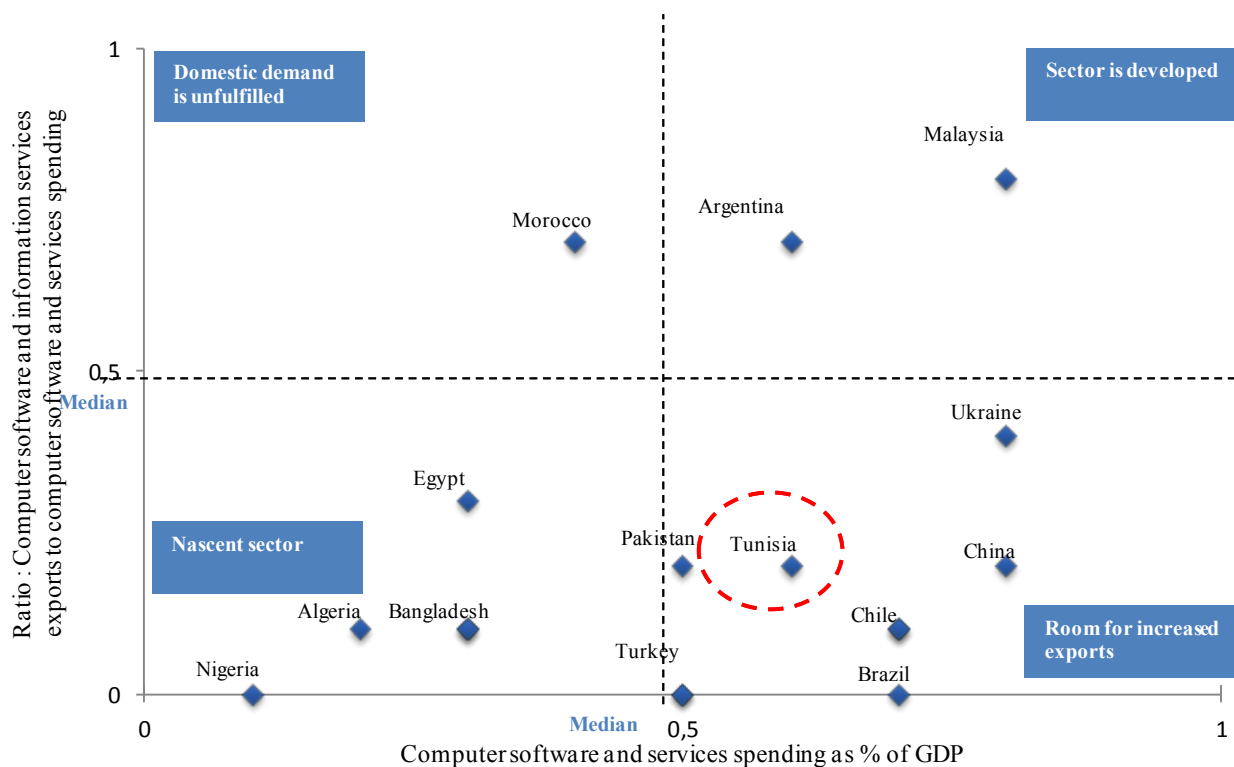
Figure[17]: Key segments of ICT sector in 2012 ⁹²

Segment share	Products	Key Players
Telecom: 66.5%	Fixed Voice Fixed Data Wireless Voice Wireless Data	Tunisie Telecom Tunisiana Orange
Hardware: 24.1%	Hardware: Servers PCs Tablets Monitors	Prologic 3i
Services: 4.2%	IT Consulting IT Training Set-up and Installation Support services Storage Systems Hardcopy peripherals Networking equipment Mobile phones	3S One-tech Business Solutions Telnet
Software: 1.7%	Enterprise Application Software. Mobile Solutions e-Payment/Security	Vermeg Oxia-Group
Offshore IT Services (ITO): 3.5%	Content Development & Management	Cynapsys Focus

⁹² Source: Primary Interviews, Whiteshield triangulation, IDC, Gartner

The fastest growing segment in the ICT sector is Hardware with a Compound Annual Growth Rate (CAGR) of 10%, followed by IT and Services (CAGR of 9% and 7% respectively). Software and Telecom are falling behind with CAGR of 5%⁹³. Software and services sub-segments, although rather small in Tunisia, show interesting potential for further growth. Though computer software and services spending to GDP ratio is rather high, export to spending ratio in Tunisia is below the median for its peers, which indicates room for increased export.

Figure [18]: Software and services sub-segments in Tunisia vs. world in 2012⁹⁴



Electric and Electronic Industry (EEI) incorporated into the world Automobile and Aerospace supply chains

The EEI is an important supplier of the world Automobile and Aeronautics industries. The global Automotive and Aeronautics industries are characterized by the presence of a limited number of large international vehicle manufacturers and integrators of systems and modules, as well as

⁹³ Source: IDC CEMA Black Book 2011

⁹⁴ Source : UNCTAD Information Technology Report 2012

several suppliers of components and raw materials. The industry value chain is characterized by a structure in “tiers”. Original equipment manufacturers (OEMs) supply finished components to assemblers and automakers, who are responsible for the assembly of the final product and selling the vehicles under their brand names. Along the value chain, suppliers are ranked in terms of the complexity of the products they manufacture. Recent trends on the market are modularization and outsourcing an increasing part of the vehicle to suppliers.

In the automotive segment, the world market for automotive components is growing. According to the KPMG Global Automotive Executive survey 2012, Electric component suppliers are expected to play a significant role over the next fifteen years.

In Tunisia, strong industrial push but also market demand initially supported by Foreign Investors. Tunisia’s policies in the 90s have led to the development of a strong Electrical and Electronic sector, providing semi-finished (Cables, Electrical distribution materials, Batteries) and sometimes finished components (Embedded electronics for industrial use in the automobile, aeronautic and medical sectors, Aeronautical wiring Equipment and aeronautic systems) to clients in the Auto and Aeronautics industries mainly in Europe. Some of the Tunisian suppliers have become regional players in Africa and Europe, as it is the case with the Coficab group and Chakira Cables. This resulted also from Foreign Direct Investors with companies like STMicroelectronics entering the market and growing since the 90s. Tunisia has already become a preferential EU partner, being one of the top 10 bundles and cables exporting countries.⁹⁵ On November 21st, 2012, Bombardier Transport group signed a partnership agreement with SICOR-Tunisia⁹⁶ providing for conception and production of cables for trains in Tunisia⁹⁷.

The EEI' market size represents 2.2 B€ with a CAGR of 16% in 2007-2011. Overall, about 350 firms employing 10 workers and more are currently active in this area, with 60% in electric subsector and 40% in electronics and household appliances. 92 companies act directly as electric and electronic suppliers for Automobile industry, 55 companies work for Aeronautics industry.

⁹⁵ Source: Horizon 2016, FIPA

⁹⁶ Note: Tunisian branch of French Sirail group (specialised in cable for industry, notably for railways sector)

⁹⁷ Source: The foreign Investment Promotion Agency

http://www.investintunisia.tn/site/en/detail_news.php?id_article=802&id_news=518

Figure [19]: EEI market in Tunisia in 2012 ⁹⁸

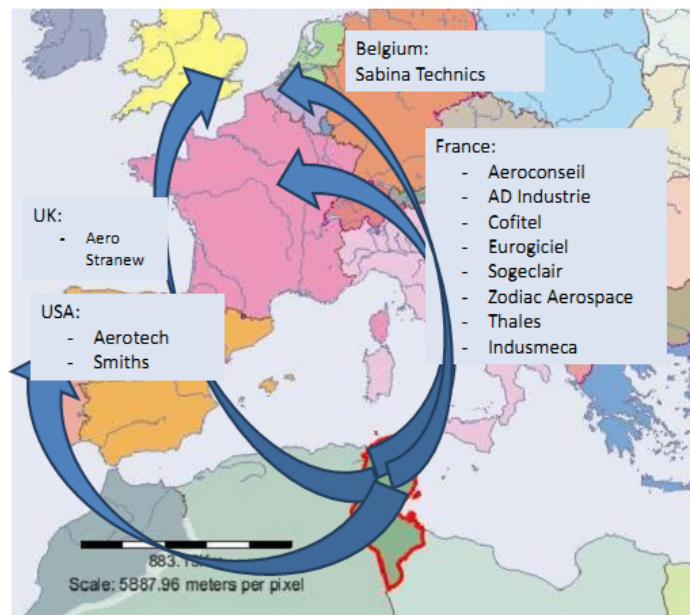
Market Size	Products	Employment	Number of Companies	Key players	ISO Certification
Total: 2,2 B€ Electrical Components: 924 M€ (2010) Electronics: 1,03B€ (2010) Other sub- segments: 194 M€(2010)	Cables Electrical distribution materials Measurement and control instruments Batteries (for variable use) Generators Embedded electronics for industrial use in the automobile, aeronautic and medical sectors.	Total: 65 100 people (2010), 86% hired by totally exporting companies	Total: 350 companies with more than 10 workers	Coficab Bosch Valeo Optelec Radiall Socomec Cofidur Zolner Kaschke Somfy LacroixElectronique Chakira	21% of the sector.24% undergoing the certification process in 2010. ISO 9001, ISO 14001, ISO TS 16949 ISO 18001 Valeo 100, QS 9000 and VDA 6.1

The segment related to electric and electronic equipment for the Aerospace industry highlights a strong potential for further growth. According to FIPA, export of aircraft components accounted alone for 92M€ in 2012 (two thirds of the total production in the sub-sector). Exported production includes electrical sets, electronic components, aerospace equipment and systems, wiring harnesses, wiring, assembly of electronic subsets and software surface treatment⁹⁹.

⁹⁸ Source: Primary Interviews, APII: *Sectoral Monographs – EEI industries –2010* http://www.tunisieindustrie.nat.tn/fr/download/CEPI/mono_iee.pdf; Tunisian Foreign Investment Promotion Agency (FIPA)

⁹⁹ Source: FIPA Tunisia <http://www.investintunisia.tn/document/573.ang.pdf>

Figure [20]: Tunisian Aerospace export map, 2011¹⁰⁰



France is the main destination for Tunisian exports in the aeronautics sector. Most of the 55 suppliers installed in Tunisia are either headquartered in France or supply components to French Aeronautics players. Moreover, Tunisia has attracted investments from other countries, including the US and the UK, yet mainly focusing on the European exports (Figure [20]).

The sector is developing rapidly and enhancing its international network:

In February 2009, Safran, the world leader in the field of propulsion and onboard aviation systems, concluded a partnership agreement with the Tunisian high-tech engineering company Telnet for the establishment of a production unit attached to the Aerolia plant.

In June 2009, Bourget Aerospace Show in Paris, Tunisia concluded a partnership agreement with Dassault Systems to train and develop skilled Tunisian engineers in the field of software development for aeronautics and the automotive sector.

In July 2009, Aerolia announced an investment plan of around \$40 million for the next five years in its new factory in Tunisia and disclosed the names of four new subcontractors that will be joining the company in the next few months: Figeac Aero, Mécahers, Mécanyvois and Corse Composites.¹⁰¹

¹⁰⁰ Source: Primary Interviews, Groupement des Industries Tunisiennes Aéronautiques et Spatiales (GITAS) – Companies List : <http://www.gitas.org/en/membre>

¹⁰¹ Source: Doing Business in Tunisia: 2012 Country Commercial Guide for U.S. Companies <http://photos.state.gov/libraries/tunisia/231771/PDFs/2012%20Tunisia%20Country%20Commercial%20Guide.pdf>

The European aerospace group EADS has chosen Tunisia to establish its fourth site specializing in the construction of aircraft components and its first outside Europe after those of Meaulte, Saint Nazaire and Toulouse¹⁰². A subsidiary of EADS, the Aerospace Park Aerolia, is located in the southern suburbs of Tunis on the territory of Aeropole in El Mghira. The site is an integrated industrial platform covering an area of 200 hectares and dedicated exclusively to the aerospace industry.

Pharmaceutical sector: Strong potential yet not fully exploited

Globally, the sector is growing steadily above GDP. According to the World Bank Guide for Investors in Private Health Care in Emerging Markets, in the countries belonging to the Organization for Economic Cooperation and Development (OECD), between 1960 and 2006 the annual growth rate in the health care sector averaged 2 percent more than GDP. The average global annual growth in pharmaceutical sales (an important marker of overall health care spending trends) is expected to reach 6 percent by 2014, resulting in sales worth €846B. The sector growth is supported by strong demand in Pharmaceuticals and Healthcare. According to the World Health Organization (WHO), in 2012 health expenditures worldwide amounted for US\$ 6.5 trillion, with 85% being spent in the OECD countries¹⁰³. In MENA, in 1995-2005 the Compound Annual Growth Rate (CAGR) of Health Care Spending was 5.8%, above the world average of 3.6%. Based on the European Intelligence Center (EIU) forecasts, in 2010-2014 health expenditures will increase by more than 50 percent in the transition economies of Eastern and Central Europe, 40 percent in the Middle East and Africa, 40 percent in Asia and Australasia, and 35 percent in Latin America¹⁰⁴.

Pharmaceutical sector in Tunisia is not fully meeting local demand and has significant room for growth: The Tunisian pharmaceutical sector is relatively small with the size of 398M€ in 2010, which represents only 5% of total production in the chemical industry and 1% of export of chemicals. However, in 2009 18% of all chemical enterprises (45 companies in 2009) specialized in Pharmaceuticals (versus only 3 companies in 1980), which indicated high potential

¹⁰² Source: FIPA, Tunisia: a performing aerospace supply chain <http://www.investintunisia.tn/document/573.ang.pdf>

¹⁰³ Source: WHO <http://www.who.int/nha/atlas2.pdf>

¹⁰⁴ Source: World Bank Group

https://www.wbginvestmentclimate.org/toolkits/upload/Guide_for_Investors_in_Private_Health_Care_in_Emerging_Markets_RESIZED.pdf

for further growth¹⁰⁵. High demand in Pharmaceuticals is also reflected by relatively high per capita annual expenditure on health (243\$ in 2009, compared to 181 for Algeria, 152\$ for Morocco and 114\$ for Egypt)¹⁰⁶.

In 2012, there were 56 production sites (28 for human medicine, 6 for veterinary drugs, 22 specialized in medical devices (50% being exporting companies) in 2012¹⁰⁷. Access to healthcare has been improving with domestic consumption of pharmaceuticals growing by 16.7% yearly from 2005 and 2010 and pharmaceutical production rapidly increasing to meet domestic demand. The coverage of market needs in medicines through local production has increased from 14% in 1990 to 45% in 2010¹⁰⁸. Import of medicines is still 15 times higher than export, and only 5% of Pharmaceutical production is being exported.¹⁰⁹

There are between 20 and 25 foreign companies in the market, including Pierre Fabre, which is in a joint venture with Tunisian SIPHAT, Bayer Schering, Leiras, OrionFarnos, Orion Pharma and Pfizer and Santena. France used to dominate pharmaceuticals imports with more than 80% share, but the number has now dropped below 60%. An important French partner is Sanofi¹¹⁰.

Growth in the Pharmaceutical sector is driven mainly by production of generics (CAGR of 26% over 2004-2007). In 1999, generics represented 21% of local pharmaceutical production in Tunisia, and by 2007 their share achieved 51%¹¹¹. In 2010 share of generics already accounted for 61% of the market for medicines¹¹².

The segment of medical services (health services, health tourism, medical education) is growing and attracting more investments and attention globally. In 2010, about 140,000 foreign patients were hosted in Tunisia for medical care: plastic surgery, orthopedics, ophthalmology, dental care and cardiovascular surgery, not to mention those who come for hydrotherapy and thalassotherapy. The public sector in Tunisia has about 2,000 basic health centers, 109 district

¹⁰⁵Source: Agency for Promotion Industry and Innovation, Chemicals industries Monograph, 2010

http://www.tunisianindustry.nat.tn/FR/download/CEPI/mono_ich.pdf

¹⁰⁶Source: World Health Organisation <http://www.who.int/nha/atlas2.pdf>

¹⁰⁷United Nations Industry Development Organisation (UNIDO), The Pharmaceutical industry in Tunisia, 2012 http://www.unido.org/fileadmin/user_media/UNIDO_Worldwide/Africa_Programme/BOUJBEL-Addis-Pharma-4June2012.pdf

¹⁰⁸Source: UNIDO, AU-UNIDO conference on economic diversification and manufacturing in Africa, 2012

¹⁰⁹Source: Agency for Promotion Industry and Innovation, Chemicals industries Monograph, 2010 http://www.tunisianindustry.nat.tn/FR/download/CEPI/mono_ich.pdf

¹¹⁰Source: UNIDO, The Pharmaceutical Industry in Tunisia, 2012

¹¹¹Source: NejiaYacoub "The Tunisian Pharmaceutical sector in transformation: inventory of fixtures and innovation prospects", 2008

¹¹²Source: UNIDO, The Pharmaceutical Industry in Tunisia, 2012

hospitals and 33 regional hospitals, while the private sector includes 75 mono or multidisciplinary clinics and 5,450 medical practices¹¹³.

