TURKEY

Deliverable 9

Simplified Report

TURKEY – ICT RTD TECHNOLOGICAL AUDIT

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"The views expressed are those of the authors and not necessarily those of the European Commission or any of its officials"

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LIST of ABBREVIATIONS:

BTYK	Supreme Council for Science and Technology
BDDK	Banking Regulation and Supervising Agency
BTK	Information and Communication Technologies Authority
CIP	Competitiveness and Innovation Programme
DB	State Ministry
DPT	State Planning Organization
DTM	Undersecretariat of Foreign Trade
EETP	Electrics Electronics Technology Platform
EPDK	Energy Market Regulatory Authority
ERA	European Research Area
GEGP	Program for Transition to a Strong Economy
HM	Undersecretariat of Treasury
IPA	Instrument for PreAccession
KGF	Credit Guarantee Fund
KIK	Public Procurement Authority
KOSGEB	Small and Medium Industry Development Organization
MB	Ministry of Finance
NMS	New Member States
MEB	Ministry of Education
MPM	National Productivity Center
RK	Turkish Competition Authority
SPK	Capital Markets Board of Turkey
TAEK	Turkish Atomic Energy Authority
TCMB	Central Bank of Turkey
TPE	Turkish Patent Institute
TSE	Turkish Standards Institute
TTGV	Technology Development Foundation of Turkey
TURKAK	Turkish Accreditation Agency
TURKSTAT	Turkish Statistics Institute
TÜBA	Turkish Academy of Science
TÜBİTAK	Scientific and Technological Research Council of Turkey
TÜBİTAK-TEYDEB	Technology and Innovation Funding Programmes Directorate
ULAKBİM	Turkish Academy Network and Information Center of TÜBİTAK
UME	National Metrology Institute of TÜBİTAK
YÖK	Higher Education Council

EXECUTIVE SUMMARY

A lack of information about RTD competencies has been identified in the New Member States (NMS) and Associated Countries where competencies are not systematically gathered or are not sufficiently known. As a consequence, consortia for research projects have mainly been built from partners that have already been active in previous projects, and the potential information and communication technologies (ICT) participants in New Member States and Associated Countries were often neglected. Thus, this Technological Audit Study on research capabilities in ICT is acting to ensure that this hidden potential is released for the construction of an all inclusive and geographically balanced ERA in ICT research area.

The ultimate aim of this project is to explore ICT research capabilities in Turkey to support full integration of researchers from Turkey into ICT networks of FP-active EU organizations and enable related research organizations in Turkey to participate in the project proposals within the context of FP7 ICT Theme.

For achieving this ultimate goal, Middle East Technical University Science and Technology Research Center (METU-TEKPOL) carried out ICT RTD Technological Audit for Turkey on behalf of DG INFSO by completing seven tasks.

In each task, a report was prepared. Then all task reports are united in Task 8 Detailed Report and this report, *Task 9: Simplified Report* is prepared as the public version of the conclusion report, mainly because of the confidentiality reasons.

Legal and Policy Framework Conditions for ICT RTD

In retrospect, Science and technology sector of Turkey has experienced a period of macroeconomic instability, and was intensively challenged by *Political and macroeconomic instability, The implicit character of sector-specific policies for ICT RTD* and *Lack of strategies and action plans to implement these RTD policies.*

The political and macroeconomic stability was reached after 2002 by the "Program for transition to a Strong Economy (GEGP)". This program had significant repercussions on science and technology sector in Turkey. A relative improvement in the global competitiveness indicators have been realized between 2002/3 and 2007/8. However, the impact of global financial crisis is observed by 2008/9.

Competitiveness of an economy in world markets is considered as one of the main indicators of success of its science and technology sector on the welfare of a society. World Economic Forum Global Competitiveness Index report placed Turkey *between an efficiency-driven economy and an innovation-driven* economy in 2008-2009, namely, as a *transition economy.* Turkey is ranked as 63rd (in 2007-2008:53rd) in the world and the 26th best performer over 30 countries in the Europe region.

Turkey, in order not to lose ground, has to perform key efforts for successfully sustaining and improving her ground. Realizations of further key efforts which lead her into an *innovation-*

driven economy are required. Over the existing efforts of Turkey, *international RTD activities* and *EU Framework Programs participation* can contribute to this transition and play a significant role.

By the end of 2013, for Turkey, **the objective of reaching an R&D intensity of 2 percent** has been set. Compared to the 2008 value of 0.73 %, with the current rate GERD Intensity, the target seems challenging unless industry and foreign components of GERD record significantly increase.

Foreign Component in RTD Financing should be improved. An important indicator in science and technology sector is distribution of GERD by Source of Finance. Although it is promising that the share of industry (Private Sector) in source of finance did catch up with the share of Government in 2007, the percentage of GERD by Industry (47.3%) and Foreign (1.3%) components are still far below EU-27 average. This situation indicates that **key efforts are required for motivating industry in international RTD activities and participation in the EU FPs**.

Direct Public Support is increasing in Turkey since 2002 and, the commitment of the government to increase R&D funding is visible. From 2002 to 2009, public ICT expenditure increased eight times. The stabilization of economy has certainly enabled such an evolution. However, there are some 'Black Holes' in Direct Public Support for RTD and **Impact Assessment is necessary** to avoid these holes.

The main cornerstones of Legal and Policy Framework Conditions for ICT RTD in Turkey are *Institutional Infrastructure in RTD, Legal Infrastructure for RTD, The Research Area Infrastructure (Turkish Research Area-TRA), and The Strategy / Policy Infrastructure.*

- **Institutional Infrastructure in RTD**: Governmental STI Policy Making Bodies, Regulatory Institutions, Technology Facilitators, Industry and Research Intermediary Organizations, Financial Bodies and Private Sector Actor
- **The Legal Infrastructure for RTD:** The core insturment is "Law on Supporting Research and Development Activities, dated 28/2/2008, numbered 5746,
- **The Research Area Infrastructure**, whose priority is integration to European Research Area (ERA), aims to develop cooperation opportunities and strategic focusing between R&D actors
- **The Strategy / Policy Infrastructure:** Comprehensive National Policy and ICT RTD Strategy Papers.

This *Legal and Policy Framework Conditions* are satisfactory to participate FPs. However, Turkey, in order not to lose ground, so to say to maintain this satisfactory situation, has to perform key efforts such as reaching the objective of an R&D intensity of 2 percent, an emblematic amount of R&D spending that represents higher investment in R&D Activities by improving foreign component in RTD financing and by increasing direct public support to RTD Activities.

Participation of Turkey in the FP6 - IST Priority and FP7- ICT Theme

In the beginning of the participation analysis of Turkey in FPs, the analysis of ICT RTD Activities is conducted by using patents and publications. The patent data show that patenting activity is concentrated mostly in *Challenge 1: Pervasive and Trustworthy Network and Service Infrastructures*. On the other hand, the RTD performers are least active in *2: Cognitive Systems, Interaction, and Robotics*. The most active actors in ICT RTD are *commercial organization-firms*. Individuals are also

very active in patenting; however the share of governmental bodies is very low. The analysis of FP Participation and Patenting shows that **the most active actors in patenting activities that have capacity to participate in FP do not prefer to participate in FP in recent years.**

In publication analysis, we see that Turkish institutions have strong research potential especially in *Challenge 3: Components, systems, engineering*. The number of researchers /contributors is higher regarding especially the Challenges 1, 2 and 3. This status may be accepted as an indicator of strength/capability in these areas. In terms of number of publications, nation's most successful universities in ICT are **public universities.** Top three universities are *Middle East Technical University (METU), Istanbul Technical University and, Bosporus University*. These universities are followed by two private universities, namely *Sabancı University and Bilkent University*. Hereby, we may argue that, academic R&D still promises the opportunity of development in ICT by leveraging academic and entrepreneurial resources in universities. This opportunity may help Turkey to create new areas of interest for both academic excellence and ICT-related economic growth.

Turkey became an associated country to FP6 in 2003, 20 years after the beginning of the FPs. Since 2003, around 700 Turkish partners and more than 2000 researchers were engaged in collaboration activities with their European counterparts in their first full appearance in ERA. In the case of ICT, 93 Turkish partners received funds from FP6 and FP7 and, around 1000 Turkish partners took part in submitted ICT RTD collaboration projects. Hence, **the first steps towards the integration of Turkish Research Area to ERA are achieved**.

The overall FP performances illustrate that EU15 countries have increased their share in FP7 ICT theme compared to FP6 IST while they have gained 96% of available FP7 ICT funding. **Comparison between EU 12 and Turkey points out that Turkey's level increased from 4% to 7%.** In both FPs, the EC funds received per FTE researcher in Turkey is around half of EU12's average.

The data obtained from DG INFSO show that Turkish participation in FP6 IST field is mostly concentrated in *IST for societal challenges, IST for work & business challenges, pervasive, mobile, wireless, trustful infrastructures* with a 20% of total funded Turkish partners. High interest on *e-Government, e-Work and e-Business* in FP6 reflects the research potential and experience in ICT area in Turkey, but the low level of success rate (4%) in these areas displays the **insufficient involvement of Turkish organizations in EU R&D networks**. 43% of Turkish participant in submitted projects are focused on IST applications. Thus, **ICT sector in Turkey is mainly oriented toward *content development.*** In FP7, Turkish researchers are mostly involved in the area of *Challenge 1: Network and Service* and *Challenge 4: Digital Libraries and Digital Preservation*, *Technology Enhanced Learning and Intelligent Information Management*. 41% of Turkish participants in FP7 funded projects are clustered in the field of **network and service infrastructure**. However, Turkish companies who took part in FP6 IST funded research projects were not successful in continuing to benefit from EU funds through their networks formed under FP6, when their performance in FP7 ICT is considered.

Although Turkey has benefitted from R&D funds and know-how via knowledge flows, Turkey's performance in EU ICT RTD demonstrates that **Turkey is performing under its potential** because of

- ✓ *Lack of integration with core networks* and
- ✓ *Insufficient Europeanization of ICT research strategies of Turkish universities*.

ICT RTD Infrastructure for an Effective Participation to FP7 – ICT Theme

In order to analyze the sufficiency of ICT RTD infrastructure for effective participation to FP7 ICT Program, ICT RTD research infrastructures in Turkey are analyzed. Current and planned physical infrastructure and, distinguishing physical infrastructure are identified. Participants to our survey are asked whether their current RTD infrastructure meets with the needs of researchers for an effective participation in the FP7 – ICT Theme, and if not what the needed infrastructure is.

Overall ICT RTD Research Infrastructure in Universities, Research Institutes and Governmental Bodies is found to be concentrated in *Challenge 1: Pervasive and Trusted Network and Service Infrastructures* and *Challenge 3: Components, systems, engineering*. The most active departments in the field of ICT in Turkish Universities are *Electrical and Electronics Engineering, Computer Engineering and Physics* in *METU, Bilkent University, Istanbul Technical University and Bosporus University.* ICT RTD Research Infrastructure clusters in **Ankara and Istanbul,** and concentrates in **Challenge 1 and Challenge 4.** Overall ICT RTD Research Infrastructure in **Private Organizations** is concentrated in **Challenge 1 and Challenge 4.**

In detail study for physical infrastructure in Turkey related to ICT RTD is conducted and **strong physical infrastructure is found in *Bilkent University, Bosporus University, Ege University, FMV Isik University, Istanbul Technical University, Izmir Institute of Technology, Koc University, METU, Sabanci University, TOBB University of Economics and Technology, Yildiz Technical University, AGMLAB Information Technologies, C2stech Information Technologies Ltd.Co, Ericsson Telecommunication, Intro Information and Telecommunication Systems, Sebit Education and Information Technologies Inc.,VESTEL Electronics AS-R&D Dep*.**

For the complete map of research infrastructure in ICT RTD in Turkey, the soft infrastructure is combined with existing physical infrastructure. The total picture of Turkish current and planned research infrastructure for effective participation to FPs are presented in detail. As the answers of the main players of the ICT Sector show that, **there is sufficient physical infrastructure in Turkey to participate in FPs and, low participation performance is not a result of insufficiency in physical infrastructure**.

However, to see the whole picture in physical infrastructure in ICT Sector and to meet needs of researchers for effective participation, **a Detailed Physical Infrastructure Examination should be done**. Because due to confidentiality reasons and unwillingness to provide information, we could not reach all physical infrastructure information.

Main Players in ICT RTD in Turkey

Major and potential centers of excellence and their competences are derived from findings of the analysis of RTD Activities by publications/patenting, successful/relatively high rate of successful proposals, physical infrastructures study, field studies (profile studies) of TUBITAK and finally organization's self-evaluation. Major Centers of Excellence in ICT RTD in Turkey is presented in Table 1(For the abbreviations of FP7 ICT objectives, see Appendix 1):

Major centers of Excellence in ICT RTD in TURKEY

ICT RTD Units & Competences in FP 7 ICT Objectives	Leading researchers/Research group Leaders
BILKENT UNIVERSITY-Electrics and Electronics Engineering Dep. **Objectives:** 1.1, 1.5, 1.6 /3.1., 3.2. ,3.3., 3.5., 3.6/ 4.1.,4.3/ 5.1/7.1	Prof. Dr. Levent ONURAL, Prof. Dr. A. Enis ÇETİN, Prof. Dr. Ezhan KARASAN, Prof. Dr. Abdullah ATALAR, Prof. Dr. Ekmel ÖZBAY (**UNAM-NANOTAM**), Prof. Dr. Levent GÜREL (**BİLCEM**)
BILKENT UNIVERSITY -Computer Engineering Department **Objectives:** 1.2,1.5/ 4.2,4.4	Ass. Prof. Dr. Tolga ÇAPIN
BOGAZICI UNIVERSITY-Computer Engineering Department **Objectives:** 1.1, 1.2, 1.3, 1.4,1.6/2.1-2.2/3.3., 3.4, 3.6/4.2, 4.3	Prof. Dr. Lale AKARUN (**PILAB**), Prof. Dr. H. Levent AKIN (**AILAB**) Assoc. Prof. Dr. Fatih ALAGÖZ **(NETLAB**), Asst Prof. Haluk BİNGÖL (**SoSLAB**), Asst. Prof. Dr. Ayşe BENER(**SoftLab**)
BOGAZICI UNIVERSITY-Electrics and Electronics Eng. Dep. **Objectives:** 2.1-2.2/ 3.1, 3.6, 3.7.	Prof. Dr. Bülent SANKUR(**IVPG)**, Ass. Prof. Şenol MUTLU (**BUMEMS**), Prof. Dr. Günhan DÜNDAR (**BETA LAB),**Prof. Dr. Işıl BOZMA(**ISLAB**)
IŞIK UNIVERSITY-Electrics and Electronics Eng. Dep. **Objectives:** 1.1/ 4.1., 4.2, 4.3., 4.4/6.1.	Prof. Dr. Erdal PANAYIRCI Prof. Dr. Selahattin KURU(on leave)
ISTANBUL TECHNICAL UNIVERSITY- National Center for High Performance Computing **Objectives:** 1.2, 1.4, 1.6, 1.7/ 3.4.	Prof. Dr. Serdar ÇELEBİ (Project Coordinator)
KOÇ UNIVERSITY-College of Engineering **Objectives:** 1.7.,2.1-2.2 , 3.2., 3.3., 3.5., 3.6., 3.7	Prof. Dr. Hakan ÜREY (**OML**), Prof. Dr. A. Murat TEKALP Ass.Prof. Dr. Erdem ALACA(**MNFL)**
KOÇ UNIVERSITY - Physics Department **Objectives:** 3.4	Prof. Dr. Ali SERPENGÜZEL (Microphotonics Research Lab.), Assc. Prof. Dr. Alper KİRAZ (Nano-Optics Research Lab.)
METU- Computer Engineering Department. **Objectives:**1.2, 1.3, 1.4, 1.6/Ch. 4/5.1, 5.2/6.1/7.1, 7.2, 7.3	Prof. Dr. Erol ŞAHİN (Kovan Res. Lab) Prof. Dr. Asuman DOĞAÇ (SRDC)
METU-Electrics and Electronics Engineering Department **Objectives:** 1.1, 1.5/2.1-2.2/ 3.1, 3.2, 3.5., 3.6., 3.7/4.2, 4.4	Prof. Dr. Tayfun AKIN (MEMS), Prof. Dr. Gözde BOZDAĞI AKAR (MMRG), Ass. Prof. Ilkay ULUSOY (METU-Vision)
SABANCI UNIVERSITY-Faculty of Engineering and Natural Sciences(FENS) **Objectives:** Ch2/ 3.1, 3.2, 3.4/ Ch.4,	Prof. Dr. Yaşar GÜRBÜZ (Microelectronics Group),Prof. Dr. Aytül ERÇİL (VPA-Lab), Prof. Dr.Yücel SAYGIN
TUBITAK BiLGEM-UEKAE **Objectives:** 1.1,1.2, 1.5/2.1-2.2/3.5/ 4.1,4.2,4.3,4.4/6.1/7.1	Prof. Dr. Mehmet Önder YETİŞ(Director) Prof. Dr. Bülent ÖRENCİK
TUBITAK Marmara Research Center **Objectives:** Ch 1/ Ch2/Ch. 3/6.1.,6.2.,6.3	Prof. Dr. Mehmet Önder YETİŞ (Director)
AGMLAB Information Technologies Ltd. Co. **Objectives:** 1.2/ 2.1-2.2/4.2,4.4	Güven FİDAN
C2TECH Information Technologies Ltd. Co. **Objectives:** 1.2., 1.3/7.3	Dr. Faruk SARI
INNOVA Technology Solutions Inc **Objectives:** 1.1, 1.3/4.2 ,4.4 /5.1	Coşkun DOLANBAY Handan YILMAZ
INTRO IT Systems Co. **Objectives:** 1.1, 1.2, 1.3, 1.4, 1.5/ 3.3/Ch. 4/5.1/7.3	Onur EVREN Serhat TUNCAY
SEBIT Education and Information Technologies Inc. **Objectives:** 1.5 ,7.3	Ali TÜRKER
TURKCELL Communication Services Plc **Objectives:** 1.1., 1.3, 1.4, 1.5, 1.6., 1.7.	Bülent YILMAZ

UNAM-NANOTAM: Institute of Material Science and Nanotechnology /Nanotechnology Research Center
BİLCEM: Computational Electromagnetic Research Center
PILAB: Perceptual Intelligence Laboratory
AILAB: Artificial Intelligence Lab.
NETLAB:Computer Networks Research Laboratory
SoSLAB: Complex Systems Research Lab
ISLAB: Intelligent Systems Laboratory
OML : Optical Micro-Systems Laboratory
MNFL: Micro –Nano Fabrication Laboratory
SRDC: Software Research & Development and Consultancy Ltd
MEMS: Micro-Electro Mechanical Systems Reseach and Application Center
MMRG: Multimedia Research Group
METU-VISION: Computer Vision and Intelligent Systems Research Lab.

Competency/Share Matrix and Policy Network Analysis

High competence – Low share		**High competence – High share:**	
Code	**Objective Name:**	**Code:**	**Objective Name:**
5.1	Personal health systems (High Competence and low share)	1.1	The network of the future (High Competence and high share)
1.4	Trustworthy ICT (Medium Competence and low share)	1.5	Networked Media and 3D Internet (High Competence and high share)
1.2	Internet of Services, Software and Virtualization (High Competence and low share)	3.6	Computing Systems (High Competence and high share)
3.5	Engineering of Networked Monitoring and Control systems (High Competence in Universities and no share)	1.3	Internet of Things and Enterprise environments (High Competence and high share)
3.7	Photonics (Medium competence and low share)	4.3	Intelligent Information Management (High Competence and high share)
Low competence – Low share		**Low competence – High share:**	
Code:	**Objective Name:**	**Code:**	**Objective Name:**
3.3.	Flexible, Organic and Large Area Electronics (low share)	-	-
1.6	Future Internet experimental facility and experimentally driven research (low share)		
7.1	ICT and ageing (no share)		
1.7	Critical Infrastructure Protection (no share)		
3.4	Embedded Systems Design (no share)		

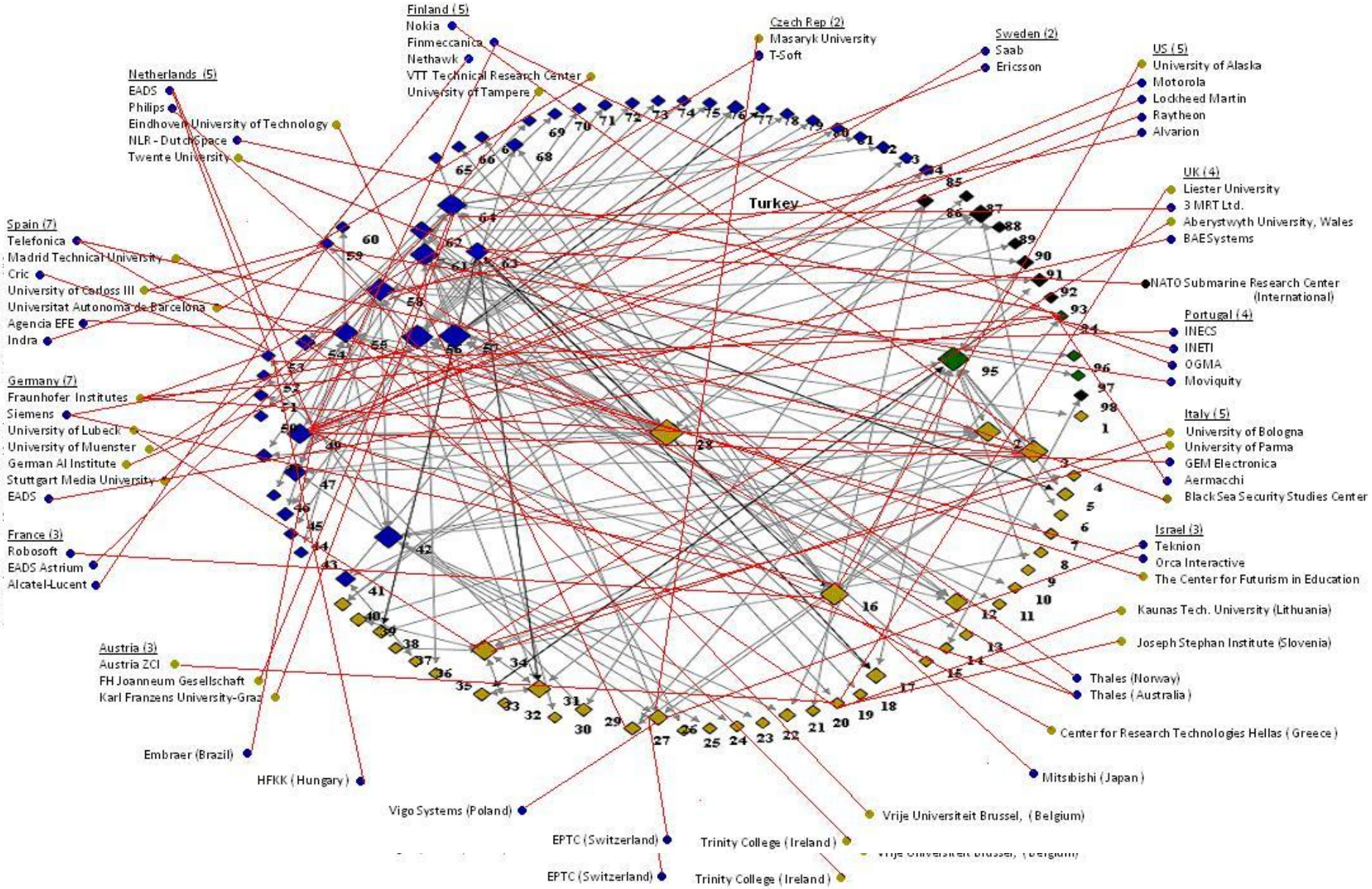
National top competences according to FPT ICT Theme Terminology:

High Competence/ High Share: 1.1,1.5, 3.6, 1.3, 4.3
High competence/ Low Share: 5.1., 1.4., 1.2., 3.5., 3.7.
Low Competence/ Low Share: 3.3., 1.6., 7.1. , 1.7. , 3.4.
Low competence/ High Share: -

By using competence share matrix and main players (both the major & potential centers of excellence, and the others that these centers are in relation) in ICT RTD in Turkey, a policy network analysis is prepared. Policy network analysis is an analysis of relationships& interactions of identified actors in ICT RTD. Although some of the relevant actors showed unwillingness to provide information and/or consider research partners information is strictly confidential, policy network analysis data is mainly gathered by reverse/cross partner check. Organization sample space is collected through findings of Task 1, Task 2; Task 3 and Task 4, reports. Followed by this policy network analysis, a "Who is who" is performed.

Policy Network Analysis – Diagram (with Domestic / International Links)

Policy Network Analysis Diagram (Blue: Industry; Gold: University; Black: Public Sector; Green: Public Research Lab/Institute)



Live Interviews for Assessment and Action in ICT RTD

RTD capabilities, technological expertise and human capital in Turkey according to FP7 ICT Objectives are assessed; barriers and possible actions for the increased integration of Turkey into the FP7 – ICT Theme are identified according to live interviews. The target group for live interviews consists of *Authorities financing ICT RTD, major and potential centers of ICT RTD excellence and successful and unsuccessful participating entities* in project proposals submitted in the FP7 – ICT Theme Calls from Turkey. Thirty-four (34) live interviews were conducted.

According to the results of interviews, **although geographical level experiences are relatively balanced, participation in the EU FPs lags behind other international level experiences**.

Top Organizational Expertise Areas for the participants of live interviews are found to be *ICT, Science & Engineering, Education & Training, and Consultancy.* **Top Research Area** as Challenge is found to be *Pervasive and Trustworthy Network Service Infrastructures*. **Top Specific Research Area** as Objective is found to be *Intelligent Information Management.*

Organization Strengths are generally Human Resources-Specific Strengths and Establishment-Level Strengths and, **organization weaknesses** are mainly in International Level and National Level in participating / applying for FP7 projects under the heading of ICT. **Opportunities** are mainly International-Level, Establishment-Level Opportunities and technology specific opportunities and, **threats** are mainly in International-Level and National-Level accompanied by technology-specific threats for organizations in participating/applying for FP projects under the heading of ICT.

A higher level, synchronized agenda for identified actions to remove internal, national and international barriers and to increase integration of Turkey into the EU FP7 ICT Theme is determined by identifying what to achieve, what to hinder and what to utilize at international, national and establishment level. For the sustainability of RTD capabilities, technological expertise and human capital in Turkey Socio-cultural Awareness and Practices are required.

