

Technical Note: Brief Summary of the Governance and Financing of Technology Centres in Europe and other Regions of the World

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1. Introduction

The Government and the private sector in many emerging countries have created or wish to develop technology or technical industrial or technology transfer and innovations centres supporting different sectors of the economy: agri-food, wood and furniture, textile and garments, mechanical, electrical, electronic and robotics, IT and web technologies, biotechnology, etc. Both government agencies and the private sector promote and supervise these types of centres, but frequently have difficulties in trying to define their governance, management, legal status, sources of funding, location and facilities, , as well as measuring their impact on the enterprises especially small and medium-sized ones, of the region and the sector. So as to standardize terminology, in this Technical Note all types of technology or technical centres or institutes with some private “participation” besides pure public financing and a non-profit status will be called “Technology Centres”.

This short Technical Note on the governance and financing of centres in Europe and other regions is based on the professional experience of the author with various technology institutions with projects funded by UNIDO, the EU, the World Bank and regional Development Banks, and on the information of the associations or networks of centres at European and international level.

2. Types, Governance and Financing of Technology Centres

Types and denominations of Technology Centres:

Technology Centres in Europe are called “Centres techniques industriels” in France and other francophone countries in Europe and Africa, and “technological innovation, research and technology transfer centres or institutes” in most other countries of Europe as well as in the rest of the world. Yet, there is no commonly-agreed definition or categorization of technology centres in Europe or around the world; although generally they can be classified into three categories:

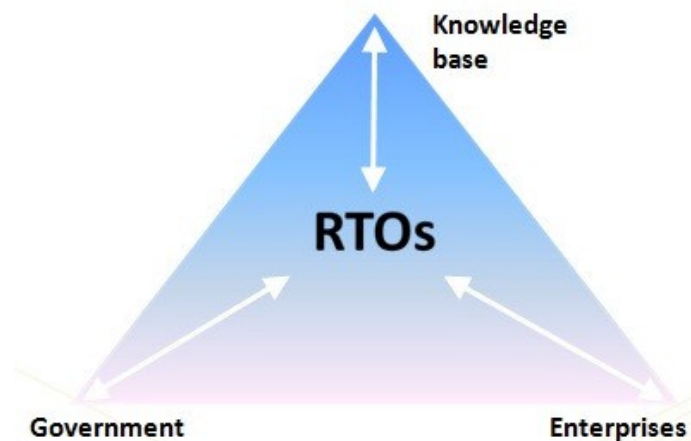
- 1) “public research institutes”,
- 2) “public-private non-profit centres”, and,
- 3) purely private for-profit “research, technology or innovation centres”.

Even if called differently, most of these Centres or Institutes deliver a mix of applied research and technological development, innovation, quality control and laboratory services, development of prototypes, design, and training to enterprises in a sector or industry, a group of sectors, or are based on applying a “horizontal technology” (such as digital or bioscience).

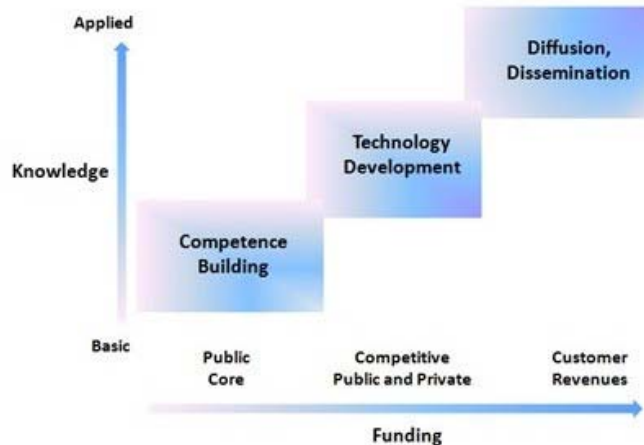
The history and policies of each country towards promoting and developing public-private technology transfer and innovation centres to support specific has implied that these centres have evolved and are organized differently in each country and region of the world, and frequently after being created and evolving have created or join national and international research and technology groupings or networks.