Figure[21]: Pharmaceutical sector structure:¹¹⁴

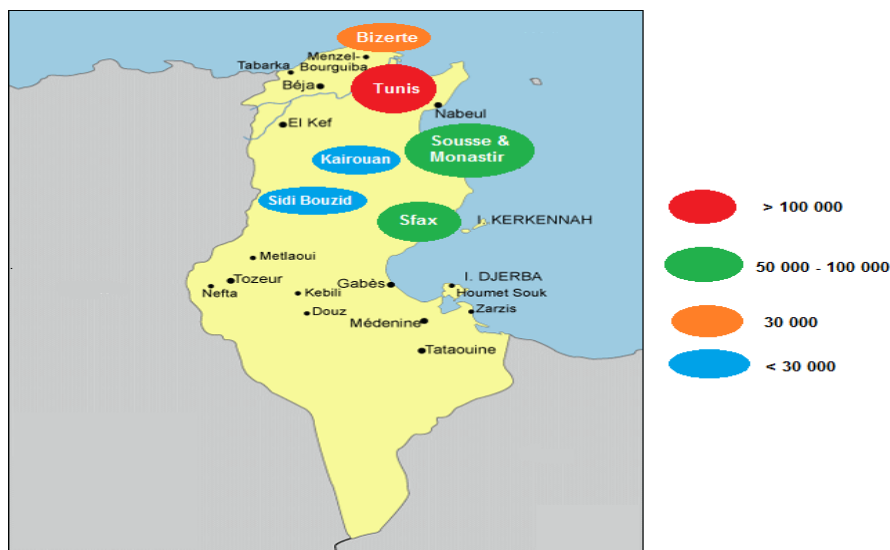
Segments of Pharmaceutical Industry	Size and employment in industrial segment	Clinic services, Public sector	Clinic services, Private sector	Structures	International laboratories	ISO
Human Medicines: 22 production sites, 61% - generics, 49% - originator medicines	Size: 398M€ (2010) Total employment - 5500	2,058 basic health centers 24 groups of basic health 109 district hospitals 33 regional hospitals 21 public health institutions (CHU) 6 specialized centers	75 mono or multidisciplinary clinics 5,450 medical practices 1,808 dental practices 1,800 dispensaries	<ul style="list-style-type: none"> •The Directorate of Pharmacy and Medicine (DPM) •The National Laboratory of Drug Control (LNCM) •The National Drug Safety Monitoring Centre (CNVP) •The Department of Pharmaceutical Inspection (DPI) •The National Agency of Sanitary and Environmental Control (ANCSEP) 	Sartorius Pierre Farbe Sanofi aventis Pfizer CAIR Igl Hemodia GlaxoSmithKline Baxter -Bristol-Myers Squibb	26% of the companies are certified (2010)
Medical Devices: 22 companies						
Veterinary drugs: 6 companies						

Territorial demand: clear regional segmentation of the country with coastal part and Tunis driving the knowledge economy.

¹¹³ Source: UNIDO, The Pharmaceutical Industry in Tunisia, 2012

¹¹⁴ Source: Agency for the Promotion of Industry and Innovation, Press Sources, 2012

Figure [22]: Number of private companies by region, 2010 ¹¹⁵



As a whole, the East Coast is better off than regions in the West and the South. According to the African Development Bank *Tunisia: Interim Country Strategy Paper 2012-2013*¹¹⁶, population and economic activity are mainly concentrated in the North-East (Tunis Governorate) and Centre-East (Sfax Governorate), given that 75% of off-farm jobs are found in the coastal area. Companies, functional clusters, and offshoring locations are also operating mainly in the coastal areas and in the capital. According to the National Institute of Statistics data¹¹⁷ on private companies' distribution, Northeast and Central-East regions of the country alone account for 80% of employment in manufacturing and 67% of employment in ICT. In some sectors territorial segmentation is even more distinct, for example, in chemicals 90% of companies are located in the North East and Center East of the country. As a result, there is a significant variation in average consumption and poverty from one region to another. This segmentation is one of the major barriers to the development of Tunisian economy,

Although the government has put in place a number of incentives and policies to address this issue, it has yet to improve the basic infrastructure of these rural regions, that are often still behind the level of development of costal zones. The poorest regions were neglected by the authorities, with coastal areas receiving 65% of public investment over the last decade. The Mid-West is the poorest region in terms of public services (health and education), as reflected in the number of inhabitants per pediatrician and youth illiteracy rate. In 2000, whereas the poverty

¹¹⁵ Source: National Institute of Statistics <http://www.ins.nat.tn/indexfr.php>

¹¹⁶ Source: Tunisia Interim Country Strategy Paper 2012–2013 www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Catalogue%20Interim%20strategy%20Paper%20Anglais_Mise%20en%20page%201.pdf

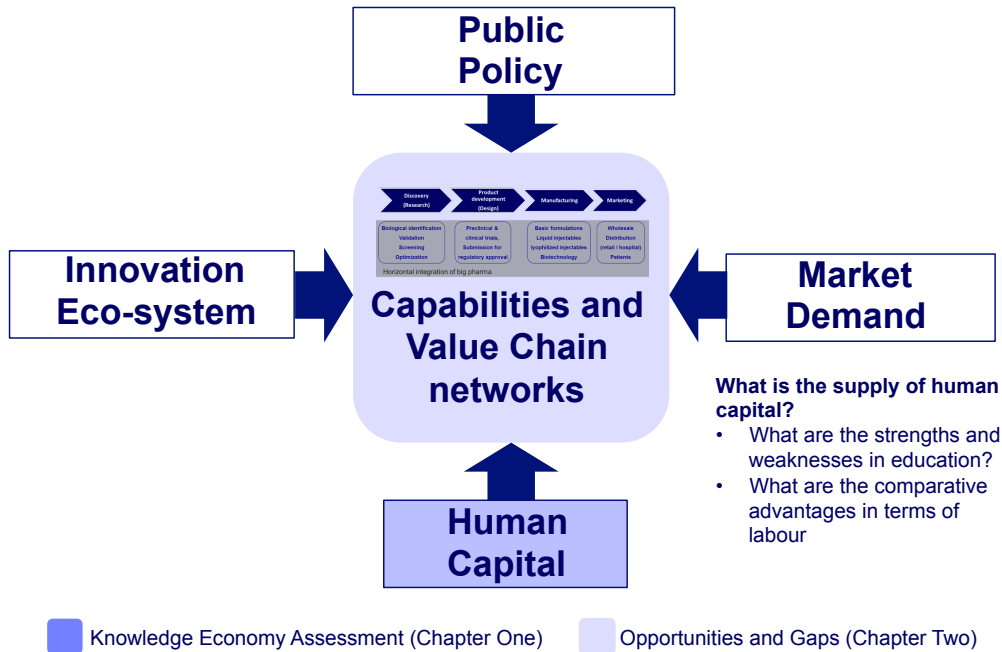
¹¹⁷ Source: National Institute of Statistics <http://www.ins.nat.tn/indexfr.php>

index (national average) stood at 18.4%, it actually varied from 6.9% in the Tunis district to 30.8% in the Mid-West. Similarly, unemployment is particularly acute in the hinterland. On average, since 2004, the unemployment rate is above 22.6% in the Jendouba, Le Kef, Kasserine and Gafsa regions¹¹⁸.

¹¹⁸ Source: Tunisia Interim Country Strategy Paper 2012–2013 www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Catalogue%20Interim%20strategy%20Paper%20Anglais_Mise%20en%20page%201.pdf

1.3. Human capital development: Strong basis to innovate yet skills gaps

Figure [23]: Knowledge and Capability Development Framework - Focus on Human Capital



Main problems to address are low participation in the workforce (especially among women) and high unemployment (especially among young people with tertiary education).

Country is highly competitive in human resources: young population with high educational level and low labor cost...

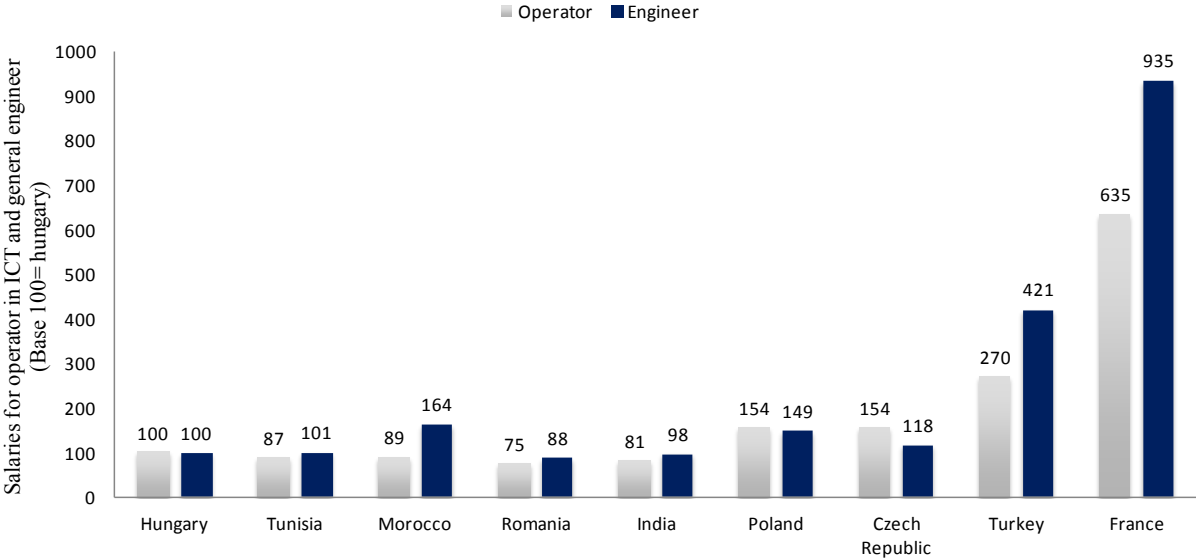
Tunisia is at the peak of its demographic window of opportunity with the majority of the population in their twenties and below. Thanks to high and sustained budget spending on education, Tunisia has made significant achievements in education since the early 1990. According to the FIFA report “New Tunisia, new opportunities”¹¹⁹, 97 % of the youth in Tunisia attend school. There are in total 365,000 students, 61% of whom are women. 33% of students are oriented towards computer science. 65,000 graduates of higher education enter the job market annually. According to the WEF Global Competitiveness Report 2011-2012, Tunisia is ranked 41st globally by the quality of its public education system and 18th by the quality of its education in math and science.¹²⁰

¹¹⁹Source: Agency for the Promotion of Industry and Innovation <http://www.investintunisia.tn/document/590.pdf>

¹²⁰Source: 2011-2012 Global Competitiveness Report (WEF).

Low labor costs along with the high quality of workforce give the country a strong competitive advantage on the world market. For example, labor costs of an ICT operator work in Tunisia are six times lower than in France and three times lower than in Turkey. Engineer labor in general is nine and four times cheaper than in France and Turkey, respectively.

Figure [24]: ICT Labour cost index (base 100 = Hungary), 2012¹²¹



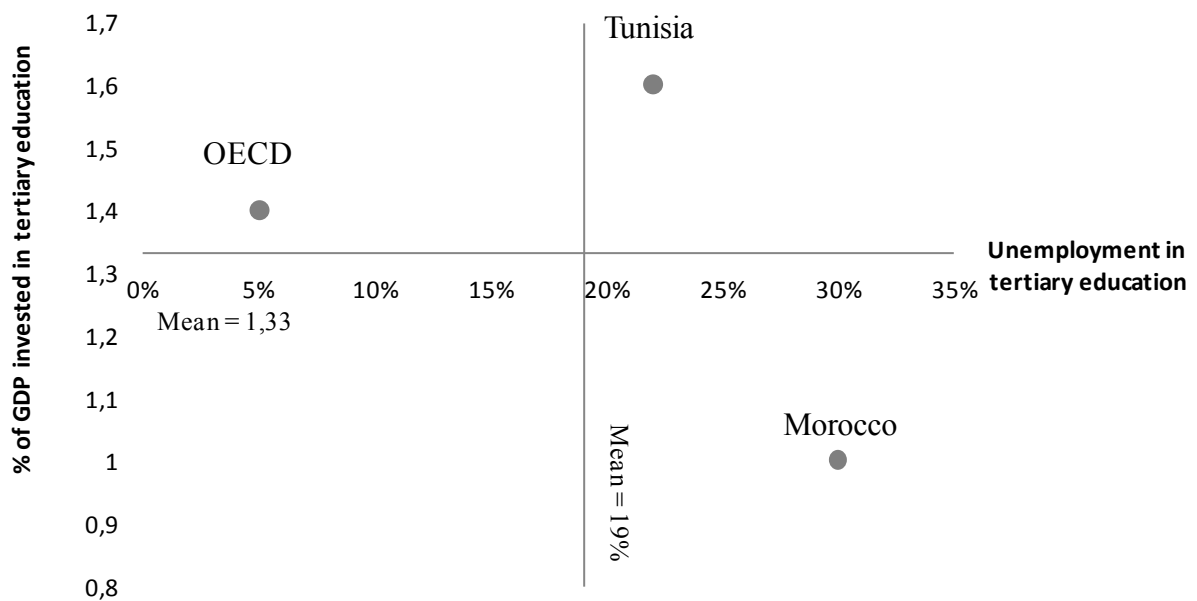
... yet low participation in the labor market, mismatch of skills and available jobs and discrimination of women. The Tunisian government has allocated a disproportionately high percentage of the national budget towards higher education (1.6% of GDP, more than the average of OECD (1.4%) and Morocco (1%))¹²². However, a strong focus on tertiary education did not yield positive economic results to-date. The educational system is not delivering graduates who have the skills needed in the marketplace, aggravating youth unemployment and the existence of the informal sector while still leaving businesses desperate for skilled labour (Figure [25]). Initial education remains focused on memory based learning vs. analytical and critical reasoning. According to the World Bank investigation¹²³, *tunisian students are well-educated and driven, yet they find it exceedingly difficult to obtain practical work experience or start their own businesses. When they graduate, their ability to accomplish concrete work tasks does not measure up to their mastery of theory.* This causes inefficiencies for employers, who

¹²¹ Source: Payscale, Worldsalaris, Whiteshield estimates
¹²² Source: Data World Bank <http://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS>
¹²³ Source: World Bank and Reboot <http://www.thereboot.org/tunisia/>

must commit additional time and resources toward training graduates to meet the demands of available jobs.

Unemployment among the university graduates stood at 23% in 2010, up from 15% in 2005, while overall unemployment rate remained at the level of 12-13% during that period¹²⁴. Among certain tertiary-educated groups, the unemployment rate is over 60%¹²⁵.

Figure [25]: Tertiary education expenditures and unemployment among tertiary educated population¹²⁶



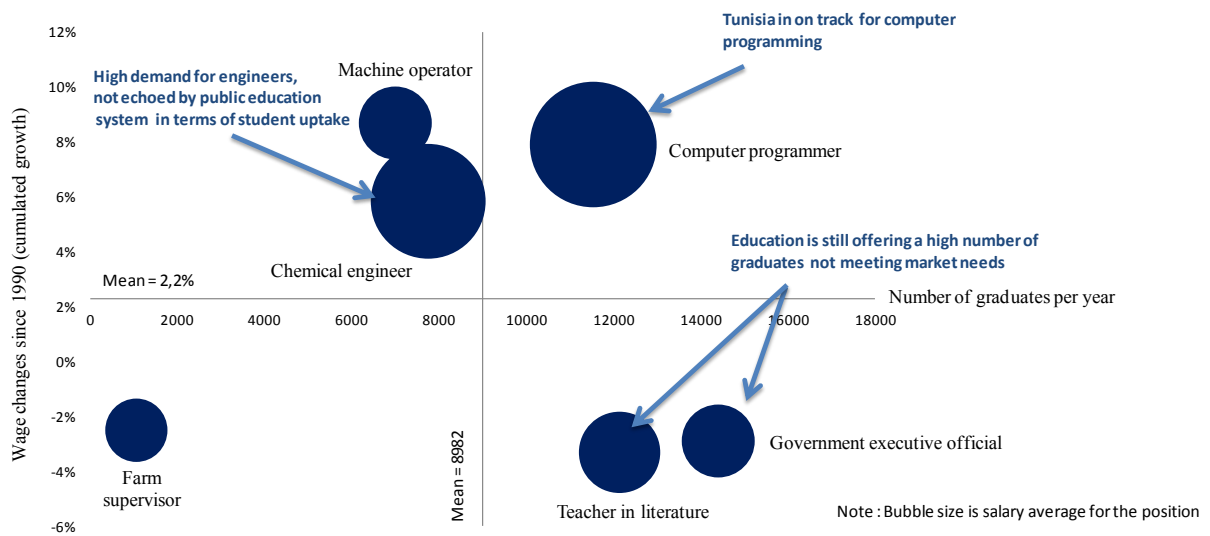
Evolution of salaries by occupation (Figure [26]) shows that the high supply of philologists and public administrators from the educational system exceeds labor market demand, whereas demand in machine operators and chemical engineers is not met by the public education system.

¹²⁴ Source: Tunisia Interim Country Strategy Paper 2012–2013 www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Catalogue%20Interim%20strategy%20Paper%20Anglais_Mise%20en%20page%201.pdf

¹²⁵ Source: Pickard Schweitzer – *Overcoming the Binding Constraint to Economic Growth in Post-Revolution Tunisia*, March 2012 – Harvard University

¹²⁶ Source: Economic research forum, Pickard Schweitzer – *Overcoming the Binding Constraint to Economic Growth in Post-Revolution Tunisia*, March 2011, Harvard University, OECD Database, World bank

Figure [26]: Evolution of salaries by occupation, 1990-2012 ¹²⁷



In the ICT labour market salaries are high and the annual number of graduates is above the average for the country, but still not high enough to meet the rising demand of the sector. Interviews conducted have shown that over 80% of interviewees believe that there is a mismatch between education supply and market demand in ICT, as well as in other key industrial sectors.