As a holistic result of live surveys:

- ✓ There are expectations, list of international level actions to be evaluated by the EC in terms of structures, processes and approaches of FPs in the field of ICT RTD in the case of new member states and associated countries.
- ✓ In order to operate potential and mutual actions to increase integration of Turkey into the FP7 ICT Theme; at national level, self evaluation and inter-organizational relations evaluation are initially required as actions by academic institutions, commercial entities and governmental bodies in the field of ICT RTD in Turkey.

Delphi Survey Analysis for Assessment of RTD Capabilities, Human Capital and Barriers/Threats in ICT RTD

As the live interviews carried out cannot cover the whole ICT community in Turkey, the survey is extended to cover the maximum number of stakeholders using the Delphi survey process. In this respect, a 2 rounds on-line Delphi survey is carried out. The main aim was to prepare and implement a systematic method, “Delphi Survey”, for eliciting and collating assessments on the RTD capabilities, technological expertise and human capital in Turkey and, for identifying barriers and possible actions to increase integration of Turkey into the FP7 – ICT Theme by enabling every stakeholder in ICT sector to be a part of the determination process.

Top Barriers are found to be Closed Nature of European Networks and Low Visibility of Turkish Institutions. Consistently, Existing International Level R&D Experience is considered as insufficient.

Experts underlined that innovative commercial companies exist but the level of innovativeness is not sufficient.

Existing knowledge and level of knowledge in universities are found to be promising like existing researchers and level of researchers in Turkey.

Lack of short-term commercial opportunities for commercial entities, lack of perceived financial benefits for researchers in commercial entities and the lack of sharing FP experience between universities and industry in Turkey are evaluated by experts as strong barriers for successful application to FP7 ICT Theme. Additionally, lack of long-term technology vision applies to both industry and academy as a barrier.

Experts say there is R&D infrastructure in Turkey however Level of R&D infrastructure and Existing R&D Stock are perceived to be insufficient for successful participation into FP7.

Lack of qualified personnel to prepare project proposals for FP and insufficient consultancy services are found to be strong barriers.

Compared to other barriers, negative past experiences in FPs and evaluation bias by the EU, are not perceived among the strongest barriers.

Analysis of the identified barriers for successful participation and integration of Turkey in the FP7-ICT Theme indicates that University-Industry collaboration in human / knowledge / technology /infrastructure complementary resources is required for eliminating barriers and triggering international level RTD competency in FP7 ICT Theme.

SWOT Analysis for Identification of Opportunities and Barriers for Successful Participation and Integration of Turkey in the FP7 ICT-Theme

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Key strengths, weaknesses, opportunities and threats for the successful participation and integration of Turkey in the FP7- ICT Theme are analyzed and compared with internal strengths and weaknesses in a structured approach using a SWOT methodology.

As Potential strengths, respondents underlined that the Turkish expertise and organizations in the ICT sector are at the forefront of the ICT business compared to global settings.

As a potential weakness, respondents underlined the need for agglomeration of Turkish organizations within established EU R&D and innovation networks.

As a potential opportunity, respondents denote that the intersectoral characteristics of ICT applications and the possibility of new opportunities due to this feature might enable the development of specific ICT technologies mobilized at the network level in Turkey.

As a potential threat, most respondents point to Turkish firms' focus on services and sales & marketing development rather than on R&D activities, mainly due to low cost of labor in ICT.

As a part of the SWOT Table, according to the result of SWOT Meeting of experts in ICT RTD in Turkey, the most important first five SWOT expressions are presented here (The list of all SWOT Expressions in form of SWOT Table can be found in the main body of the report pages 59-60_Table 9.13):

SWOT TABLE: Most important SWOT Expressions for ICT RTD in Turkey

STRENGTHS *(Positive –Internal)*	WEAKNESSES *(Negative – Internal)*
✓ Presence of well known academicians with good reputation and pledged effective potential of private sector in "Networked and 3D Media Internet" Research Area ✓ Highly competent researcher potential in academicians and graduate education system to provide important contributions to EU research Agenda in ICT themes. ✓ Recently increasing support for R&D activities at the national level ✓ As compared to Europe, successful students in Turkey prefer to study in departments related to ICT in higher education. ✓ Efficient support of TUBITAK NCO ICT Team in consortium building and project management	✓ Insufficient presence of Turkish organizations within established EU R&D and innovation networks ✓ Lack of international project experience for most of Turkish Research Capacity in ICT RTD themes and focus on individual studies ✓ Lack of technology vision in firms present in ICT themes. Focus on short-term applications rather than technology development ✓ Despite the existence of policies and plans in ICT, insufficiency of incentives and enforcements in application and monitoring of the results ✓ Existence of problems in transferring accumulated knowledge from universities in ICT to industry
OPPORTUNITIES *(Positive – External)*	**THREATS** *(Negative – External)*
✓ New R&D Law and its advantages ✓ Strong human resources capacity in Turkey in ICT research areas under FP7 content as compared to other areas ✓ Intersectoral characteristics of ICT Applications and the possibility of new opportunities due to this feature ✓ Potential of transferring researchers' own Individual ties that were constructed during their PhD or post doc studies in ICT themes in EU to FP projects ✓ Enactment of strategic policies to increase the number of researchers	✓ Due to the fact that Turkey is seen as center of cheap labor, coming of production and sale-marketing facilities rather than R&D. ✓ Closed networks in EU FP. Difficulty of participating for newcomers ✓ Long and troublesome project application and management processes and their demotivating effects on Turkish organizations ✓ Inability to establish sufficient integration between institutions to determine ICT policies and being in distance to private sector dynamics ✓ Increasing concentration of FP7 project proposals to some specific areas and low success rate

Main Barriers

According to the result of Live Interviews, Delphi Survey Analysis and SWOT Analysis presented above, main barriers that prevent Turkey from reaching its potential participation level in the ICT Theme are identified as:

- ✓ Closed Nature of European Networks
- ✓ Low Visibility of Turkish Institutions.
- ✓ Insufficiency of Existing International Level R&D Experience.
- ✓ Lack of qualified personnel to prepare project proposals for FP
- ✓ Insufficient consultancy services
- ✓ Lack of short-term commercial opportunities for commercial entities,

- ✓ Lack of perceived financial benefits for researchers in commercial entities
- ✓ Lack of sharing FP experience between universities and industry
- ✓ Lack of contribution of EU Framework Programme projects to academic career
- ✓ Teaching workload for academician
- ✓ Inadequate organizational structure for being a coordinator
- ✓ Lack of awareness, motivation and experience
- ✓ Finding suitable projects which are matching to vision of organizations
- ✓ Mobility problem between the EU and Turkey
- ✓ Direct influence of major stakeholders in the EU

Overall Conclusions

In Turkey, we can observe some positive quantitative enhancements in GERD intensity, R&D Personnel, Sources and Performers of R&D. However, in order not to lose ground, Turkey has to perform key efforts for successfully sustaining and improving efficiency and to be an innovation-driven economy. *But how?* Since this ground is being challenged by *innovation and business sophistication,* it is important to remove any obstacles to seize the benefits of ICT, by continuing to encourage effective competition in ICT infrastructure and network services for Turkey and by focusing to realize the transition into an innovation-driven economy under political and macroeconomic stability.

Over the existing potential of Turkey, with an explicit and specialized ICT RTD policy/strategy/action plan document as a legal and more awareness-friendly ICT RTD policy document with selective strategies and action plans, effective utilization of academia industry collaboration and cross disciplinary collaboration for international RTD activities and the EU FPs participation can be promoted. This effort can contribute to transition into an innovation-driven economy and can play a significant role in integration of Turkish Research Area (TRA) with ERA. *A renewed statement of Turkey's ICT macro-policy may* be required in order to achieve more awareness through transparency and explicitness, and in turn, to achieve higher levels of effective participation and collaboration by academia and industry at implementation level.

One of the most important and noteworthy points is at GERD by *sources of finance*. Although promising, current rates of industry and foreign percentages in gross GERD as source of finance are insufficient. Ongoing situation may demonstrate unutilized opportunities for assimilation of international technological expertise and unutilized opportunities for knowledge transfer supported by accumulative learning processes. Therefore, appropriate design and conception of intervention and clarification of respective roles of public and private sectors are required.

General nature of potential barriers is common and can potentially emanate in every country unless opportunities/barriers are adequately monitored. Degree of coordination barrier -if significant or if exists- for university-industry collaboration and national/international financing of these collaborations in the field of ICT RTD in Turkey require further analysis based on statistical ground.

Trends in Turkish inventors who are active in ICT RTD point out that the most active actors in patenting are commercial organizations. Then comes individuals, and governmental organizations.

High patent numbers in Precision and Industrial Process Equipment and Information Service Activities related to ICT show that the patenting activity in ICT is towards providing the additional needs which become existent after including ICT facilities to industrial processes and, the adaptation

of present industrial processes to ICT sector, a kind of updating these activities by including ICT facilities rather than specialization or competition in ICT field.

Publication data about ICT sector in Turkey show that Turkey has an important basic research potential (especially in Challenge 3: Components, systems, engineering area) but this basic research potential should be converted to application and should provide practical benefits by increasing the publications in applied research areas. Low number of publications in applied areas of ICT compared to basic research can be interpreted as "insufficient university industry relationship" in the field of ICT. This relationship should be enhanced by various policy tools through both national and international channels. Publication figures point out that entrepreneurial culture of a university may perhaps lead to a strong influence on the commercialization of FP projects. In this manner, networking may help creating new opportunities for entrepreneurs to work with potential producers, corporate clients, industry partners, service providers, and other institutions as well.

When we analyze Turkey's performance in EU IST RTD, it demonstrates that Turkey is performing under its potential because of Lack of integration with core networks and Insufficient Europeanization of ICT research strategies.

Findings of this study on Turkish ICT sector implies that lack of networking of Turkish organizations with the EU ICT hubs inhibited achieving success in FP ICT Thematic Area. Because, the level of networking of Turkish organizations with EU ICT Hubs is not adequate, due to the fact that Turkish researchers have limited personal contacts with EU researchers while the structure of EU ICT RTD is based on *preferential attachment rather than self-organizing networks*. In that sense, accompanying actions aiming to facilitate more enhanced participation in EU ICT RTD were not effective enough to trigger Turkish participation since the emphasis in those supportive actions was given to awareness raising and informing activities.

It is important to activate the hidden potential of Turkish Research Area in ICT with the aim to enhance competitiveness and to meet the challenges of the 21st cc. By the existence of sufficient academic research potential and interest to European ICT RTD programmes, there is room for improvement while Europeanization of ICT research strategies of Turkish institutions is considered. To do this, following recommendations are listed to increase the Turkish involvement in FP7 ICT:

- ✓ Design supporting actions aimed at inducing cooperation between the central organizations which serve as "hubs"in FPs and research organizations of countries like Turkey.
- ✓ Initiate mechanisms to ease Europeanization of ICT research strategies of Turkish institutions.
- ✓ Introduce a comprehensive brain circulation strategy in the field of ICT research.
- ✓ Enhance the partnerships between successful Turkish universities and R&D performers from business sector, and sustain previously established collaborations.
- ✓ Attract the European and multinational corporations to establish R&D facilities in Turkey which can trigger the involvement in EU ICT RTD networks.

The results of the live interviews show that organizations in Turkey have initially human resources-specific strengths and establishment level-establishment specific strengths in participating/applying FPs in ICT theme. In relation to strengths, organizations in Turkey set national level weaknesses and international level weaknesses which are challenging establishment-specific strengths of organizations in participating into FPs in ICT theme. In consistency with strengths and weaknesses, organizations evaluate opportunities which are mainly international level and establishment level. The nature of opportunities in these levels is technology-specific. Consistently,

threats for organizations are evaluated as international level and national level which hinder utilization of opportunities in participating/ applying for FP6 and/or FP7 projects under the heading of ICT.

At regional/national level, academic institutions expect governmental bodies to create specific platforms to share the experience of EU FP active and experienced organizations operating in academia and in industry. Another main point, at international level, is mobility of academic researchers. Researchers experience difficulties in attending or participating EU level actions and activities, since financial coverage and repetitive visa constraints are evaluated as problematic. Most of the researchers consider these limitations as barriers preventing them to establish personal, informal connections and negatively affecting individual or institutional visibility for the EU networks.

Similarly, commercial entities also experience difficulties in participating in top consortiums due to low visibility and closed nature of top EU ICT RTD scene. To resolve that issue, commercial entities expect to be supported in strengthening establishment level visibility for either human resources-specific or technology-specific visibilities by national and international lobbying activities.

What to do to remove barrier: Further Recommendations

To assist removal of barriers and to assist increase of the participation of Turkey in the FP7 ICT Theme, there are mutual and interacting actions expected to be performed at stakeholder level, national level and EU level.

At stakeholder level:

- ✓ Defining organizational strategies parallel to priorities of FP and defining road map coherently.
- ✓ Organizational innovation to be adaptable into international environment.
- ✓ Prioritization of knowledge transfer and exchange in the field of ICT RTD by FP Projects.
- ✓ Focusing on learning by doing activities in FP7 ICT RTD.

At national level:

- ✓ Promoting academy-industry relations in Turkey in terms of effective and cross disciplinary collaborations for participating into FPs- level ICT RTD.
- ✓ Developing policies for academic career contribution of FP projects by new regulations in universities, supporting organizational innovation.
- ✓ More active lobbying activities, support for attending international actions increasing establishment level visibility.
- ✓ Support for clustering activities, research institutes, high-tech SMEs and start-ups.
- ✓ Resolution of cultural incompatibilities of Turkey in the field of ICT RTD.

At EU level:

- ✓ Promoting being open to new participants from NMS and candidate countries in FPs projects of top consortia.
- ✓ Promoting high value added work packages of projects which are sources of learning by doing, knowledge transfer and exchange in the field of ICT RTD for NMS and candidate countries.
- ✓ Redefinition of currently low material gains.
- ✓ Eliminating inappropriate timing of payments.

- ✓ Promoting academic career contribution of FP7 projects in universities in NMS and candidate countries.
- ✓ Establishing new programme approaches reducing mismatches at objective level for organizations in NMS and candidate countries.
- ✓ Defining short term (1-1.5 years) projects to gain experience.
- ✓ Defining small-scale projects to gain experience.
- ✓ Providing support for more equal participation including visa/mobility constraints and issues of researchers/businessmen from candidate countries.
- ✓ Reducing bureaucratic workload and paperwork for application processes.
- ✓ Online access for strengthening transparency in evaluation of projects.
- ✓ In order to deliver appropriate services to academia and industry in the field of international RTD, effective and mutual synchronization with the EC is desired by national authorities.

Three specific, supporting mechanisms: *Social Mechanism, Socio-technical Mechanism and Technical Mechanism* can be exemplified and defined to assist removal of barriers and to assist increase of the participation of Turkey in the FP7 ICT Theme.

Although, the EU FPs in ICT RTD are not the only programmes and/or strategies available to the organizations active in Turkey by the field of ICT RTD, three specific, supporting mechanisms: Social, Socio-technical and Technical Mechanisms can be defined to assist removal of barriers and to assist increase of the participation of Turkey in the FP7 ICT Theme. These mechanisms are not structurally different than the present mechanisms however their content and designs are totally new (the details can be seen in Conclusions and Further Recommendations part). This is to state; these mechanisms are not necessarily to be implemented by new budget allocations, though shifting present resources within existing or non-increasing budget packages are essential.

-END of EXECUTIVE SUMMARY-

9.1 INTRODUCTION

A lack of information about RTD competencies has been identified particularly in the New Member States (NMS) and Associated Countries where competencies are not systematically gathered or are not sufficiently known. As a consequence, consortia for research projects have mainly been built from partners that have already been active in previous projects while the ICT research and innovative potential in NMS and Associated Countries was often neglected. Thus, this Technological Audit Study on research capabilities in ICT is acting to ensure that this hidden potential is released for the construction of an all inclusive and geographically balanced ERA in ICT research area.

The ultimate aim of this project is to explore ICT research capabilities in Turkey to support full integration of Turkish researchers into ICT networks of FP-active EU organizations and enable them to participate in the project proposals within the context of FP7 ICT Theme.

The key objectives of this project can be listed as follows:

- To review and analysis of the ICT RTD policy environment in order to determine potentials, opportunities and barriers.
- To evaluate the efficiency and effectiveness of the current ICT RTD policy framework
- To create awareness of potential and opportunities for efficient and proper utilization of available resources
- To map of current status of ICT RTD activities identifying the centers of excellence and centers with development potential per FP7 – ICT Theme Challenge and Objective
- To evaluate the core technological capabilities of the ICT RTD community in terms of both research infrastructure and human capital
- To identify roadmaps in order to overcome the obstacles and barriers which have been explored previously
- To contribute to the ICT oriented actions of Turkey in FP7 and enhancing the participation
- level of Turkish researchers from both public and private sector to FP7 ICT Theme.
- To enhance integration of Turkish Research Area (TRA) to ERA in ICT field.

For achieving these objectives, seven tasks were completed during this auditing project period. In each task, a report was prepared. Then all task reports are united in Task 8 Detailed Report. The public version of the conclusion report (Task 8 Report) is prepared due to the fact that the raw data to be analyzed is provided by the European Commission on a confidential basis. Therefore, this public version of the detailed conclusion report is prepared electronically suitable for publication, paying attention to all confidentiality rules. Each building block to set public version of the conclusion report is presented in the Table 9.1 below:

Table 9. 1..Building Blocks for Public Version for the Conclusion Report

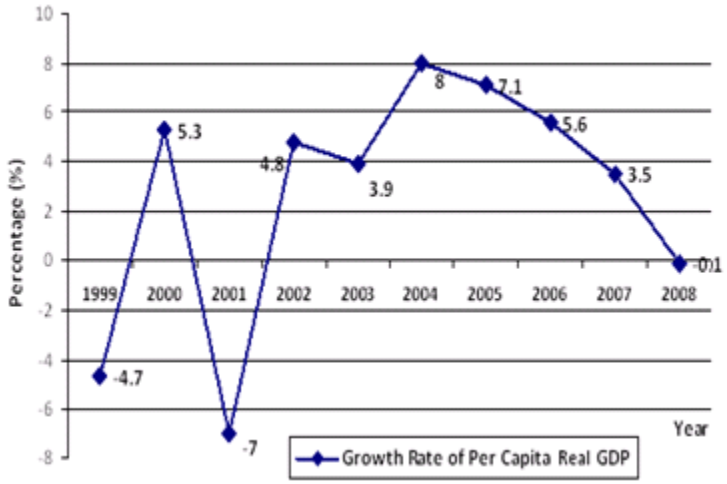
SECTION CODES	BUILDING BLOCKS
SECTION 9.10	• Main Barriers and Actions to overcome
SECTION 9.9	• SWOT Analysis for Identification of Opportunities and Barriers for the Successful Participation and Integration of Turkey In the FP7 ICT-Theme
SECTION 9.8	• Delphi Survey Analysis for Assessment of RTD Capabilities, Human Capital and Barriers/Threats in ICT RTD
SECTION 9.7	• Live Interviews for Assessment and Action in ICT RTD
SECTION 9.6	• Competency/Share Matrix and Policy Network Analysis
SECTION 9.5	• Main Players in ICT RTD in Turkey
SECTION 9.4	• ICT RTD Infrastructure for an Effective Participation to FP7 - ICT Theme
SECTION 9.3.	• Participation of Turkey in the FP6 - IST Priority and FP7- ICT Theme
SECTION 9.1	• Legal and Policy Framework Conditions for ICT RTD

9.2. LEGAL AND POLICY FRAMEWORK CONDITIONS FOR ICT RTD

In this section, the summary of *Task 1: Review of Studies and Strategy Papers on the basis of Desk Research Report* is presented. The main aim of this report was to make a comprehensive review of complete framework conditions for the Turkish RTD activities in general and RTD activities in ICT sector in particular. This framework consists of national economic environment, global position of the country with comparisons and institutional, legal, financial and policy components of ICT RTD framework.

In retrospect, Science and technology sector of Turkey has experienced a prolonged period of macroeconomic instability, especially until the year 2002. In this period, Turkey could organize public and private initiatives to define various policies and policy instruments in ICT RTD in response to scientific and technological developments in the world.

Graph 9. 1. Growth Rate of per Capita Real GDP (1998 constant prices)



However, until 2002/3 Turkey was intensively challenged by *Political and macroeconomic instability, The implicit character of sector-specific policies for ICT RTD* and *Lack of determination to implement these implicit RTD policies, strategies and action plans* (Graph 9.1).

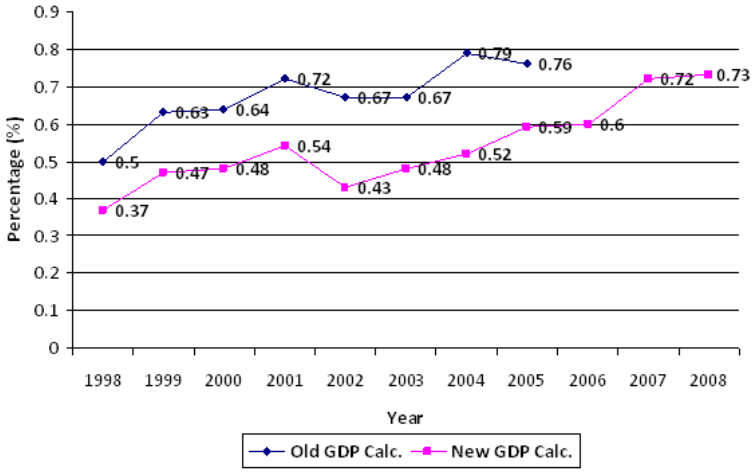
After 2002, the political and macroeconomic stability are reached by the implementation of the *"Program for transition to a Strong Economy (GEGP)".* This situation had significant repercussions on science and technology sector in Turkey. A relative improvement in the global competitiveness indicators have been realized between 2002/3 and 2007/8, the recovery period after the national economic crisis of 2001. However, the impact of global financial crisis is observed by 2008/9.

One of the main indicators of a country's success in science and technology sector can be accepted as *competitiveness of an economy in world markets*. As a result of mentioned recovery period, World Economic Forum Global Competitiveness Index report placed Turkey between an efficiency-driven economy and an innovation-driven economy according to the rankings of 2008-2009, namely, as a *transition economy.* However, as a transition economy for the world and a candidate country for the EU, Turkey is ranked as 63rd (in 2007-2008:53rd) in the world and the 26th best performer over 30 countries in the Europe region. According to overall global competitiveness index by 2008/2009, Turkey demonstrated a steep downwards movement of 10-rankings in one year (from 53rd to 63rd).

At this point, the question was simple: *Is Turkey Losing Ground?* **Turkey, in order not to lose ground, has to perform key efforts for successfully sustaining and improving existing situation.** Realization of further key efforts in higher education and training, goods market efficiency, labor market efficiency, financial market sophistication, technological readiness and market size are required. Because Turkey is confronted with and challenged by business sophistication and innovation effort requirements in order to realize the transition into an innovation-driven economy.

Over the existing efforts of Turkey, international RTD activities and EU FP participation can contribute to this transition and play a significant role.

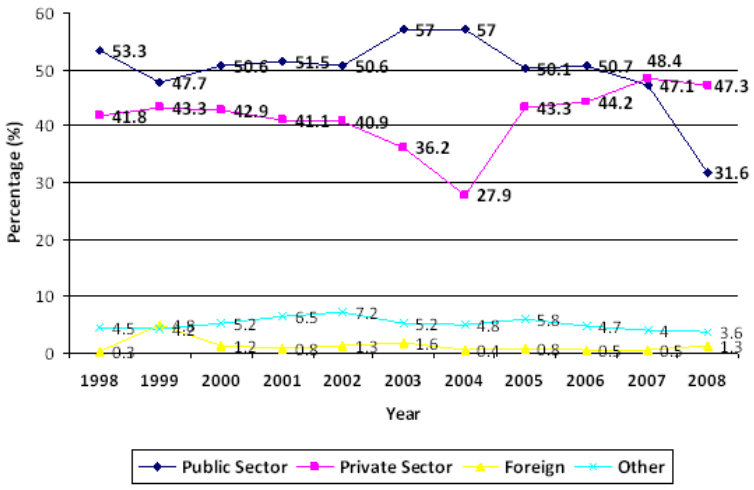
For this transition to be achieved, some targets in R&D efforts are determined. One of them is **the objective of reaching an R&D intensity of 2 percent by the end of 2013.**



Graph 9. 2. Gross Domestic R&D Expenditures as a percentage of GDP (GERD Intensity)
0.73% equals to 6.893 Million TL , 2008 constant prices

Compared to the 2008 value of 0.73%, with the current rate of intensification in Gross Domestic Expenditure on RTD as a percentage of GDP (GERD Intensity), the target seems challenging to be realized unless industry and foreign components of GERD record significant increases(Graph 9.2).

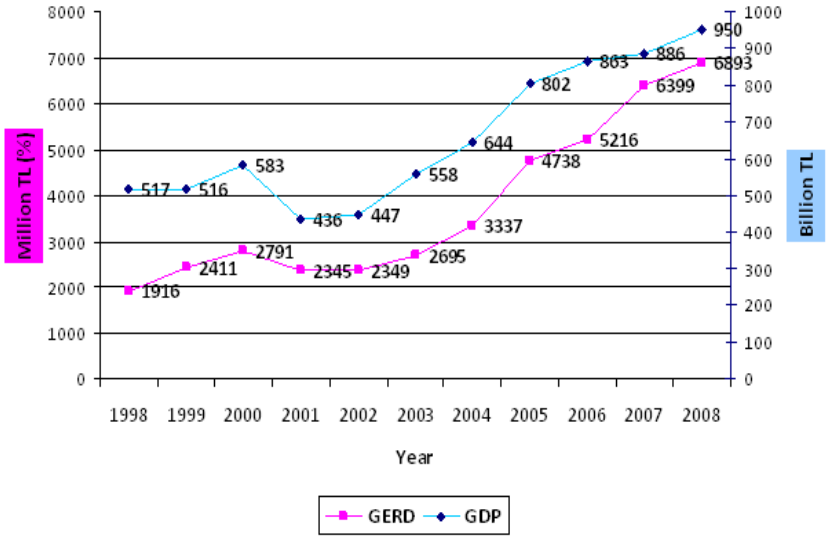
Hence, Foreign Component in RTD Financing should be improved. Although it is promising that the share of Industry in source of finance did catch up with the share of Government in source of finance in 2007, the percentages of GERD by source of finance by Industry (47.3%) and Foreign (1.3%) component are still far below EU-27 average (Graph 9.3). This situation indicates that key efforts are required for motivating industry (Private Sector) in international RTD activities and participation in the EU Framework Programmes to increase Industry and Foreign components in GERD intensity.