European Union:

The European Union (EU) does not define nor classify public-private Technology or Technical centres, but rather groups them together with all other entities dealing with research, development and innovation; whether public, mixed management or private, into the general category of institutions called “Research and Technology Organizations” or RTOs. The EU considers RTOs as one of the key elements of innovation ecosystems in Europe, which also include research universities and Public Research Institutes (PRI). The European Association of Research and Technology Organizations, EARTO based in Brussels, www.earto.eu, is the largest association of institutes and centres dealing with applied research, development and innovation; it has more than 350 members. This association defines the Research and technology organizations as institutions serving as a "bridge between businesses, the Government and the sources of knowledge” (or 'knowledge base'); as expressed in the graphic below:



The evolution of maturity and the financing of RTOs is described by EARTO as happening in three phases; starting with a “public core funding” which develops the technical and technological competences; followed by a phase of “technology development with competitive public and private funding”, and a final “maturity phase of diffusion and dissemination” of the technology, mostly based on private or public customer revenues (contracts); as expressed in the graphic below:



Despite the fact that the EU does not classify RTOs, EARTO analyses of its members in 2015 and in previous years identified that the category of public-private “Technology centres” represent more than half of its 350 active members. The legal status of these institutes or centres varies by country, but it is generally a foundation, association or non-profit “society” with the public sector and the private sector represented in its board or supervisory committee. The governance is usually public and private institutions, but as the centre evolves the key role is given to the private sector or national associations (see Annex 1 with examples of centres and its supervisory institutions, other partners, and their legal status).

These EARTO studies estimated that the socio-economic impact in 2014 of members:

- Generated approximately 40 billion EUR of additional “value-added”; calculated as direct impact in customer companies and institutions of 10 - 12 billion EUR, indirect impact of 9 - 13 billion EUR, and induced social impact of 14 - 18 billion EUR),
- Supported over 100,000 enterprises per year, with technical and non-technical services (the majority are SMEs, but the proportion was not given), and were financed partly by at national and regional Governments, and the majority of the scientific and industrial
- Employed over 150,000 qualified staff; including scientists, technologists and other highly-specialized qualified professionals.

Regarding selected individual countries in the EU, in **Germany**, research and technology centres and institutes have traditionally had much initial public funding from Federal and State (Länder) governments, especially two large networks: the 67 large Fraunhofer Institutes of research and technology development, and the Steinbeis network of over 750 “technology transfer institutes”. Within the “Fraunhofer Financial Model”, the Fraunhofer headquarters (Society or G.F.F) earns about 70% of its income through contracts with private enterprise or government projects, while the other 30% of the budget comes from federal and state government direct grants to fund

preparatory research for groups of enterprises or sectors. Other networks of technology centres are associated to universities and local governments together with the industry.

Many other **central and northern European** countries have developed a similar model of institutes and networks (see later graphic of a comparison of funding in 5 countries).

In **France**, technical centres are classified into industrial and agri-food centres, belonging to two separate networks:

- ACTIA, which groups the Agro-food Centres association (www.actia.fr), with more than 80 locations in France employing over 1,200 researchers, engineers and technicians, and a large network of national and international collaborators and partners,
- The Industrial Technical Centres, grouped around the CTI network (www.reseau-cti.com), with over 50 facilities serving 32 industrial sub-sectors and 120 “trades”, and employing more than 3200 engineers, technicians and researchers in 2014.

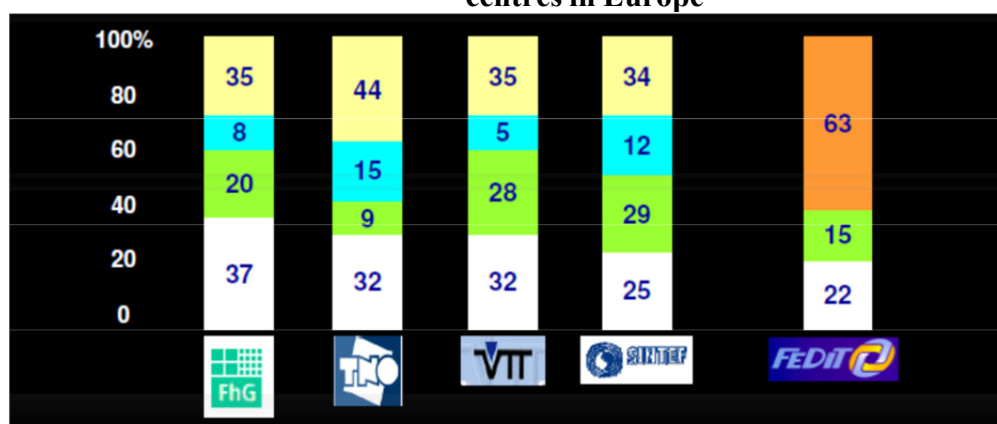
In **Spain**, there was great expansion of technology centres, as they are officially by Government Decrees of the Ministry of Industry, Energy and Tourism Spain (the Decree 2093/2008 of 19 December defined and created a register of Technological Centres- TC- and Centres for Support of Technological Innovation- CAIT). The CTs must have at least some type of laboratory or other technical and technological resources, while CAIT must necessarily count with these technical resources in its facilities. This registry is voluntary but over 100 centres of both types were registered at present, because the Government entitles exclusive centres registered in some calls for supply and public subsidies. In Spain the national association of Technology Centres is called FEDIT (www.fedit.es/en) has 36 members in 2015, but there are various regional networks too (REDIT in Valencia, Tecnio in Catalonia, etc.).