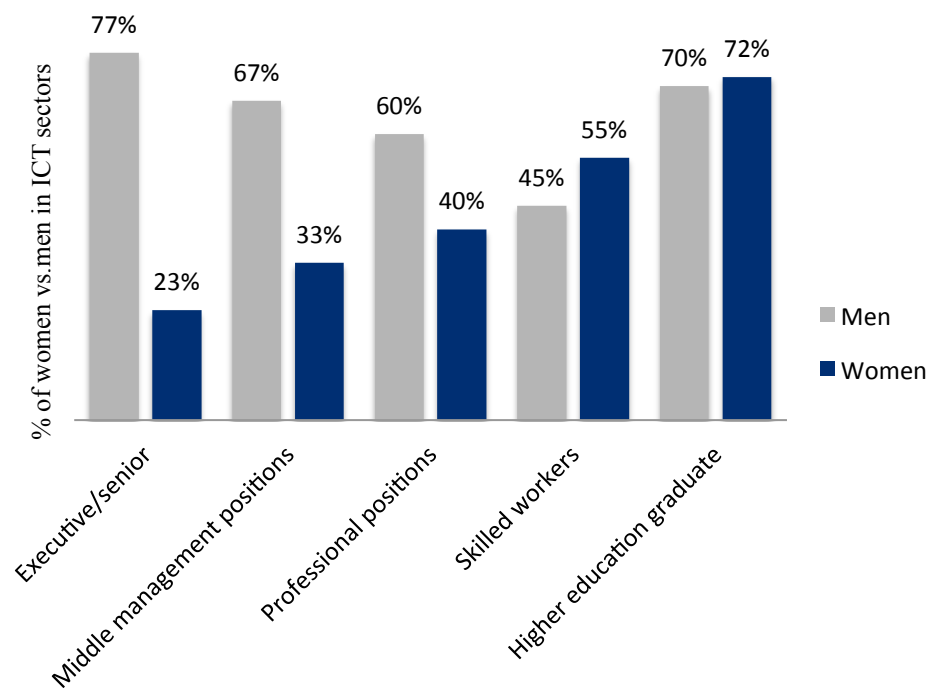
Women employment improving but still a challenge

Discrimination of women in the labor market remains a challenge to address. Female participation in the labor market is still only at about 25% of the overall workforce, which is below the MENA average¹²⁸. The education level among women is comparable or even higher than among men (see box [7]), women employment in Science and Technology is at 51%, which is almost the median for the European Union. However, in business, the higher up in the hierarchy, the lower the number of female workers. For example, in ICT (Figure [27]) the number of female skilled workers is slightly higher than those of men, but in the positions higher up (such as those of Senior Executives) there are almost four times more men than women.

¹²⁷ Source: Ministry of Higher Education Tunisia – Statistics-: <http://www.education.gov.tn/index.php?id=548>, Whiteshield Analysis, triangulation with Tunisia today 2010, Business news

¹²⁸ Source :World Bank, data.worldbank.org/indicator/SL.TLF.CACT.FE.ZS

Figure [27]: Access to high positions for women and men within ICT sector (2010)¹²⁹



Box [7]: Women in Tunisia: status, education and employment

Despite recent questions related to the status of women in Tunisia, the Code of Personal Status (women’s rights) remains a reference in the Middle East. It was promulgated as soon as the country gained independence in 1956. The Code abolished polygamy, and Article 6 of the Tunisian Constitution enshrines the principle of equality of all citizens. Tunisia is a signatory to the Copenhagen Convention on the Elimination of All Forms of Discrimination against women.

Within the family, women and men have the same parental authority since the 1993 reforms and share the same rights with respect to divorce. Although the Tunisian government has made progress, inheritance remains a key challenge to address.

Regarding women's physical integrity, Tunisia has laws that punish violence against women but in practice the police hardly enforce these laws. It appears that customs and traditions are difficult to change.

Regarding ownership rights and civil liberties, Tunisian women have the same ownership rights as men and can exercise their civil liberties more freely than in the past. They have the same access to land, to property and to bank loans as men.

¹²⁹ Source: Women and Work in Tunisia – Tourism and ICT sectors : a case study European Commission, European Training Foundation – 2010

Women have had the right to vote since 1957. According to the 2012 *World Economic Forum Global Gender Gap report* Tunisia is ranked 108th among 134 countries, still better than its peers (Morocco is ranked 129th in 2011).¹³⁰

In the field of education, the schooling rate is the same for girls and boys. Schooling is free of charge and compulsory. The obligation to attend school has been strengthened since 1991 by means of a law which penalizes withdrawal of children from the school curriculum, especially young girls. In terms of education, women are achieving better results than their male peers with 209,064 girls out of 339,619 students (61.6%) enrolled in higher education in 2011-2012.¹³¹ With 10,579 female teachers out of a total of 22,410 (47.2%)¹³² in higher education, gender parity has almost been achieved. Tunisia is also ahead compared to its peers in terms of female enrolment ratio, with a female secondary enrolment ratio of 93.1% vs. 72.9% for MENA¹³³.

However, in terms of employment women only account for 25%¹³⁴ of the active working population in 2011. Unemployment rate among women is eight points higher than among men (18.9% against 10.9% in 2010¹³⁵). Thus, there is need to improve these indicators structurally in the medium term.

The mismatch between supply and demand in the labour market and discrimination of women results in high unemployment and low female participation in the workforce. Consequently, despite record-high proportions of working-age population (median age for the country is 30 years both for men and women¹³⁶), their participation in the labor force has remained steady at around 48%, and has been the lowest in the region since the early 1990s. This issue was expected to be addressed by the government through the “Horizon 2016 Plan”. Some incentives already exist today: for example the government pays for 70% of post university training schemes for young graduates to compensate for the lack of “operational training” before their first employment.

¹³⁰ Source: World Economic Forum – *Global Gender Gap Report 2012*

¹³¹ Source: Ministry of Higher Education Tunisia – Statistics-: <http://www.education.gov.tn/index.php?id=548>

¹³² Source: Ministry of Higher Education Tunisia– Statistics-: <http://www.education.gov.tn/index.php?id=548>

¹³³ Source: Data World Bank, <http://data.worldbank.org/indicator/SE.SEC.ENRR.FE>

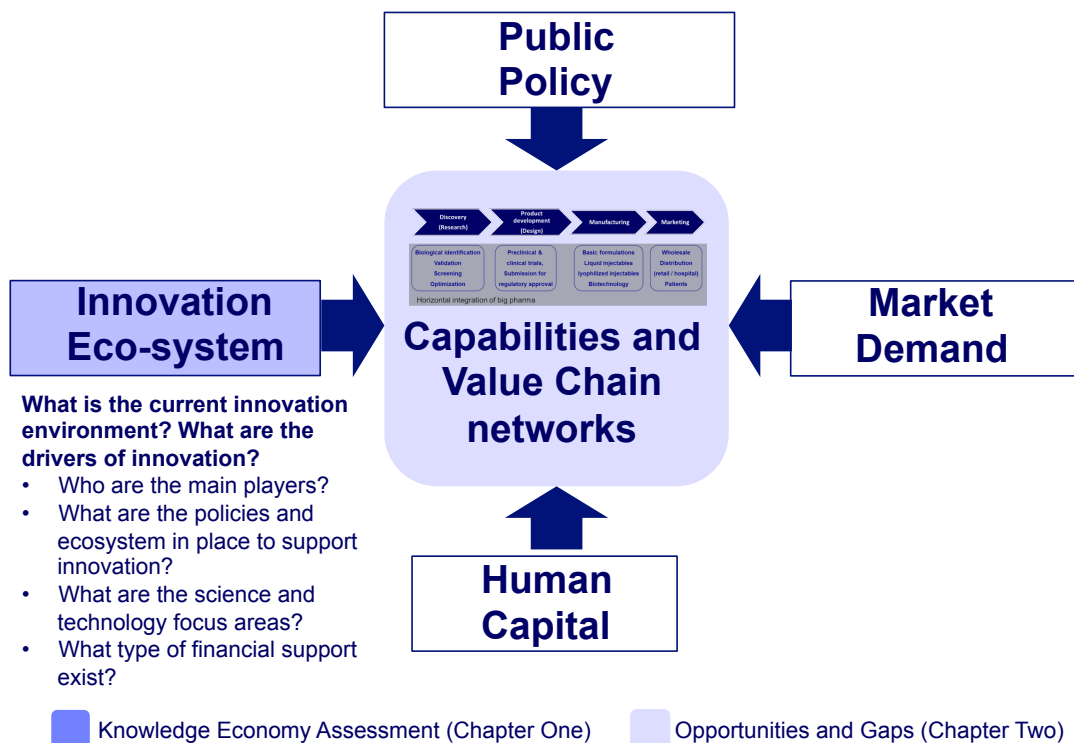
¹³⁴ Source: Enquête nationale sur l’emploi Tunisie 2011

¹³⁵ Source: Tunisia Interim Country Strategy Paper 2012–2013 Project-and-Operations/Catalogue%20Interim%20strategy%20Paper%20Anglais_Mise%20en%20page%201.pdf

¹³⁶ Source: Central Intelligence Agency <https://www.cia.gov/library/publications/the-world-factbook/>

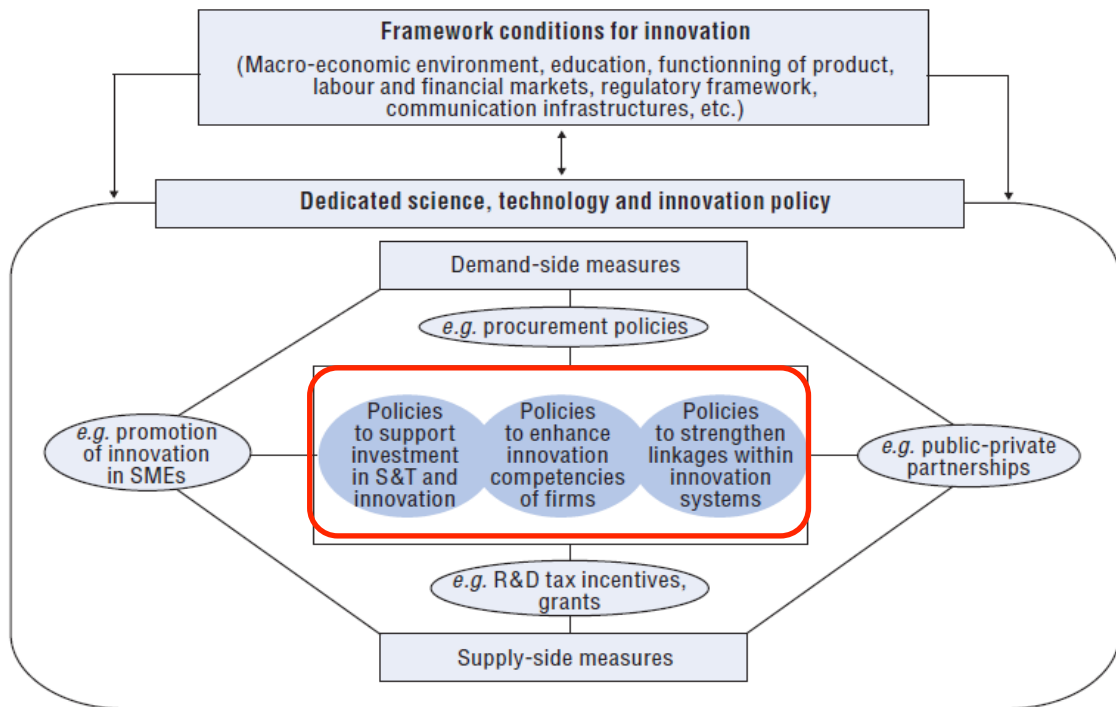
1.4. Innovation Eco-system: Essentials in place but need for more adapted framework and further coordination

Figure [28]: Knowledge and Capability Development Framework - Focus on Eco-Innovation System.



Most of the elements described in the framework of conditions for innovation (Figure 29) have already been addressed in the previous sections of this report. This section will rather focus on additional areas covering innovation policies, regulations and ecosystem supporting innovation, Research and Development (R&D), international and local collaboration, access to finance and procurement.

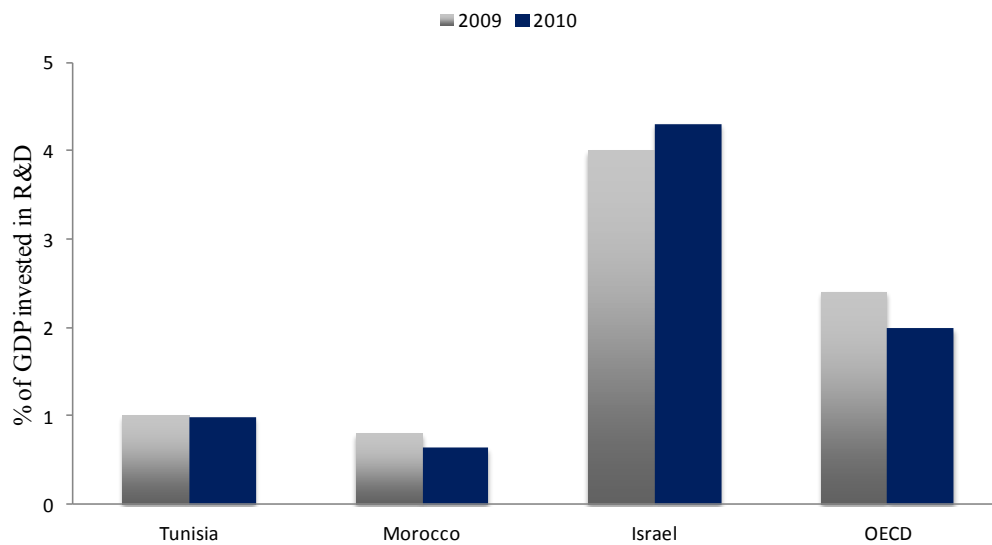
Figure 29: Innovation framework¹³⁷



Basic policies to support investment in innovation in place, but financing through venture capital and private equity is under-developed. State spending on R&D amounts to about 1.1% of GDP against 2% in OECD countries and 4.2% in Israel (Figure [30]). This is lower than spending on education, which is on the contrary very high (7.4% of GDP on education in general, 1.6% of GDP spent on tertiary education).

¹³⁷ Source: OECD, Whiteshield Analysis

Figure [30]: Share of GDP spent on R&D in Tunisia vs. Morocco and OECD¹³⁸



The risk capital industry is developing but could be developed much further. Investment capital (or private equity) and Venture Capital were introduced in Tunisia through regulations governing "fixed-capital investment companies" (SICAFs). This framework was reinforced in 1993 with the creation of "risk-capital investment companies" (SICARs). The sector now has more than 40 SICARs, 20 venture capital funds, and two start-up funds. The first Business Angels association was created in June 2011. However, the majority of the Tunisian economy relies mainly on credit banking. Capacity for credit loans poses a problem, as credit loans are principally directed towards large projects rather than towards entrepreneurship, and even less so towards services. Venture capital and private equity financing is not very widespread, lacking a solid regulatory framework and taxation system to support their development. Feedback from a relatively large sample of innovative firms highlights the inadequate financing mechanisms of SICARs and a strong demand for start-up funds with international backing.

It should be noted that foreign investors can hold up to 100% of the project capital and can freely repatriate profits and proceeds from the sale of the capital invested in foreign currencies. Establishment procedures can be made at the one-stop desks at the Agency for the Promotion of Industry and Innovation.¹³⁹ One-stop desk was set up in 2006 to act as the vis-à-vis for promoters

¹³⁸ Source: World Bank, <http://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>, Ministry of Higher Education and Scientific Research Morocco.

Note: The latest official data regarding the R&D expenditures were published in 2009 by the Ministry of Education and Scientific Research. It was indicated that these expenditures do not exceed 0,8% of the GDP. There was a plan to increase this percentage to 1% by 2010, but there is no evidence that this goal was achieved.

¹³⁹ APII, <http://www.tunisianindustry.nat.tn/en/doc.asp?mcat=13&mrub=96>

to carry out the formalities required to set up a business. According to FIPA official site, “this office is in charge of carrying out on their behalf, within 24 hours of the submission of a request and determination that it is complete, the formalities required to set up a legal entity, be it a private individual (individual company) or corporate entity (limited company, ‘uni personal’ limited company, limited liability company)”. However, such a one stop shop does not exist for innovative firms.

Policies to enhancing innovation competencies of firms lack coordination and private sector involvement

Several national institutions provide active support and assistance to innovation and investors efficiently: the Foreign Investment Promotion Agency (FIPA-Tunisia), the Agency for the Promotion of Industry and Innovation (APII), the Center for Export Promotion (CEPEX), Technical Center for Mechanical and Electronic Industries (CETIME), The Agency for Agricultural Investment Promotion (APIA), The Tunisian Tourism National Board (ONTT).

However, there is strong demand for private sector support. Few but growing private innovation initiative comes from e.g. Tunisiana Start Up Factory and WikiStart UP. Tunisiana StartUp Factory was launched in October, 2012 by the Telecom operator Tunisiana. The incubator is aiming at creating startups developing mobile apps. Tunisiana has allocated a 1.2 M€ fund for this incubator; with investments per incubation project ranging from 23,000 to 46,000 €. The management of this fund was delegated to the financial investment firm UGFS. Beyond the financing of the projects, Tunisiana offers the incubated startups access to a business infrastructure, mentorship and business advisory. The initiative is sponsored also by the following companies/institutions: Microsoft, Google, Alcatel Lucent, Bull, BFPME, SupCom, l’ENIS, and the GIZ. The initiative has just started; however, it is expected to create 5 startups by the end of 2013 and 10 startups each year for the following 4 years.