Graph 9. 3 Percentage of GERD by Source of Finance in Turkey
Foreign, 1.3% equals to 90 Million TL (2008 constant prices)
Industry, 47.3% equals to 3257 Million TL (2008 constant prices)

For achieving this target, public financing for RTD activities in Turkey plays an important role.

Graph 9. 4. Gross Domestic R&D Expenditure and GDP (1998-2008)



Direct public support providers for RTD in Turkey are TÜBİTAK, DPT, BAP, DTM, TTGV, EU-FP Fees and KOSGEB. **Direct Public Support is increasing** in Turkey since 2002 and, the commitment of the government to increase funding for R&D is visible in Graph 9.4.

From 2002 to 2009, in eight years public ICT expenditure increased eight times (Table 9.2). The stabilization of economy has certainly enabled such an evolution. However, there are some '*Black Holes*' in Direct Public Support for RTD and Impact Assessment is necessary to avoid these holes.

Table 9. 2. Public ICT Expenditure for the period 2002-2009

	2003	2004	2005	2006	2007	2008	2009
Cumulative Public ICT Expenditure (1000 $)	393.355	374.080	321.280	351.403	533.124	1.094.072	1.486.352

Supported by such that general dynamics in RTD presented above, The Legal and Policy Situation represented by *Legal and Policy Framework Conditions for ICT RTD in Turkey* made up of:

1. **Institutional Infrastructure in RTD:**

- *Governmental STI Policy Making Bodies* (President, Prime Minister, BTYK, MEB, STB, MB, DB, UB, TÜBITAK, YÖK, DPT, DTM, HM, TÜBA,TAEK)
- *Regulatory Institutions* (BTK, TURKSTAT, TSE, TPE, KIK, RK, SPK, BDDK, EPDK, TCMB, TURKAK)
- *Technology Facilitators (* TÜBITAK ULAKBIM, TÜBITAK UME, MPM)
- *Industry and Research Intermediary Organizations* (TÜBITAK Institutes, Public / Private Research Centers, Universities, Technoparks)
- *Financial Bodies* (TÜBITAK TEYDEB, TTGV, KOSGEB, International Funds, KGF, Banking System)
- *Private Sector Actors* (TOBB, Companies, Associations, Technology Platforms)

2. **The Legal Infrastructure for RTD:**

The "Law on Supporting Research and Development Activities, dated 28/2/2008, numbered 5746,

3. **The Research Area Infrastructure:**

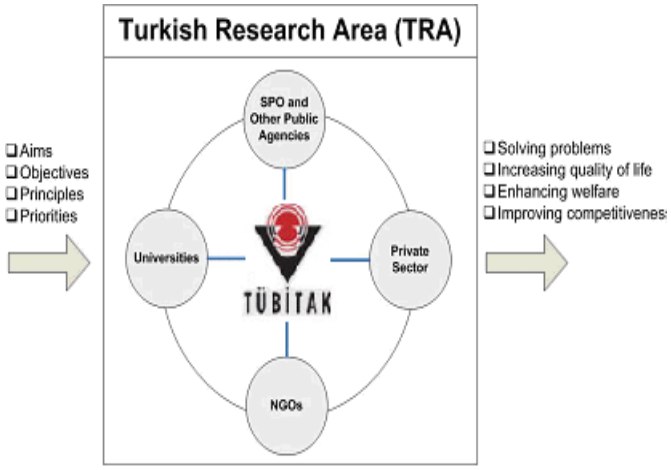


Figure 9. 1.Turkish Research Area and Interactions

Defined in the year 2004 and aimed at developing cooperation opportunities and strategic focusing between R&D fund providers (public, private), Performers of R&D activities, Demanders for outputs of R&D activities (Figure 9.1). For TRA, integration to European Research Area (ERA) is a priority.

4. **The Strategy / Policy Infrastructure:** National Policy and Strategy Papers on ICT RTD

No	Document Name	Organization(s)	Time Scope
1	Vision 2023 National Science and Technology Policies	BTYK – TÜBİTAK	2003-2023
2	Vision 2023 ICT Panel Report	BTYK – TÜBİTAK	2003-2023
3	National Science, Technology and Innovation Action Plan	BTYK – TÜBİTAK	2005-2010
4	Information Society Strategy	DPT	2006-2010
5	Information Society Action Plan	DPT	2006-2010
6	International RTD Strategy	BTYK – TÜBİTAK	2007-2010
7	9th Six-Year Development Plan	DPT	2007-2013

BTYK: Supreme Council for Science and Technology, TÜBİTAK: Scientific and Technological Research Council of Turkey, DPT: State Planning Organization

Table 9. 3. The Policy / Strategy Infrastructure – ICT RTD

These are the Comprehensive National Policy and Strategy Papers on ICT RTD that constitute the strategy /policy infrastructure part of the legal and policy framework conditions for ICT RTD in Turkey (Table 9.3).

This *Legal and Policy Framework Conditions in ICT RTD* are satisfactory to participate Framework Programs. However, Turkey, in order not to lose ground, so to say to maintain this satisfactory situation, has to perform key efforts for successfully sustaining and improving her ground such as reaching the objective of an R&D intensity of 2 percent, an emblematic amount of R&D spending that represents higher investment in R&D Activities by improving foreign component in RTD financing and by increasing direct public support to RTD Activities.

9.3. PARTICIPATION OF TURKEY IN THE FP6 – IST PRIORITY AND FP7 – ICT THEME

9.3.1. RTD Activities of ICT Organizations: Patents & Publications

In this section, the summary of *Task 2: Reviewing the activities of organizations that carry out RTD in the field of ICT in Turkey Report* is presented. The main aim of this report was to review and analyze the activities of organizations that carry out ICT RTD based on the patent data and publication data. The patent and publication analysis is used as a tool to assess the direction of research and development efforts in the field of ICT.

The data obtained from Turkish Patent Institute and TR-Espacenet for the years 2000-2008 show that patenting activity is concentrated mostly in *Challenge 1: Pervasive and Trustworthy Network and Service Infrastructures.* On the other hand, Challenge 2: *Cognitive Systems, Interaction, and Robotics* is seen as the ICT class where the RTD performers are least active in patenting activity in recent years (Figure 9.2).

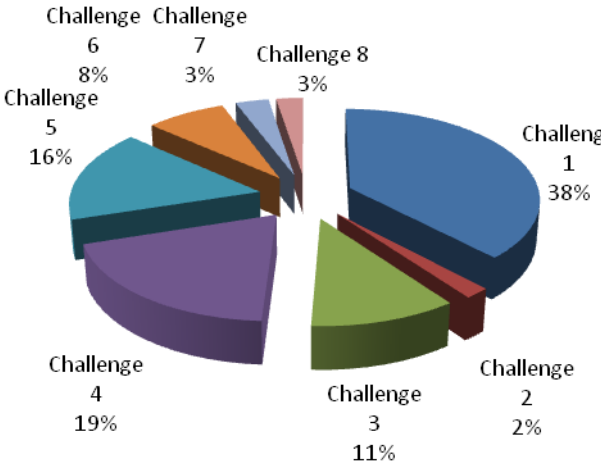
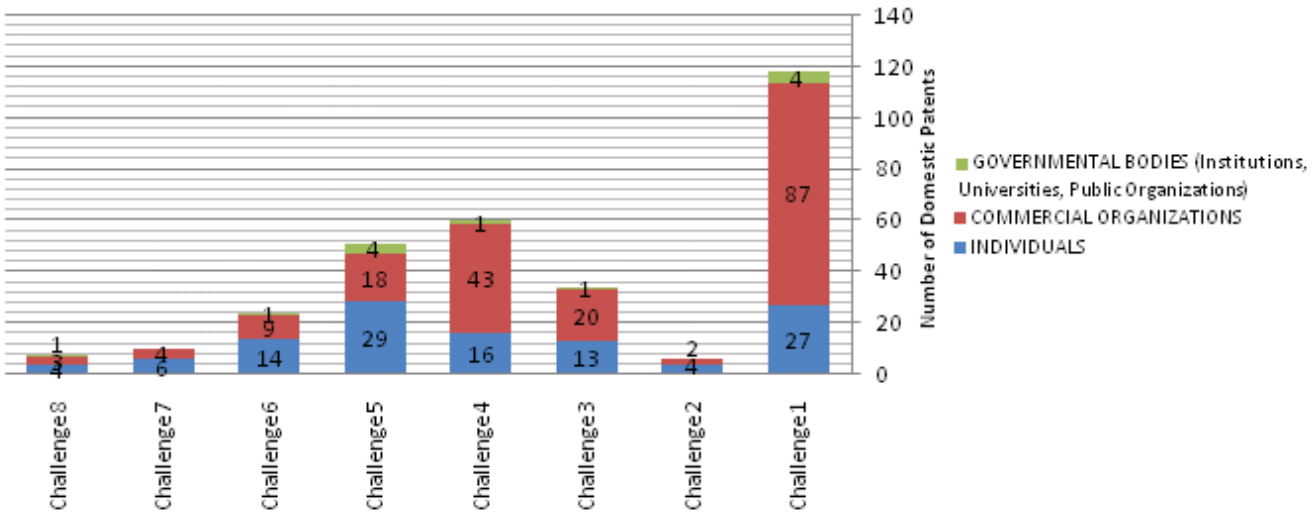


Figure 9. 2 Distribution of Patents in ICT Sector among FP7-ICT Challenges (2000-2008)



Graph 9. 5. The Distribution of Domestic Patents in ICT Sector among FP7-ICT Challenges according to actors (2000-2008)

The most active actors in RTD activities in ICT sector are *commercial organizations* (Graph 9.5). Among these organizations, there are large-scale firms in sector such as *Arcelik, Grundig, Vodafone, Beko, Turk Telekom, Koc Holding, Eczacibasi and Ford Automotive* and, small-scale firms like *AirTies, Pozitron, Verisoft, and Gate Electronics. Individuals* such as academicians and, researcher mainly from commercial organizations and academic units such as universities and research institutions are also very active in patenting activity. However, the share of *governmental bodies* (universities, research institutes and public organizations) is very low (3.9%). The most active governmental organizations in patenting activity are *TUBITAK Research Institutes* such as Information Technologies Institutes, and Space Technologies Research Institute.

From this patent analysis, we can see that there is an intensive effort aimed at patenting in ICT sector. Hence we can expect high potential in patenting for the activities in FP7 challenges. However, our analysis does not confirm such an expectation and the aforementioned potential does not support the participation in FP. Additionally, the most active actors in patenting activity and in participation to FP7 do not match and, and this indicates **weak correlation between patenting activity and participation to FP7 in ICT**.

In the analysis of publication data for the last 10 years over 2000-2009, it is seen that Turkish institutions (both organizations and individuals) have a strong research potential especially in the area of *Challenge 3: Components, systems,* engineering (Figure 9.3). Totally, 87 % of publications in ICT sector are about the first three challenges. It can be accepted that the first three challenges in FP7 ICT WP are related to basic research in the Turkish ICT sector and the last four challenges are about

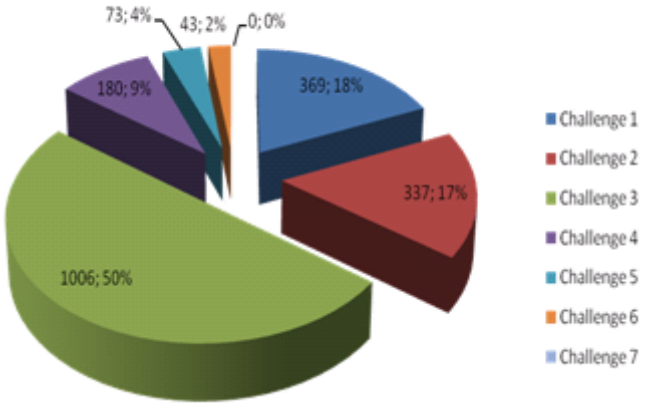


Figure 9. 3. Distribution of academic publications among FP7-ICT challenges

the application of basic research in first three challenges. As it can easily be seen from the publication figures, **the basic research especially in "Challenge3: Components, Systems and Engineering" is strong and competitive in Turkey.**

In terms of number of publications, **nation's most successful universities in the field of ICT are public universities.** They have the strongest capacity to transfer technology and to innovate. Top

three universities are *Middle East Technical University (20% of all publications), Istanbul Technical University (19% of all publications)* and *Bosporus University (13% of all publications.* These top three public universities are followed by two private universities, namely *Sabancı University (10% of all publications) and Bilkent University (9% of all publications.)*

In sum, in the analysis of RTD Activities of ICT Organizations, the patent data shows that especially the commercial organizations have strong capacity to participate in FPs in Challenge 1, but the most active actors in patenting activities that have capacity to participate in FP do not prefer to participate in FP in recent years. The publication analysis shows that mainly the public universities followed by private universities have capacity to participate in FPs in Challenges 1, 2 and 3, and this capacity can be realized by leveraging academic and entrepreneurial resources in universities by benefiting from joint projects and co-operations in order to build related capabilities and develop technology transfer strategies. This can be carried out by strengthening existing support programs implemented by public institutions, and the basic research potential in Turkey can further be utilized in FP7 through supportive actions taken by EU.

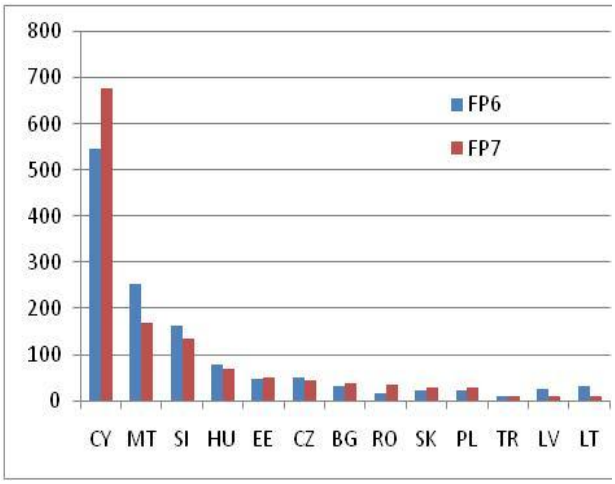
9.3.2. Participation Performance of Turkey in the FP6 – IST Priority and FP7 – ICT Theme

In this section, the summary of the *Task 3: Analysis of the participation of Turkey in the FP6 – IST Priority and FP7 – ICT Theme Report* is presented**.** The main aim of this report is to analyze the participation of Turkey in the FP6 – IST Priority and FP7 – ICT Theme. The input for this task is provided by EC-DGINFSO. The complete data for FP6 and FP7 project proposals are sorted and analyzed in cooperation with ICT NCP Turkey and Turkish ICTC Delegate. This dataset will be handled in a confidentiality basis.

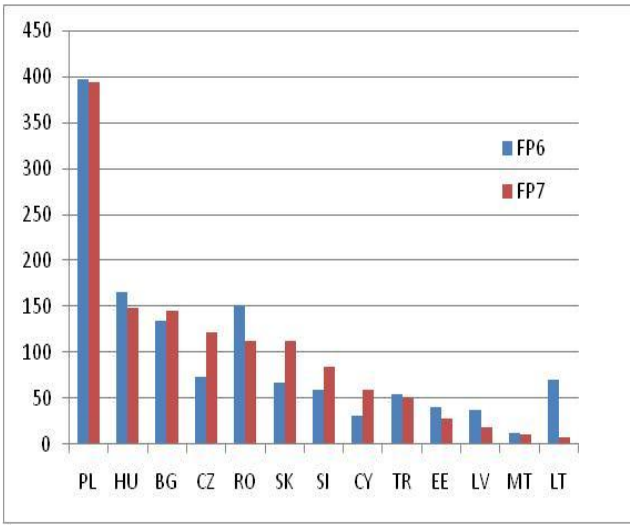
Turkey became an associated country to FP6 in 2003, 20 years after the beginning of the FPs, in conformity with long term STI policy objectives. Since 2003, around 700 Turkish partners and more than 2000 researchers were engaged in collaboration activities with their European counterparts in in ERA. In the case of ICT, 93 Turkish partners received funds from FP6 and FP7 and around 1000 Turkish partners took part in submitted ICT RTD collaboration projects. **Hence, the first steps towards the integration of Turkish Research Area to ERA are achieved**.

The overall FP performances illustrate that EU15 countries have increased their share in FP7 ICT theme compared to FP6 IST. They have gained 96% of available FP7 ICT funding. Comparison between EU 12 and Turkey points out that Turkey's level increased from 4% to 7%. In both

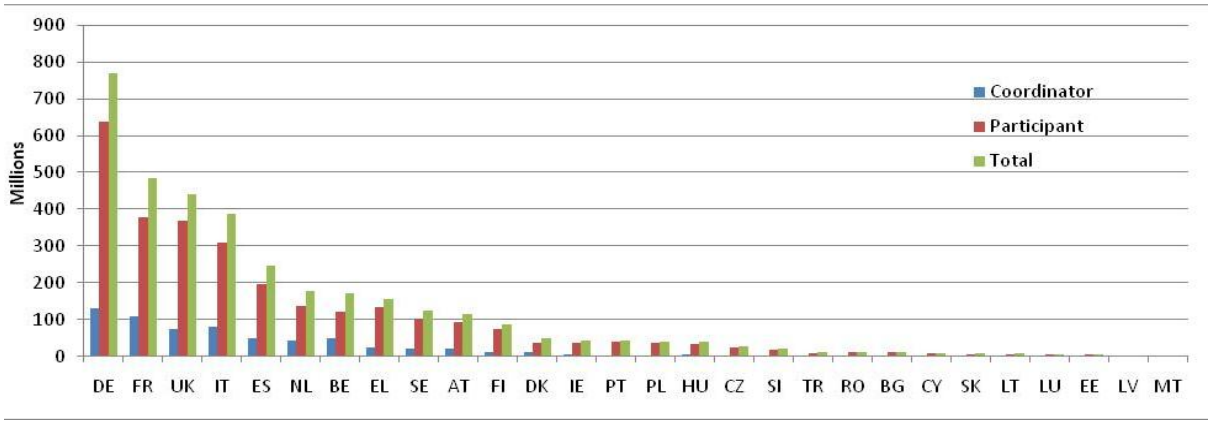
programmes (FP6 IST and FP7 ICT), the EC funds received per FTE[1] researcher in Turkey is around one tenth of EU12's average (Graph 9.6). If the data for EC funds received (in FP6 IST and FP7 ICT) is normalized with national R&D expenditure per FTE researcher, Turkey's level is around half of EU12 average (Graph 9.7). For both analyses, Turkey's data is almost unchanged from FP6 IST to FP7 ICT, although there was a considerable increase in the number of FTE researchers and national R&D expenditures in Turkey from 2003 to 2007.



Graph 9. 6. EU 12 and Turkey in FP6 IST and FP7 ICT, breakdown based on fund received per FTE researcher



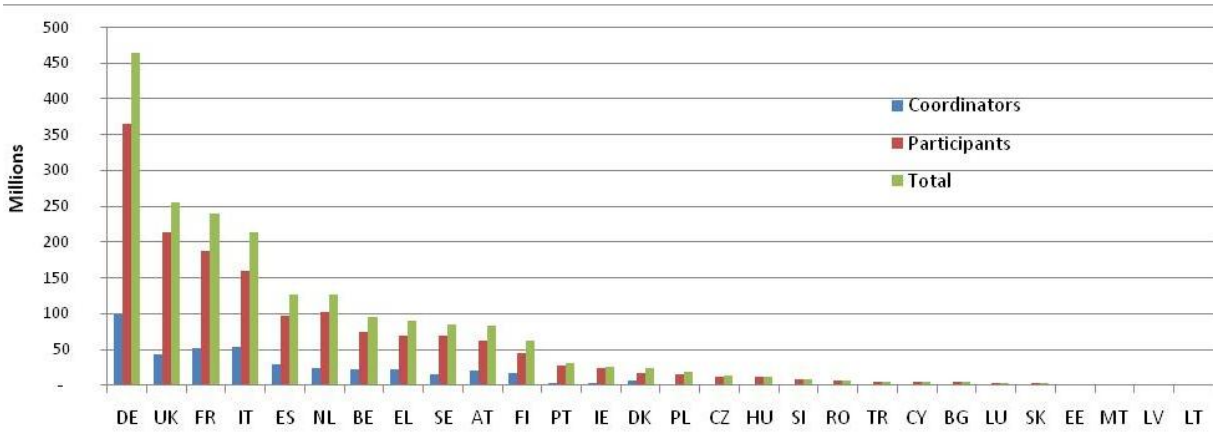
Graph 9. 7. EU 12 and Turkey in FP6 IST and FP7 ICT, breakdown based on funds received normalized with national R&D expenditure per FTE researcher



Graph 9. 8. EU 27 and Turkey in FP6 IST (2003-2006), breakdown based on fund received from the EC

[1] Full time equivalent

According to the FP6 IST data, around 3.5 billion € was allocated by the European Commission to EU 27 and Turkey for retained projects. The breakdown of this budget is as follows: EU15: 90%, EU12: 10%, Turkey: 0.3%. If the performance of Turkey is compared with EU15 and EU12, it is seen that Turkey's level is about 0.4 % of EU15 and 3% of EU12 (Graph 9.8).



Graph 9. 9. EU 27 and Turkey in FP7 ICT (2007-2008), breakdown based on fund received from the EC

The similar analysis for FP7 ICT shows that, 2.0 billion € was allocated by the European Commission to EU 27 and Turkey for retained (Graph 9.9). The breakdown of this budget is as follows: EU 15: 96%, EU 12: 4%, Turkey: 0.3%. If the performance of Turkey is compared with EU 15, Turkey's level decreased from 0.4% to 0.3%. On the other hand, comparison with EU 12 indicates that Turkey's level increased from 4% to 7%. This is because EU 12's share decreased from 10% to 4% when fund allocation breakdown of FP IST and FP7 ICT is taken into consideration. The overall results illustrate that **EU15 countries have increased their share in FP7 ICT theme compared to FP6 IST**.

The data obtained from DG INFSO show that Turkish participation in FP6 IST field is mostly concentrated in *IST for societal challenges, IST for work & business challenges, pervasive, mobile, wireless, trustful infrastructures* with 20% of total funded Turkish partners. High interests on *e-Government, e-Work and e-Business* in FP6 reflect the research potential and experience in ICT area in Turkey. 43% of Turkish participants[2] in submitted projects are focused on IST applications. Thus, ICT sector in Turkey is mainly oriented toward *content development.* On the other hand, the low level of success rate (4%) in e-Government, e-Work and e-Business topics[3] displays the insufficient

[2] 292 out of 677 participations.

[3] 1) Networked business and governments; 2) Integrating Technologies for the Fast and Flexible Manufacturing Enterprise; 3) E-government; 4) Collaborative Working Environments

involvement of Turkish organizations in EU R&D networks in that field[4]. Although the publication data shows somewhat different results, **the researchers in ICT sector are much involved in application- oriented partnerships in FP6**.

Concerning the funded FP6 IST projects, most visible Turkish organizations in EU ICT RTD arena are *Bilkent University (5 projects), METU (12 projects), Koc University (5 projects) and TUBITAK-UEKAE (5 project).* On the other hand, well-known universities such as Bosporus University (2), Sabancı University (2), Istanbul Technical University (0) and Hacettepe University (0) performed under their potential. The same can be argued for the large enterprises like BMC (0), Arcelik (0), Ford Otosan (0), Tofas (0), and Vestel (0) which are the most important R&D investors of Turkish business sector. [5] Small and Medium-Sized Enterprises (SMEs) like Tepe Technology (2) Intro (2), Innova (1), Momentum (1), IES (1), RTB (1), Yogurt (1) which act in the application side of the ICT sector in Turkey managed to take part in funded FP6 IST projects by intermediary role of METU and Bilkent University. Conversely, SMEs like AirTies, Pozitron, Verisoft, and Gate Electronics which are active in patenting were not present in the European IST RTD arena.

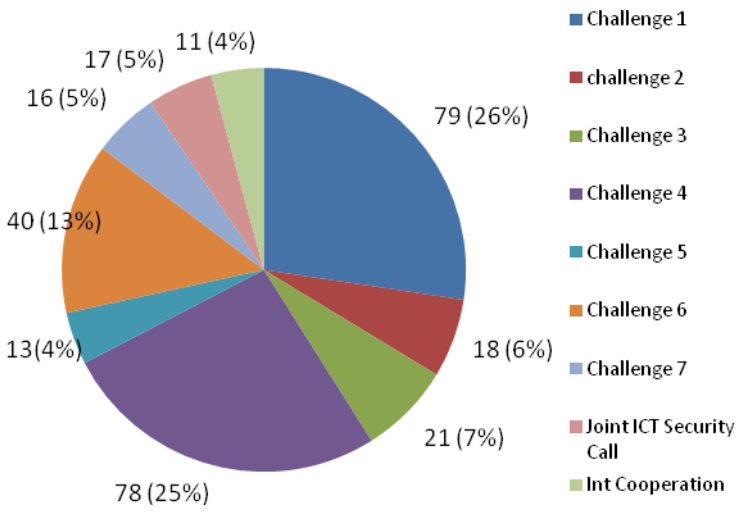


Figure 9. 4. Distribution of Turkish Partnerships in Submitted FP7 ICT Projects per Challenges - (Call 1, Call 2, Call 3, Joint ICT-Sec Call)

In the analysis of Turkish participation in FP7 ICT (Call 1 Call 2, Call 3 and Joint ICT-Security Call), it is seen that Turkish researchers are mostly involved in *Challenge 1: Network and Service Infrastructures* dominated by the Service & SW architectures, infrastructures and engineering objective and *Challenge 4: Digital Libraries and Digital Preservation, Technology Enhanced Learning* and *Intelligent Information Management* dominated by Digital libraries and technology-enhanced learning objectives (Figure 9.4). Low level of participation in Challenge 2, Challenge 3, Challenge 5 and Challenge 7 are compatible with the results of the patent data.

[4] This also exhibits US orientation of ICT solutions market in Turkey with the main dominance of corporations such as Microsoft, IBM, Cisco Systems, Oracle and Sun Microsystems.
[5] www.turkishtime.org/files/Arastirmalar/Ar-Ge/Ar-ge_100_2007.xls

In the analysis of Turkish ICT RTD actors' performance in funded FP projects, we see that 41% of Turkish participants in FP7 funded projects are clustered in the field of *network and service infrastructure* (Figure 9.5). This is the result of the successful transformation of 3DTV research performed in FP6 into the relevant FP7 topics via Bilkent University and METU, and also from conveying the national network which appeared in FP6. Relatively high effort is seen in Digital Libraries and Content (challenge 4), Mobility, Sustainability and Energy Efficiency (Challenge 6) topics in FP7.