In **Italy**, “Centri e istituti tecnici e tecnologiche» were also created during in the last 25 years, but the public-private Technology centre model is not structured as independently as in France or Spain. Technology centres or institutes usually belong to technology or innovation parks or universities, while in other Southern European countries they are more independent foundations or associations. In **Greece's** technological research institutes and public-private technology centres also have been created, and sometimes are grouped into technological or research corporations; for example is the Research and Technology Centre Hellas (www.cedth.gr), which includes six research and technological transfer facilities in Thessalonika. There are very few detailed funding or impact studies of European Technology or Technical Centres in Italy or in Greece, except the corresponding country sections of the EARTO European-wide studies.

Comparison of Financing of Research and Technology Centres among EU countries:

As to financing sources, the following graphic compares networks of Technology Centres and institutes in five European countries (Norway is not a EU Member, but is also included in the study as a member of the European Free Trade Agreement):

Figure 1: Comparative sources of income of some key networks of Technology centres in Europe



White: non-competitive public subsidies (for the specific Centre or network, central or regional).

Green: competitive public projects (call for tenders, "call for proposals", etc.; national or European).

Blue: direct contracts with private companies (both large firms and SMEs).

Yellow: direct contracts with public enterprises or entities with State participation.

Orange (only Spain): the sum of Yellow and Blue, ie, all contracts with enterprises and institutions.

FhG (Germany): Fraunhofer Institut, the largest network in Europe with 67 Research and technology institutes

TNO (Netherlands): Network of Research and technological centres

VTT (Finland): Research and Technology centres

SINTEF (Norway): Group of 12 Research and Technology centres

FEDIT (Spain): Federation of Technology centres (48 in 2008, 36 today)

As shown in the graphic above, Technology Centres in Spain had 63% of their revenues coming from service contracts with private and public entities; while 22% came from direct grants (public subsidies) to the centres, and 15% from applied research and technology projects, both at national and European level (the R&D programme now called Horizon 2020 and others). As can be seen, German and other northern European Research and Technology organizations had in 2008 a greater proportion of public subsidies; between 25 and 37% in these four networks, mostly for pre-competitive sector research and subsidies for supporting SME.

Other Regions of the World:

Annex 1 shows a sample of public-private Technology centres and institutes in other continents, based on the "World Association of Technology and Research Organisations" (WAITRO, based in Malaysia, but with members across the world) and other sources. As can be seen from the Table, a wide variety of centres and institutes exist around the world, with differing legal status, supervisory institutions and other partners.

Yet all Technology centres and institutes reviewed in these regions have some characteristics in common:

- They were created either as a non-profit institution or as a public company (or parastatal entity), but always incorporate the private sector either in the founding

partners, or in a supervisory or advisory committee.

- Initial funding has almost universally been from public and international institutions (this is not shown in table as it is usually not declared by the Centres, but it is based on the author's experience with many of these institutions).
- The main Supervisory public institution is usually the Ministry of Industry and Trade (or similar), yet a number of them have a Ministry of Science and Technology or similar agency. Some sector institutes or centres have sector ministries, such as Agriculture in France for the agri-food institutes, Ministry of Transport in Tanzania for a Transport Centre, etc. Reaching stable agreements among the various public institutions and the regional/local bodies to fund, supervise and monitor the Centre, while at the same time involving fully the private sector, is one of the most complicated issues in these structures and requires delicate negotiations and utilizing "best practices" to avoid conflicts.