Wikistartup was created in 2011 with an initial investment from business angels (including M. Mondher Khanfir who is the current GM). The incubator offers the following services: Venture Catalyst services (assistance in planning the project, risk analysis and refinement of the business plan, assessment of resources requirement); Venture Fundraising services (development of the financing plan and fundraising strategy, project management and control of the process of raising capital); Business Development Services (technical assistance in drafting the investment plan, project management and control of the process of raising capital). As of late 2012, 12 companies

were incubated in Wikistartup and 21 scientific spin-off projects are in the pipeline. The projects required between 0.15M€ and 1.5M€ of investments.

However, much more could be done including defining clear criteria in the law defining young innovative companies, how they could benefit from tax reliefs, support in public procurement like in Korea or training support.

Box [8]: Intellectual Property in place but effective global IP rights still expensive ¹⁴⁰

The IP rights situation is improving in Tunisia but still efforts are required to reach international standards. The *2012 International Property Rights* report ranked Tunisia 11 of 18 in MENA and 73 of 130 worldwide in Intellectual Property Rights with a rating of 5.4 on a scale of 1 to 10 (1 being the worst) and with a poor 71 of 130 (2.8) in copyright piracy.

Overall, the legal framework governing intellectual property is close to international standards, but falls short in its enforcement, especially with respect to piracy, which needs to be improved.

Indeed, Tunisia is a member of the World Intellectual Property Organization (WIPO) and has signed the Berne Convention for the Protection of Literary and Artistic Works and the Paris Convention for the Protection of Industrial Property. It has also adhered to the principle international treaties offering investors the opportunity to register intellectual property rights, the Hague Agreement (industrial designs and models) and the Patent Cooperation Treaty. Tunisia has, however, withdrawn from the Madrid Agreement regarding trademarks.

Patent applications are examined by the Patent Office and are published together with the grant of a patent in the Official Gazette. At the end of 2008 INNORPI (National Institute for Standardization & Industrial Properties) was managing around 5,550 patents, more than 62,000 trademarks and almost 3,200 industrial designs. The Tunisian Institution for the Protection of Copyright is in charge of applying the Tunisian Copyright Law of 1994, which determined the Copyright as the right of the owner to have the exclusive right to copy the work in a material form.

Although national IP rights are in place, effective protection of IP at the global level remains a challenge due to high cost of registration.

Strengthening linkages within innovation system: policies in place, but innovation eco-system is only emerging.

¹⁴⁰WIPO, IPR 2012, United Nations, INNORPI

According to the Tunisian Strategic Social and Economic Development Plan¹⁴¹, “reforms will be directed towards development of the national innovation system through the creation of clusters in promising sectors and the development of partnerships between universities, companies and research centres. In addition, creating technologic zones to attract investment in high technological value activities”. In 2012, only one ‘technopole’ –EL Ghazala - was fully operational. Several others, for example, Biotechnology technopark Sidi Thabet, Agriculture cluster in Bizerte, Textile cluster in Monastir, though partially active, are still under construction.

According to APII, there were only 11 business incubators in 2005 and 518 promoters versus more than 1,900 promoters and 30 incubators in 2012¹⁴². The existing incubators are relatively well-distributed across the country and provide an infrastructure that can be improved and iterated upon. Physical locations are useful for lowering startup costs for entrepreneurs, because they are housed in technoparks. Incubators often have better access to ICTs than the surrounding region. However, there is no accurate metrics for judging incubator success. Incubators are evaluated based on imprecise indicators, such as occupancy rates and number of foreign visitors. Many stakeholders in the incubator community would prefer to see their performance measured by total revenue earned, jobs created by resident companies, or other indicators that track more accurately to the amount of economic value generated by incubator activities¹⁴³.

Sector specific innovation nascent yet has a high potential

In the ICT sector, two main public initiatives: (1) Construction and equipment of additional premises covering an area of 100,000 m² within the scope of ElGhazala Pole but also extension to new areas in the governmental areas of Ariana and La Manouba, and additional premises to be created with a surface of 100,000 m² distributed between the technological areas in Sousse and Sfax. (2) A new ICT one-stop service has recently opened. Its mission is to encourage employment and investment in this field. The one stop service offers the possibility to bring together in a single place various service providers in import and export of electronic communication systems and equipment. It also includes a survey and research center devoted to

¹⁴¹ Source: Strategic Social and Economic Development Plan 2012-2016

¹⁴² Source: APII, http://www.investintunisia.tn/site/en/article.php?id_article=828, Whiteshield interviews

¹⁴³ Source: A report by the World Bank & Reboot, “From revolution to Institutions”, 2012
<http://www.thereboot.org/tunisia/entrep.html>

the communication sector: the National Frequencies Agency and the Electronic Certification National Agency¹⁴⁴.

International collaboration between universities and research institutes being promoted. Efforts are made to increase international collaboration. For example, in the Aeronautics sector the company Aerolia as a main foreign investor created a research and training centre in Meghira to train young graduates. The company ST Microelectronics does the same in the EEI sector. In December 2010 The French organization *Réseau Entreprendre* launched offices in Tunis and the coastal city Monastir looking to incubate entrepreneurial talent in Tunisia through mentors that belong to local networks of experienced entrepreneurs¹⁴⁵.

There are also examples of integration of existing research institutes into universities, for example, in the agriculture field, where IRESA (l'Institution de recherche et d'enseignement supérieur agricoles) has merged with INRA (Institut National de Recherche Agronomique).

Box [9]: Geographical distribution of technoparks and business incubators in Tunisia

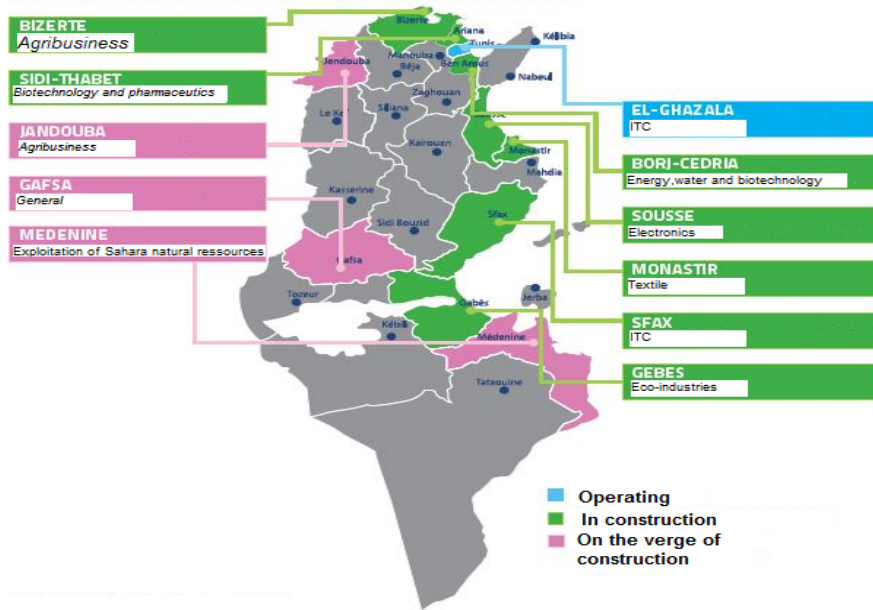
Tunis, Sfax, Meghira and Sousse, are regions leading knowledge-based development in Tunisia.

The map below shows the distribution of technoparks in Tunisia. So far, only El Ghazala is operating, and it is aimed at developing ICT in the country with more than 90 firms and 2,000 jobs. Several others are being constructed in the country.

¹⁴⁴ Source: FIPA Tunisia, http://www.investintunisia.tn/site/en/article.php?id_article=828

¹⁴⁵ Source: Tunisialive, <http://www.tunisia-live.net/2012/11/28/hothousing-entrepreneurial-talent-picks-up-in-tunisia/>

Figure [31]: Regional dispatch of technoparks (2010)¹⁴⁶



The National network for incubators in Tunisia is composed of 30 incubators of which 26 depend on APII, 3 on Sfax, Borj Cedria and El Ghazala technopoles and 1 on the *Ministère du Commerce et de l'Artisanat*.

Figure [32]: Regional dispatch of business incubators in 2012¹⁴⁷



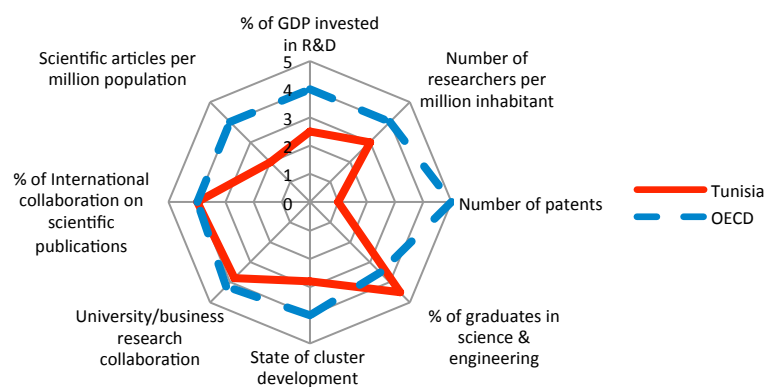
¹⁴⁶ Source : Higher Education And Scientific Research In Tunisia <http://www.mes.tn/anglais/index.htm> APII, 2012 – National Innovation System in Tunisia Dossier – Nadia Ben Miled-M'Rabet

¹⁴⁷ Source : FIPA, Réseau National des Pépinières d'Entreprises <http://www.tunisieindustrie.nat.tn/pepinieres/doc.asp?mcat=20&mrub=223>

Science and technology capabilities have a high potential

Figure [33] reveals striking disproportions in the Tunisian science and innovation profile. Although Tunisia has a higher percentage of graduates in science and technology than the OECD average it has a very low number of researches, scientific articles and patents per million inhabitants. Investment in R&D is far below OECD average. All these facts highlight existing inefficiencies in innovation policy and potential barriers to innovative businesses.

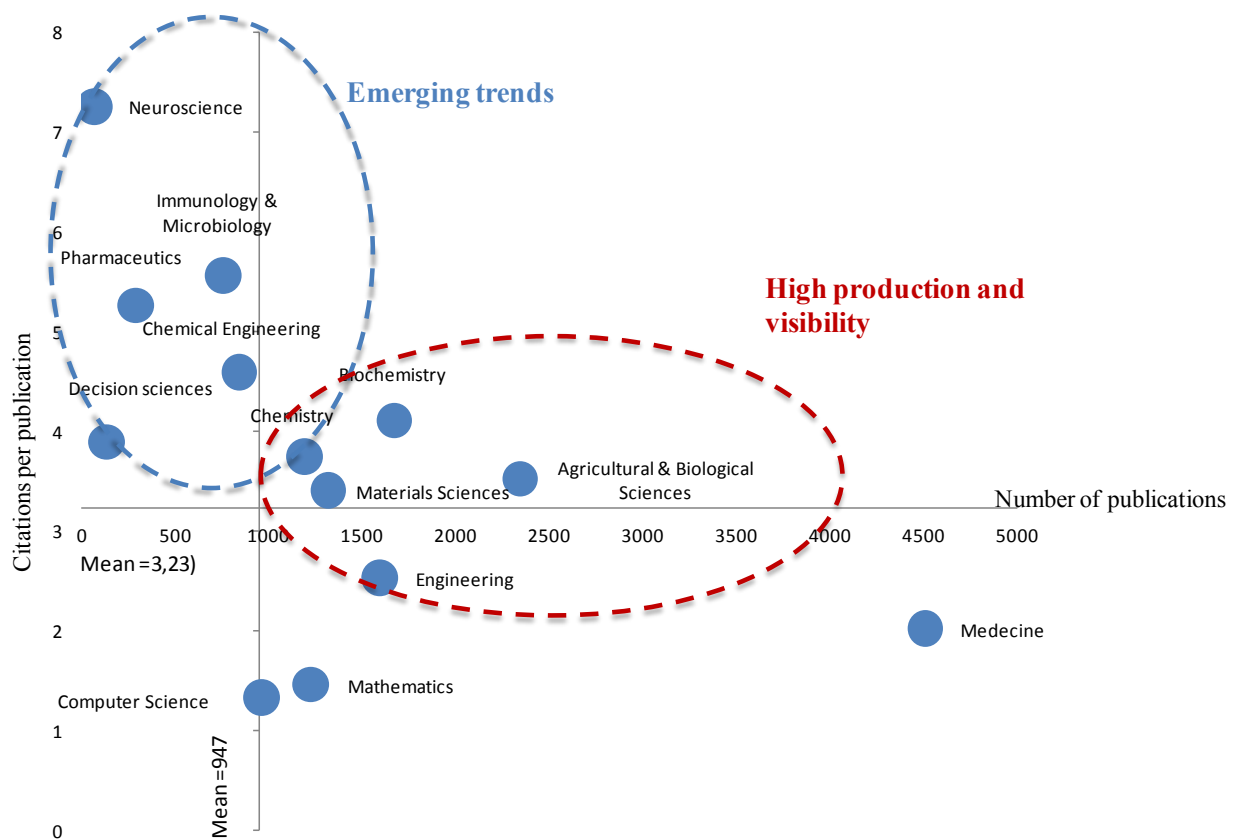
Figure [33]: Science and innovation profile in Tunisia in 2012¹⁴⁸



The development of the R&D sector has made significant progress in Tunisia. Key focus areas are pharmaceuticals, medical, biological and neuroscience. Medicine outperforms other fields by the number of scientific articles, whereas neuroscience, immunology, microbiology and pharmaceutics lead by the number of citation per publication (Figure [34]).

¹⁴⁸ Source: World Bank, Ministry of Higher Education Tunisia, Global Innovation Index 2012, SCImago. (2007).SJR - SCImago Journal & Country Rank. UNESCO Institute for Statistics, Whiteshield analysis

Figure [34]: Scientific articles and number of citations per publication¹⁴⁹



However, the number of patents created by Tunisia is far lower when compared to European competitors with only 70 patents created by residents in 2008 vs. 177 in Morocco, 481 in Egypt and 1,528 in Israel.¹⁵⁰ This poor number can be explained by the lack of coordination between the private sector, the researchers and the research center.

Box [10] Tunisia in The Global Innovation Index 2012¹⁵¹

INSEAD business school and the World Intellectual Property Organization launched the Global Innovation Index (GII) project in 2007. GII 2012 covers 141 economies, which represent 94.9% of the world’s population and 99.4% of the world’s GDP (in current US dollars). The index relies on two sub-indices: the Innovation Input Sub-Index and the Innovation Output Sub-Index. The former is a simple average of five “pillars” score: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication. The latter is composed of two “pillars”: (6) Knowledge and technology outputs and (7) Creative outputs. GGI is a simple average of the two Sub-indices.

¹⁴⁹SCImago. (2007).SJR - SCImago Journal & Country Rank.

¹⁵⁰World Bank, <http://data.worldbank.org/indicator/IP.PAT.RESD>

¹⁵¹ Source: World Intellectual Property Organization - The Global Innovation Index 2012, Soumitra Dutta, INSEAD Editor

Tunisia is ranked 1st in Northern Africa, at position 59th (versus 66th position in 2011) just after Thailand (57th) and Brazil (58th), and does better than Morocco (88th), Egypt (103rd), and Algeria (124th). Tunisia received high score by Business environment (28th), Current expenditure on education (13th), Creative intangibles (11th) and Innovation linkages (46th, including 1st position by PCT patent filling with foreign investors and 20th by R&D financed from abroad). Political environment (72nd, including 108th position by press freedom), Credit (104th), Trade and Competition (107th) and Knowledge absorption (109th) are pushing the country down in the ranking.

Overall, the review of the innovation eco-system in Tunisia highlights solid capabilities for ICT, EEI and Chemical sector development, yet numerous barriers to innovation including inefficiency in the implementation of policy plans and the lack of efficient public-private cooperation. This situation is reflected in the Global Innovation Index 2012 (Box [10]): Knowledge absorption is the key non-political indicator pushing the country down in the ranking, whereas Business environment, Spending on education, R&D and Innovative linkages are not the binding constraints. There is a need for a stronger alignment between public R&D and private sector demand through efficient clusters and technopoles, more solid intellectual property protection rights and enforcement and a functional financial support system to boost innovation.

Chapter 2

Gaps & Opportunities: Software services, Electronics and Pharmaceutical sectors driving innovation

2.1. Economic Complexity: Capabilities identified in ICT, Electric and Electronic Industry and Pharmaceuticals

Chapter one focused on describing the current innovation base-line in Tunisia, however, key underlying factors driving knowledge and innovation remain to be fully addressed:

- Where are capabilities and capability gaps?
- What are the drivers of innovation?
- Which value chain networks and products have a high potential? Which ones are to be addressees in priority?

The Economic complexity approach was used to address these questions. As a reminder, the key indicators of this approach are the:

- Economic Complexity Index (ECI), which shows productive knowledge and capabilities of a country.
- Opportunity value (OV), showing opportunities for further capability-based development.
- Missing Products, indicating capability gaps in the economy.

These indicators apply only to exported goods¹⁵². Services are analysed based on the Revealed Comparative Advantages in Offshoring sector¹⁵³.