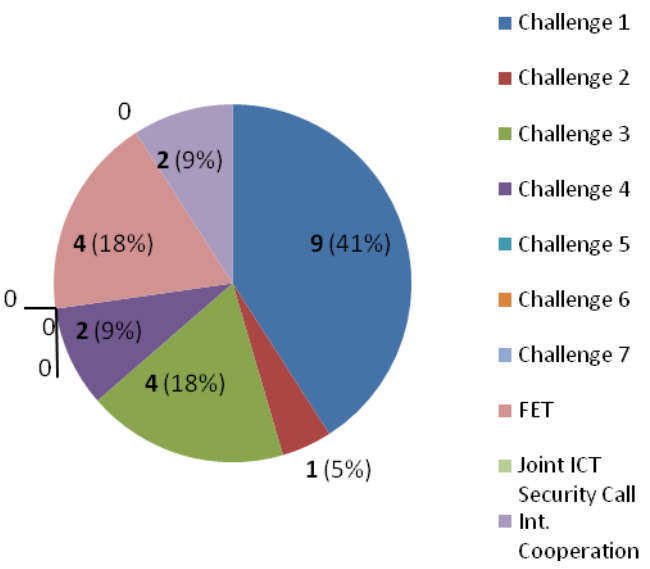


Figure 9. 5.Distribution of Turkish Partnerships in Funded FP7 ICT Projects per Challenges - (Call 1, Call 2, Call 3, Joint ICT-Sec Call)

127 participations (submitted projects) in those two fields resulted in only two partnerships. If participations in these two fields are excluded from the analysis, Turkish organizations' success rate reaches to 10% which is similar to that in FP6 IST theme. If the problems (such as low visibility of Turkish institutions and integration to EU ICT RTD networks) are settled in these two challenges, it is possible to increase Turkey's success rate in FP7 ICT.

Among a total of 22 partnerships in FP7 ICT projects, the successful organizations can be listed as; Bilkent University (6), METU (3), Turkcell (3), Koc University (2) and Software Research & Development and Consultancy (SRDC) -a METU spin-off company-(2).[6] The current status represents successful transformation of FP6 experiences to new FP7 by Bilkent University, METU and Turkcell. On the other hand, it can be argued that Bosporus University, Sabanci University and Istanbul Technical University are still lagging behind their potential compared to their publication data[7].

[6] Figures in parentheses show the number of partnerships in funded FP6 IST projects.
[7] As the latest figures in call 4 are consired the the number of participants in submitted proposals are 81 for Turkey and number of participants in funded projects are 11. This indicates 13.5% success rate for Turkish participants in Call 4. Among a total of 11partnerships in FP7 ICT-call 4 projects, the successful organizations can be listed as: Koc University(2), Sabanci University(1), Bilkent University(1),TUBITAK(1),ARCELIK(2),Turksat(1), SRDC(1),Başar Comp.(1), Datasel Inf. Systems(1)
[7] Figures in parentheses show the number of partnerships in funded FP6 IST projects.

Different than FP6, large enterprises mainly from automotive industry (Tofas, Ford Otosan and Temsa), display industry (Beko and Vestel) and e-government technologies (Turksat) showed greater interest to FP7 ICT, however, they are not sufficiently integrated into core ICT RTD networks dominated by the main players of European industry.

In the analysis of latest figures in Turkish participation in **FP7 ICT Call 4,** it is seen that there are 11 projects that Turkish researchers are involved in. 3 of them are about the objective of *Networked Media and 3D Internet* (Challenge 1), 3 of them are about *ICT for Governance and Policy Modelling* (Challenge 7), 2 of them are about *Personal Health Systems* (Challenge 5), 1 is about *Accessible and Assistive ICT* (Challenge 7), 1 is in *Organic photonics and other disruptive photonics technologies* (Challenge 3) and 1 is about *General Accompanying Measures* (Challenge 9). Like the figures in Call 1-3, the latest figures in Call 4 show that Turkish researchers are mostly involved in the area of Challenge 1. Additionally, we see Challenge 7 as the area that Turkish researchers are most active with 4 projects in Call 4. This is different than the situation in first 3 calls. Despite low number of project about Challenge 7 in first 3 calls, **we see a remarkable increase in participation to Challenge 7 in Call 4.** Additionally, increase in participation rates in Challenge 5 is also noticed.

Both in FP6 and FP7, funded projects are dominated by universities in Ankara and Istanbul. METU, Bilkent University, and Koc University constitute 43% of all Turkish participants in IPs, STREPs and NoEs when the whole IST/ICT FPs experience of Turkey is considered. Involvement of those three universities increases to 50% in FP7 ICT. Different than FP6 IST, in FP 7 (till now) a weaker role is played by METU and Bilkent University in introducing (some) SMEs into the core ICT RTD networks. As a result, Turkish companies who took part in FP6 IST funded research projects[8] were not successful in continuing to benefit from EU funds through their networks formed under FP6, when the first four calls of FP7 ICT are considered.

In sum, we can claim that although Turkey has benefitted from R&D funds and know-how via knowledge flows, Turkey's performance in EU ICT RTD demonstrates that Turkey is performing under its potential because of

- Lack of integration with core networks and
- Insufficient Europeanization of ICT research strategies of Turkish universities.

Findings of this study on Turkish ICT sector imply that lack of networking of Turkish organizations with the EU ICT hubs inhibited achieving success in FP ICT Thematic Area. Turkish

[8] IP, NoE, STREP

researchers have limited personal contacts with EU researchers while the structure of EU ICT RTD is based on *preferential attachment rather than self-organizing networks*. Around 90% of the participation in submitted projects resulted with an unsatisfactory performance. Therefore, weak integration of Turkish organizations in official and non-official EU networks is the main reason of underperformance in ICT projects. It is important to activate the hidden potential of Turkish Research Area in ICT field. *But how?* By:

- *Recommendation 1*: Paving the way to increase R&D collaboration activities among Member States and Turkey especially in areas where there is a thematic concentration and proximity (At national and EU Level).
- *Recommendation 2*: Designing supporting actions aimed at inducing cooperation between the central organizations which serve as "hubs"in Framework Programmes and research organizations of countries like Turkey (At EU Level and National Level).
- *Recommendation 3:* Initiating mechanisms to ease Europeanization of ICT research strategies of Turkish institutions (At National Level).
- *Recommendation 4:* Introducing a comprehensive brain circulation strategy in the field of ICT research (At national Level and EU Level).
- *Recommendation 5:* Enhancing the partnerships between successful Turkish universities and R&D performers from business sector, and also sustain the collaborations under previously established networks in FP6 IST (At stakeholder level and EU Level).
- *Recommendation 6:* Attracting the European and multinational corporations to establish R&D facilities in Turkey which can trigger the involvement in EU ICT RTD networks (At EU Level and National Level).

9.4. ICT RTD INFRASTRUCTURE FOR AN EFFECTIVE PARTICIPATION TO FP7 – ICT THEME

In this section, the summary of Task 4: Reviewing Analysis of the sufficiency of ICT RTD infrastructure for an effective participation to FP7 – ICT Theme Report is presented. The main aim of this task was to identify research infrastructures related to ICT RTD in Turkey to analyze the sufficiency of the ICT RTD infrastructure for effective participation to FP7 ICT Programme. For this purpose, current and planned physical infrastructure and, distinguishing physical infrastructure are identified. Participants to our survey are asked whether their current RTD infrastructure meets with the needs of researchers for an effective participation in the FP7 – ICT Theme, and if not what the needed infrastructure is. Main data sources for information on the ICT RTD actors are following information:

- Turkish organizations that took part in the FP6 IST/FP7 ICT Projects,
- Related departments of major universities and research institutions in the field of ICT,
- Research infrastructure project already funded by State Planning Organization (DPT),
- TUBITAK Profile Study: Sources of "EXPLORE YOUR PARTNER" and "TR POTENTIAL PARTNERS",
- Members of National Electrics and Electronics Technology Platform(EETP) in Turkey
- Granted Institutions under REGPOT Centers of Excellence Call: FP6- 2004-ACC-SSA-2
- High Performance Computing Centers and Centers of Grid Sources.

- Centers of Excellence related to ICT RTD that are supported by Turkish R&D Law No:5746
- R&D Centers related to ICT RTD that are declared by TUBITAK (BTYK) Report in December, 2009

The competence of the aforementioned actors in ICT RTD are determined by matching their current and planned research infrastructures, participation and application performance to FP Programs, their funded projects by governmental organizations, their potential pointed out by TUBITAK profile studies and their national and international support granted for established as center of excellence with the objectives and challenges in 2007 ICT WP Program.

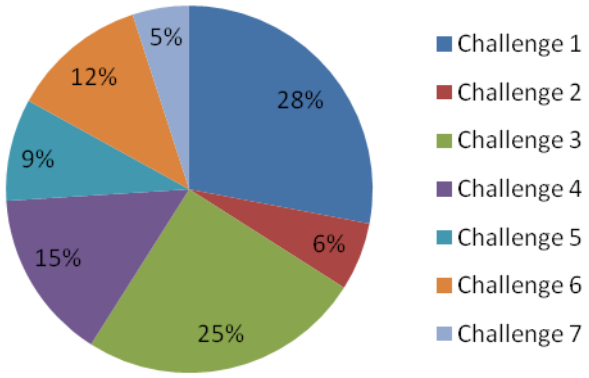


Figure 9. 6. Overall Research infrastructure (Universities, Research Institutes and Governmental Bodies)

In overall ICT RTD Research Infrastructure in universities, research institutes and governmental bodies, It is observed that in research infrastructure that has potential to participate in FP, the highest share of universities, research institutes and governmental bodies is in *Challenge 1: Pervasive and Trusted Network and Service Infrastructures. Challenge 3: Components, systems, engineering* follows Challenge 1. Third is Challenge *4: Digital Libraries and Content.(*Figure 9.6)

The most active departments in ICT RTD in Turkish Universities are *Department of Electrical and Electronics Engineering, Department of Computer Engineering and Department of Physics*. Almost in all universities in Turkey, these three departments are active in ICT RTD Activities. Especially, in top universities which are derived from publication analysis, so to say Middle East Technical University (METU), Istanbul Technical University(İTÜ), Bosporus University, Sabancı University, Bilkent University, Koc University, all these three departments can be seen as active actors in ICT RTD and constitute an important part of research infrastructure in Turkey.

Our analysis about research infrastructure in ICT RTD Activities showed that there is a strong pattern of **domination of Ankara and Istanbul**.

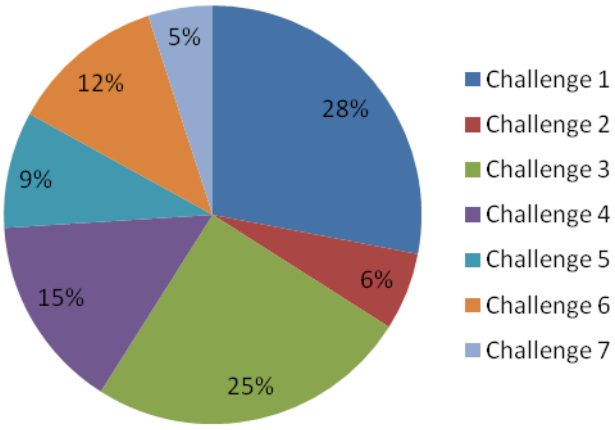


Figure 9. 7. Research infrastructure in total (Private Sector Organizations)

In overall ICT RTD Research Infrastructure in private organizations, it is observed that in research infrastructure that has potential to participate in FP, the highest share of private organizations is in *Challenge 1: Pervasive and Trusted Network and Service Infrastructures.* Challenge *4: Digital Libraries and Content* follows Challenge 1. Third is *Challenge 6: ICT for Mobility, Environmental Sustainability and Energy Efficiency* (Figure 9.7).

After presenting this soft infrastructure in ICT RTD in Turkey, for the complete map of research infrastructure in the field of ICT in Turkey, the soft infrastructure which represents the competence of each actor is combined with existing physical infrastructure in ICT sector in Turkey. For this purpose, all identified actors that have expertise and potential in objectives of ICT WP are firstly asked by physical research infrastructure form via mail. Then they are called by phone twice to learn about their current and planned research infrastructure, their distinguishing physical infrastructure, whether their current physical infrastructure meet the needs of researchers for effective participation to FPs and if not, what the physical infrastructure needs of these actors for effective participation to FPs. After evolution of the research infrastructure, ICT RTD research infrastructure (the combination of soft infrastructure and physical infrastructure) are identified by challenges and objectives, and the total picture of Turkish current planned research infrastructure for effective participation to FPs are presented comprehensively by the "Table of ICT RTD Physical Infrastructure (Matrix of Research Infrastructure) in Turkey". By using this matrix of research infrastructure, two tables are prepared to present the physical infrastructure related to ICT RTD in Turkey separately, one for major centers of excellence Table 9.4), and the other for potential centers of excellence (Table 9.5).

Table 9. 4. ICT RTD Physical Infrastructure for Major Centers of Excellence in Turkey

ICT RTD UNITS AND COMPETENCES IN FP 7 ICT OBJECTIVES	PHYSICAL INFRASTRUCTURE
BILKENT UNIVERSITY- Electrical and Electronics Engineering Dep. **Objectives**: Ch1, Ch4,Ch 6, Ch 7	Vector Network Analyzer, Signal Generator, Antenna Near Field Scanner
BILKENT UNIVERSITY- Electrical and Electronics Engineering Dep. and Institute of Material Science and Nanotechnology-Nanotechnology Research Center(UNAM-NANOTAM) **Objectives**: 3.1., 3.5., 3.6	Accurate-Mass Quadrupole Time-of-Flight (Q-TOF) LC/MS,Asher,Atomic Force Microscope (AFM, PSIA) ,Atomic Force Microscope (AFM, Asylum),Atomic Layer Deposition (ALD) ,Autoclave Carbon dioxide Laser (CO2),Cary UV-VIS Spectrophotometer, Cary Fluorescence, Spectrophotometer, Circular Dichroism System (CD),Confocal Microscope, Contact Angle Measurement System, Critical Point Dryer, Cut-off and Grinding Machine, Dicing Saw Differential Scanning Calorimetry, Dimple Grinder, Disc Grinder, Disc Punch E-Beam Evaporation, E-Beam Lithography (E-BEAM),Electrolytical Thinner Ellipsometer (IR-WASE), Ellipsometer (V-VASE),Env. Scanning Electron Microscope (ESEM) Femtosecond Laser System,FFT Network Analyzer, Fiber Tower, Focused Ion Beam (FIB),FSP Spectrum Analyzer,FTIR (Tensor 37) ,FTIR with Microscope, Function Generator, Gas Chromatography Mass Spectrometry (GC/MS) ,Gas Permeation Chromatography / Size Exclusion Chromatography (GPC / SEC) ,Glass feMaker, Glovebox, Grinding and Polishing Machines He-Cd Laser ,He-Ne Lasers ,High Performance Computer ,High Resolution Mass Time-of-Flight (TOF) LC/MS, Hot Plates ,Inductively Coupled Plasma (GaN, GaAs),Inductively Coupled Plasma (Si) Infrared Camera ,Isothermal Titration Calorimetry (ITC),LCR Meter, Lock-In Amplifier, LPCVD Mask Aligner, Mask Aligner with Nanoimprint Lithography ,Mask Writer, Material Microscope Materials Research Diffractometer (MRD),Mounting Press ,Multi-Purpose X-Ray Diffractometer Network Analyzer, Nuclear Magnetic Resonance (NMR),Optical Microscopes, Optical Profilometer Optical Spectrum Analyzer ,Organic Thin Film Evaporator, Oscilloscopes ,Oxidation Furnace Parameter Analyzer ,PECVD ,Precision Etching Coating System (PECS),Precision Ion Polishing System (PIPS) ,Preform Consolidator, Preparative High Performance Liquid Chromatography (Prep-HPLC) ,Probe Stations ,Rapid Thermal Annealing (RTA) ,Remoter ,Rocking Furnace Semiconductor Parameter Analyzer ,Signal generator ,SNOM + Raman MicroscopeSpectrum Analyzer ,Spinners ,Sputtering System, Stylus Profilometer ,Thermal Evaporator, Thermal Evaporation System, Thermal Gravimetric Analysis (TGA) ,Three-zone Furnace (1200 C) ,Time-resolved Fluorescence, Transmission Electron Microscope TEM),Ultra microtome, Ultrasonic Cutter ,UV-Vis-NIR spectrophotometer, Vacuum Impregnation, Vacuum Ovens ,Wire Bonder X-ray Photoelectron Spectroscopy (XPS),Zeta Potential (Zeta Sizer)
BILKENT UNIVERSITY-Electrics and Electronics Eng.-Computational Electromagnetic Research Center(BİLCEM) **Objectives**: 1.1,3.1	HP Clusters (with 16 processors), Parallel Computers, Servers (Intel source), system room
BILKENT UNIVERSITY -Computer Engineering Dep. **Objectives:** 1.2, 1.5, 4.2,4.3	No Information/UWPI
BOSPORUS UNIVERSITY – Computer Eng. Dep- Perceptual Intelligence Lab.(PILAB) **Objectives:** 1.1,1.2,1.4,3.3,3.4	No Information/UWPI
BOSPORUS UNIVERSITY – Computer Eng. Dep-Artificial Intelligence Lab.(AILAB) **Objectives:** 1.4, 1.6, 2.1,2.2	No Information/UWPI
BOSPORUS UNIVERSITY- Computer Eng. Dep-Complex Systems Research Lab/ SoSLAB) **Objectives:** 1.2, 1.3, 1.6., 2.2, 3.6,4.2, 4.3	No Information/UWPI
BOSPORUS UNIVERSITY- Computer Eng. Dep-Software Research Laboratory.(SoftLAB) **Objectives**: 1.4	No Information/UWPI

BOSPORUS UNIVERSITY- Computer Eng. Dep- Computer Networks Research Laboratory(NETLAB) **Objectives**: 1.1, 1.2, 3.3., 3.4	2 server rooms and a laboratory, 50 computers, SUN workstations, LINUX and Windows servers and high-end PC's, interconnected through a 100 Mbps Ethernet network. Several printers and a photocopier, 4 modems, All computers and communication devices have 24 hour UPS power, the emergency electricity generating plant. One HP LAN analyzer, one HP WAN analyzer; one 100MHz oscilloscope, one 100MHz logic analyzer and several other instruments are available for measurement studies. NetLab has a small electronic workshop for board development and testing, and also 680xx development .Software: SOLARIS, UNIX, VMExec, LINUX, Windows XP operating systems, all common compilers and assemblers, PC software such as word processors, spreadsheets, databases, OPNET modeling and simulation software package, network management software, several public network simulation and analysis tools.
BOSPORUS UNIVERSITY- Electrics and Electronics Eng. Dep.- Micro Electro Mechanical Systems Lab (BUMEMS) **Objectives:** 2.1,2.2, 3.1	Nanovak- Thin Film Thermal Evaporator, Nikon Measurement Microscope, Nanovak- Oxygen plasma asher,Photoresist spinner, Hot plate (2 units),Polymer lithography line, Micro manipulators (3 units),De-ionized water generation system, Optical Spectrometer and integrating sphere Fume hoods (2 units), Precision weight measurement system, Ultrasonic Cleaner
BOSPORUS UNIVERSITY- Electrics and Electronics Eng. Dep.- Electronic CAD Lab. (BETA LAB) **Objectives:** 2.1,2.2, 3.6, 3.7	Sun Microsystems Ultra-45 Workstation (3 units),Sun Microsystems Ultra-27 Workstation (2 units),Sun Microsystems Sparcstation Workstation (1 unit),Sun Microsystems Ultra-5 Workstation (5 units),Sun Microsystems Sunblade-1500 Workstation (2 units),Mentor Graphics Design Suite (15 Licenses),Synopsys HSpice (15 Licenses),Altera (15 Licenses)
BOSPORUS UNIVERSITY- Electrics and Electronics Eng. Dep.- Intelligent Systems Laboratory **Objectives**: 1.1.	Server - HP Quad Core Intel Zeon, Private Computers (12), Versa200 Laser Cutter, Tektronix DPO4000 Digital Osciloscope, Hameg HM-203 Oscilloscope, Goodwill Function Generator, Multimeters(Protek, Lutron,TES, DC Power Supplies,2 Soldering Stations (Fonton, Ersa), RS Fluorescent Magnifier, Fluke Mini Non-contact Thermometer, Sensors, Altium, Autocad, Solidworks
ISIK UNIVERSITY- Electronics Engineering Dep. **Objectives:** 1.1, 4.1., 4.2, 4.3., 6.1.	Electrical Circuits Lab (Oscilloscope (Instek GOS-620): 20 Mhz Bandwidth, Dual Channel, and 1mV/div, X-Y Function, DC Power Supply (DF-1731): Two adjustable Channel (0-30V),Max. Current : 3 A., Current protection ,Signal Generator (Instek GFG-8210): Frequency Range: 0.1Hz ~ 10MHz ,Waveforms: Sine, Triangle, Square, Ramp, TTL and CMOS Output, Two-Step (-20dBx2) and Variable attenuator, LIN/LOG Sweep Mode,Multimeter (Goldstar DM-332):Number of Digits : 3.5 Digits, DC Voltage Range : 400mV - 1000V,AC Voltage Range : 400mV - 750V, DC Current Range : 4mA - 10A, AC Current Range : 4mA - 10A, Resistance Range : 400Ω - 40MΩ, Capacitance Range : 40nF - 40µF).,Logic Design Lab(C.A.D.E.T breadboard,Hp Agilent 5421D Logic analyzer, Logic Probe, C.A.D.E.T breadboard, New high & low buffered logic indicators,8 channel logic monitor, New 8 selectable logic switches, Function Generator with continuously variable sine, square and triangle waveforms and TTL pulse, Triple output power supply offers fixed 5 VDC supply plus two variable outputs: ±1.3 to ±15VDC,Two Digital Pulsers, Hp Agilent 5421D Logic analyzer(60 Mhz, 4 MB MegaZoom deep memory standard),Logic Probe(Power Supply: 5V (4.75V~6.5V), 30mA~35mA,,Frequency: 5Hz~40MHz, Input Signal: TTL or CMOS Level, Input Impedance: 400K ohm).,Electronics Lab(Oscilloscope-Agilent 54621D , Tektronix TDS210(Unique 2+16 channel MSO model,60 MHz ,4 MB of MegaZoom deep memory mapped to 32 levels of intensity, 25 million vectors/sec. ,Powerful, flexible triggering including I^2C, SPI, LIN, CAN and USB ,Standard built-in floppy, RS-232 and parallel ports, FFT's , 60 MHz or 100 MHz with 1 GS/s Sample Rate on all Channels ,2 Channel, Automatic Measurements ,Autoset ,Waveform and Setup Memories) Power Supply -Instek GPS-3030DD, LG GP-4303D, DF1731SB(3 channels. ,3 A max., Short-circuit Protection) Signal Generator -Instek GFG-8210, Goldstar FG-2002C, Topward 8150(Frequency Range: 10MHz ,Waveforms: Sine, Triangle, Square, Ramp, TTL and CMOS Output ,Two-Step (-20dBx2) and Variable attenuator ,Built-in 6 Digit Counter with INT/EXT Function up to 150 MHz high resolution) Multimeter-Goldstar DM-312, Brymen BM807, Protek 506(Number of Digits : 3.5 Digits,DC Voltage Range : 400mV - 1000V,AC Voltage Range : 400mV - 750V,DC Current Range : 4mA - 10A,AC Current Range : 4mA - 10A,Resistance ,Range : 400Ω - 40MΩ,Capacitance Range : 40nF - 40µF), ,Signal and Image Processing Lab., Telecom and Microwave Lab.(Lab-Volt Microwave Technology Training System (8090), TIMS-301 Telecommunications Instructional Modeling System, Tektronix TDS210 Digital Real-Time Oscilloscope, Pico ADC-100 PC Based Oscilloscope / Spectrum Analyser, HP ESA-L 1500 A, PC
ISTANBUL TECHNICAL UNIVERSITY- National Center for High Performance Computing **Objectives:** 1.2, 1.4, 1.6,1.7, 3.4	1. server system: Anadolu, cluster/ 2. server system: Trakya, SMP/3. server system: Ege, blade, 4. server system: Karadeniz, blade – Network Connection: InfiniBand 20 Gbps (DDR), Gigabit Ethernet- Processors: 266 x Intel Xeon 5140 2.33 GHz, 118 x Intel Xeon E5430 2.33 GHz, 210 x Intel Xeon E5430 2.66 GHz, 128 x Intel Xeon X5550 2.66 GHz, 32 x Intel Itanium2 1.6 GHz
KOC UNIVERSITY- College of Eng.- Electrics and Electronics Engineering- Optical Microsystems Lab.(OML) **Objectives:** 3.2., 3.3., 3.5., 3.6., 3.7.	MOEM (micro-opto-electro-mechanical) and MEMS devices, Micro-scanners, Micro-optics (e.g. diffractive elements and micro lenses), Image quality measurements in display systems.,Recently expanded 300m2 facility housing 8 optical tables, various electrical, optical, and mechanical, characterization equipment, A 20m2 clean room area within the lab dedicated for wire-bonding and testing of delicate micro/nano systems.