3. Conclusions of the International Experience of Public-private Technology Centres Analysed for Emerging Countries

Some conclusions of the international comparisons can be especially relevant for the emerging countries in Africa, Asia, Latin America and the Caribbean:

- 1) Technology Centres should be established preferably as non-profit institutions which allow both public and private participation. Their legal status and its national supervisory institution should ensure the establishment of the Centre, and the first years of governance; but after a few years should leave the private sector institutions to govern and define the activities and services of the Centre, together with the regional or local authorities.
- 2) Initial funding of public-private Technology Centres or similar structures has to be based at first in a significant proportion (at least 80%) on public funds, especially the first 3-5 years of operation. Such has been the experience in Europe, Asia and also in the North African countries analysed. The objective should be to achieve in the medium term a proportion of around 60- 70% of income from private businesses and institutions, but only if the Centre has achieved a good level of technical services and a sound maturity in its governance.
- 3) It is absolutely necessary that the private sector is well-represented in the Technology Centre's governance and management structures, involving the key private sector actors of the sector or the technologies served by the Centre, so as to adapt its services to the real needs of companies in the region.
- 4) After becoming more mature, public-private Technology Centres can spend a few years without significant public funding, due to fiscal crisis or budgetary constraints, but they can only survive delivering specialized services to a few large private enterprises and

especially to medium-sized firms. In order to survive with only private contracts and competitive public projects, the Centre must be well-established and its services must be appreciated and marketed well to enterprises in the sector and abroad if feasible (internationalization phase).

- 5) A wide private participation in supervisory and management committees makes Technology Centres withstand better the competition and to become self-sustaining. Networks of Technology Centres usually evolve from “traditional sectors” to intermediate-high technologies, to high-technology and cluster-innovation support. Yet, traditional manufacturing sectors should still be attended, and subsidized indirectly, if the country does not want to lose its “industrial know-how”, but always in synchrony with its industrial and scientific policies.

4. Bibliography

1. WAITRO (World Association of International Technology and Research Organisations); December 201;, see www.waitro.org
2. EARTO (European Association of Research and Technology Organisations « EU R&I Policy and Data-driven Decision making- Knowing your innovation system actors: data on European RTOs”;) website; March 13 2015; see www.earto.eu/about_rtos.html
3. Websites of all Centres in Annex 1 and others not included of public research institutes with no apparent private participation or significant services to private companies.

Annex 1: Technology Centers and Institutes with public and private participation: sectors, governance, partners and legal form

Name of Centre	Country	Main Sectors of Activity	Supervisory Public Institution	Other public and private institutions	Legal form	Website
AFRICA						
National Food Technology & Research Center	Botswana	Food Technology Food Biochemistry Food Microbiology & Biotech Nutrition & Dietetics	Ministry of Commerce and Industry (MCI)	Associations and chambers of commerce	Independent company limited by guarantee	http://www.naftec.org/
Botswana Institute for Technology Research and Innovation (BITRI)	Botswana	Natural resources and materials; agriculture, health, energy, ICT	Ministry of Infrastructure Science and Technology,	Associations and chambers of commerce	Is a parastatal organization established in 2012 through an Act of Parliament	http://www.bitri.co.bw/
Botswana Technology Centre (BOTE)/RIPCO merged centre	Botswana	Energy, industrial sectors	Ministry of Infrastructure, Science and Technology	Associations and chambers of commerce	Established as parastatal organizations, and later merged	
Malawi Industrial Research and Technology Development Centre (MIRTDC)	Malawi	Agro-processing Sector Technologies, Energy Sector Technologies, Building Sector, Ceramic, Agricultural technology	Ministry of Industry and Trade	Associations and chambers of commerce	Established as a parastatal company in 1991. Reports directly to the Ministry of Industry and Trade as its line ministry and also the Ministry of Statutory Corporations as a parastatal.	http://www.mirtdcmalawi.com/Index.html
Raw Materials and Development Council	Nigeria	Raw materials	Federal Ministry of Science and Technology		Was established through a presidential Decree (now Act) No. 39 of 1987	http://www.mrdc.gov.ng/MainPage.aspx