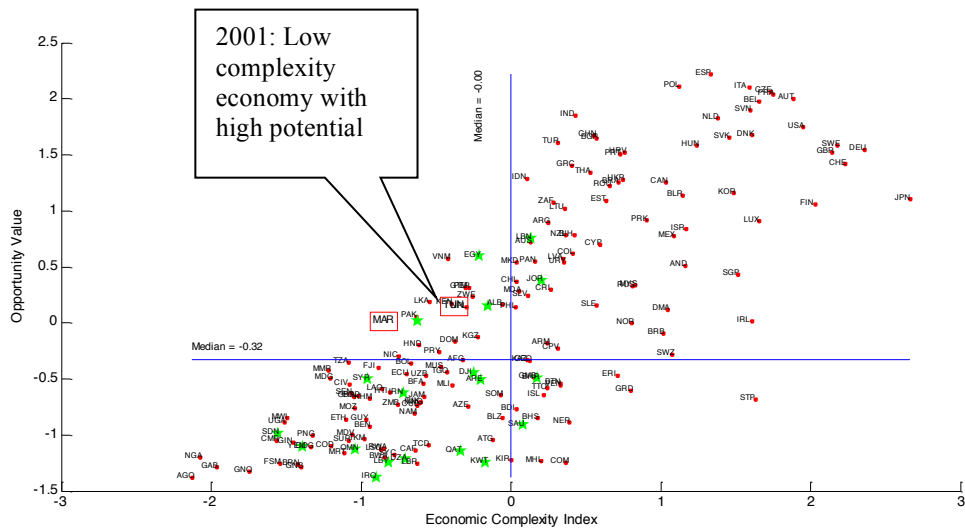
A strong capability potential: a historical analysis highlighting a true success story

Starting with the analysis of historical capabilities in Tunisia: In 2001 the country had ECI of 0.15 and OV of 0.14, which means that it had a low complexity economy with above median potential to improve.

¹⁵² Note: Data on services is not provided by the customs, so there is not enough statistical data for such analysis

¹⁵³ Note: For more details see definition box 1.

Figure [35]: Economic Complexity Index and Opportunity Value Analysis, 2001.¹⁵⁴

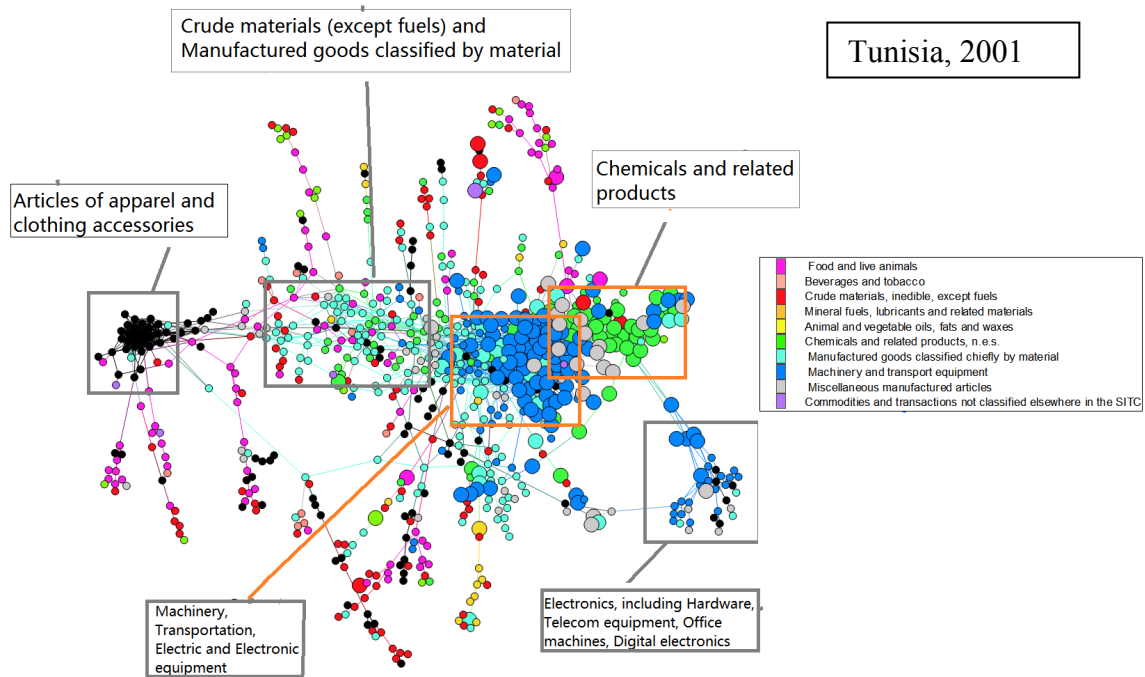


Note: MENA countries are marked with green pentagons

The visual representation of economic complexity indicators is the Product Space – a graph, in which products form clusters by their proximities. Low economic complexity was determined by the structure of Tunisian exports. Historically, in 2001, the country held strong positions in the Textile and apparel cluster, had comparative advantages in some agricultural, manufacturing products and raw materials on the periphery as well as several low-complexity products in the mechanical and electrical segments (mainly, components of machinery). However, Tunisia was represented in all key clusters of products in the Product space, which means that it already had capabilities to increase its complexity. That is why opportunity value was above median.

¹⁵⁴ Source: UN Comtrade, <http://comtrade.un.org/db/dqQuickQuery.aspx>, Whiteshield Analysis.

Figure [36]: Product space, Tunisia, 2001.¹⁵⁵

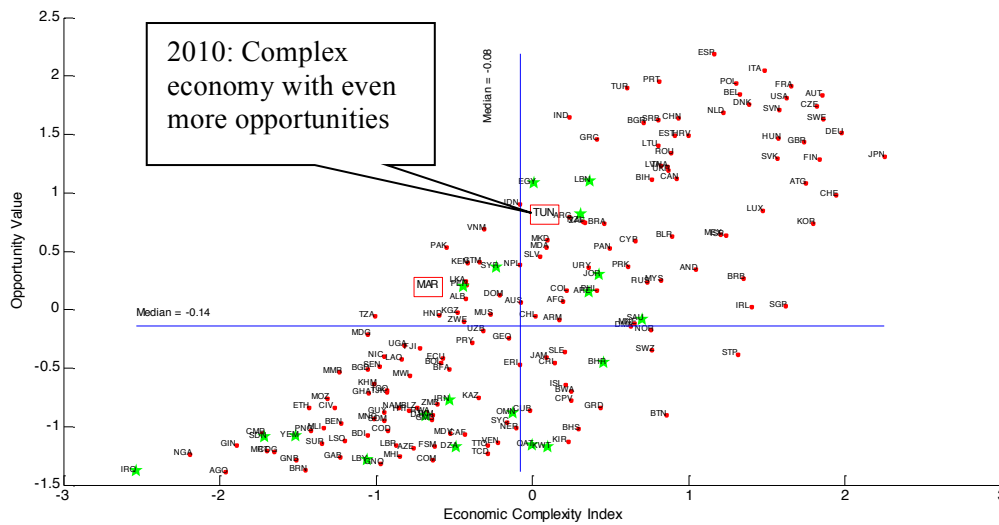


Note: Black bubbles represent Tunisia's RCAs in 2001. Big colored bubbles are products with the highest opportunity gains for the country. Grey frames show clusters in which Tunisia held strong positions. Orange frames highlight clusters with the highest concentration of "Missing" products.

The development of Tunisia in 2001-2010 is a success story of developing capabilities and increasing complexity. In 2010 with an ECI of 0.32 and OV 0.8 it moved to the quadrant of the most successful countries with high complexity and high potential for further development:

¹⁵⁵ Source: UN Comtrade, <http://comtrade.un.org/db/dqQuickQuery.aspx>, Whiteshield Analysis.

Figure [37]: Economic Complexity Index and Opportunity Value Analysis, 2010.¹⁵⁶



Note: MENA countries are marked with green pentagons

Positions on the Product space improved in line with the increase of economic complexity:

- In total Tunisia developed 24 new products in different manufacturing areas, such as Reconstituted wood, Fiber, building board of wood, Wool woven fabrics, Glass fibre fabrics, Pottery etc.
- In Crude materials and material processing segment Tunisia significantly improved its positions in metal manufacturing (Iron/steel structures, Wires, cables and ropes, Metal cask for packing goods, Iron/steel structures, Worked tin and alloys etc).
- In EEI and Telecommunication equipment clusters, starting from parts of electrical equipment, Tunisia developed RCAs in telecommunication equipment (Color TV, Vehicles radio receivers, Video and sound recorders, Microphone, amplifiers and loudspeakers, Telecom equipment)

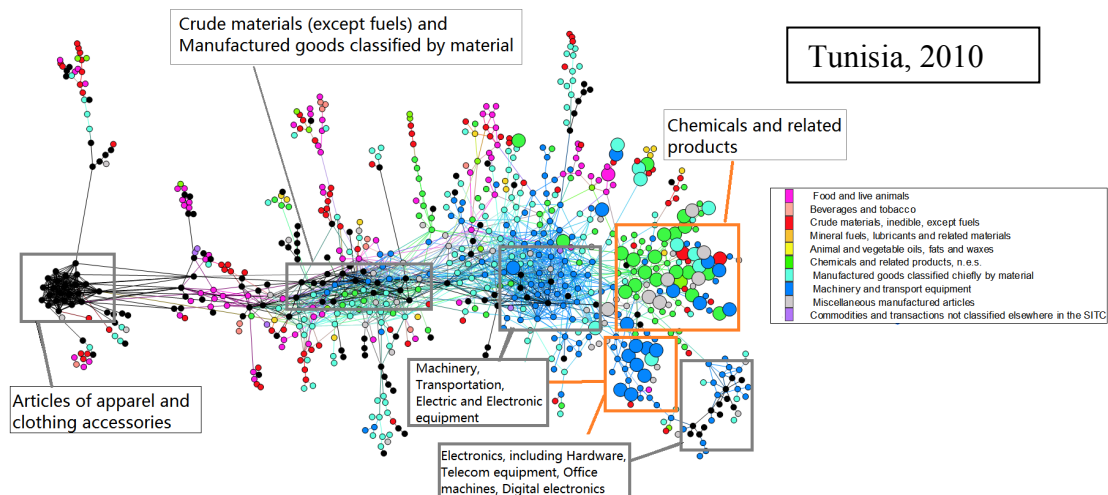
However, there is still much room for improvement:

- Positions in machinery (mechanical and electrical) are becoming stronger with new RCAs in Piston engines parts, AC electric motors and generators, Gas generators and parts, Calculating and ticketing machines, and Condensers. However, most RCAs are still in semi-finished production and components.

¹⁵⁶ Source: UN Comtrade, <http://comtrade.un.org/db/dqQuickQuery.aspx>, Whiteshield Analysis.

- In the Chemical cluster Tunisia holds strong positions in Fertilizers, Inorganic chemicals, Plastics and Rubbers. However, positions in Organic chemicals and Medicals in relation to the world market are still rather weak.

Figure [38]: Product space, Tunisia, 2010.¹⁵⁷



Note: Black bubbles represent Tunisia's RCAs in 2010. Big colored bubbles are products with the highest opportunity gains for the country. Grey frames show clusters in which Tunisia holds strong positions. Orange frames highlight clusters with the highest concentration of "missing" products

High potential for capability-based products: future scenarios

Which products could have been produced by the country from 2001 to 2010? Which products could the country produce by 2020? Hausmann, Hidalgo (2011) claim, that the evolution of countries' export usually goes in direction of highest proximity, which means that products that have the strongest links with current RCAs of a certain country, are most likely to be produced by this country in the future. According to capability based approach, a country already has most capabilities needed to produce such products. This idea is proven by the actual evolution of Tunisian exports in 2001-2010, which seems to be in line with outlined scenarios. Based on historical analysis we can derive a forecast about the future development of Tunisia's exports.

The development of new Revealed Comparative Advantages driven by proximity¹⁵⁸ between products can be found in *all sectors of the Tunisian economy*. For example, in the *Food and Agriculture sector* in 2001 Tunisia has RCA in Fresh and chilled fish, as well as in Fresh,

¹⁵⁷ Source: UN Comtrade, <http://comtrade.un.org/db/dqQuickQuery.aspx>, Whiteshield Analysis.

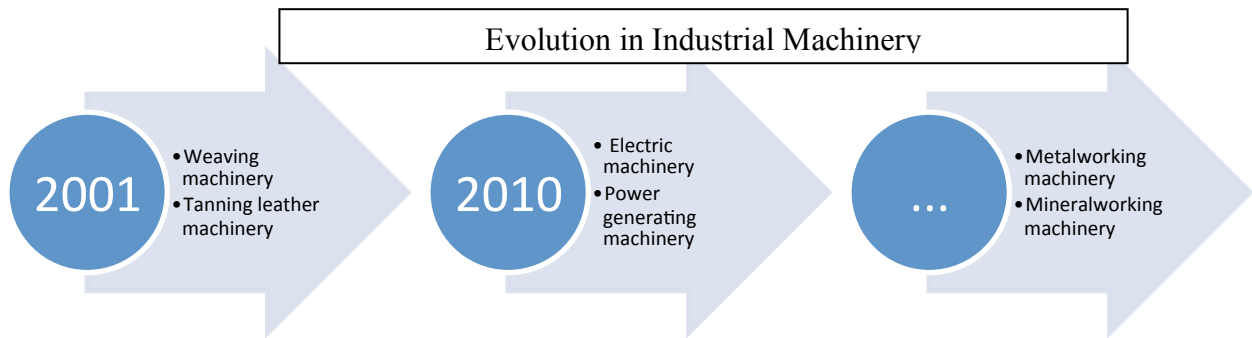
¹⁵⁸ Note: Proximity above 0.5-0.6 is considered to be high (2-3 times above average proximity between products)

chilled, frozen or salted crustaceans and molluscs. Productive knowledge accrued from these products made it possible to develop RCA in Frozen fish fillets by 2010. In 2001 Tunisia had RCA in Pasta and in 2010 it moved to Bakery. In the *Textile and Leather sectors* in 2001 Tunisia exported Yarn of textile, synthetic and regenerated fibres, moving to Tulle, lace, ribbons and Bags and sacks for packing by 2010. In the *Machinery for particular industries* starting from Wearing and Tanning machinery in 2001, by 2010 Tunisia developed RCA in Sewing machinery. In *Chemicals* Tunisia moved from Inorganic acids metallic salts, Inorganic acids metallic salts and Non-metals inorganic acids to Metallic oxides of zinc, iron, lead, chromium. In *Professional and scientific apparatus* Tunisia had RCA in Gas, liquid and electric meters in 2001 and in Gas, liquid and electric control apparatus in 2010.

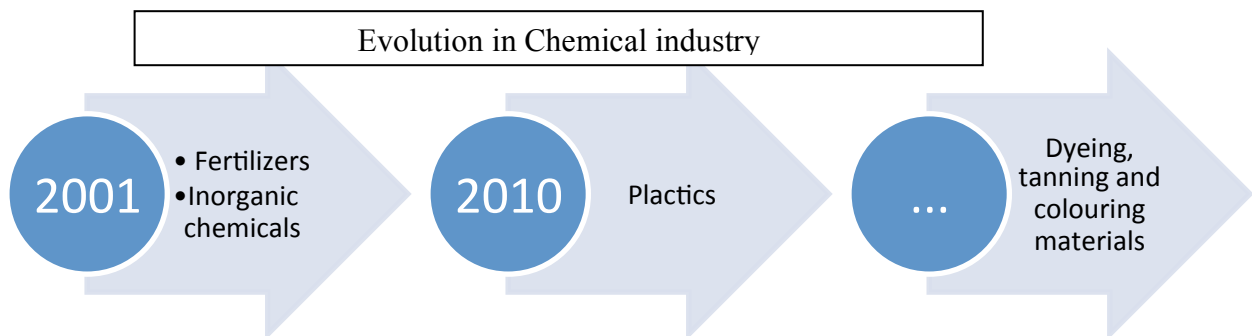
However, generally the evolution of the Product space of a certain country is determined not by proximities between distinct products but by the overall knowledge accumulated in its economy. A special pool of products selected by proximities¹⁵⁹ makes it possible to trace back the evolution of different sectors over 2001-2010 and to forecast feasible paths of their future development.

In the Industrial Machinery segment the proximity-based analysis shows that the evolution is likely to go in line with key trends of industrial development in Tunisia. In 2001 Tunisia already had comparative advantages in machinery for textile industry, the strongest traditional sector in the country. Becoming the number one African country in ICT and claiming the second position in production of Automobile components, by 2010 Tunisia developed RCAs in electric and power generating machinery. A logical path would be to leverage existing capabilities to develop metal- and mineral-working machinery and in this way raise complexity of mining and metalworking industries.

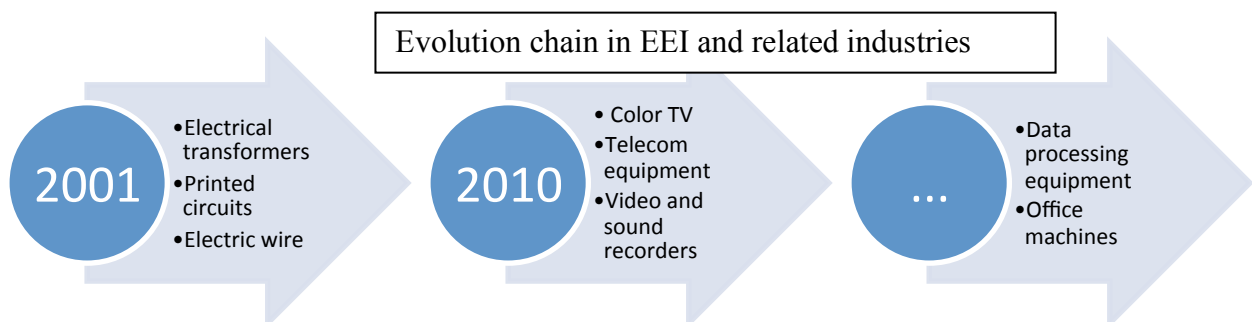
¹⁵⁹ Note: The pool includes three types of products: Type 2 – products in which Tunisia developed RCA between 2001 and 2010; Type 1 – top 5 RCAs in 2001 with the strongest links to Type 2 products. Type 3 – products with the highest proximity to current RCAs (most likely to be produced in the future)



In the Chemical industry in 2001 Tunisia was strong in fertilizers and inorganic products, by 2010 new capabilities were developed in plastics, and now it has capabilities to develop comparative advantages in Dyeing, tanning and colouring materials, that can be used afterwards by developing manufacturing industries. However, without filling capability gaps on the sectorial value-chain network there is no natural path to organic chemicals and medicaments.