KOC UNIVERSITY- College of Eng.- Mechanical Engineering Dep.- Micro –Nano Fabrication Laboratory(MNFL) **Objectives:** 3.1., 3.5., 3.6	Class 1000 cleanroom (Air handling units, chillers, DI water production) with fumehoods and laminar flow benches, Aligner for UV lithography, Spincoater, Surface profiler, Electro-plating baths, RF magnetron sputter, Wafer inspection microscope, Mechanical Characterization
KOC UNIVERSITY Physics Dep.- Micro photonics Research Lab. **Objectives**: 3.4.	Pulse lasers (Nd: YAG, excimer, dye, Ti: Al2O3), diode lasers (800-1600 nm), optical communication equipment, spectrometers (300-1000 nm), optical tables, and opto mechanical equipment.
KOC UNIVERSITY- Physics Dep.- Nano-Optics Research Lab. **Objectives**: 3.4.	Optical micro cavities - Liquid micro droplet spectroscopy equipments, Single molecule microscopy / spectroscopy, Applications using optical tweezers
METU-Computer Eng. Dep./ Kovan Research Lab. **Objectives**: 1.7.,2.1,2.2,3.3	1 semi size mobile robot, 1 humanoid robot, 20 small robot, Mechatronics Development Equipments, Computer controlled Lathe, Mechatronics and Electronic Workshop Equipments (Saw, drills...etc)Motion Capture Equipments, Range Cameras,
METU- Computer Eng. Dep./ SRDC (Software Research & Development and Consultancy Ltd) **Objectives:** 1.1-1.5, 2.1, 2.2, 3.4,3.5, 3.6, 4.2, 4.3,5.1,6.1-6.5	Metro DSL Network Connection, 5TB Storage Space, 12 Computation node, 24 Computing core number, Intel Core2 Duo E Series (mostly E8400) Processors, Operating Systems and Office Package
METU- Electrical and Electronics Engineering Dep. **Objectives:** 1.1, 2.1,2.2	Biomedical Engineering Lab, Magnetic Resonance Imaging Lab(The laboratory has a 0.15 Tesla, Gradient and RF amplifiers, Development of the gradient coils, RF coils, the signal acquisition hardware and software and the system integration X and Y gradient (0.8Gauss/cm),Gradient amplifiers, electronic workshop and computational facilities), Brain Research Lab.(Computer Lab and Hardware Lab.) Control Lab., Computer Vision and Neural Networks Lab., Electrical Machines and Power Electronics Lab., Mechatronics Lab., Microelectronics Lab., Multimedia Lab., Next Generation Wireless Communications Laboratory Lab., Optic Communications Laboratory Lab(Fiber Optic Telecommunication Wavelength Lasers, Optical Spectrum Analyzer, Ericson Fusion Splicer, Electro-Optic Modulators, Optical Attenuators, Various Fiber Optic Components, Anritsu Pattern Generator and Error Tester, Oscilloscopes and other Electrical Test Equipments.), Power Systems Lab. , Process Control Lab., Robotics Lab.,, Power Systems Lab., Sensor Array and Multichannel Signal Processing Lab., Signal Processing Lab, Telecommunication Lab.(Anritsu Spectrum Analyzer (9kHz-3GHz), Function Generators, Signal Generators, Workstations for Telecommunications Research Work, Oscilloscopes and other Electrical Test Equipments.), Electromagnetic Fields and Microwave Techniques Lab., (10 MHz - 40 GHz Scalar Network Analysis,10 MHz - 26.5 GHz Vector Network Analysis,10 MHz - 40 GHz 15 dBm Signal Generation,18 GHz - 40 GHz 30 Watts Signal Generation,14 GHz - 14.5 GHz 300 Watts Signal Generation,10 MHz - 40 GHz Spectrum Analysis (-130 dBm @ 1 Hz Resolution),10 MHz - 40 GHz Power Measurement (-70 dBm),MMIC Probe Test Station (26.5 GHz) , Microstrip Probe Test Station (26.5 GHz),LPKF computer controlled (CAM) mechanical RF and electronic PCB prototyping,Digital Multimeter (1 uV), Logic Analyzer and 100 MHz Digital Oscilloscope,Pulse Generator, Function Generator,0-50 VDC/5 A DC Power Supply, 2 units of UPS,GPS Receiver, Electronic Gyro Compass, Satellite Transponder Simulator(Ku),800 MHz - 40 GHz Antenna Measuring System and,Shielded Anechoic Chamber (Rectangular shape 6 meters long),Transportable Satellite Earth Station (10 Mbit/s, Ku-Band ,e.i.r.p = 67 dBW),18-40 GHz Computer Controlled Electronic Warfare System [ESM & ECM],35 GHz Pulse Modulated Radar,SUN Sparc Work Station, 4 PC's (Windows XP) , 2 Laser Printers and 2 Plotters,,Electronically Thermal Controlled Soldering Station,Mechanical Workshop Hardware,RF Cable Assemblies and Connectors (10 MHz to 40 GHz),Semirigid Cabling Facility up to 50 GHz,Waveguide Hardware (8 GHz to 40 GHz),RF Components : (800 MHz to 40 GHz),Amplifiers, Mixers, Detectors, Couplers, Power Dividers,Terminations ,Filters,Switches Diodes,Attenuators, Phase Shifters,antennas(Horn, Microstrip etc.) 10 MHz to 100 GHz Microwave,PCB Substrates , Ferrite Disk and Dielectric Rod Microwave Materials,electronic IC Chip components,SOFTWARE FACILITIES IN THE LABORATOR(AutoCad, PCB Design Software (Circuit CAM & Board Master), XILINX, MATLAB, RF: 2D SONNET(EM simulation), RF:LIBRA(Microwave Circuit Design and Optimization),RF: 2D ENSEMBLE(EM simulation),RF:3D HFSS(EM simulation), RF:C/NL-2 (Microwave Circuit Design and Optimization), RF/FILPRO (Filter Design), MIR (Microwave Reflector Antenna Design), RADCAL(Radar Performance and Low Altitude Propagation Simulation),
METU- Electrics and Electronics Eng. Dep. -Multimedia Research Group(MMRG) **Objectives:** 1.5, 3.2, 4.2, 4.4	Servers, Computers (2-4 core), 3D Screens, DPS Cards,3D Screens for multimedia Research, a simple video broadcasting system with one transmitter and one receiver, software for image processing

METU- Electrics and Electronics Eng. Dep.-Micro-Electro Mechanical Systems Research and Application Center (METU-MEMS) **Objectives:** 3.1., 3.5., 3.6., 3.7	Available computing facilities: SUN Fire V440 Server(4x1GHz processor,8 GB RAM,140 GB HD)/SUN Blade 1000(2x800MHz processor,3 GB RAM,140 GB HD)/SUN Blade 100/5x SUN ULTRA 5 terminal/SUN ULTRA 1 terminal/HP ML350G4 File Server/10x HP DC7100 3Ghz terminal/HP Color LaserJet 2500 printer/2xHP LaserJet 1200 printer ,Available Software Packages: Cadence IC Design 4.4.5/Coventorware 2003/Synopsys 2003,Process facilities: Lithography(1µm resolution, EVG 620 Precision Alignment System & Bond Aligner for 4" & 6",Karl Suss MA 56 Aligner, Cobilt CA-800 Manual Mask Aligners (APPLIED MATERIALS)/Wafer Bonding(EVG 501 Universal Bonder 4" & 6",Silicon to glass anodic bonding, Eutectic bonding, Thermo compression bonding, Fusion bonding)/Dry / Wet Oxidation(5 furnaces, THERMCO), Deep Reactive Ion Etching-DRIE(STS Multiplex ASE HRM System for 4" and 6" wafers, upgradable to 8") Diffusion(Boron (Source : BBr 3 , B 2 H 6)/Phosphorus-Source : POCl 3 , 26 furnaces, THERMCO),Electroplating(Nickel electroplating, Copper electroplating), SU-8 molding-Under development-SU-8 patterns. Feature size: 5-20 um, height: 35-40 um, Evaporation(Au, Au/As, Ni, Cr, Cu, Ti./VARIAN 3119 e-gun source system)SPUTTERING(Al, Cr, Ni-Cr, Cu, Ti, Ta. ,BALZERS BAS 450 PM planar magnetron sputtering system),Etching(Silicon dioxide etching, Anisotropic silicon etching (KOH, TMAH, EDP),Isotropic silicon etching (HNA),Electrochemical etch stop (KOH, TMAH),Oxygen plasma, Metal etching),Passivation(PSG-G.S. TEMPRESS B.V.), Wafer Dicing(DISCO DAD 321), Back-Lapping (Speedfam), Scanning Electron Microscope-SEM(JEOL), Critical Point Drier(Supercritical Automegasamdri 915B)Test Laboratory: Available Testing Equipments: 2x Personal Computers with Data Acquision and TV cards, KarlSuss PM5 Probe Station, Kluicke Soffa Wire-Bonder, Ideal Aerosmith Rate Table, Tenney Humidity Chamber, HP 4299A Precision Impedance Analyzer, HP 4395A Network/Spectrum/Impedance Analyzer, HP Infinium Oscilloscope, HP 35670A Dynamic Signal Analyzer , 2x HP 54602B Oscilloscope , 2x HP 33120 Function Generator, 2x HP 34401A Multimeter ,2x HP E3631A DC Power Supply, 2x Keithley 224 Programmable Current Source , Tektronix 576 Curve Tracer , Xytronic 988 Temperature Controlled Soldering/Desoldering Station ,Xilinx FPGA chips and programming equipments, HP-VEE software, VLSI Design Student Laboratory:10 Personal Computers are available(Pentium 4 - 1.7 Ghz,128 MB RAM,60 GB HD),Available Software(Windows XP OS,OpenOffice.org 1.1,XWinPro and Putty, A number of tools like Filezilla, IrfanView, WinRAR,
METU- Electrics and Electronics Eng. Dep -Computer Vision and Intelligent Systems Research LAB.(METU-VISION) **Objectives**: 2.1,2.2, 4.1, 4.2, 4.3	Computers (to develop software), cameras(to develop image processing methods),3D face scanner based on cameras(to collect 3D data), Pioneer Active X moving robot base(to test robotics applications), FPGA (field programmable gate array) and DSP (digital signal processor)
SABANCI UNIVERSITY- Faculty of Engineering and Natural Sciences (FENS)- Computer Science and Engineering Prog. **Objectives**: 2.2, 4.1., 4.3.	Cryptography and Information Security Laboratory, Natural Language and Speech Technologies Laboratory, Computer Vision and Pattern Analysis Laboratory, Computer Graphics Laboratory
SABANCI UNIVERSITY- Faculty of Engineering and Natural Sciences (FENS)- Computer Science and Engineering Programe/ Computer Vision and Patterns Analysis Lab. (VPALab.) **Objectives**: 1.4, 1.5, 6.1, 6.3	No Information/UWPI
SABANCI UNIVERSITY- FENS/Electronics Engineering Dep.-Microelectronics Group **Objectives**: 3.1., 3.2., 3.5., 3.6., ,7.2	Cad Lab: Computer Aided Design lab. contains a host of software for drawing, simulating and testing micro devices may it be digital, analogue chip design or MEMS. It contains six Sun workstations, with 500MB - 1GB RAM and 32G hard disks. There are two PCs also running: Solaris operating system and are connected to the rest of machines in lab. Professional design packages selected exclusively for Microelectronics group provide cutting edge support in research work,/Software installed in workstations: Ansysy, Cadence, Coventor ,Silvaco ,Synopsys, Clean Room: Mask Aligner: High resolution optical lithography (< 1 micrometer) ,500 Watt XeHg light source with intensity controlling power supply ,6" diameter collimated exposure beam, Maximum wafer size: 4" in diameter, User selectable output spectrum for either near UV or Deep UV exposure ,Differential micrometers stage controls (X, Y and theta) for precision alignments ,Split field microscope with X,Y motion locking ,Accept mask up to 5" x ,Sputter: Low metals consumption ,Cool sputtering with magnetically enhanced deflection head ,Fast sputtering to reduce damage to heat sensitive samples ,Connections for water cooling of sample stage, Easy-change cathode assembly ,DC sputtering with air or gas; 1.5 kV at head; mA meter; 2-minute timer; on/off switch; work chamber 4" dia. x 5" high; 3 mil (76 µm) gold target supplied RIE & ICP: High homogeneity and excellent reproducibility of the etch processes, Computer controlled operation ,Data logging ,Through-the-wall installation, Parallel plate reactor driven at 13.56 MHz (600 W),Automated and manual process control ,Recipe controlled etch processes ,Intelligent process control by jumps, loops, and calls in recipes ,Different access levels Wet Bentch, COMNET LAB., IC Test and measurement equipment: Agilent 16702B Logic Analysis System, Agilent 4155B Semiconductor Parameter Analyzer ,Agilent 54810 500 MHZ Infinium Oscilloscope (2 Channel) ,Agilent 54835A 1 GHZ Infiniium Oscilloscope (4 Channel) ,Agilent E4407B Spectrum Analyzer ,Agilent 4294A Impedance Analyzer ,Agilent E4424B RF Signal Generator, Agilent 86100A Sampling Oscilloscope ,Agilent 33250A Arbitrary Waveform Generator ,Agilent 8110A Pulse Generator, Human Language and Speech Technologies Lab. ,VPA Lab. ,RF /Wireless Lab: Hardware: Agilent,(9 kHz - 26.5 GHz) ESA-E Series Spectrum Analyzer,(50 MHz - 20 GHz) S-Parameter Network Analyzer, EPM Series Power Meter, (80 MHz), Function/Arbitrary, Waveform Generator, Mixed Signal Oscilloscope,(250 kHz -4.0 GHz) ESG-DP Series signal generator, (DC-2650 MHz) Vector Signal Analyzer ,Software: ADS, MatLab ,Cadence, Ansoft, HFSS ,Photonics Lab.

TUBITAK BiLGEM-UEKAE -Center of Research for Advanced Technologies of Informatics and Information- The National Research Institute of Electronics and Cryptology **Objectives**: 1.1, 1.2, 1.5, 2.1,2.2, 3.5, 4.1, 4.2, 4.3, 6.1, 7.1	EXISTENT and CONFIDENTIAL(UWPI)
TUBITAK- Marmara Research Center **Objectives:** 6.1., 6.2., 6.3	EXISTENT and CONFIDENTIAL(UWPI)
AGMLAB Inf. Tech. Ltd. Co. **Objectives:** 1.2, 2.1,2.2, Ch 4	Galba–METU Dep. Of Computer Engineering: "Collaborative Web Intelligence Laboratory"
C2TECH Information Technologies Ltd. Co. **Objectives**: 1.4., 3.3, 6.3	Aurora Sw Product Line, Light House Software, Process Management, Framework Case Tools,
INNOVA Informatics solutions **Objectives**: 1.1, 1.3, 4.2, 4.3, 5.1	EXISTENT and CONFIDENTIAL(UWPI)
INTRO Information and Telecommunication Systems. **Objectives:** 11.1-1.5, 3.3, Ch4,5.1, 7.3	Servers, Computers, Work Stations (Special Computers for software developers), Microsoft Development Tools (AutoCAD, Photoshop…etc).
SEBIT Education and Information Technologies Inc. **Objectives:** 4.2, 4.3	Special and Effective software and hardware developed for remote education
TURKCELL Communication Services PLC **Objectives**: Ch1,Ch 4,5.2, 6.3,7.2	EXISTENT and CONFIDENTIAL(UWPI)

Table 9. 5. ICT RTD Physical Infrastructure for Potential Centers of Excellence in Turkey

ICT RTD UNITS AND COMPETENCES IN FP 7 ICT OBJECTIVES	PHYSICAL INFRASTRUCTURE
BILKENT UNIVERSITY- Physics Dep.- Advanced Research Lab. **Objectives:** 3.3., 3.4., 3.5.	Process lab: Box Coater, Reactive Ion Etcher (RIE),Rapid Thermal Annealer (RTP),Plasma Enhanced Chemical Vapor Deposition Systems (PECVDs),Surface Profiler (DEKTAK),Ellipsometer, Ovens Photolithography Lab: Mask Aligner System, Scanning Electron Microscope (SEM),Metallurgical Microscope Characterization Lab: Ultra High Vacuum System, Wire Bonder, Network Analiser,Excimer Laser, Probe Station, Monochromatic Spectroscopy Lab: Ar Laser, Monochrometer, Photomultiplier, Low Temperature Cryostat, Optical Wave Guide Testing Set-Up
EGE UNIVERSITY International Computer Institute **Objectives:** 4.1., 4.3.	ICI building has excellent networking infrastructure that includes fast Ethernet switches, state of the art structured cabling and UPS. There are four computer labs: Unix Lab contains 10 SUN Ultra 5 (all running Solaris 8),1 SUN Blade 1000 Server (Solaris 10),1 SUN 2xQuadCore x 86 Servers (Solaris 10). PC Lab contains 12 computers and a printer, Linux Lab contains 14 computers in a cluster structure, for parallel & distributed computing (OS:RedHat 7.3), Multi-Media Lab containing 1 five-degree-of -freedom Rhino robot arm, 1 PC based vision set with real-time capabilities, 1 Macintosh G4 with image processing software, 2 Macintosh 8500 PCs with image capabilities, 1 color printer. Linguistic Lab containing 1 Pentium PC
HACETTEPE UNIVERSITY- Science Fac. -Applied Biology Dep **Objectives:** 1.6, 2.1,2.2, 3.6, 4.3 , 6.4,6.5, 7.3	All lab instruments, microscope, equipment for chemical analysis.

ISTANBUL TECHNICAL UNIVERSITY Computer Engineering Dep.-Natural Language Processing Lab. **Objectives:** 1.1,1.2	Servers, Data Processing Centers
ISTANBUL TECHNICAL UNIVERSITY- Automotive Control and Mechantronics Research Center **Objectives:** 2.1,2.2, 6.1, 6.2	Two in-house developed driving simulators, One Silicon Graphics Octane (unix) workstation with two processors ,10 high performance PCs, 6 low performance PCs, 5 laptops and peripheral equipment (printer, scanner, plotter),One general purpose dSpace microautobox ECU (electronic control unit),One dSpace compact size simulator (DS1005, DS2210) with crank angle based processing (for engine ECU testing),One dSpace DS1103 rapid prototyping and HiL board with two processors ,One in house developed engine ECU HiL test system ,One xPC targetbox with A/D, D/A, DIO ports and two CAN ports for real time controller implementation, One National Instruments 6025E PCI data acquisition and control card ,Two 6024E data acquisition and control PC cards (for use in laptops),Three National Instruments LabPC 1200 ISA data acquisition and control cards, One National Instruments Daq 1200 parallel port data acquisition and control card ,Three National Instruments DaqPad accessories ,One gyroscopic yaw rate sensor ,one stroboscopic speed sensor ,Large set of proximity sensors ,Three pressure transducers ,One OROS portable spectrum analyzer ,2 ½ axes (xyq) precision positioning system with controller ,Two oscilloscopes ,Eight power supplies ,Five signal generators ,Several breadboards, electronic parts, soldering iron, mechanical tools, drill ,Two portable compressors ,Pneumatic educational breadboard with large selection of pneumatic components ,Electro-pneumatic educational breadboard with large selection of electro-pneumatic components ,Modular production system ,Siemens PLC trainers (S7-300, S7-200),Two tank system ,Self erecting inverted pendulum with rapid controller prototyping (Quanser) ,In-house built pneumatic positioning system with rapid controller prototyping ,Two industrial pneumatic positioning systems ,AS-I (actuator sensor interface) training kit ,Fieldbus training kit ,Proximity sensor training kit ,Transparent hydraulic system demo units ,One quad-rotor Draganflyer helicopter ,One Vario benzin RC helicopter ,One Vario electric RC helicopter ,One in-house developed piloted helicopter simulator ,Two Garmin GPS sensors ,RC helicopter mountable camera ,One IMU unit (three rate gyros and three accelerometers) ,One sonar altimeter ,One pressure altimeter ,One MPC555 embedded control board ,One piloted helicopter simulator with real avionics, command levers, 120 degrees field of view and ,realistic model (available end of 2005) ,In House Developed Software: Vehicle Models Blockset for Simulink ,Driveline Blockset for Simulink ,SI Engine Blockset for Simulink, Bell 205 Helicopter Model ,Software: All Microsoft products are site licensed at Istanbul Technical University ,Matlab/Simulink (site license) ,Adams and Adams/Car (site license) ,Dymola ,dSpace Real Time Interface ,dSpace Controldesk ,dSpace CAN blockset ,dSpace Motiondesk ,Labview, Labview PID Toolkit, Labview Application Builder ,Step7 ,Fluidsim-P,A suspension control test rig and a steering control test rig are in development. The development
ISTANBUL TECHNICAL UNIVERSITY-Informatics Institute **Objectives:** 1.2, 1.3	PC LAB I(21 HP Compaq dc7900 Ultra-Slim Desktop, Intel(R) Core(TM)2 Duo CPU E8400 @ 3.00GHz Bellek: DDR2 800 MHz 2 GB,16GB SSD, Red Hat 5.5)PC LAB II(36 Model: HP Compaq dc7900 Ultra-Slim Desktop, Intel(R) Core(TM)2 Duo CPU E8400 @ 3.00GHz, DR2 800 MHz 2GB , 16GB SSD, Red Hat 5.5),THIN PROCESSOR LAB(20 Sun-Ray150 ince istemci ,Sun Blade 2000 work :900-MHz UltraSPARC III Cu MiB, 4 GB , 73 GB Sun XVR-1000 graphics card, SunOS 5.9)
ISTANBUL TECHNICAL UNIVERSITY -RFID Research and Test Center **Objectives**: 1.1,1.3, 1.6, Ch6	RFID Systems that are working in LF, HF and UHF frequency (RFID reader, tag and printer), RFID middleware, other software (ERP, storage management), storage units and moving conveyor systems
IZMIR INSTITUTE OF TECHNOLOGY-Computer Engineering Dep.- Distributed Intelligent Virtual Environments Lab. **Objectives:** 6.1.	Software: Distributed simulation kernels and protocols, Framework software for developing distributed virtual applications, Sample distributed virtual applications ,Embedded Oss Hardware:1 Server, 4 Node cluster (Gbps Ethernet) ,80GB HD at each node ,1 Switch (Gbps Ethernet) ,6 Small-sized mobile robots (16 b aspic 30F6014A micro controller, 144 KB flash, 8 KB RAM); IR; camera; Bluetooth,12 Programmable robot kits (32 b ARM7TDMI micro processor, 256 KB flash, 64 KB RAM; 8 b ATmega48 micro controller, 4 KB flash, 512 B RAM); touch; sound; ultrasound; color; light; gyroscope; compass; Bluetooth,1 model pitch (185 cm length; 300 cm width; 20 cm height),

METU- Informatics Institute **Objectives**: 4.1.4.2,,4.3,5.2	60 computers, 12 servers, 7 routers, 4 wireless access point, 48 portals, Network writers
METU- Brain Research Center **Objectives:** 1.1, 2.1-2.2	Beawolf Clusters for high performance computation, major equipment for developing electromagnetic systems, and instrumentation, 256 channel homemade EEG Device
METU Modeling and Simulation Research and Development Center **Objective:** 1.6, 1.7,3.2	Motion Capture, 3D Scanner, Wireless Sensor Network, Functional Near Infrared (fNIR), Human Startle System,1500 kg Motion Platform, High Performance Computer Graphics System, State of the art network infrastructure and workstations, Visual System, AutoCAD Civil 3D 2010, Autodesk 3DS Max. 2010, Motionbuilder 2010, Adobe CS4 Master Collection, Ez Frisk,Cocla Stratum Compass, PhotoModeler Scanner Software
SABANCI UNIVERSITY Computer Science and Engineering Dep. /Computer Graphics Lab. **Objectives:** 1.4,1.5	Workstations:1 IBM IntellStation with NVIDIA Quadro FX 3400 Graphics Card/1 Dell Precision 450 with NVIDIA Quadro FX 1000 Graphics Card/1 Workstation with Dual core 64 bit AMD CPU with NVIDIA Geforce 7800 Graphics Card/2 Workstations with ATI Radeon X800 XT Graphics Card/3 Dell Optiplex with ATI Radeon 9800 Pro Graphics Card/2 HP xw4300 Workstations with NVIDIA Quadro FX Series Graphics Card/ 3 HP xw9300 Workstations with NVIDIA Quadro FX Series Graphics CardSensors:.Xsense Tracker/Intersense Tracker/GPS Sensor/Two Point Grey Cameras/Fastrak Sensor Set with Six Tranmitters(together with VPA lab)/Cyberglove (together with VPA lab)/Flock of Birds Sensor Set with Wanda and ERT/(Extended Range Transmitter)Mobile Computing:HP iPAQ Pocket PC h2210/Compact Camera for Pocket PC Display Devices
TOBB ETU-UNIVERSITY OF ECONOMICS AND TECHNOLOGY Computer Engineering/ Microprocessors Lab. **Objectives:** 1.1,2.1,2.2, 4.1,4.2,4.3	Clusters with 8 Nodes, high performance computing equipments, image processing-recognition lab., microprocessors lab, wireless network labs.
TOBB ETU-UNIVERSITY OF ECONOMICS AND TECHNOLOGY-Electrical and Electronics Engineering Dep./ Swarm Systems Research Laboratory **Objectives:** 2.1,2.2,6.3	5m x 10m Lab Space, 3 Akrep series mobile robots, 9 Khepera III mini mobile robots, 6 e-puck mini mobile robots, 7 PCs, Webots 5 , Physics Based Simulation Tool, Design and Development Tools, Akrep Mobile Robot, Khepera III Mini Mobile Robot, E-Puck Mini Mobile Robot
ULUDAĞ UNIVERSITY- Industrial Engineering Department **Objectives**: 4.2,4.4	Computers Lab, Robotics and Production Automation Lab, Computer Aided Production Lab, Vibration and Noise Labs
ASELSAN **Objectives:** 1.1, 1.4,Ch 2, 6.1	EXISTENT and CONFIDENTIAL(UWPI)
BASARI Mobile IT Products and Services Inc **Objectives:** 1.2,4.2, 4.3,7.2	6 High capacity Servers(300 concurrent users), 4 Oracle Database,
BIZITEK Computer software and Internet Technologies Inc. **Objectives:** 1.2., 4.2, 4.3 6.1	Servers(for workflow), Servers for code development and testing, Live servers
GENETLAB Information Technologies Trade Inc **Objectives**: 2.1,2.2, 3.7, 6.3	Istanbul Technical University Laboratories
MANTIS Software and Consultancy Company **Objectives**: 3.6, 4.1, 5.1, 5.4	Major equipment for research are the supercomputers, development tools and kits and a high bandwidth for the internet connection.
METEKSAN Savunma Industry Inc. **Objectives:** 1.1, 4.1.,4.3, 6.1, 6.2	Bilkent University Laboratories
MOBILERA Informatics and Communication Technologies Co. **Objectives:** 1.1-1.5,2.1-2.2,3.1,7.1, 7.3	Application Development Programs(C-Sharps, dot.net,Java, C++),

NETCAD **Objectives:** Ch 1,Ch 3	Basic research equipment: Pcs, Softwares, Servers
SİMSOFT Communication Technologies: **Objectives:** 3.4, 4.1, 4.3, 5.1, 5.2, 5.3, 6.3	Computers, Servers, Networks Infrastructure
TURKSAT Satellite Communication &Cable TV Operation Inc. **Objectives:** Ch1, Ch4,Ch 6, Ch 7	EXISTENT and CONFIDENTIAL(UWPI)
Turk Automobile Factory (TOFAS) **Objectives:** 6.1.	In the area of Noise Vibration Harshness semi-anechoic room and acoustics lab, Electrical systems testing beds, 3D axes vibration testing beds, Emission lab. ,HVAC testing equipments, Center of gravity measurement beds, road simulators, battery testing system, physics and chemistry lab, virtual room, chassis dynamometer, prototype production facilities, motor calibration control and development equipments

For planned research infrastructure in physical infrastructure resources, there are some ongoing studies which are organized by State Planning Organization(DPT) and TUBITAK, but we could not reach these sources to determine exact planned physical research infrastructure. Due to this reason we asked by phone calls about their planned research infrastructure to each major and potential center of excellence. According to the answers of the contact person of these actors (who answered our phones and have willingness to provide information), the planned physical infrastructure investments will be done by these actors about their following needs:

Table 9. 6. List of Institutions that have Planned Research Infrastructure

Bilkent University-Computational Electromagnetic Research Center (BILCEM): Investments to increase processors
METU-Electrical and Electronics Engineering/MMRG Dep: DMAP Circuit Card
METU- Kovan Research Lab.: Additional Mechantronics and Electronic Workshop Equipment
Istanbul Technical University- Department of Computer Engineering/Natural Language Processing Laboratory: High Capacity Calculation servers
Basari Mobile: Streaming Server
Bosporus University- Electrical and Electronics Engineering Dep. /Beta VLS Design Lab.: new Keydens Software,20GH spectrum analyzer
Ege University- Electrical and Electronics Eng. Dep. /Magnetics And Optics Research Lab.: Magnetometer, spectrometer
METU- Informatics Institute: Computers, new servers
METU- Electrical and Electronics Engineering Dep./Computer Vision and Intelligent Systems Research LAB(METU-VISION).: 3D laser scanner, thermal cameras, more professional camera based 3D scanner
SEBIT Education and Information Technologies Inc.: Digital Value Management System
TOBB ETU-Department of Computer Engineering: Equipment for internet security
TOFAS: Additional investment in materials lab., Alpha cabin, brake testing beds, prototype production bending press, Diagnostic Network Automatic Measurement for Integration Test,CANscope HW&SW

For checking the needs of these research centers for effective participation to FPs, they are asked whether their current RTD infrastructure meets the needs of researchers for an effective participation in the FP7- ICT Theme by phone calls. They said that their current infrastructure meets the needs of researcher for an effective participation to FP-7 ICT. Most of the people that answered our phones claimed that there is no such a serious problem about the physical infrastructure for effective participation to FPs. However, for a detailed and more comprehensive physical research infrastructure map of Turkey ICT RTD Realm, *more detailed inventory study should be conducted* to see the whole picture of physical infrastructure in Turkey. Because due to confidentiality reasons and unwillingness to provide information about physical infrastructure, we could not identify whole physical infrastructure in Turkey about ICT RTD. In regard to physical infrastructure, firstly *a detailed inventory study should be conducted*.