Institut de Technologie Alimentaire (ITA)	Sénégal	Cereals, vegetables and fruits Meats Fisheries Products Biotechnologies and other	Ministère du Commerce, de l'Industrie et du Secteur informel (Trade and Industry)	Chambers and associations	l'Institut jouit d'un Statut d'Établissement Public à caractère Scientifique et Technologique (public science and technology company)	http://www.ita.sn
Tanzania Transportation Technology Transfer (TanT2) Centre	Tanzania	Transport	Under the Ministry of Works	World Road Association (PIARC), United States Department of Transportation, Federal Aviation Administration (US DOT FAA), Institute of Transportation Engineers of USA, TRL of UK	The Centre is an institution attached to Tanzania National Roads Agency (TANROADS)	http://www.tant2centre.org.tz/aboutUS.asp
Tanzania Engineering and Manufacturing Design Organization (TEMDO)	Tanzania	Design and Development of machinery, equipment and mechanical engineering products and systems	Ministry of Industry, Trade and Marketing.		Institution established through Parliament Act No 23 of 1980	http://www.temdo.or.tz/Introduction.html
The Technology Development Centre (TDC)- Uganda Industrial Research Institute (UIRI)	Uganda	Minerals and Material; Hand-made paper	Ministry of Trade Industry and Cooperatives (MTIC)			http://www.uiri.org/

Tanzania Industrial & research organization	Tanzania	Renewable Energies, Textile and Leather Technologies; Environment, Food and Biotechnology	Ministry for Industry and Trade	Its governing Council includes Government officials, business community, industrialists and academia		http://www.tirido.org/aboutus.htm
Tanzania Automotive Technology Centre	Tanzania	Automotive	Government institution		Is a government Research institution established on 1985, under a Presidential Order.	http://www.atcnyumbu.org/?page_id=38
The National Institute for Scientific and Industrial Research (NISIR)	Zambia	Civil, mechanic, chemical, electronic and electrical engineering, nuclear science, textile technology, biotechnology, energy resources, industrial chemistry, food science, materials science and natural products, information science, cartographic and location analysis	Ministry of Science, Technology and Vocational Training (MSTVT)	Multilateral and bilateral cooperating partners fund specific projects of mutual interest.	Is a government institution set up by the Science and Technology Act No. 26 of 1997 through the Statutory Instrument No. 73 of 1998	http://www.nisir.org.zm
Zimbabwe Technology Center	Zimbabwe	Food Technology, Industrial Biotechnology and Applied Chemistry; Building Technology; Electronics and Communications; energy			Established by the Government of Zimbabwe in February 1993 under the provisions of the Research Act of 1986	http://www.sirdc.ac.zw/

ASIA						
Industrial Technology Research Institute	Taiwan	Smart Living, Quality Health, and Sustainable Environment.			ITRI is a nonprofit R&D Founded in 1973	https://www.itri.org.tw/eng/Content/Messagess/contents.aspx?SiteID=1&MmmID=617731521661672477
Korea Institute of Industrial Technology	South Korea	Robotics Technology, Manufacturing Systems and Industrial technology	Ministry of Commerce & Industry.	All private sector associations and main public universities	Today receives funds from Government and Private sectors	http://eng.itech.re.kr/introduction/page2.php#e
Sirim Berhad Corporate Center	Malasya	Advanced materials, environmental, renewable energy, industrial biotechnology, Automotive, etc.	Ministry of Science Technology and Innovation		Public company	http://www.sirim.my/