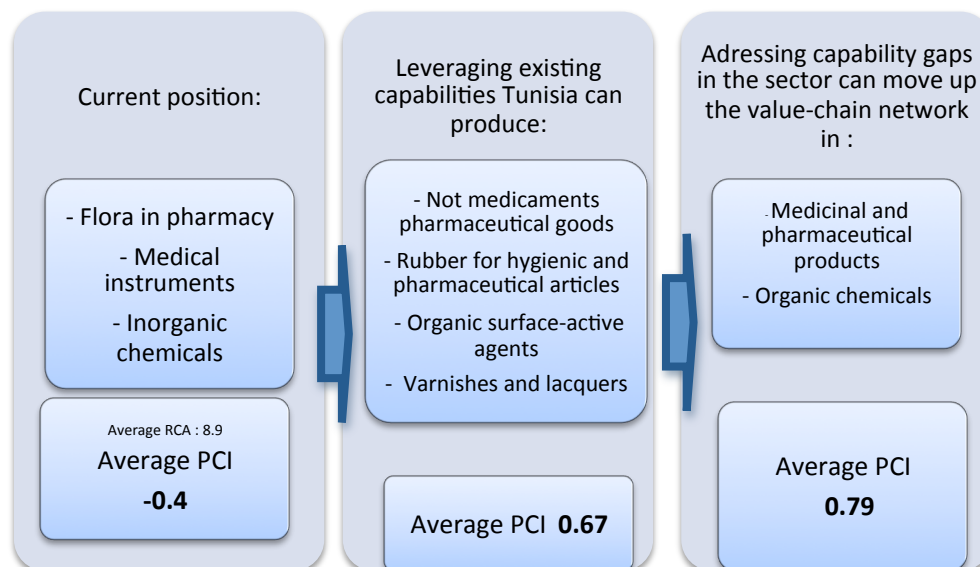
The Electric and Electronic sector (and related Telecommunication equipment) in Tunisia demonstrated the highest progress over the 2001-2010 period. Starting from the low-end production (Electrical transformers, Parts of electric power machinery, Printed circuits and Switchboards, relays and fuses) by 2010 the country developed RCAs in high-end electrical and telecommunication equipment, including Calculating and ticketing machines, Color TV, Video and sound recorders, Vehicles radio receivers. The next step would be to develop further in electronics.



Gaps to address

Based on the Economic Complexity analysis given above, the first recommendation is to fill capability gaps in Medical and pharmaceutical products and Organic chemicals based on existing capabilities in Inorganic chemicals and Medical instruments as well as on Tunisia's significant research base in medical and chemical sciences.

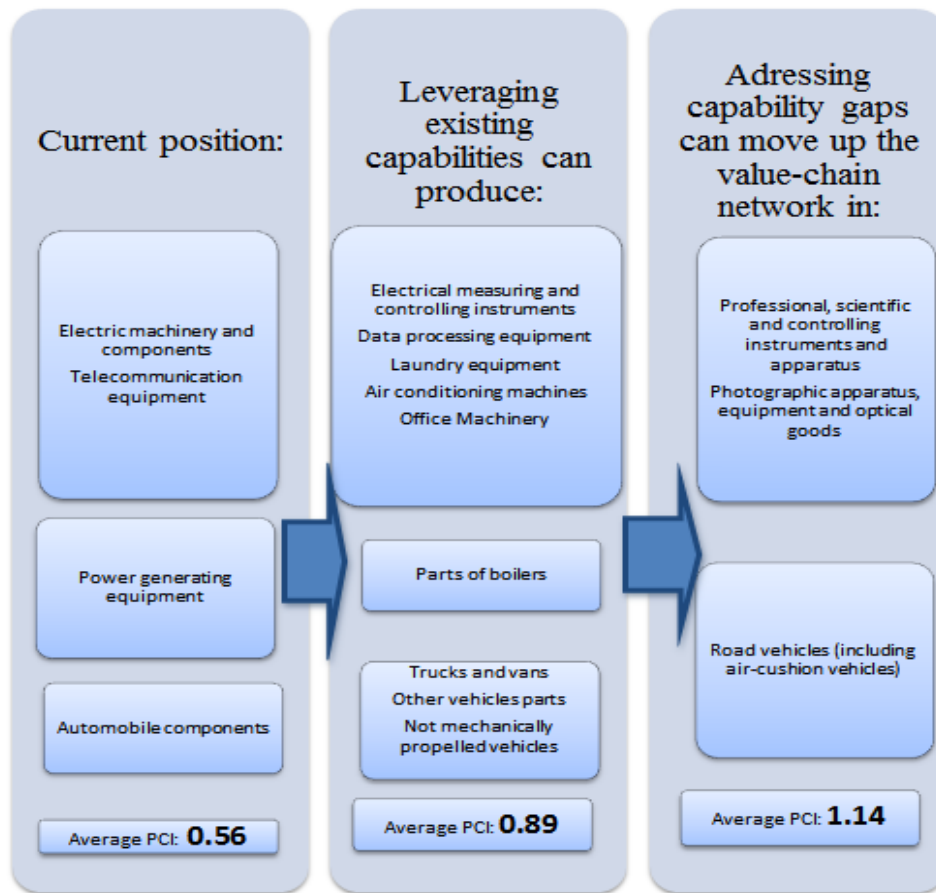
Figure [40]: Economic complexity analysis' product evolution in Chemical and Medical industries, in Tunisia¹⁶¹



The second recommendation is to use strong capabilities, developed in EEI and Telecommunication equipment to fill capability gaps and move up the value chain networks in the automotive sector, Scientific apparatus, Photographic and optical equipment.

¹⁶¹Source : UN Comtrade, Whiteshield Analysis

Figure 41: Economic complexity analysis' product evolution in EEI, in Tunisia¹⁶²



The analysis given above is however not sufficient to fully map capabilities in ICT using the same exact methodology. Indeed, entire hardware sector represented only 24% of the Tunisian ICT sector in 2010 and is characterized by reselling of foreign brands rather than production.¹⁶³ Adding data on Off Shoring services as a proxy for exports of services reveals that Tunisia has Revealed Comparative Advantage only in BPO, the low-end of Off Shoring. Thus, the key recommendation in the ICT sector is to use strong capabilities in the Telecommunication equipment segment and high quality of education to further nurture KPO capabilities, beyond BPO.

¹⁶² Source : UN Comtrade, Whiteshield Analysis

¹⁶³ Source: IDC CEMA Black Book 2011

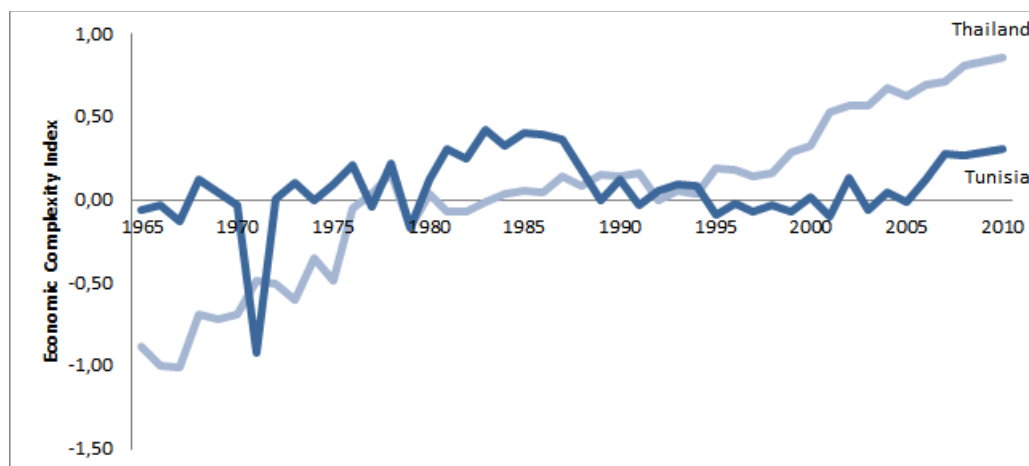
Figure [42]: Offshoring in Tunisia compared to the world, 2009-2010¹⁶⁴

ICT Offshoring Market	Segments	Tunisia, 2009		World, 2010		RCA
		Value (mn USD)	Share	Value (mn USD)	Share	
ITO	Content Development and Management	70.29	0.25	93,100	0.51	0.50
BPO	Call Centers Other Services (HR, Finance)	184.64	0.67	70,200	0.39	1.73
R&D Engineering	Engineering/Technical support centers	22.7	0.08	19,000	0.10	0.78

Box [11] Comparing Tunisia to Thailand – learning from experience

Position of Thailand on the Product Space in 1998 resembled position of Tunisia, however Thailand succeeded much more on the way of developing capabilities. What lessons of success can be derived from historical analysis?

Figure [43]: Economic Complexity Index in Tunisia and Thailand, 1964- 2010¹⁶⁵

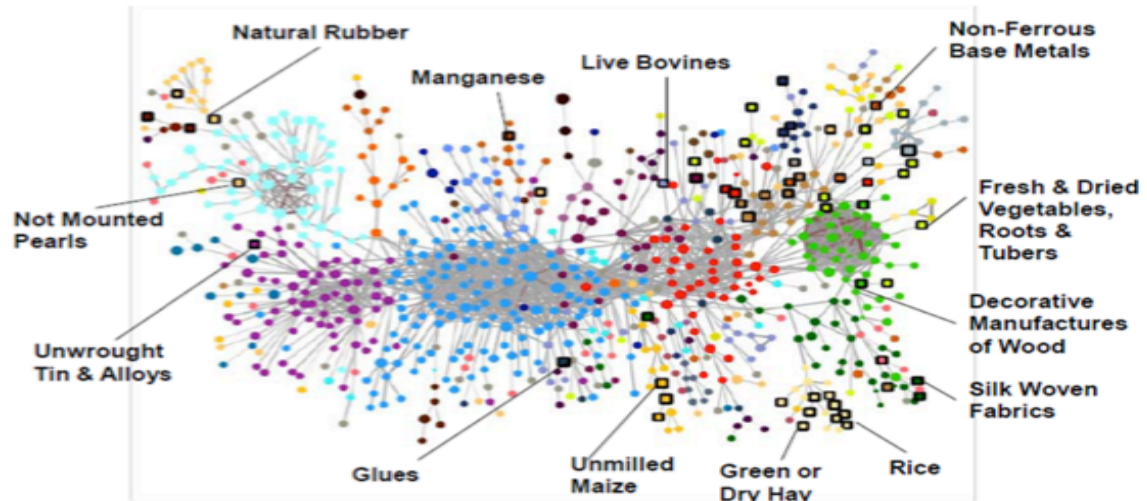


¹⁶⁴ Source: IDC CEMA Black Book 2011, Gartner, IDC, Neo-H, ATK, OECD

¹⁶⁵ Source: The Observatory of Economic Complexity, <http://atlas.media.mit.edu/rankings/>, Whiteshield Analysis

In 1965 with ECI of -0,88 Thailand had much more simple economy than Tunisia. It had about 60 RCAs, all located on the periphery of the Product space (Non-ferrous base metals, natural rubber, Minerals, Glues, Live animals, Silk fabrics, Rice).

Figure [44]:Product Space of Thailand, 1964 ¹⁶⁶

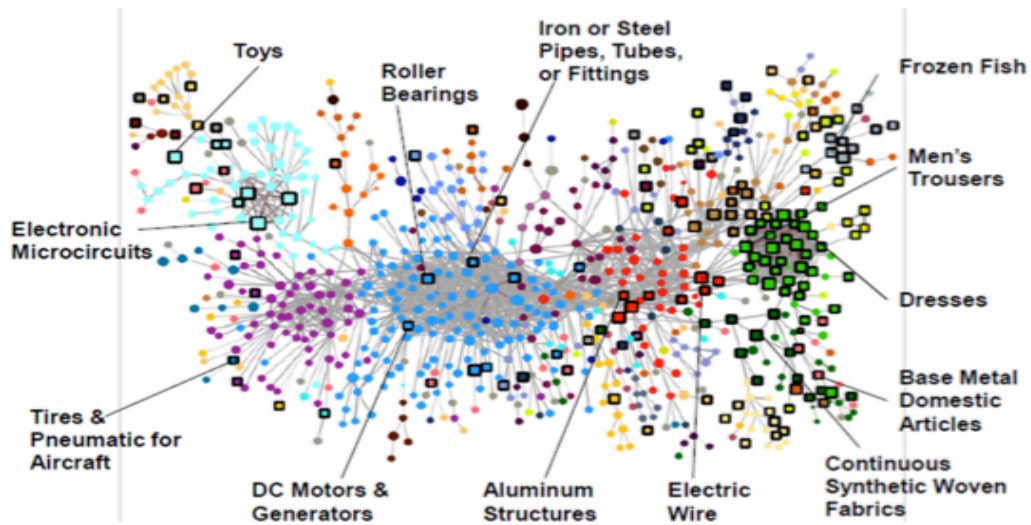


Note: RCAs higher than 1 are squared

What happened in the period 1964-1998? Thailand significantly improved its positions on the Product Space, moving from the periphery towards the center. However, it first moved to the less complex clusters of products, developing strong positions in Apparel and Textile cluster, Electric wires, Metal structures, simple semi-finished products for Aircraft manufacturing, as well as more complex Electronic microcircuits, DC Motors and generators. The position of Thailand at that time was only slightly better than that of Tunisia.

¹⁶⁶ The Atlas of Economic Complexity, Hausmann, Hidalgo et al, Harvard, MIT, 2011

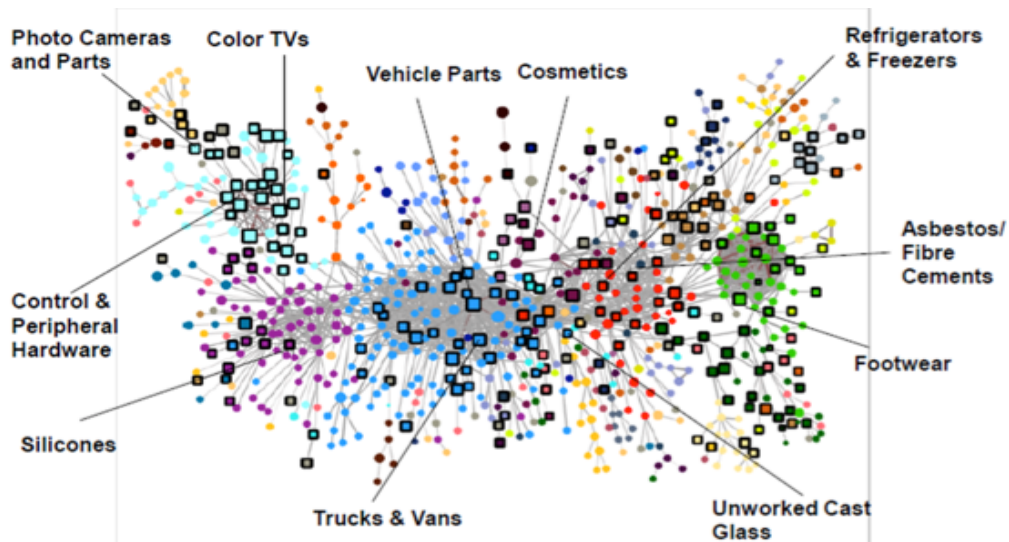
Figure [45]:Product Space of Thailand, 1998¹⁶⁷



Note: RCAs higher than 1 are squared

What happened next? In 1998-2008, economic complexity of Thailand skyrocketed. With ECI of 0,81 the country almost completely moved away from Apparel and Textile cluster, developing strong position in Transportation vehicles, Household, Hardware and Telecommunication Electronics within EEI and Mechanical sectors, Silicones and Cosmetics within Chemicals sector.

Figure [46]:Product Space of Thailand, 2008¹⁶⁸



Note: RCAs higher than 1 are squared

¹⁶⁷ The Atlas of Economic Complexity, Hausmann, Hidalgo et al, Harvard, MIT, 2011

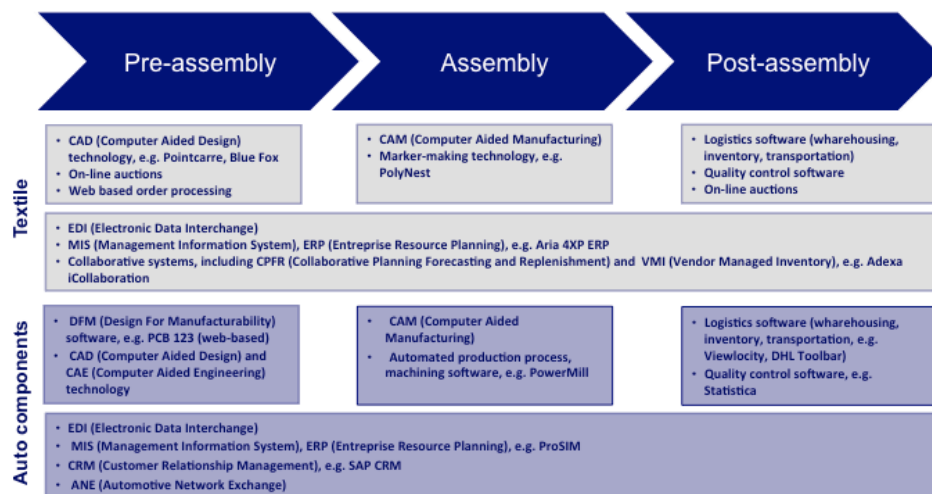
¹⁶⁸ The Atlas of Economic Complexity, Hausmann, Hidalgo et al, Harvard, MIT, 2011

Tunisia is now following the path Thailand took in 1998-2008. However, as reflected by the Opportunity Value almost three times exceeding Economic Complexity Index, Tunisia still has much room to raise complexity by addressing its gaps on the Product space. The country has well-diversified economy, the key now is to concentrate on the high-complexity segments of the Product Space and develop more capabilities in these segments.