In addition to the physical infrastructure, problems that are related to effective participation to FPs also have roots in other areas. As can be seen from the physical infrastructure study, there is strong physical infrastructure in the research centers, departments of the universities, research institution, theoretical background in ICT sector, important know-how in private sector. Despite the fact that there are common objectives in strongest research areas for private sector and universities, research institutes and governmental bodies; the figures indicate the absence of R&D-based cooperation between Turkish universities and private sector actors within the context of FP6 IST and FP7 ICT. Because the strongest research fields of Turkish universities and research institutions differ from the strongest research fields of Turkish private sector partners participated in funded projects. Due to this fact, these actors do not meet in the same objective to cooperate, which results in the absence of R&D Based Cooperation. To meet the needs of researchers in terms of infrastructure, R&D based cooperation between private organizations and universities and research institutions should be promoted to create such kind of complementarities between them.

9.5. MAIN PLAYERS IN ICT RTD IN TURKEY

The main players (excellent and potentially excellent at the level of research teams) in Turkey are determined by using mainly FP6 and FP7 participation performances, patent and publication analysis, physical infrastructure study, Live interviews, Delphi analysis and TUBITAK Profile studies. The detailed list of the main players-ICT RTD Units, their competences on FP 7 ICT objectives, and Leading researchers and research group leaders are presented in Table 9.7 major centers of excellence and Table 9.8 potential centers of excellence

Table 9. 7. Major Centers of Excellence

MAIN BODIES	DEPARTMENTS, INSTITUTES and RESEARCH GROUPS	COMPETENCES IN FP7 ICT OBJECTIVES	Leading researchers/Research group	CONTACT DETAILS
BILKENT UNIVERSITY	Electrical and Electronics Engineering Dep.	1.1, 1.5, 1.6, 3.2, 3.3., 4.1., 4.3., 5.1., 7.1	Prof. Dr. Levent ONURAL, Prof. Dr. A. Enis ÇETİN, Prof. Dr. Ezhan KARASAN, Prof. Dr. Abdullah ATALAR	onural@bilkent.edu.tr cetin@bilkent.edu.tr ezhan@ee.bilkent.edu.tr atalar@ee.bilkent.edu.tr
	EEE&UNAM-Institute of Material Science and Nanotechnology - Nanotechnology Research Center /NANOTAM	3.1., 3.5., 3.6	Prof. Dr. Ekmel ÖZBAY	ozbay@bilkent.edu.tr
	Electrics and Electronics Eng.Dep. -Computational Electromagnetic Research Center /BİLCEM	1.1,3.1	Prof. Dr. Levent GÜREL	lgurel@ee.bilkent.edu.tr
	Computer Engineering Dep	1.2, 1.5, 4.2,4.3	Ass. Prof. Dr. Tolga ÇAPIN	tcapin@cs.bilkent.edu.tr
BOSPORUS UNIVERSITY	Computer Engineering Dep. /Perceptual Intelligence Laboratory (PILAB)	1.1,1.2,1.4,3.3,3.4	Prof. Dr. Lale AKARUN	akarun@boun.edu.tr
	Computer Engineering Dep./Artificial Intelligence Lab (AILAB)	1.4, 1.6, 2.1,2.2	Prof. Dr. H. Levent AKIN	akin@boun.edu.tr
	Computer Engineering Dep. /Computer Networks Research Lab (NETLAB)	1.1, 1.2, 3.3., 3.4	Assc. Prof. Dr. Fatih ALAGÖZ	alagoz@boun.edu.tr
	Computer Engineering Dep./Complex Systems Research Lab (SosLAB)	1.2, 1.3, 1.6., 2.2, 3.6,4.2, 4.3	Asst. Prof. Haluk BİNGÖL	bingol@boun.edu.tr
	Computer Engineering Dep./Software Researh Lab(SoftLAB)	1.4	Asst. Prof. Dr. Ayşe BENER	bener@boun.edu.tr
	Electrical and Electronics Engineering Dep-Image and Video Processing Group	2.1, 2.2	Prof. Dr. Bülent SANKUR	bulent.sankur@boun.edu.tr
	Electrical and Electronics Engineering Dep./Micro Electro Mechanical Systems Lab (BUMEMS)	2.1,2.2, 3.1	Ass. Prof. Şenol MUTLU	senol.mutlu@boun.edu.tr
	Electrical and Electronics Engineering Dep. /Beta VLS Design Lab (BETA LAB)	2.1,2.2, 3.6, 3.7	Prof. Dr. Günhan DÜNDAR	dundar@boun.edu.tr
	Electrical and Electronics Engineering Dep./Intelligent Systems Lab(ISLAB)	1.1	Prof. Dr. Işıl BOZMA	bozma@boun.edu.tr
ISIK UNIVERSITY	Electronics Engineering Dep.	1.1, Ch 4, 6.1.	Prof. Dr. Erdal PANAYIRCI Prof. Dr. Selahattin KURU	eepanay @ isikun. edu.tr selahattinkuru@gmail.com
ITU	National Center for High Performance Computing	1.2, 1.4, 1.6,1.7, 3.4	Prof. Dr. Serdar ÇELEBİ	mscelebi@itu.edu.tr
	EE Faculty- Control Engineering Department	2.1, 3.4 , 3.5, 6.1,6.3	Ass. Prof. Dr. Murat YEŞİLOĞLU	smy@ieee.org
KOC UNIVERSITY	College of Engineering-EEE Dep.	1.2, 1.3,1.6,2.1,2.2	Prof. Dr. Murat TEKALP	mtekalp@ku.edu.tr
	College of Engineering-EEE. - Optical Microsystems Lab. (OML)	3.2., 3.3., 3.5., 3.6., 3.7.	Prof. Dr. Hakan ÜREY	hurey@ku.edu.tr
	College of Eng.- Micro-Nano Fabrication Lab.	3.1., 3.5., 3.6	Ass.Prof. Dr. Erdem ALACA	ealaca@ku.edu.tr
	Physics Dep.- Micro photonics Research Laboratory	3.4	Prof. Dr. Ali SERPENGÜZEL	aserpenguzel@ku.edu.tr
	Physics Dep.-Nano-Optics Research Laboratory.	3.4	Assc. Prof. Dr. Alper KİRAZ	akiraz@ku.edu.tr
METU	Computer Engineering Department	1.1-1.5, 2.1, 2.2, 3.4,3.5, 3.6, 4.2, 4.3.5.1.6.1-6.5	Prof. Dr. Müslüm BOZYİĞİT	bozyigit@ceng.edu.tr
	Computer Engineering Dep -Kovan Research Lab	1.7, 2.1,2.2, 3.3	Prof. Dr. Erol ŞAHİN	erol@metu.edu.tr
	Computer Engineering Dep. /SRDC	1.2-1.6, Ch 4, 5.1, 5.2, 6.1, 7.1, 7.2, 7.3	Prof. Dr. Asuman DOĞAÇ	asuman@srdc.com.tr
	Electrical and Electronics Eng. Dep	1.1, 2.1,2.2	Prof. Dr. İsmet ERKMEN	erkmen@eee.metu.edu.tr
	EEE. –Micro Electro Mechanical Systems Research and Application Center (METU-MEMS)	3.1., 3.5., 3.6., 3.7	Prof. Dr. Tayfun AKIN	tayfun-akin@metu.edu.tr
	EEE. Multimedia Research Group (MMRG)	1.5, 3.2, 4.2, 4.3	Prof. Dr. Gözde BOZDAĞI	bozdagi@eee.metu.edu.tr
	EEE. Dep./Computer Vision and Intelligent Systems Research LAB(METU_VISION)	2.1,2.2, 4.1, 4.2, 4.3,	Ass. Prof. Ilkay ULUSOY	ilkay@metu.edu.tr
SABANCI UNIVERSITY	Faculty of Engineering and Natural Sciences (FENS)- Computer Science and Engineering	2.2., 4.1., 4.3	Prof. Dr.Yücel SAYGIN	ysaygin@sabanciuniv.edu
	FENS Computer Science and Eng. Prog /Computer Vision and Patterns Analysis Lab. (VPALab.)	1.4, 1.5, 6.1, 6.3	Prof. Dr. Aytül ERÇİL	aytulercilsabanciuniv.edu
	EEE- Microelectronics Group	3.1.,3.2.,3.5.,3.6, 7.2	Prof. Dr. Yaşar GÜRBÜZ	yasar@sabanciuniv.edu

TUBITAK	Center of Research for Advanced Technologies of Informatics and Information- The National Research Institute of Electronics&Cryptology (BİLGEM-UEKAE)	1.1, 1.2, 1.5, 2.1,2.2, 3.5, 4.1, 4.2, 4.3, 6.1, 7.1	Prof. Dr. M.Önder YETİŞ(Director) Prof. Dr. Bülent ÖRENCİK	http://www.uekae.tubitak.gov.tr/home.do
	UEKAE/Cryptology Department/ Cryptographic Test and Design Lab.	1.4.	Prof. Dr. M.Önder YETİŞ (Director-D) Prof. Dr. Bülent ÖRENCİK	http://www.uekae.tubitak.gov.tr/home.do
	UEKAE/Microelectronics Department	1.4., 3.1, 3.6	Prof. Dr. M.Önder YETİŞ(D) Prof. Dr. Bülent ÖRENCİK	http://www.uekae.tubitak.gov.tr/home.do
	UEKAE/ Product Development	6.3, 7.3	Prof. Dr. M.Önder YETİŞ(D) Prof. Dr. Bülent ÖRENCİK	http://www.uekae.tubitak.gov.tr/home.do
	UEKAE/Network Security Department	1.4	Prof. Dr. M.Önder YETİŞ(D) Prof. Dr. Bülent ÖRENCİK	http://www.uekae.tubitak.gov.tr/home.do
	Advanced Technologies Electro-Magnetics Tomography Image Systems Development	3.1., 3.2, 3.3., 3.4	Prof. Dr. M. Önder YETİŞ(D) Prof. Dr. Bülent ÖRENCİK	http://www.uekae.tubitak.gov.tr/home.do
	UEKAE/MTRD-Multimedia Technologies Assessment Research and Development Lab.	3.3	Prof. Dr. M.Önder YETİŞ (D)	http://www.uekae.tubitak.gov.tr/home.do
	Marmara Research Center	6.1., 6.2., 6.3	Prof. Dr. M.Önder YETİŞ(D)	http://www.mam.gov.tr/english/index.html
	Turkish Academic Network and Information Center-ULAKBIM/Cahit ARF Information Center	1.7.,4.1., 4.3	Prof Dr. Cem SARAÇ (Director)	http://www.ulakbim.gov.tr/eng/
	Turkish Academic Network and Information Center (ULAKBIM)-National Academic Network Unit .	1.2., 1.4, 1.7	Prof Dr. Cem SARAÇ (D) Serkan ORCAN (Technical D.)	http://www.ulakbim.gov.tr/eng/ serkan@ulakbim.com.tr
FIRM	AGMLAB Information Technologies	1.2, 2.1,2.2, Ch 4	Güven FİDAN	guven.fidan@agmlab.com
FIRM	C2tech Information Technologies Ltd.Co	1.4., 3.3, 6.3	Dr. Faruk SARI	faruk.sarı@ctech.com.tr
FIRM	Innova Informatics solutions	1.1, 1.3, 4.2, 4.3, 5.1	Coşkun DOLANBAY	cdolanbay@innova.com.tr3
FIRM	Intro Information and Telecommunication Systems.	1.1-1.5, 3.3, Ch4,5.1, 7.3	Onur EVREN Serhat TUNCAY	onur.evren@introsolutions.com
FIRM	SEBIT /IES Education and Info. Techn	4.2, 4.3	Ali TÜRKER	ali.turker@sebit.com.tr
FIRM	TURKCELL Communication Services PLC	Ch1,Ch 4,5.2, 6.3,7.2	Bülent YILMAZ	bulent.yilmaz@turkcell.com.tr

Table 9. 8. Potential Centers of Excellences

MAIN BODIES	DEPARTMENTS, INSTITUTES and RESEARCH GROUPS	COMPETENCES IN FP7 ICT OBJECTIVES	Leading researchers/Research group Leaders	Contact Details
BILKENT UNIVERSITY	Physics Dep. /Advanced Research Lab.	3.3., 3.4., 3.5	Prof. Atilla AYDINLI (Coordinator)	aydinli@fen.bilkent.edu.tr
EGE UNIVERSITY	International Computer Institute	4.1., 4.3	Prof. Dr. Mehmet Emin DALKILIÇ (Chair)	mehmet.emin.dalkilic@ege.edu.tr
HACETTEPE UNIVERSITY	Science Faculty Applied Biology Department	1.6, 2.1,2.2, 3.6, 4.3 , 6.4,6.5, 7.3	Ass. Prof. Murat AYTEKİN	ama@hacettepe.edu.tr
ITU	CE -Natural Language Processing Lab.	1.1, 1.2	Prof. Dr. Eşref ADALI	adali@itu.edu.tr
	Informatics Institute	1.2, 1.3	Prof. Dr. Serdar ÇELEBİ (D)	mscelebi@itu.edu.tr
	RFID Research and Test Center	1.1,1.3, 1.6, Ch6	Alp ÜSTÜNDAĞ	ustundaga@itu.edu.tr
	Automotive Control &Mechantronics Res. Center.	2.1,2.2, 6.1, 6.2	Prof. Dr. Levent Güvenç	guvencl@itu.edu.tr
IZMIR INST. OF TECHN.	Computer Eng. Dep./ Distributed Intelligent Virtual Environments Lab	6.1	Prof. Dr. Bora KUMOVA	borakumova@iyte.edu.tr
METU	Informatics Institute	4.1-4.3 ,5.2	Prof. Dr. Nazife BAYKAL (D)	baykal@ii.metu.edu.tr
	Brain Research Center	1.1, 2.1,2.2	Prof. Dr. Nevzat GENCER	ngencer@metu.edu.tr
	Modeling and Simulation Research and Development Center (MODSIMMER)	1.6, 1.7,3.2	Prof. Dr. Veysi İŞLER(Director)	isler@ceng.metu.edu.tr
SABANCI UNIVERSITY	Computer Science and Eng. Prog./Computer Graphics Lab	1.4, 1.5	Ass. Prof.Selim BALCISOY	balcisoy@sabanciuniv.edu
TOBB ETU	Computer Eng. /Micro Processors Lab	1.1,2.1,2.2, Ch 4	Ass Prof. Dr.Oğuz ERGİN	oergin@etu.edu.tr
	EEE Eng. Dep./Swarm Systems Research Lab	2.1,2.2, 6.3	Assc. Prof. Dr. Veysel GAZİ	vgazi@etu.edu.tr
ULUDAG UNIVERSITY	Industrial Eng. Dep	4.2, 4.3	Assc.Prof. Dr.Seda ÖZMUTLU	seda@uludag.edu.tr

FIRM	ASELSAN Inc. Communications Divisions	1.1, 1.4,Ch 2, 6.1	Perin ÜNAL	punal@aselsan.com.tr
FIRM	Basari Mobile	1.2,4.2, 4.3,7.2	Mert TULUMEN	mert.tulumen@basari.com.tr
FIRM	Bizitek Computer software& Internet Tech. Inc	1.2., 4.2, 4.3 6.1	Dr. Özgür GÜNGÖR	ozgur.gungor@bizitek.com
FIRM	Genetlab Information Technologies Co.	2.1,2.2, 3.7, 6.3	Can KABLAN	can.kablan@genetlab.com
FIRM	Mantis Software and Consultancy Company.	3.6, 4.1, 5.1, 5.4	Müzeyyen DEDEOĞLU Prof. Dr. Hayri SEVER	bilgi@mantis.com.tr sever@hacettepe.edu.tr
FIRM	Meteksan Defense Industry Inc	1.1, 4.1.,4.3, 6.1, 6.2	Nilgün DİNÇARSLAN	ndincarslan@meteksansavunma.com.tr
FIRM	METUTECH Inc.	Ch 1-7	Canan SANDIKÇIOĞLU	canan.s@metutech.metu.edu.tr
FIRM	Mobilera Informatics and Communication Technologies Co	1.1-1.5,2.1-2.2,3.1,7.1, 7.3	Zeynep SARILAR	zeynep.sarilar@mobilera.net
FIRM	NETCAD	Ch1, Ch3	Nalan SEVER	nalan.sever@netcad.com.tr
FIRM	Simsoft Computer Technologies	3.4, 4.1, 4.3, 5.1, 5.2, 5.3, 6.3	Dr. Gökçe YILDIRIM	gokce@simsoft.com.tr
FIRM	Turk Automobile Factory (TOFAS)/ Mekatro R&D Laboratory	6.1	Kemal Yazıcı-R&D Director Nurdan NAZLI	Kemal.Yazici@tofas.com.tr nurdan.nazli@tofas.com.tr
FIRM	TURKSAT International Satellite Operator Company	Ch1, Ch4,Ch 6, Ch 7	Dr. Tunç MEDENİ	tdmedeni@turksat.com.tr

9.6. COMPETENCE SHARE MATRIX AND POLICY NETWORK ANALYSIS

9.6.1. Competence Share Matrix

The competence share matrix is prepared by using the methodology explained below. The main aim was to determine the areas that Turkey has high competence-low share, high competence high share, low competence low share and low competence high share. Then this information is combined with the main players' analysis and their expertise areas, and policy network analysis is derived.

Table 9. 9. Competence/Share Matrix

High competence – Low share		**High competence – High share:**	
Code	**Objective Name:**	**Code:**	**Objective Name:**
5.1	Personal health systems (High Competence & low share)	1.1	The network of the future (High Competence and high share)
1.4	Trustworthy ICT (Medium Competence and low share)	1.5	Networked Media and 3D Internet (High Competence and high share)
1.2	Internet of Services, Software and Virtualization (High Competence and low share)	3.6	Computing Systems (High Competence and high share)
3.5	Engineering of Networked Monitoring and Control systems (High Competence in Universities and no share)	1.3	Internet of Things and Enterprise environments (High Competence and high share)
3.7	Photonics (Medium competence and low share)	4.3	Intelligent Information Management (High Competence and high share)
Low competence – Low share		**Low competence – High share:**	
Code:	**Objective Name:**	**Code:**	**Objective Name:**
3.3.	Flexible, Organic and Large Area Electronics (low share)	-	-
1.6	Future Internet experimental facility and experimentally driven research (low share)		
7.1	ICT and ageing (no share)		
1.7	Critical Infrastructure Protection (no share)		
3.4	Embedded Systems Design (no share)		

National top competences according to FPT ICT Theme Terminology:

High Competence/ High Share: 1.1, 1.5, 3.6, 1.3, 4.3
High competence/ Low Share: 5.1, 1.4, 1.2, 3.5, 3.7
Low Competence/ Low Share: 3.3, 1.6, 7.1, 1.7, 3.4
Low Competence/ High Share:-

Methodology (How it is built): (1) Obtaining data about number of competences - sub areas of expertise for each area of expertise: Data about competences are obtained by live interviews, the Delphi study and information on publishing in ICT research, (2) Matching areas of expertise with strategic objectives, (3) Obtaining statistics of applied and retained proposals relative to strategic objectives, (4) Forming a matching table between competences and strategic objectives, (5) Filling in objectives table competences: number of strategic objectives retained, (6) First logical control; controlling of competencies in objectives table relative to publications and other information, (7) Second logical control; results of objectives table relative to number of strategic objectives applied, (8) Third logical control: overall judgment relative to all available inputs.

9.6.2. Policy Network Analysis:

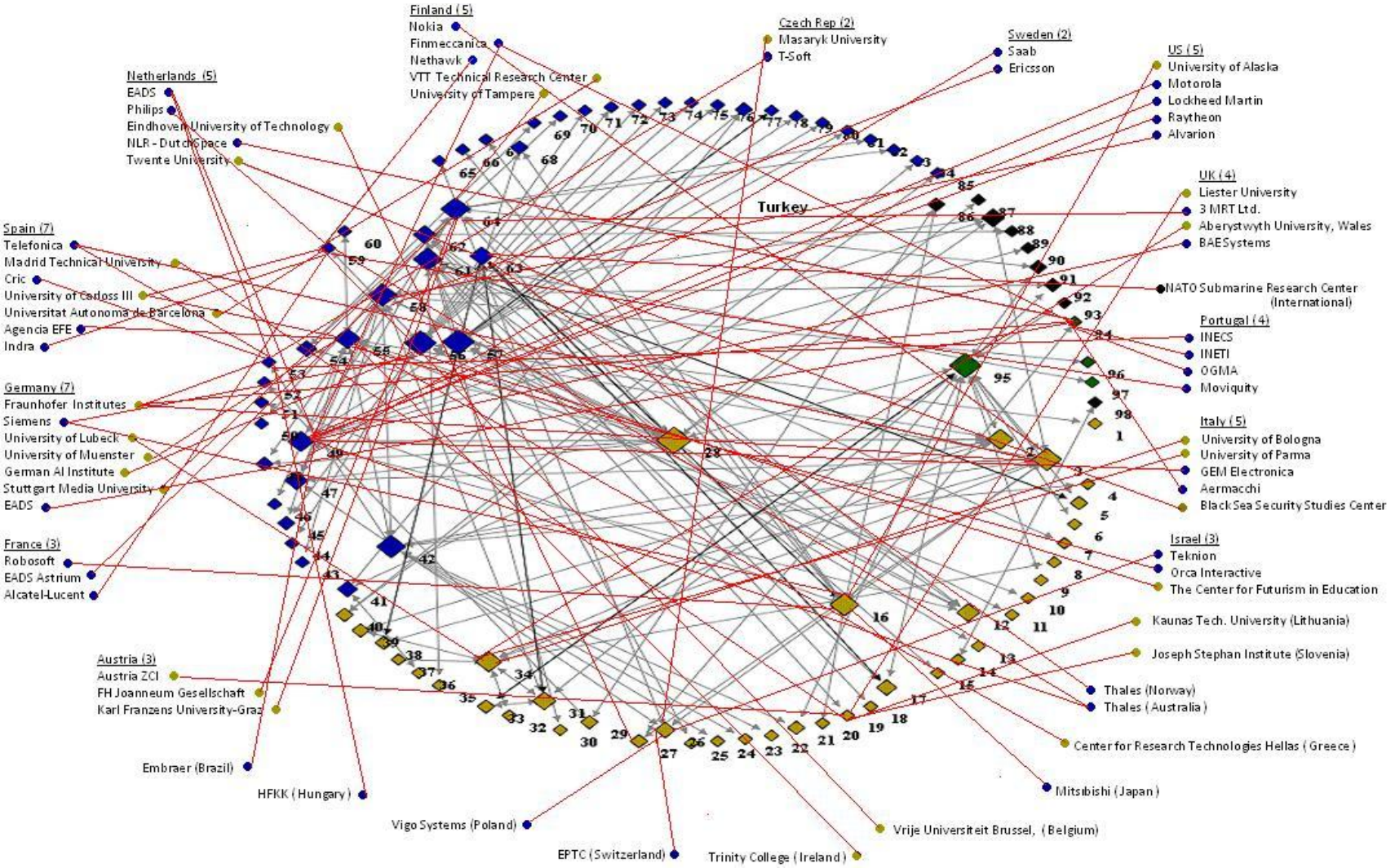
Policy network analysis is an analysis of relationships and interactions of identified relevant actors in the field of ICT RTD. *Source: EU DGINFSO, Invitation to negotiate: "TURKEY – RTD TECHNOLOGICAL AUDIT" Negotiated procedure with 5 candidates (Article 129.1 IR).*

Although some of the identified and relevant actors showed evidence of unwillingness to provide information and/or consider research partners (relationships and interactions) information is strictly confidential, by reverse/cross partner check, policy network analysis data is mainly gathered. Organization sample space is collected through findings of Task 1, report; Task 2, report, Task 3 report and Task 4 report.