Shriram Institute for Industrial Research	India	Healthcare Drugs, Pharmaceutical & Cosmetics Food, Farms & Herbal Products Environment & Energy Infrastructure Automotive Metals & Alloys Petroleum Products & Fuels Textile, Paper & Leather Chemical, Pesticides & Agro Chemicals Plastic, Rubbers, Coating & Adhesives Minerals & Ores Electricals & Electronics Inorganic Chemicals & Fertilizer, Soil and Solid Waste & Air, Wood	Technology centres and Institutes for Industrial research are supervised by the Ministry of Science and Technology	This Institute is a unit of Shriram Scientific Industrial Research Foundation	Independent, not-for-profit, self-supporting Foundation for research and technology organization	http://www.shriraminstitute.org/
Pakistan Council of Scientific & Industrial Research	Pakistan	Raw Materials	Ministry for Science & Technology		Since 1973, it is functioning under the Act of Parliament	http://www.pcsir.gov.pk/
National Engineering R&D centre	Sri Lanka	Agricultural and Postharvest industry, housing, energy	Ministry for Science Technology & Research		NERDC was in acted by an act of parliament under Special gazette Notification (No 124/6) was published under the Industrial Corporation Act No. 49 of 1957 of 14 August 1974	http://nerdc.lk/en/index.php
The Industrial Technology Institute (ITI)	Sri Lanka	Food Technology; Herbal Technology; Material Technology - Products & Services	Ministry for Science Technology & Research	Functions under the jurisdiction of the Ministry of Highways, Higher Education and Investment Promotion.	Wholly owned institute of the Government of Sri Lanka	http://iti.lk/en/

EUROPE						
Danish Technological Institute (DTI)	Denmark	Building & Construction; Chemistry & biotechnology; Energy & climate; Food & packaging; Environmental & health; Materials & surface technology; Transport & logistic, etc.	Initially by the Ministry of Science and Technology and later became a self-owned, not-for-profit institution with the Queen as the patroness	Associations and chambers	Started as a Public institute and became a Private Institute non-profit private foundation	http://www.dti.dk
ARVALIS –Institut du Vegetal (member of the Instituts Techniques Agroalimentaires association o- ACTIA)	France	8 Technical institutes with 80 locations	Ministry of Agriculture overall, Regional governments operationally	Regional governments, local governments chambers, associations	Ministry of Agriculture Decree of September 15 2006 established 15 ITAI	http://www.actia-asso.eu
AINIA (member of Federación Española de Centros Tecnológicos - FEDIT)	Spain	Agrofood (the 35 FEDIT centers in cover all sectors: manufacturing, food, ICT, robotics, etc.=	Ministry of Industry overall supervision; operationally by the 17 Regional Government departments of Economy or Industry	Other regional and local government departments, Chambers of commerce, business and sector associations, etc.	Ministry of Industry and Trade Decree N. 2093/2008 of 19 December	http://www.fedit.es

AMERICAS						
CIDET (Example of 40 CDTs- Centros de Desarrollo Tecnológico)	Colombia	Electricity and electronics	COLCIENCIAS, the public science and technology agency of Government	Ministries of Industry and trade, Antioquia regional government, chambers and business associations, etc.	Non-profit Corporation	http://www.cidet.org.co/

Centro de Ciencias Aplicadas y Desarrollo Tecnológico (CCADET)	Mexico	Instrumentation, micro and nanotechnologies, information technologies, etc.	Universidad Autónoma de México (UAM)	Private partners and the Regional government of the State of Mexico	Non-profit entity belonging to the Coordination of Scientific Research UNAM	http://www.ccaDET.unam.mx/
CIATEQ, A.C. Center of Research and Technical Assistance	Mexico	manufacturing industry; chemical engineering; Plastics and advanced materials; Telecommunications, IT, electronics and control	CONACYT (The National Council of Science and Technology)	LANFI, the State Government of Querétaro as well as by the industrialists of the State	Created as a para-statal entity with special Decree	http://www.ciateg.mx
CITEMadera (example of Centros de Innovación Tecnológica - 6 Publicly-funded and 7 privately-funded)	Peru	Cover all sectors: the publicly funded the from traditional ones	Ministry of through the agency "Instituto Tecnológico de la Producción"- ITP (Production Technology Institute) as other CITEs		The publicly-funded CITEs are public institutions created in October 2000 by Supreme Resolution 150- 2000-ITINCI. All CITEs have their own standard Statute, even private ones.	http://www.itp.gob.pe (all) http://citemadera.gob.pe (CITE wood and furniture)
Hollings Manufacturing Extension Partnership (390 Centres)	United States of America	All manufacturing sectors across the USA	Department of Commerce (Ministry), through the National Institute of Standards and Technology (NIST)	Private sector associations and firms in each of the 390 partnership centres	Each institute has a specific Partnership statute	http://www.nist.gov/mep

Source : Julio Fuster, TenStep- Corporate Solutions S.A.