2.2.Value chain networks: opportunities in e-payment, software, telecom, electronics, medical devices and healthcare

Most value-chains are connected through common capabilities and knowledge. For example a Computer Aided Design system can be used for textile but also automotive components manufacturing. As such, we define them as *value chain networks*.

Example of Value Chain Network: CAD systems leverage in textile and automotive¹⁶⁹



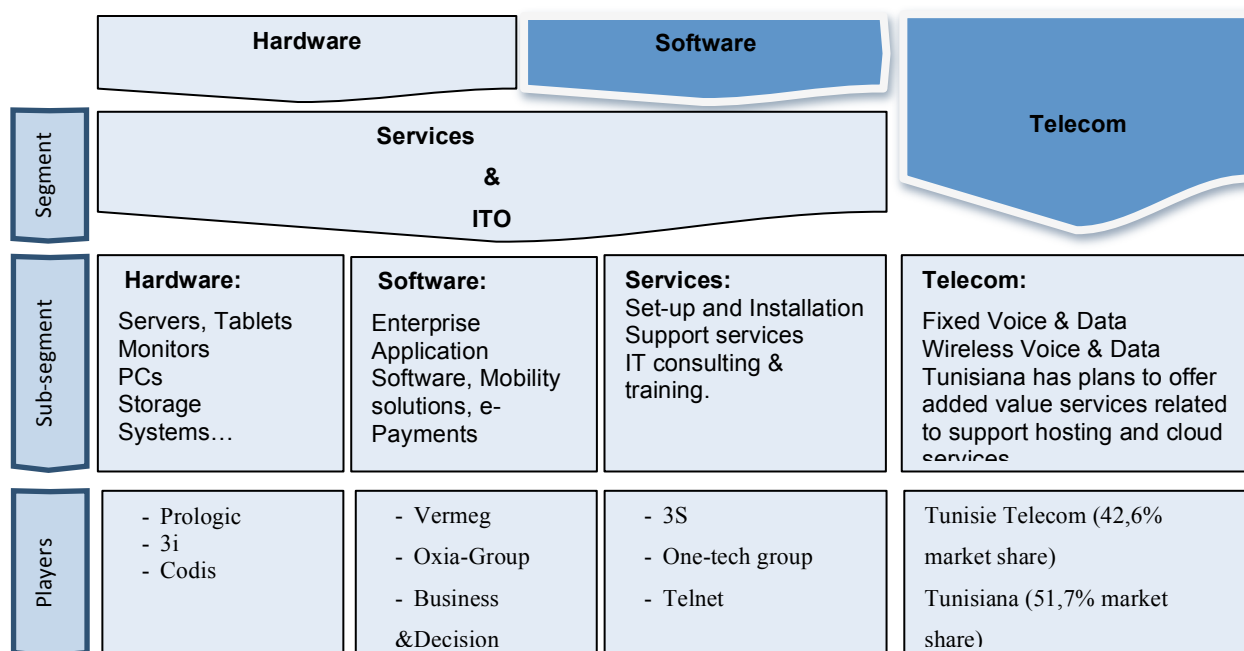
Value chain networks imply that knowledge goes beyond horizontal isolated value-chains. As such a sector like ICT has multiple knowledge touch points impacting electronics, medical devices but also a number of service and industrial sectors. Based on this approach, a number of segments were identified as having high spill over effects.

Market and value mapping for ICT shows, that two main segments, telecommunications and e-payments software, emerge as interesting investment opportunities as they combine both high return on investment and high potential for innovation¹⁷⁰.

¹⁶⁹Source: OECD, Whiteshield analysis

¹⁷⁰Note: ROI for the companies is assessed as industry average ROI. and is valud as high, medium and low.

Figure [47]: Main players in the ICT market in Tunisia (2012)¹⁷¹



Note: Dark blue segments are recommendation areas for investment

The Telecom segment represents 66,5% of the Tunisian ICT sector, another 24,1% are accounted for by the Hardware sector. Software, services and ITO represent 9,4% of the sector.

The Hardware sector is the second ICT sub-segment in terms of market size, but it remains relatively low in terms of margins and innovation potential. Compared to other sub-segments, barriers to entry to Hardware are low. However, most players in the segment rely on reselling equipment by international brands such as HP and IBM, so opportunities are limited.

Margins in IT services are much higher, but the fact that most service providers in Tunisia offer basic set up and installation services make this segment unattractive in terms of innovation potential. Barriers to enter the market are high due to the investments needed in technical resources as well as high investment in Human Capital and internal capabilities. Demand from the local market is low, because most local players are either present or are planning projects in offshore markets.

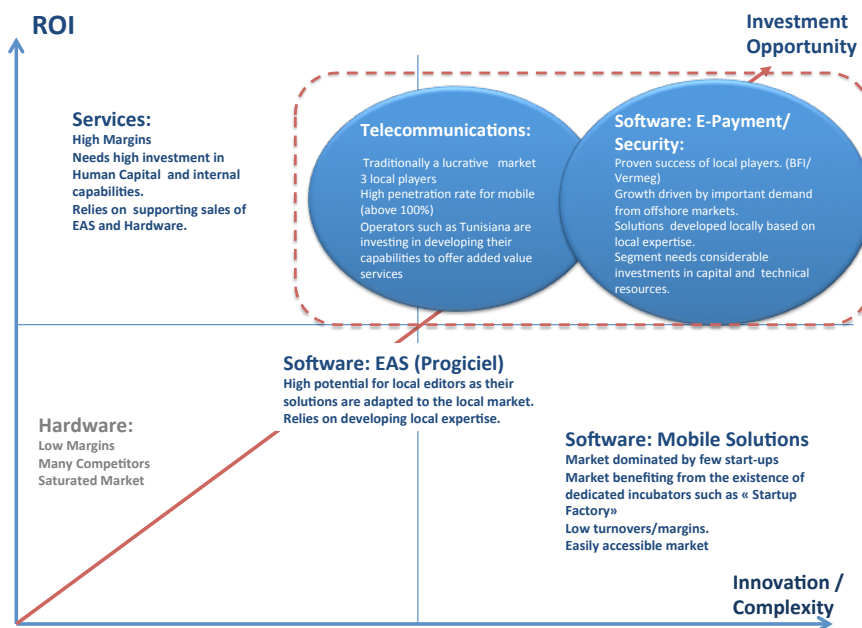
The Software segment takes advantage of the existence of dedicated IT technopoles and two incubators, one of which is dedicated to mobile solutions (Startup Factory). Software sub-segments, such as Enterprise Application Software and Mobile Solutions, offer greater innovation potential than IT services due to their reliance on more complex expertise

¹⁷¹ Source: IDC CEMA Black Book 2011, Gartner, IDC, Neo-H, ATK, OECD

requirements. Margins are low for Mobile solutions and EAS and high for the Enterprise Application Software segment. The e-payment sub-segment of Software, fuelled by the strong growth of few companies such as BFI and Vermeg, offers both high margins and high investment potential.

The Telecom segment is another segment with both a high potential for innovation and good margins. Telecom operators benefit from having a large pool of consumers and the constant emergence of services related to their voice and data products offered to the market. Tunisia has a high mobile and internet penetration rates compared to other countries in the region. However, the telecom market is expected to reach a plateau level soon due to the relatively small population, unless Telecom operators start offering added value services to the enterprise sector (including Cloud and hosting services).

Figure [48]: ICT sector value mapping of high potential segments (2012)¹⁷²



In the Telecom and Software sub segments Tunisia already has capabilities to move up the value chain from low-end coding, testing and maintenance operations to conceptualization, architecture, systems design, business process automation and systems integration work.

Tunisian firms should engage in developing customized software packages or solutions, as well as focusing on the most promising vertical markets, where the customization of existing packaged solutions is needed and is very expensive due to the shortage of skilled experts.

¹⁷² Source: Whiteshield analysis

Globally, the trend is towards web-based, e-business software systems such as Customer Relationship Management (CRM), Application Service Provider (ASP), Enterprise Resource Planning (ERP) solutions for the financial, telecommunications, education and training, retail and manufacturing industries.

Major development opportunities also exist in systems integration and convergence activities and software customization and localization. These groups have succeeded mainly in attracting foreign clients, particularly in Europe and have positioned Tunisia as an important **offshoring** destination. Beyond companies working in the e-payment sub-segment, other service providers such as the Oxia Group offer also added value software development and specific application development services to European clients.

However, 67% of the offshoring market in Tunisia is still dominated by BPO services. The focus is now on developing the capacity of Tunisian enterprises to shift the balance towards added value ITO services, R&D and KPO services, which offer both a high return on investment and have greater innovation potential.

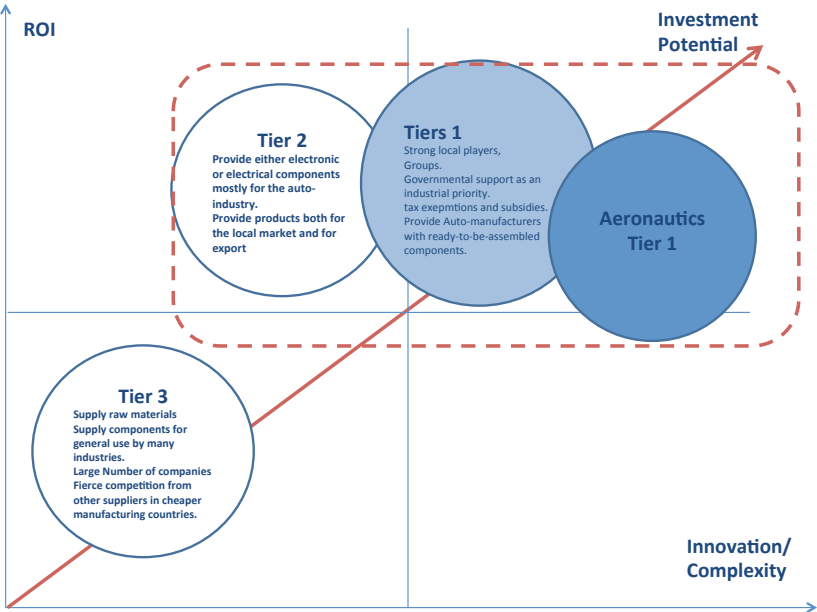
Focusing on EEI opportunities linked to Automobile and Aeronautics sector, with particular interest in Tier 1 and Tier 2 companies, as well as in R&D and Engineering subsector.

Overall, about 350 firms employing 10 workers and more are currently active in this sector¹⁷³. The sector is providing semi-finished and sometimes finished components to clients in the Auto and Aeronautics industries mainly in Europe. Some of the Tunisian suppliers have become regional players in Africa and Europe.

The analysis of the Tunisian coverage of the EEI sector value-chain network reveals strong positions of the country in all three tiers of suppliers. The country has capabilities to produce many types of simple electric components as well as complete cabling systems and car parts ready for assembly. However, it still focuses much more on the former than on the latter (217 companies in Tier 3 versus 85 companies in Tier 2 and 55 in Tier 1).

Companies representing real innovation potential coupled with a possible high return on investment are Tier 1 suppliers as these provide the most complex solutions developed thanks to their advanced expertise. This competitive advantage allows them to charge premium prices leading, in turn, to high margins, so the most compelling recommendation in terms of existing capabilities, expected margins and investment potential is to focus on the Tier 1 sub-segment.

Figure [49]: EEI sector value mapping of high potential segments (2012)¹⁷⁴

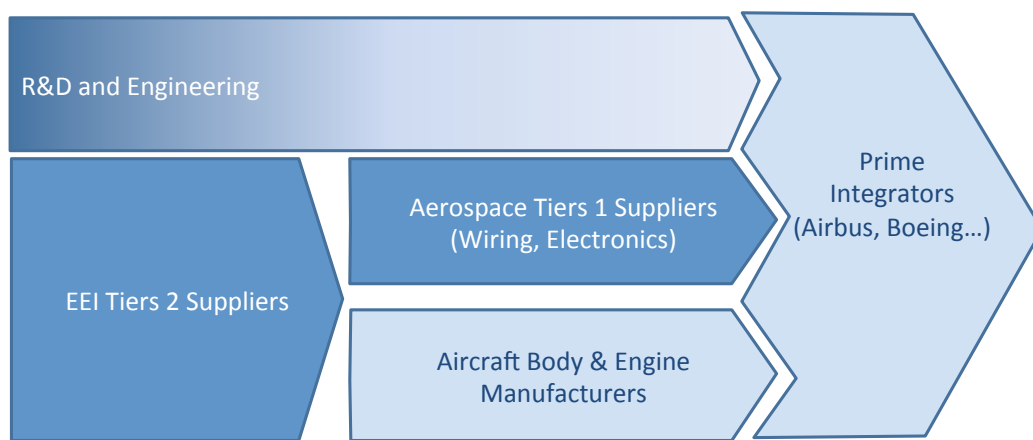


¹⁷³ Source: FIPA: Tunisia http://www.investintunisia.tn/site/en/article.php?id_article=774

¹⁷⁴ Source: Whiteshield analysis

Tunisia has attracted recently many companies operating in the Aerospace field, precisely because of the existence of a strong EEI sector. The companies that chose Tunisia as an offshoring platform, such as Aerolia, Zodiac or Thales, benefited from an already existing pool of qualified employees and the presence of local suppliers, which is a considerable logistical advantage. At its current state in Aeronautics segment, Tunisia keeps strong positions as Tier 2, Tier 1 supplier, and relatively in the R&D and Engineering field.

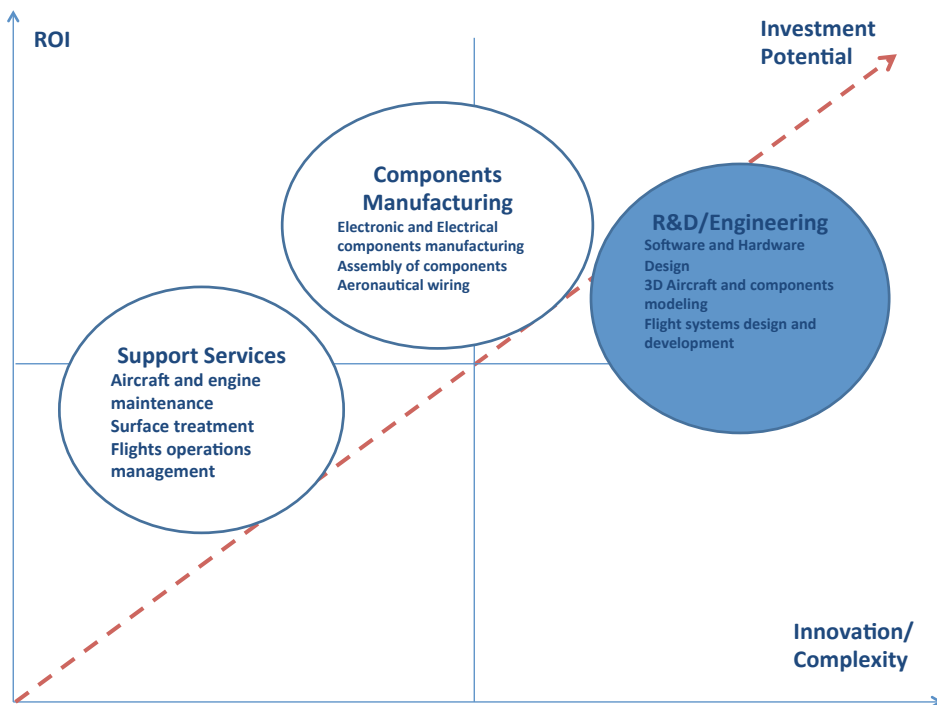
Figure [50]: International Aeronautics value chain, with the segments located in Tunisia and abroad (2012)¹⁷⁵



Value mapping of the Aeronautics sector demonstrates that margins are high for different types of Aircraft Components, which can be successfully produced with existing capabilities in EEI, Mechanical and Metal manufacturing. However, high investment potential exists in R&D and Engineering. Given the very high level of Tunisian education in mathematical and technical sciences and existence of many specialists in this field, this area can be strongly recommended for investment.

¹⁷⁵Source: KPMG’s Global Automotive Executive, Survey 2012: Managing growth while navigating uncharted routes:<http://www.kpmg.com/GE/en/IssuesAndInsights/ArticlesPublications/Documents/Global-automotive-executive-survey-2012.pdf>, Whiteshield analysis.