Followed by this policy network analysis, a "Who is who" is performed. By using all of the information which is available, the table of policy network analysis data (Appendix 2) is constructed. Each organization may have more number of relationships and interactions, however, organizations refused to provide more explicit or implicit data because of unwillingness to provide information and/or confidentiality issues.

Policy Network Analysis – Diagram (with Domestic / International Links)

Figure 9. 8. Policy Network Analysis Diagram (Blue: Industry; Gold: University; Black: Public Sector; Green: Public Research Lab/Institute)



1 “Baskent University Computer Eng. Dep."
2 "Bilkent University Computer Eng. Dep."
3 "Bilkent University Electrics Electronics Eng. Dep."
4 "Bilkent University Mechanical Eng. Dep."
5 "Bogazici University Computer Eng. Dep."
6 "Bogazici University Chemical Eng. Dep."
7 "Bogazici Information Management Dep."
8 "Bogazici Mechatronics Researh and Application Center"
9 "Ege University International Computer Institute"
10 "Gazi Uni Computer Eng. Dep."
11 "Gebze Institute of Technology Electrics Electronics Eng. Dep."
12 "Hacettepe University Computer Eng. Dep."
13 "Hacettepe University Mathematics IT Man. Dep."
14 "Hacettepe University Applied Biology Dep."
15 "Hacettepe University Mining Eng. Dep."
16 "Istanbul Technical University Control Eng. Dep."
17 "Istanbul Technical University Computer Eng. Dep."
18 "Istanbul Technical University Geomatics Eng. Dep."
19 "Istanbul Technical University Industrial Eng. Dep."
20 "Isik University Informatics Research and Application Center"
21 "Izmir High Technology Institute"
22 "Kadir Has University Electrics Electronics Eng. Dep"
23 "Kadir Has University Computer Eng. Deg."
24 "Kadir Has University Mechanical Eng. Dep."
25 "Karadeniz Technical University Comp. Eng. Dep."
26 "Koc University Optical Microsystems Lab."
27 "Koc University Electrics Electronics Eng. Dep."
28 "Middle East Technical University Computer Eng. Dep."
29 "Middle East Technical University Industrial Eng. Dep."
30 "Middle East Technical University Geodetic Geographic IT Dep."
31 "Middle East Technical University Electrics Electronics Eng. Dep."
32 "Middle East Technical University Mechanical Eng. Dep."
33 "Middle East Technical University Brain Research Center"
34 "Middle East Technical University Kovan Research Lab."
35 "Mimar Sinan University Statistics Dep."
36 "Sabanci University Information Technolgies Dep."
37 "Sabanci University Mechatronics Dep."
38 "Sabanci University Electrics Electronics Eng. Dep."
39 "TOBB University Swarm Systems Research Lab."
40 "Uludag University Industrial Eng. Dep."
41 "TURKSAT Satellite Comm. Cable TV Inc."
42 "TURKCELL Communication Services Inc."
43 "TURK TELEKOM Inc."

44 "TTnet"
45 "AVEA Telecomm. Operator"
46 "VODAFONE Turkey",
47 "ASELSAN Electronics Industries Inc."
48 "HAVELSAN Inc."
49 "METEKSAN Defense Industry Inc."
50 "KOC Defense Inc."
51 "FORD OTOSAN Inc."
52 "TOFAS Turk Automobile Factory Inc."
53 "MOBILERA Company"
54 "INTRO IT Systems Ltd. Co."
55 "BASARI Mobile IT Inc.
56 "SEBIT Education and IT Inc."
57 "MANTIS Software and Consultancy Company"
58 "C2TECH IT Ltd. Co."
59 "INNOVA Technology Solutions Inc."
60 "AGMLAB Information Technologies Ltd. Co."
61 "BIZITEK Computer Software and Internet Technologies Inc."
62 "NETCAD Inc."
63 "GENETLAB Information Technologies Industry and Trade Inc."
64 "SIMSOFT Computer Technologies Ltd. Co."
65 "ARCELIK Inc."
66 "TEMSA Inc."
67 "SIEMENS Turkey Inc."
68 "KALEALTI ROBOTICS Company"
69 "SAYTEK Systems Company"
70 "Istanbul Parkyeri Co."
71 "ENOCTA Com."
72 "BILSA Company"
73 "ARGELA Company"
74 "SOBEE Company"
75 "AssisTT Company"
76 "SOFTAS Company"
77 "BASARSOFT Company"
78 "ZIRVE Comp."
79 "I3S International Software Solution Services Co."
80 "AKIN Computer Company"
81 "ESKOM Computer Company"
82 "GATE Electronics"
83 "CITO Turkey"
84 "OYAK RENAULt Turkey Inc."
85 "TURKTICARET.Net"
86 "Turkey State Railways"
87 "Ministry of Defense"
88 "Undersecreteriat of Defense (SSM)"
89 "Ministry of Environment"
90 "Turkish Armed Forces (TAF) Land Forces"
91 "Ministry of Culture (e-Library)"
92 "General Directorate of State Airports Authority (DHLI)"
93 "Turkish Atomic Energy Institution (TAEK) "
94 "TUBITAK MAM Information Technologies Institute"
95 "TUBITAK ULAKBIM Turkish Academic Network and Information Center"
96 "TUBITAK UEKAE"
97 "TUBITAK Feza Gursoy Resarch Institute"
98 "Ministry of Agriculture"

Policy Network Analysis – Statistics

DENSITY: SPARSE NETWORK .02798

NUMBER OF CLIQUES (CLQs) OF EACH NODE IF NOT 0

The idea of a clique is: a clique is a sub-set of a network in which the actors are more closely and intensely tied to one another than they are to other members of the network.

Table 9. 10. Policy Network Analysis Cliques and Organizations

NODE	Number of CLQs	ORGANIZATION NAME
2	4	"Bilkent University Computer Eng. Dep."
3	3	"Bilkent University Electrics Electronics Eng. Dep."
26	1	"Koc University Optical Microsystems Lab."
27	1	"Koc University Electrics Electronics Eng. Dep."
28	10	"Middle East Technical University Computer Eng. Dep."
31	1	"Middle East Technical University Electrics Electronics Eng. Dep."
33	1	"Middle East Technical University Brain Research Center"
34	1	"Middle East Technical University Kovan Research Lab."
39	1	"TOBB University Swarm Systems Research Lab."
42	1	"TURKCELL Communication Services Inc."
47	3	"ASELSAN Electronics Industries Inc."
48	1	"HAVELSAN Inc."
49	6	"METEKSAN Defense Industry Inc."
55	1	"BASARI Mobile IT Inc.
56	1	"SEBIT Education and IT Inc."
57	3	"MANTIS Software and Consultancy Company"
58	3	"C2TECH IT Ltd. Co."
62	1	"NETCAD Inc."
64	3	"SIMSOFT Computer Technologies Ltd. Co."
88	2	"Undersecretariat of Defense (SSM)"
95	**3**	"TUBITAK ULAKBIM Turkish Academic Network and Information Center"

Policy Network Analysis – Various Central Organizations in Research

Table 9. 11. Policy Network Analysis Various Central Organizations in Research (See Figure 9.8)

NODE	ORGANIZATION NAME
2	**"Bilkent University Computer Eng. Dep."**
3	**"Bilkent University Electrics Electronics Eng. Dep."**
12	**"Hacettepe University Computer Eng. Dep."**
16	**"Istanbul Technical University Control Eng. Dep."**
17	**"Istanbul Technical University Computer Eng. Dep."**
21	**"Izmir High Technology Institute"**
26	**"Koc University Optical Microsystems Lab."**
27	**"Koc University Electrics Electronics Eng. Dep."**
28	**"Middle East Technical University Computer Eng. Dep."**
31	**"Middle East Technical University Electrics Electronics Eng. Dep."**
34	**"Middle East Technical University Kovan Research Lab."**
41	**"TURKSAT Satellite Comm. Cable TV Inc."**
42	**"TURKCELL Communication Services Inc."**
47	**"ASELSAN Electronics Industries Inc."**
48	**"HAVELSAN Inc."**
49	**"METEKSAN Defense Industry Inc."**
53	**"SIMSOFT Computer Technologies Ltd. Co."**
55	**"BASARI Mobile IT Inc.**
56	**"SEBIT Education and IT Inc."**
57	**"MANTIS Software and Consultancy Company"**
58	**"C2TECH IT Ltd. Co."**
61	**"BIZITEK Computer Software and Internet Technologies Inc."**
62	**"NETCAD Inc."**
63	**"GENETLAB Information Technologies Industry and Trade Inc."**
64	**"SIMSOFT Computer Technologies Ltd. Co."**
88	**"Undersecretariat of Defense (SSM)"**
95	**"TUBITAK ULAKBIM Turkish Academic Network and Information Center"**

9.7. LIVE INTERVIEWS FOR ASSESSMENT and ACTION IN ICT RTD

In this section, the summary of the *Task 5: Analysis of the ICT-RTD capabilities in Turkey and the measures to maximize the country's potential in the FP7-ICT Theme – Live Interviews Report* is presented. The main aim of this task is to analyze the live interviews to assess the RTD capabilities, technological expertise and human capital in Turkey.

Methodology of the study: Live interviews were performed face-to-face with ICT RTD performers in Turkey. Priority is assigned to establishments which took part in FP6 IST and/or FP7 ICT RTD projects, the group of relevant authorities financing ICT RTD in Turkey and, the group of Relevant ICT RTD performers. "WHO IS WHO in ICT Research" template is used. Interviews were conducted using this scripted questionnaire to collect data, while most of the interviews simultaneously digitized into MS office programmes at where all of the results, notes, etc. were recorded. These files are transferred to MS Access database as requested. Each of the interview processes, which was interviewer led, has lasted for around one and a half hour. A sample from main players (public and private organizations) involved in ICT RTD at an amount of sixty seven (67) establishments is identified and included in the study. Interview study was conducted at a response level of **thirty four (34) establishments** between the dates, September 1st 2009 and October 31st 2009, two months of time. The number of interviews is **thirty four (34).**

Participants are chosen from the target group of *Authorities financing ICT RTD, Major and potential centers of ICT RTD excellence* and *Successful and unsuccessful participating entities in project proposals submitted in the FP7 – ICT Theme Calls from Turkey.* 50% (17) of participants are coming from private/commercial organizations, 26% (9) are affiliated to a university, 12% (4) of them are working for public agencies, and 9% (3) of the participants are conducting RTD in public research labs. and 3% (1) of them is working in a foundation. As can be seen from the number and distribution of participants, the sample is representative for ICT RTD community in Turkey.

According to the overall results of these live interviews, it is seen that

- ✓ Participation in the EU FPs lags behind other **international level experiences** although geographical level experiences are relatively balanced (26% of participant are conducting RTD in regional/national level, 25% in internal level, 24% at international level and 22% at EU/FP level).
- ✓ **Top Organizational Expertise Areas** are found to be *ICT, Science & Engineering, Education & Training, Consultancy*. These areas dominate other areas such as Environment, Energy, Commerce, Transport and manufacturing whilst Culture& Sports, Tourism remain poor as areas of main expertise.

- ✓ With respect to distribution of responses, the most focused research area of main expertise is *Challenge 1: Pervasive and Trustworthy Network Service Infrastructures*. This challenge is followed by *Challenge 4: Digital Libraries and Content,* Challenge 2: Components, Systems, engineering and *Challenge 6: ICT for Mobility, Environmental Sustainability.*
- ✓ Top Specific Research Area as Objective is found to be *Intelligent Information Management (4.3).* It is followed by *Technology Enhanced Learning (4.2), Computing Systems (3.6), and Cognitive Systems and Robotics (2.1).*
- ✓ According to the results of organizational SWOT analysis in questionnaires, **Organization Strengths** are generally Human Resources-Specific Strengths (such as academic personnel expertise, experienced and qualified engineering teams) and Establishment-Level Strengths (such as having strong equity capital, organizational flexibility, being an institutionalized R&D Firm) in participating/applying for FP7 projects under the heading of ICT. International level strengths and technology-specific strengths are relatively balanced and less prominent. **Weaknesses** are mainly in International Level (such as international level low visibility, insufficient presence of Turkish organizations within established EU R&D and innovation networks) and National Level (such as general market dynamics, product sales and marketing, relatively weak research culture, demand irregularities) in participating/applying for FP7 projects under the heading of ICT.
- ✓ **Organizational opportunities** are mainly International-Level (such as establishing new business partnerships, presence of important resources in the EU FPs evaluating feasibility of research by the EU FP7 ICT project proposals, presenting works to international institutions, performing joint/cooperative research) and Establishment-Level Opportunities (such as competing better, proximity to academia, cooperation opportunities emanating from being the only firm operating in the field, joint participation with industry, being a unique center in Turkey). Organizations consider there are establishment-level opportunities in participating into FPs in order to translate their human resource specific strengths and establishment level strengths into international level strengths and technology level strengths. **Threats** are mainly in international *level (such as long and troublesome project application and management processes de-motivating effects on Turkish organizations, closed networks in the EU FP, difficulty of participating for newcomers, being not experienced in the EU projects)* and national level *(such as economic uncertainty, difficulties in financial sustainability, traditional industry, inappropriate competition in national market).*Organizations, in order to translate their human resource

specific strengths and establishment level strengths into international level strengths and technology level strengths, consider that there are challenging international level and national level threats in participating into FPs.

✓ **Main barriers identified in live interviews**:

	For academic institutions	*For Commercial Entities*	*For Governmental Bodies:*
At international Level	• Lack of contribution of EU FP projects to academic career • Teaching workload: Supportive regulations for decreasing teaching workload are expected from university administration in case of EU projects participation	•Inadequate incentives: Commercial entities require organizational and financial incentives in line with their targets and visions to be motivated to participate into EU Framework Programmes in the field of ICT RTD.	-
At Regional/ national Level	Information and experience sharing: Academic institutions expect governmental bodies to organize events/conferences/actions aimed at gathering experienced academic and industrial organizations which are active in the EU FPs in order to share experience with potential participants.	•Visibility: Expectations point out TÜBİTAK to perform more lobbying activities and introduce their RTD capabilities and technological expertise to EU networks formed in EU Framework Programmes in the field of ICT RTD.	Focus is more on defining organizational strategies parallel to priorities of FP 7 and defining roadmaps coherently, strengthening clustering activities and research institutes, strengthening academia-industry collaboration and cross-disciplinary collaborations in Turkey.
At international Level	Low visibility of academic institutions is considered as a main barrier hindering participation in top consortia.	• Inappropriate timing of payments for EU FP7 projects. • Mismatches in Objective level • Inexistence of experimental projects calls with short duration and limited workload aimed at gaining experience • Taking part mainly in low value added work packages of projects which are otherwise source of learning by doing, knowledge transfer and exchange in the field of ICT RTD.	•In order to deliver appropriate services to academia and industry in the field of international RTD, effective synchronization with the EC is desired. •National coordination between different public agencies is desired.

As a holistic result of live surveys:

✓ There are expectations to be evaluated by the EC in terms of structures, processes and approaches of FPs in the field of ICT RTD in the case of new member states and associated countries.

✓ In order to operate potential and mutual actions to increase integration of Turkey into the FP7 ICT Theme; at national level, self evaluation and inter-organizational relations evaluation are

initially required as actions by academic institutions, commercial entities and governmental bodies in the field of ICT RTD in Turkey.

9.8. DELPHI SURVEY ANALYSIS for ASSESSMENT of CAPABILITIES, HUMAN CAPITAL and BARRIERS/THREATS in ICT RTD

In this section, the summary of the Task 6: *Delphi survey to identify latent ICT-RTD potential in Turkey Report is presented.* As the live interviews carried out in Task 5 cannot cover the whole ICT community in Turkey, the survey is extended to cover the maximum number of stakeholders using the Delphi survey process. In this respect, a 2 rounds on-line Delphi survey is carried out. The main aim in this task is to implement "Delphi Survey" for eliciting and collating assessments on the RTD capabilities, technological expertise and human capital in Turkey and, for identifying barriers and possible actions to increase integration of Turkey into the FP7 – ICT Theme by enabling every stakeholder in ICT sector to be a part of the determination process.

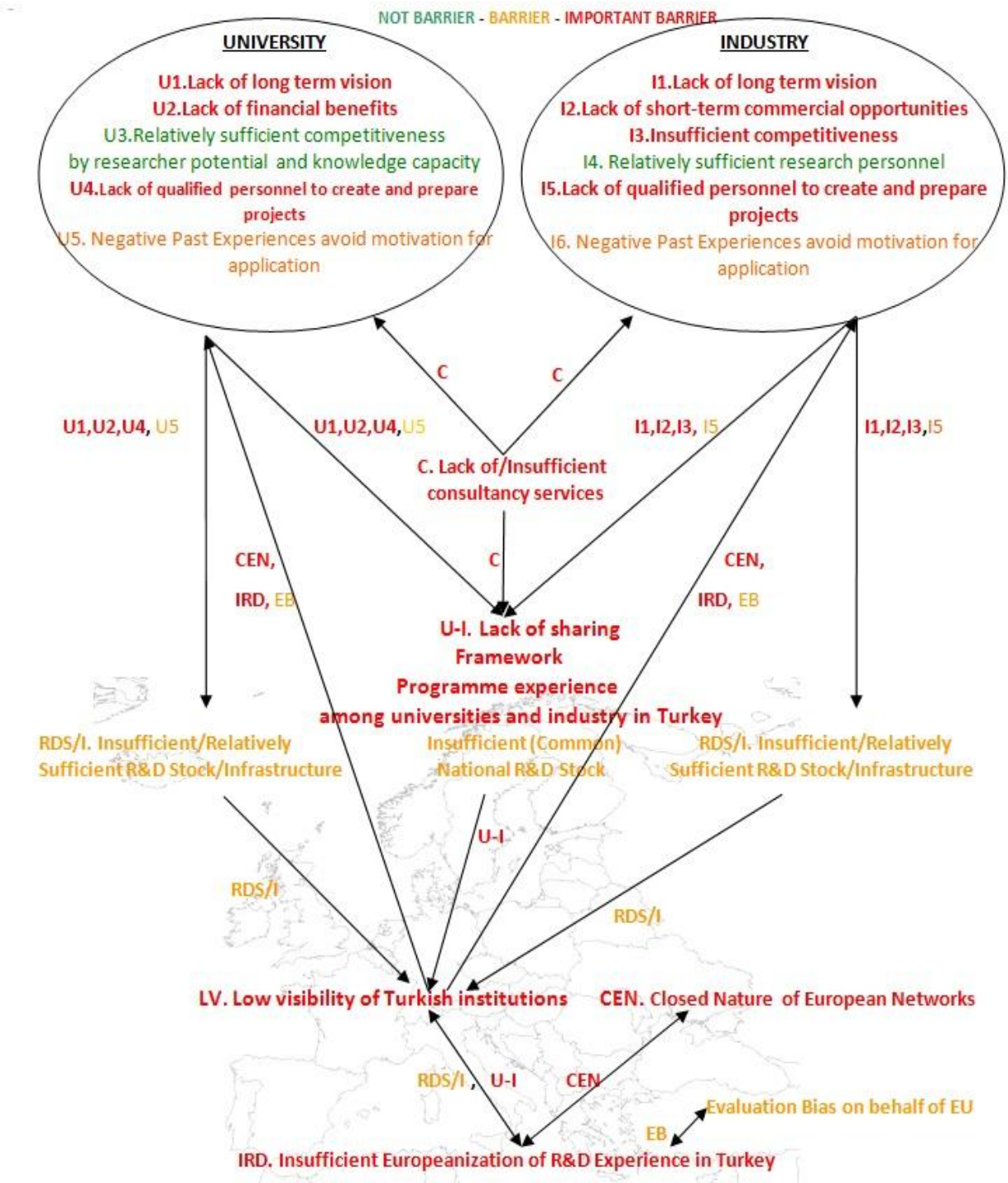
Methodology of the study: At pre-delphi stage, a dedicated on-line questionnaire after the formation of Delphi statements and, a list consisting of ICT experts are prepared. Identification of target group is done by the list providing (574) expert stakeholders in public and private organizations in the field of ICT RTD. Then, Delphi Survey is applied as 2-round. In the 1st Round secured access link is sent to the target group of 574 potential participants via each expert stakeholder's personal email. 1st round Delphi finalized in fifteen days. First draft roadmap document based on the input gathered is prepared and 'Individual Answer Sheet Documents'' covering 1st round answers of experts are formed and, sent to expert stakeholders, personally in 2nd round. This round of Delphi finalized in fifteen days. Results that are aggregated in each challenge and objective are extracted and analyzed.

According to the overall results of this Delphi survey,

- ✓ Top barriers are found to be *Closed Nature of European Networks* and *Low Visibility of Turkish Institutions*. According to 87% of experts, "Finding correct partners due to closed nature of European networks to Turkish institutions" and according to 84% of experts "Finding correct partners due to low visibility of Turkish institutions" are the most important barriers for integration of Turkey into the FP7 – ICT Theme. Consistently, *Existing International Level R&D Experience* is considered as insufficient. Experts indicate that there is "International level R&D experience" (acc. to 91% of experts), however, "Level of international level R&D experience" is not sufficient for integration of Turkey into the FP7 – ICT Theme (acc. to 92% of experts).

- ✓ 83% of experts underlined that there are innovative commercial companies however "Level of innovativeness" is considered as insufficient. This finding supports findings in live interviews.
- ✓ Existing knowledge and level of knowledge in universities are found to be promising. Because, 93% of experts say that there is knowledge capacity in universities and "Level of knowledge capacity in universities" is considered as relatively sufficient acc. to 66% of experts. Similarly, existing researchers and level of researchers in Turkey are promising, because 98% of experts say that there are potential researchers in Turkey in a great extent, although, "Competence level of researchers" is considered relatively sufficient (60%).
- ✓ However, *lack of short-term commercial opportunities for commercial entities* (acc. to 79% of experts) and *lack of perceived financial benefits for researchers in commercial entities* (acc. to 74% of experts) are strong barriers for successful application to FP7 ICT Theme in Turkey. Additionally, *lack of long-term technology vision* applies to both industry and academy as a barrier (81%).
- ✓ One major finding concerning barriers is the *lack of sharing FP experience between universities and industry in Turkey.* 81% of experts evaluate this as a strong barrier by industry and academy in successful participation into FP7 ICT Theme.
- ✓ Findings point to the insufficiency of existing physical R&D infrastructure. Experts say there is R&D infrastructure in Turkey (98%) however "Level of R&D infrastructure" (71%) is considered as insufficient. Additionally, experts perceive that there is R&D stock in Turkey (86%) however "Level of R&D stock" (83%) is considered as insufficient. In addition to R&D stock insufficiency, *the lack of qualified personnel to prepare project proposals for FP7* (81%) and *insufficient consultancy services (such as consultancy firms and university offices)* (74 %) are perceived to be important barriers.
- ✓ Compared to other barriers, negative past experiences in FPs and evaluation bias by the EU, are not perceived among the strongest barriers. Experts evaluate "Negative past experiences avoiding motivation for application" (66%) and "Evaluation bias on behalf of the EU" (66%) as barriers however, they are relatively not strong.
- ✓ In sum, analysis of the identified barriers for successful participation of Turkey in the FP7 – ICT Theme indicates that *University-Industry collaboration in human/ knowledge/ technology /infrastructure complementary resources* is required for eliminating barriers and triggering international level RTD competency in FP7 ICT Theme (Figure 9.9).

Figure 9. 9. Analysis and Interaction of identified barriers in 2-Round Delphi Survey for General ICT RTD in Turkey integration of Turkey in the FP7 – ICT Theme



9.9. SWOT ANALYSIS for IDENTIFICATION of OPPORTUNITIES and BARRIERS for SUCCESSFUL PARTICIPATION and INTEGRATION of TURKEY in the FP7 ICT-THEME

In this section, the summary of Task 7: *SWOT Analysis for Identification of Opportunities and Barriers for the Successful Participation and Integration of Turkey in the FP7 ICT-Theme Report* is presented. The main aim of this task is to analyze key external opportunities and threats/ barriers for the successful participation and integration of Turkey in the FP7 – ICT Theme and to compare them with internal strengths and weaknesses

Table 9. 12. Table of SWOT Analysis

SWOT ANALYSIS		REGARDING EFFECTS	
		Positive	**Negative**
REGARDING SOURCE	**Internal**	Strengths	Weaknesses
	External	Opportunities	Threats

Methodology of the study: In this analysis; first strengths, weaknesses, opportunities and threats for successful participation and integration of Turkey in FP for ICT Sector were determined in the first round of the meeting by using creative methods for production of new ideas (see Table 9.12). In the second round of the SWOT Analysis, the ideas about SWOT of ICT Sector in Turkey considering participation to FP were put together and a final report was prepared for final voting of SWOT expressions in order to prioritize these expressions. Each expression is evaluated over 5 points and an average score is calculated for each expression. 18 experts participated to the SWOT meeting and a sufficient number of responses were obtained. We identified a pick-list of 16 potential strengths, 17 weaknesses, 14 opportunities and 15 potential threats in the field of ICT related to FPs participation (Table 9.13). The study was completed by collecting evaluations of SWOT expressions according to the degree of importance attached to each expression by all participants. At final step, a consensus report was prepared and final recommendations for the consensus report were collected and integrated into the report.