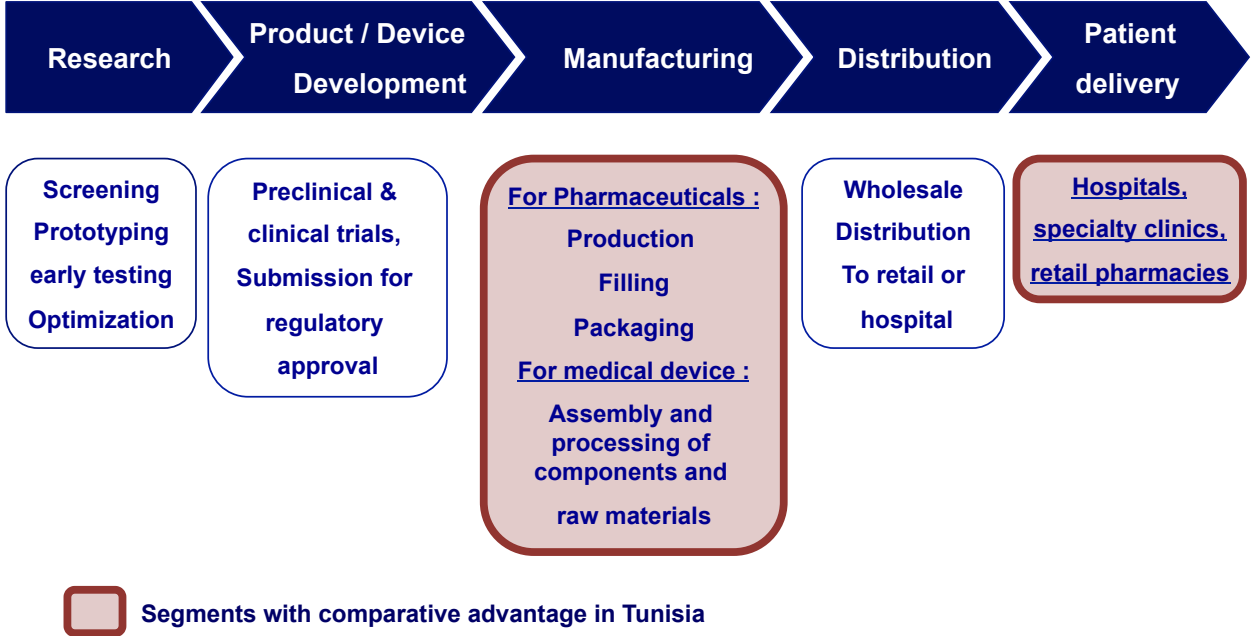
Figure [51]: Aerospace sector value mapping, and high potential segments in Tunisia (2012)¹⁷⁶



¹⁷⁶ Source: Managing the International Value Chain in the Automotive Industry, Stefan Schmid; Philipp Grosche. 2008: http://www.escp-eap.eu/uploads/media/Managing_the_International_Value_Chain_in_the_Automotive_Industr.pdf, Primary Interviews, Whiteshield Analysis. Groupement des Industries Tunisiennes des Aéronautiques et Spatiales (Gitas), ForeignInvestment Promotion Agency (FIPA)

Focus on Medical equipment manufacturing: leveraging capabilities of three key innovating sectors

Figure [50]: pharmaceutical value chain and main segments in Tunisia (2012)¹⁷⁷



The main innovative segments within the Tunisian Medical and Pharmaceutical sector are the manufacturing of drugs and the clinical services segment. The country’s offer in health care covers the R&D segment outsourcing as well as the clinical segment, with an offer centered on surgical clinics providing low price plastic surgery to European tourists seeking health services and cosmetic surgery. The drug testing and clinical trials sub segments are outsourced to Tunisia as well, through local CROs.

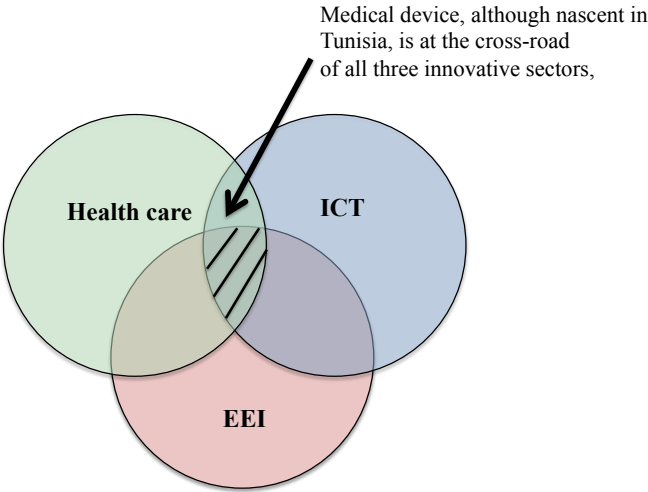
Next step: Moving to knowledge intensive manufacturing and biotechnology

Historically manufacturing outsourcing to Tunisia was boosted by increased privatization and FDI interest in manufacturing plants. The offer here is centered mainly on generics, on the low end of the value chain, but is moving fast up the value chain with a progressive switch to more technically demanding and sophisticated products, i.e. knowledge intensive manufacturing such as oncology injectable products and biotechnology injectables over the next few years. This move applies both to pharmaceutical drugs, medical devices and biotechnology products, which constitute the next step forward. The country has a very strong research base in chemical and

¹⁷⁷ Source: Whiteshield analysis

medical sciences. The Medicine subsector of the Pharmaceutical industry is not strong enough to even meet domestic demand, but it receives support and privileges from the State. Moreover, the country has strong capabilities in Electronic apparatus and Telecommunication equipment. Together this raises the attractiveness and represents strong opportunities for the Medical electronic equipment subsector of the Pharmaceutical/Medical electronic manufacturing sector.

Figure[51]: Potential of medical device as its offer constitutes a link between all three innovative value chains.¹⁷⁸



¹⁷⁸ Source: Whiteshield analysis

2.3. Innovation Investment Index: prioritizing potential target areas

Scientific and Medical apparatus, Aircraft and Auto equipment, Hardware and Telecom electronics are top recommendations for industry. Telecom, Mobile solutions, E-payments and R&D engineering are the most promising subsectors within ICT. Beyond those sectors, agriculture and textile sectors have also been analyzed separately in Box [13].

Figure [52]: Tunisia Innovation Investment Index, 2012¹⁷⁹

Tunisia Innovation Investment Index 2012								
Dimensions	1. Does the country have capabilities in this product/service?	2. Is it complex and innovative?		3. Is it an opportunity?		4. Does it support employment?		Innovation-Investment Index
Sub-questions	1.1. Do capabilities exist?	2.1. Does the country focus on the high or low end of value chain network?	2.2. Is the product/service complex?	3.1. Do they have a market?	3.2. What is the potential gain in Opportunity value?	4.1. What is the geographical distribution of companies over the country?	4.2. Is employment high?	
Variables	Revealed Comparative Advantage (scaled)	Sector value chain network level of complexity (scaled)	Product complexity index (scaled)	Market size (scaled)	Opportunity Gain (scaled)	Herfindal-Hirschman Index for companies' distribution (scaled)	Employment in the sector (scaled)	Weighted average of all dimensions
Scientific, Measuring and Medical electronic equipment	100	49	100	29	99	100	39	77
Auto parts	47	49	75	44	79	93	98	66
Hardware and telecom electronics	78	49	48	34	82	100	39	64
Telecom	64	47	38	100	38	51	100	63
Mobile Solutions	64	100	100	3	94	51	24	62
Aircraft equipment parts	68	49	88	7	100	93	20	62
E-Payment/Security	64	100	75	3	100	51	24	60
R&D - Engineering	64	55	100	5	100	51	24	58
Household electronics	47	49	62	29	79	100	39	57
Enterprise Application Software	64	100	63	3	88	51	24	57
Essential Oils, soaps, Odoriferous substances, organic surface-active agents	89	41	13	15	81	92	19	55
ITO	64	55	75	5	88	51	24	53
IT Implementation	64	67	63	6	81	51	24	52
IT consulting	64	67	50	6	88	51	24	52
Operations management	64	67	50	6	69	51	24	49
Training and education	64	67	38	6	81	51	24	49
Non-medical pharma	36	41	68	13	87	92	16	49
Perfumery and cosmetics	59	41	16	15	81	92	19	48
Hardware	64	32	25	34	75	51	35	47
Support services	64	67	38	6	63	51	24	47
Medicines	7	41	73	13	91	92	16	43
Organic Chemicals	11	41	47	4	94	92	29	41

Allocated Weights for dimensions within the index	0.25	0.25	0.25	0.25
Allocated Weights for variables within the dimensions	1	0.5	0.5	0.5

Note: Industrial products are in grey, ICT and Offshoring services are in blue

¹⁷⁹ Source: Whiteshield analysis

The Innovation Investment Index, constructed on basis of the Whiteshield tripartite approach (economic complexity, value chain network and territory analysis) helps to reveal subsectors with the highest potential effect of investment.

Sample selection consisted of two stages. On the *first stage*, segments with the highest capabilities were identified. These included:

- Traditional sectors: Agrifood, Textile and Basic Fertilizers with RCAs from 5 to 110 in different categories of products (see Box [13]).
- Knowledge economy sectors: Inorganic Chemicals (RCA of 9.7¹⁸⁰), Plastics (RCA of 5.5), Medical instruments (RCA of 1.1), Metal structures (RCA of 2.4), EEI tier 3 suppliers production (wires, cables – RCA of 7.7), EEI tier 2 suppliers (RCA of 4.4), EEI tier 1 suppliers (RCA of 2.4) and even several types of industrial and consumer electronics, including Color TVs, Telecommunication equipment and Ticketing machines (RCA of 1.6).

Traditional sectors are located on the periphery of the Product space, and thus, have low product complexity and low opportunity gains for Tunisia. Therefore, these sectors were excluded from the further analysis. On the contrary, knowledge economy sectors have high product complexity and are associated with high opportunity gains. Now Tunisia concentrates on the low-end production in these sectors (tier 2 and tier 3 suppliers). Moving up the value chain networks in these sectors would leverage existing capabilities and improve economic complexity of the country. To differentiate between these sectors and select the most promising targets for investment the Investment Innovation Index was constructed.

Based on the first stage analysis, Organic Chemicals, Medicaments, Household chemicals, EEI tier 1 suppliers, Medical, Telecom and Household electronics were selected as key segments of interest. ICT segments, not covered by the economic complexity analysis directly, were added to the list based on the market data. On the *second stage*, for each product or service in the list, different indicators of tripartite approach were calculated. These indicators are the Product Complexity Index, Revealed Comparative Advantage and Opportunity Gains (Economic complexity indicators), Distribution of companies over different levels of value chain networks (Value chain network indicators), Employment, Market size and Geographical distribution of companies around the country (Territory and Market indicators). These indicators were reorganized into four dimensions according to four key questions of interest:

¹⁸⁰ Note: It means, that export share is almost 10 times above world average

- Does the country have capabilities to produce this product or service?
- Is this product or service complex and innovative?
- Is it an opportunity?
- Does it support employment?

In the resulting **Innovation Investment Index** all four dimensions were given equal weight (Box [12]).

Innovation Investment Index (III) reveals that Scientific and Medical apparatus, Aircraft and Auto equipment, Hardware and Telecom electronics are top recommendations for industry; Telecom, Mobile solutions, E-payments and R&D engineering are the most promising subsectors within ICT.

However, capabilities and opportunities are distributed unevenly around products and services. Medicines, for example, have one of the highest PCI and are associated with very high Opportunity Gain. However, low existing capabilities, small market size, low employment and chemical value chain network hugely biased toward low-end inorganics and fertilizers push Medicine subsector down in the resulting ranking.

Medical and scientific electronic equipment are on the top of the list (assuming that their potential market size can be approximated by the size of Tunisian electronic segment). The country has strong capabilities in electronics and measuring scientific equipment. The corresponding EEI, though biased towards low-end manufacturing, covers all three tiers of suppliers on the value chain network, with no capability gaps. High Product Complexity and Opportunity gains indicate innovative nature and high potential of this sub-sector. Finally, high employment in electronics and 90% of companies concentrated in North-east and Central-East regions of the country ensure high effect on employment. Reasoning beyond the III methodology, this segment bears high opportunities for Tunisia because of big and developing clinical services segment of Pharmaceutical sector in the country.

In Hardware and Telecom electronic equipment capabilities are also very high, though product complexity and opportunities are slightly lower. Apparent advantage of this segment is large Hardware ICT sub-segment, which constitutes potential market for this industry. Hardware ICT segment itself is located at the bottom of the ranking, because the segment is currently engaged in reselling of famous brands, and thus is already saturated and is positioned at the low end of the value chain. High potential lies in linking nascent Hardware and Telecom Equipment production industry with ICT Hardware services segment.

All ICT and Offshoring services are distributed more evenly around the country, and thus their effect on employment is expected to be lower. However, Telecom outperforms all other sectors by market size and absolute number of employees. Mobile solutions and E-payments/Security are very attractive because of high complexity, high-end biased structure of Software value chain network, high ROI and investment potential (proxy of Opportunity Gains for ICT and Offshoring). R&D engineering, being a High-end Offshoring segment, also bears high opportunities for investment, however its position is aggravated by Tunisian Offshoring hugely biased towards low-end BPO, which accounts for 67% of all Offshoring in the country

Auto equipment suppliers benefit from the large market and many employers. Aircraft equipment, though still nascent in Tunisia, as reflected by small market size, has higher RCA, PCI and Opportunity gain. Thus, the aeronautics sector in Tunisia, though being more challenging, offers interesting opportunities for investment.

Box [12]: Innovation Investment Index Composition ¹⁸¹

Innovation Investment Index is composed of four dimensions, each aimed at answering one particular question:

1. *Does the country have capabilities to produce this product or service?* This dimension is represented by absolute value of Revealed Comparative Advantage (RCA). For most services export volumes are not reported, and therefore average RCA in ITO and Offshoring of R&D engineering was taken as a proxy
2. *Is this product or service complex and innovative?* The question is addressed by two indicators: Product Complexity Index (PCI) and Value Chain Structure. The former is taken from Economic Complexity analysis (Chapter 2.1) for industrial products. For services it is approximated by position of particular service on the value-chain network, 25 being the very low end, 100 – the very high end. Value Chain Network Structure indicator reflects whether the whole sector (Chemicals, EEI, Software, Telecom etc.) is dominated by low-end or high-end production.
3. *Is it an opportunity?* Opportunities are measured by two indicators: relative Market Size of the corresponding subsector (Electricals for machinery components, Electronics for Household, Medical and Telecom electronics, Parachemicals for perfumery and cosmetics etc.) and Opportunity Gain (OG). Opportunity gains are taken from Economic complexity analysis (Chapter 2.1) for industrial products. For services they are approximated by the combination of ROI and investment potential, assessed in Chapter 2.2.
4. *Does it support employment?* Effect on employment is assessed by two indicators: Number of workers in the corresponding subsector and Geographical Distribution of Companies in the corresponding

¹⁸¹ Source: Whiteshield Analysis

economic sector (EEI, Chemicals and ICT). To get the latter Herfindal-Hirshmann Index for geographical concentration of companies was calculated.

All dimensions are included into the final index with the weight of 25%. Within each dimension all indicator are scaled and averaged.

Box [13] Capabilities identified in traditional sectors in Tunisia

Economic complexity analysis covers all industrial sectors in Tunisia, including Agriculture and Food, Textile and Apparel, Wood, Mining, Metalworking, Chemicals (Basic chemicals, Pharmaceuticals, Plastics, Rubbers and Parachemicals), Electrical, Electronic and Mechanical semi-finished and finished production (General industrial machinery, Machinery for particular industries, Power generating machinery, Medical and scientific apparatus, Office machinery, Household machinery, Telecommunication machinery, Transportation vehicles and equipment etc) as well as many types of Manufactures articles (Porcelain, Jewelry, Musical instruments, Clocks, Books, Office suppliers etc.) In total, there are 761 products, broken up into 98 categories according to SITC 3rd revision.

Based on the Economic complexity analysis in Tunisia, three main categories of sectors were identified: (1) Strong traditional sectors (high capabilities and low complexity), (2) Developing innovative industries (intermediate capabilities and high complexity) and (3) Nascent sectors with the highest innovation potential (RCA less than 1, high complexity and opportunity gains).

The two latter categories are the knowledge economy sectors, covered in the Chapters 1 and 2 of the report. The first category includes Agrifood, Textile and Basic Fertilizers sectors. In Agrifood Tunisia has the most pronounced capabilities in Pasta (export share 16 times above world average), Fresh and dried fruit and Dried vegetables (export share 7,6 and 5 times above world average respectively). In Textile and Apparel RCA varies from 3 to 25 (highest RCAs in Men's clothes, skirts, corsets as well as furnishing textile articles). In general Fertilizers, Tunisia has RCA of 26, and export share of Phosphate fertilizers alone is 115 times above the world average. Product complexity of all these sectors is low: -0.9 for Agrifood, -0.63 for Fertilizers, -0.42 for Textile and Apparel.

High capabilities in the traditional sectors are supported by the presence of numerous companies. These companies have generally reached a critical size, which allows them to weigh on the national market and as well to play an important role on the global level. For instance, Granuphos, a company, which produces and commercializes various types of fertilizers, is leading the market in Tunisia, but it is also an important actor on different markets in Europe, Asia and Latin America. As far as Agri-food is concerned, GIPA, which is part of the Poulina Holding, one of the most financially solid Tunisian groups, commercializes different food products ranging from oils to flavoured ice-cream products. The financial backing of Poulina has allowed GIPA to comfortably develop a market leadership position across different food products on the regional level. More examples are given in the company profiles in Appendix 2.

Appendix 1: Interview and company summaries

Appendix 2: Investment and capacity building profiles

Appendix 3: List of all publications reviewed

Appendix 4. Methodology of economic complexity approach