Table 9. 13. SWOT Table

STRENGTHS *(Positive –Internal)*	WEAKNESSES *(Negative – Internal)*
✓ Presence of well known academicians with good reputation and pledged effective potential of private sector in "Networked and 3D Media Internet" Research Area ✓ Highly competent researcher potential in academicians and graduate education system to provide important contributions to EU research Agenda in ICT themes. ✓ Recently increasing support for R&D activities at the national level	✓ Insufficient presence of Turkish organizations within established EU R&D and innovation networks ✓ Lack of international project experience for most of Turkish Research Capacity in ICT RTD themes and focus on individual studies ✓ Lack of technology vision in firms present in ICT themes. Focus on short-term applications rather than technology development ✓ Despite the existence of policies and plans in ICT, insufficiency of

✓ As compared to Europe, successful students in Turkey prefer to study in departments related to ICT in higher education. ✓ Efficient support of TUBITAK NCO ICT Team in consortium building and project management ✓ High quality/ cost ratio in content production ✓ Highly qualified researchers in signal processing ✓ Important progress with respect to the integration process of TRA to ERA ✓ Competent Private Sector and strong Academic Potential in the research area of ICT: "Challenge 4: Content Management" ✓ Ability to conduct field and market tests at very competitive costs ✓ Increasing demand for innovative ICT products due to rapidly adaptable young population and hardworking private sector to satisfy this demand ✓ Rapid transfer of widespread and advanced applications of ICT available in other countries to Turkey ✓ Positive and highly adaptive approach of public institutions towards building of legal foundations about EU FPs ✓ Existence of powerful and successful private sector in "Critical Infrastructures Protection" Area ✓ Existence of potential markets for simulation and animation in ICT sector; and entrepreneurial ability to benefit from this potential ✓ Worldwide known national research institutions such as UEKAE in "Trustworthy ICT"	incentives and enforcements in application and monitoring of the results ✓ Existence of problems in transferring accumulated knowledge from universities in ICT to industry ✓ Non-existence of autonomous ICT related institutes in financial issues and human resources ✓ Insufficiency in management knowledge, especially technology management, and management application practices in industry and academy ✓ Lack of R&D Investment of multi-national cooperations (MNCs) (the main actors in participation to FP) in Turkey and their passivism in participation to FP in Turkey ✓ Lack of national clusters ✓ Lack of periodical conduct of monitoring exercises in ICT ✓ Inadequate level of efficiency in national networks of the active universities in international research networks ✓ The slow implementation by universities even though the preparation of legal infrastructure is accomplished by the public sector ✓ Brain drain in ICT sector ✓ Most successful Turkish Researchers prefer USA rather than EU in international cooperations ✓ R&D Support in ICT is provided for all software activities without discrimination for R&D in software ✓ Low wage rates and overtime in the ICT sector due to the excessive preference of ICT sector by young population for employment ✓ Excessive turnover in technical staff in the ICT sector
OPPORTUNITIES *(Positive – External)*	**THREATS *(Negative – External)***
✓ New R&D Law and its advantages ✓ Strong human resources capacity in Turkey in ICT research areas under FP7 content as compared to other areas ✓ Intersectoral characteristics of ICT Applications and the possibility of new opportunities due to this feature ✓ Potential of transferring researchers' own individual ties that were constructed during their PhD or post doc studies in ICT themes in EU to FP projects ✓ Enactment of strategic policies to increase the number of researchers ✓ Existence of technoparks and clustering of ICT firms in specific centers ✓ Increasing recognition of our firms which are active in screening technologies, GSM applications and content development in Europe ✓ Brain gain of Turkish Researchers especially from USA ✓ Existence of national R&D Support Mechanism ✓ Prioritization of ICT themes in Turkish policy documents ✓ Opportunity of emerging new FP projects from collaboration between large scale sector leaders in industry and important R&D providers of Europe ✓ Recent increase in foreign direct investment and integration of Turkish firms with foreign firms ✓ Synergy that can be built by bilateral R&D agreements with other countries ✓ Relatively easy establishment of SMEs that can employ qualified researchers in ICT sector	✓ Due to the fact that Turkey is seen as center of cheap labor, coming of production and sale-marketing facilities rather than R&D. ✓ Closed networks in EU FP. Difficulty of participating for newcomers ✓ Long and troublesome project application and management processes and their demotivating effects on Turkish organizations ✓ Inability to establish sufficient integration between institutions to determine ICT policies and being in distance to private sector dynamics ✓ Increasing concentration of FP7 project proposals to some specific areas and low success rate ✓ The difference of EU FP7 ICT Research roadmaps from studies in Turkey ✓ Insufficiencies in commercialization of ICT research in Turkey ✓ Proximity of education system and networks to USA ✓ Lack of financial actors that share R&D risk ✓ Lack of career planning for researchers in Turkey ✓ Blurred understanding of R&D content of software ✓ Due to the fact that labor costs are the most important part of the budget in EU projects, Turkey positions as low share partner although most of the tasks are performed by Turkey. ✓ Absence of a timetable for Turkish membership to the EU (which harms belonging to ERA) ✓ Public sector as the greatest buyer ✓ Nonexistence of project support mechanisms for consortiums with many partners

Main Strengths (Top 5 Expressions):

- ✓ Presence of well known academicians with good reputation and pledged effective potential of private sector in "Networked and 3D Media Internet" Research Area (4.06 points).
- ✓ Highly competent researcher potential in academicians and graduate education system to provide important contributions to EU research Agenda in ICT themes (4 points).
- ✓ Recently increasing support for R&D activities at the national level (3.94 points).
- ✓ As compared to Europe, successful students in Turkey prefer to study in departments related to ICT in higher education (3.83 points).
- ✓ Efficient support of TUBITAK NCO ICT Team in consortium building and project management (3.61 points).

There is a general agreement *about highly flexible, service-oriented, experienced Turkish organizations/technical staff and about their effective cooperation potential with other organizations/individuals*. Most of the SWOT participants have also underlined that there exists a sufficient pool of technical knowledge and academic personnel in specific ICT research areas. Researchers may eventually focus on a more integrative approach to deal with the challenges of FP7. They may further stimulate industry's willingness to innovate in ICT applications in line with an increasing support of private sector.

Parallel to certain high quality/cost ratio ([9]) in ICT content production, respondents seem considerably to be aware of FP7 resources dedicated to ICT. Moreover, the increasing national academic R&D efforts (the number of academic programmes supporting ICT are increasing) and sectoral R&D efforts (the financial resources for R&D allocated to ICT are increasing) have also been reported to be the crucial *potential strength* factor driving the FP7 ICT applications substantially stimulating the potential by strengthening and reassessing national and EU research activities.

Main Weaknesses (Top 5 Expressions):

- ✓ Insufficient presence of Turkish organizations within established EU R&D and innovation networks(4.39 points)
- ✓ Lack of international project experience for most of Turkish Research Capacity in ICT RTD themes and focus on individual studies (4.33 points)
- ✓ Lack of technology vision in firms present in ICT themes. Focus on short-term applications rather than technology development (4.28 points)
- ✓ Despite the existence of policies and plans in ICT, insufficiency of incentives and enforcements in application and monitoring of the results (4.28 points)
- ✓ Existence of problems in transferring accumulated knowledge from universities in ICT to industry (4 points).

[9] Appraising innovative ICT-related projects in terms of business / impact value is higher compared to the low cost of labor in Turkey.

Respondents have also notified that much of the policy debate depending upon the success of research and education in ICT has revolved around a trade-off between networking actors. Furthermore, the global demand for innovative products in the ICT-based industries is reported to be high despite insufficient but increasing research incentives in Turkey. Moreover, the number of academicians and technical personnel (engineers, experts, etc.) who contribute to produce and commercialize new ICT-related knowledge is stated to be sufficient as strength of Turkish ICT community. However, the new ICT-based research and FP7 support on new technical knowledge generate greater employment opportunities reflecting a weak international project experience for most of Turkish research capacity in ICT RTD themes. In addition, the lack of technology vision in some firms and their emphasis on short-term issues seem to be contrary to the nature of FP7 projects.

We also concurred with many different insights from our respondents stressing the role of national institutional capacity and networks in supporting ICT development. But, public and private institutions and the increased reliance of MNCs on the innovative capacity of ICT performers are reported to reduce potentially relational and innovation asymmetries within global production networks (GPNs).

Main Opportunities (Top 5 Expressions):

- ✓ New R&D Law and its advantages (3.83 points)
- ✓ Strong human resources capacity in Turkey in ICT research areas under FP7 content as compared to other areas (3.83 points)
- ✓ Intersectoral characteristics of ICT Applications and the possibility of new opportunities due to this feature (3.78 points)
- ✓ Potential of **transferring researchers' own** individual ties that were constructed during their PhD or post doc studies in ICT themes in EU to FP projects (3.72 points)
- ✓ Enactment of strategic policies to increase the number of researchers (3.67 points)

Together with:

- the new R&D law,
- the prioritization of ICT themes in Turkish policy documents,
- their supportive role combined with the relative human resources capacity in Turkey in ICT research areas under FP7 content,

respondents denote that it is generically impossible to define a mature inter-firm network that can sustain a strong institutional diversity in the Turkish ICT research area.

Secondly, most of the respondents denote that the existence of technoparks and networking of ICT firms in specific centers may help to increase the recognition of specific ICT technologies by Turkish firms which are generally active in screening technologies, GSM applications and content development. Here, networks and informal relations among technopark firms should be seen as inter-organizational clustering that enables a complex integration and recognition of research activities, competencies and knowledge that create the required synergy among organizations.

Main Threats (Top 5 Expressions):

- ✓ Due to the fact that Turkey is seen as center of cheap labor, coming of production and sale-marketing facilities rather than R&D (4.44 points)
- ✓ Closed networks in EU FP. Difficulty of participating for newcomers (4.28 points)
- ✓ Long and troublesome project application and management processes and their demotivating effects on Turkish organizations (4.11 points)
- ✓ Inability to establish sufficient integration between institutions to determine ICT policies and being in distance to private sector dynamics (4.11 points)
- ✓ Increasing concentration of FP7 project proposals to some specific areas and low success rate (3.89 points)

In this respect, we may denote that the technological opportunities evaluated mainly in ICT services. Service industries also differ from each other in the amount of resources devoted to innovation and, the types and ways in which new knowledge is generated or adopted. In the case of ICT sector, labor and technical knowledge/expertise are important factors in the profitability and competitiveness of the industry. Nevertheless, this situation impedes the development of human capital for R&D-intensive activities in the long term.

- The long and problematic FP7 project applications,
- tedious management procedures,
- their demotivating effects on Turkish organizations,

may gradually lead to decreasing popularity of FPs among economic actors in the ICT sector. Respondents underline the importance of collaborative activities in the sector. They further denote that inter/intra-industry transactions between firms, universities and institutions allow knowledge exchanges through formal contracts or social, cultural and political ties. However, this probably causes a closed network structure. The difficulty for newcomers in participating to FP projects may be overcome by the development of specialization and interdependence based on different levels of organizational proximity in the EU economic area.

It is also noteworthy that 5 barriers (threats) were crucial. These barriers may be classified as:

- ✓ sectoral (the development of production and sale-marketing facilities rather than R&D, closed networking in EU FP),
- ✓ administrative (the difficulty of participating for newcomers, long and troublesome project application and management processes and their demotivating effects on Turkish organizations, inability to establish sufficient integration between institutions to determine ICT policies and being in distance to private sector dynamics) and,
- ✓ economic (increasing concentration of FP7 project proposals to some specific areas and low success).

9.10. MAIN BARRIERS

According to the result of "Live Interviews for Assessment and Action in ICT RTD", "Delphi Survey Analysis for Assessment of RTD Capabilities, Human Capital and Barriers/Threats in ICT RTD" and "SWOT Analysis for Identification of Opportunities and Barriers for Successful Participation and Integration of Turkey in the FP7 ICT-Theme", main barriers that prevent Turkey from reaching its potential participation level in the ICT Theme are identified as:

- ✓ Closed Nature of European Networks
- ✓ Low Visibility of Turkish Institutions.
- ✓ Insufficiency of Existing International Level R&D Experience.
- ✓ Lack of qualified personnel to prepare project proposals for FP
- ✓ Insufficient consultancy services
- ✓ Lack of short-term commercial opportunities for commercial entities,
- ✓ Lack of perceived financial benefits for researchers in commercial entities
- ✓ Lack of sharing FP experience between universities and industry
- ✓ Lack of contribution of EU FP projects to academic career
- ✓ Teaching workload for academician
- ✓ Inadequate organizational structure for being a coordinator
- ✓ Lack of awareness, motivation and experience
- ✓ Finding suitable projects which are matching to vision of organizations
- ✓ Mobility problem between the EU and Turkey
- ✓ Direct influence of major stakeholders in the EU

For the sustainability of RTD capabilities, technological expertise and human capital in Turkey, most of the organizations, consider actual and prospective science and technology base and innovative outcomes in ICT sector and in the field of ICT RTD, require social and cultural compatibility, awareness and promotion under the guidance of well defined, clear regional, national and international ICT RTD policies. In order to operate potential and mutual actions to increase integration of Turkey into the FP7 ICT Theme, some actions are needed to overcome the barriers mentioned above.

Three specific, supporting mechanisms: *Social, Socio-technical and Technical* can be exemplified and defined to assist removal of barriers and to assist increase of the participation of Turkey in the FP7 ICT Theme (table 9.14). These mechanisms are not structurally different than the present mechanisms however their content and designs are totally new and required in the light of findings. This is to state; these mechanisms are not necessarily to be implemented by new budget allocations, though shifting present resources within existing or non-increasing budget packages are also possible. Although, approximately each objectives requires these mechanism to be assisted in overcoming the barriers faced, final operational and temporal prioritization of FP7 ICT Challenges and Objectives fields has to be done in accordance with the data provided by Live Interviews, Delphi Analysis and SWOT Meeting.

Table 9. 14. 14.Three Exemplar Mechanisms and Six Associated Programmes

Type of Mechanism	Name of Mechanism Programme	Mechanism Code
Social Mechanism	Vision & Share Sub-Programme	VSP
Socio-technical Mechanism	Visibility & Consultancy Sub-Programme	VCP
Technical Mechanism	(Prepatory) Competition & Cooperation Sub-Programme	CCP-University Support CCP-University-Industry Cooperation Support CCP-Industry Support SST- Small Scale Short Time Projects

Mechanisms are in “highly required” or “required” conditions for each of the FP7 ICT challenges and objectives (For details of each challenge, see Table 9.19). **However specific attention and priority need to be paid in High competence / Low share and Low Competence/ Low Share FP7 ICT Objectives of Turkey. Mechanisms are required for:**

To increase Share in

High competence – low share: 1.4 Trustworthy ICT (High Competence and low share), 3.5 Networked embedded and control systems (High Competence and low share), 5.1 Personal health systems for monitoring and point-of-care diagnostics (High Competence and low share), 1.2 Service and software architectures, infrastructures and engineering (High Competence and low share), 2.1 - 2.2 Cognitive systems, interaction, robotics (High Competence and low share), 3.7 Photonic components and subsystems (High Competence and no share), 6.3 ICT for environmental management and energy efficiency (High Competence and no share) , 7.3 ICT for Governance and Policy Modeling (Medial Competence and no share), 4.1- 4.3 Digital libraries and technology-enhanced learning (High Competence and low share) ,

To increase Competence and Share in

Low competence – low share 3.3 Embedded systems design (low share), 1.6 New paradigms and experimental facilities (low share), 1.7.Critical Infrastructure Protection (no share), 3.1 Next generation nano-electronics components and electronics integration (no share), 3.4 Computing systems (no share), 5.3 Virtual physiological human (no share), 6.1 ICT for the intelligent vehicles and mobility services (no share), 6.2 ICT for cooperative systems (no share) , 7.2 Accessible and inclusive ICT (no share), 7.1 ICT and ageing (Medial Competence and low share).

9.11. EVALUATION OF THE FINDINGS: CONCLUSIONS

In general, this project aimed at improving the international competence and experience of the actors in Turkish ICT Sector with regard to creation of network linkages with the EU hubs. These linkages are expected to make Turkey more competitive and visible in the FP area eventually. Hence, as a future benefit of networking and competence building processes, one of the major topics investigated in this project was *to develop international co-operation* and *to create future business development paths with regard to FP7 ICT challenges*. In Table 9.15, we have listed the expected outcomes of this project synchronized with the overall objectives of the project.

Table 9. 15. Expected outcomes/ results vs. Overall Objectives

EXPECTED OUTCOMES / RESULTS	OVERALL OBJECTIVES
• Roadmap for the Sectoral Development • Increased participation to FP7-ICT international business processes • Increased networking (national and transnational networks) and cooperation among Turkish and EU actors. • New co-operative projects • New business ideas • Increased competitiveness of Turkish firms in the ICT sector	• ICT Business Development • Stronger support from supporting organisations (especially public institutions) using new contacts • Increased international competence • Increased awareness on potential / competitive challenges • New tools for business and networking

The study on *Legal and Policy Framework Conditions* assumes that the macroeconomic instability can negatively affect science and technology sector. This effect, in turn, can challenge the competitiveness of overall economy in developing countries like Turkey. The competitiveness of an economy cannot be utilized or realized fully in macroeconomic instability since demand and supply channels for science and technology are distorted. For a long time, Science and technology sector of Turkey has experienced a period of macroeconomic instability; however Turkey experienced a relative recovery from such a political and macroeconomic instability after 2002. The pattern of science and technology sector indicates that competitiveness and research environment received positive contribution from political and economic stability. Therefore, *Turkey should firstly sustain its political and macroeconomics stability.*

However, this is not the only effort to be carried out because the ground which is achieved after the relative recovery may be lost. Although, we can observe some positive quantitative enhancements in GERD intensity, R&D Personnel, Sources and Performers of R&D, *Turkey, in order to not lose ground, has to perform key effort requirements* for successfully sustaining and improving efficiency and to be an *innovation-driven economy*. More technically, higher education and training, market efficiency, labor market efficiency, financial market sophistication, technological readiness and market size constitute the ground for Turkey. Since this ground is being challenged by innovation and business sophistication, it is important *to remove any obstacles to seize the benefits of ICT, by continuing to encourage effective competition in ICT infrastructure and network services for Turkey and by focusing to realize the transition into an innovation-driven economy under political and macroeconomic stability.*

Over the existing potential of Turkey, with an *explicit and specialized ICT RTD policy/strategy/action plan document as a legal and more awareness-friendly ICT RTD policy document with selective strategies and action plans*, effective utilization of academia industry collaboration and cross disciplinary collaboration for international RTD activities and the EU FP participation can be promoted. This can contribute to transition into an innovation-driven economy and can play a significant role in integration of TRA with ERA, which is already an official priority.

Although there is operational consistency between ICT RTD, information society and information and communication infrastructure policies issued by public organizations, *a renewed statement of Turkey's ICT macro-policy* may be required to achieve more awareness through

transparency and explicitness, and in turn, to achieve higher levels of effective participation and collaboration by academia and industry at implementation level.

In this sense, one of the most important and noteworthy points is at GERD *by sources of finance*. Although promising, current rates of Industry and Foreign percentages in GERD as source of finance are insufficient. Foreign source of finance cannot be received at higher levels. Turkey has institutional infrastructure which can set policy making and execution infrastructure to promote participation into the EU FPs, IPA and CIP 2007-2013. However, *more solid and commercialized technological outputs, more advanced expertise, more open and broader technological vision as a holistic image of visibility for international sources of finance are required.* Otherwise, ongoing situation may demonstrate unutilized opportunities for assimilation of international technological expertise and unutilized opportunities for knowledge transfer supported by accumulative learning processes. Therefore, appropriate design and conception of intervention and clarification of respective roles of public and private sectors are required. Existence of a variety of support programmes and funding mechanisms which are supported by the legal Infrastructure shows that Turkey set technology laws for national and internal R&D as well as to participate into international RTD and the EU FPs. However, opportunities and barriers stemming from ICT RTD Environment cannot be evaluated only at national level but additionally they have to be evaluated at international level since characteristics of leading RTD has international dimensions.

At the implementation level of ICT RTD policies, national funding programmes are promising, however, in an unintended manner, barriers can also emanate from *discouraging international RTD.* This situation assigns required international institutional visibilities for cooperative experience and knowledge transfer, and consequently encouraging participation into national support programmes. This excessive use of national funds necessitates establishing a *monitoring and evaluation (M&E), benchmarking and impact assessment of national support programmes* to measure progress, to assess the fulfillment of objectives and eventually to report on a regular basis. Such kind of consolidated assessments, benchmarks, monitoring and evaluation (M&E) allow for continuous and proper refinement of policy actions and instruments in terms of reconsidering efficiency and effectiveness in coordination of wide variety of funds and monitoring-evaluation of ICT RTD policy, programmes and funds with the usage of ICT for governance and policy modeling.

TÜBİTAK begin to take steps for designing and establishing such an innovative benchmarking system. While such impact analyses of R&D subsidies granted by TÜBİTAK are necessary to avoid

"black holes"; policies/strategies aimed at maximizing benefits of foreign direct investments, technological spillovers, integration to global RTD networks and production networks of multinational corporations (MNC) are also important. *An innovative design and application of industrial and technology policy instruments* for effective utilization of industry-academia collaboration and cross disciplinary collaboration for international level RTD is desired.

In this sense, general nature of potential barriers is common and can potentially emanate in every country unless opportunities/barriers are adequately monitored. Degree of *coordination barrier* -if significant or if exists- for university-industry collaboration and national/international financing of these collaborations in ICT RTD in Turkey require further analysis based on statistical ground. Moreover, the relation between university and industry and conflict of interests[10] introduce the need for scrutinizing the analysis of these relations in ICT RTD under the *subject of governance barrier*. Whether degree of governance barrier is significant or exists in Turkey, how relations of university, industry and state govern policy processes (making, implementation, monitoring) in the ICT RTD in order to access international RTD networks, require further analysis based on statistical ground. Awareness on the requirement of interoperability of institutions from different sectors and explicitness of policy processes with owned concrete outcomes (policy instruments) require being designed and implemented with coordination by a large number of entities aware and clear on consensus.

In the analysis of participation performance of Turkey in FPs, firstly *patenting and publication in ICT* are used as indicators of the ICT RTD activities of actors in Turkey. Patent data shows that Turkey's *patent applications in ICT in high tech. sectors show an upward trend*. Moreover, analysis of the ownership of patents indicates that f*oreign ownership of domestic patents rises and domestic ownership of foreign patents decreases*. Additionally, the economic crisis periods are very influential for patenting and the upward trend following 2002 may reflect the increasing attention that Turkish authorities direct to science and technology policies in Turkey. The most active actors in patenting activity in the field of ICT are *commercial organizations*. However, governmental organizations such as universities, research institutions and some branches of public organizations that perform RTD in ICT are not very active in patenting.

The most interesting point about the patent figures is the *high patent number in Precision and Industrial Process Equipment related to ICT.* If we analyze the activities in this sector, we can see

[10] Such as short term projects, applied research/commercialization, profit maximization in industry side versus long term projects, basic research and progress in knowledge base of society in university side.

that these activities mainly serve for the adaptation of present industrial processes to ICT sector, a kind of updating these activities by including ICT facilities. This point is very interesting and shows that the present patenting trends are not due to specialization or competition in ICT field, rather these trends are for providing the additional needs which become existent after including ICT facilities to industrial processes. Therefore, we cannot say anything about internationalization of innovative activity or obtaining a comparative advantage by looking at this figure being as the highest amount of patenting in ICT sector in Turkey. Secondly, we can count on the *Information Service Activities.* These activities are also mainly performed to provide the basic need in ICT Sector in Turkey, like the *Telecommunications* activities in third order in patenting activities.

As the relationship between FP7 and patenting activity is considered, the most active organizations those have patents ICT in Turkey are specialized in *Challenge 1.* This means there is an important potential in participation to FP for Challenge 1. Then come C*hallenge 4* and *Challenge 5*. As found in publication analysis, there is an important potential in basic research for this challenge but this potential cannot be reflected as patenting activity and cannot be converted to an intellectual property right in this field . Additionally if we accept patent as an indicator of commercialization of innovation, we can claim that the basic research in Challenge 3 cannot be commercialized effectively.

Publication data also show that in some research areas such as Challenge 3, Challenge 2 and Challenge 1, the publications and citations have been increasing. These areas are the most common areas in which worldwide ICT publications are made. Therefore, Turkey should differentiate its position in ICT publication field by considering the least elaborated areas such as "Sustainable and personalized healthcare (Challenge 5), ICT for Mobility, Environmental Sustainability and Energy (Challenge 6) and ICT for Independent Living, Inclusion and Governance (Challenge 7)". The results show that there are almost no publications in these fields in Turkey. However, the sufficiency of research infrastructure in Turkey to differentiate its position in these areas is very crucial for the effort sacrificed to have comparative advantage in these areas. As can be seen from the physical infrastructure study , there are important and well equipped centers[11] and it is believed that to realize this publication potential in these centers are possible and by this way Turkey can become more active in these areas in participation to FPs.

[11] Some of these centers in challange 5, 6and 7: Bilkent University-Dep.of Electrical and Electronics Eng,(Ch. 5, ch 6 and Ch. 7), Bosporus University- Biomedical Eng. Institute(Ch. 5), Bosporus University- Department of Geophysics/Kandilli Observatory and Earthquake Research Institute(Ch. 6), METU-Dep. of Computer Eng./SRDC(Ch. 5,ch 7), METU- Dep. of Biological Sciences (Ch. 5), Istanbul Technical University- Automotive Control and Mechantronics Research Center,(Ch. 6), DATASEL Inf. Sys.Co.(Ch. 5), Istanbul Technical University - RFID Research and Test Center(Ch. 6), Izmir Institute of Technology- Dep. of Computer Eng./Distributed Intelligent Virtual , Environments Lab(Ch. 6),Cybersoft(Ch5,ch 7), Bizitech (Ch. 6), Sebit Education and Inf. Tech..(Ch. 5, Ch 7).

As for the analysis of the citation data among universities, we can say that *the entrepreneurial culture of a university may perhaps lead to a strong and pervasive influence on the commercialization of FP projects.* By creating an entrepreneurial academic culture, the combination of efforts may force an entrepreneurial shift in transferring academic capabilities and experience to FP7 ICT related projects. In this manner, networking will additionally help creating new opportunities for entrepreneurs to network with potential producers, corporate clients, industry partners, service providers, and other institutions as well.

When we closely observe joint authorship of papers as an indicator of university-industry collaboration, we may also denote that project applications may have a strong effect on universities' and private institutions' basic and applied research. For each actor involved in these patent and publication analyses, there may be cases when academicians think of developing new private sector collaborations as unnecessary while taking in part/proposing for one of the project calls. On the other hand, private institutions/researchers may not aim to get academic help for the progress of the applied research. In these cases, even if joint researches seem to fail, both the academy and the private sector seek ways to reduce time issues, bureaucracy, cost, etc. while applying for a project or patent. By way of contrast, in the case of forming joint project collaborations, one may expect that research funding can be sustained through dense cooperation with industry/academy, and finally, it can be presumed that the levels of acceptance performance for the FP7 ICT may be improved.

Moreover, in FP7 ICT Work Programme, the first three challenges are accepted to provide basic research for ICT sector and last four challenges include the areas for more practical purposes which provide application possibilities of basic research done in first three challenges. Publication data about ICT sector in Turkey show that Turkey has an important basic research potential (especially in Challenge 3[12]) but this basic research potential should be converted to application and should provide practical benefits by increasing the publications in last four research areas. Low

[12] The main centers that have strong research infrastructure in challenge 3 are: Bilkent University-Department of Electrical and Electronics Eng., , Bilkent University-Department of Physics/Advanced Research Lab. , Bilkent University -UNAM-Institute of Material Science and Nanotechnology/Nanotechnology Research Center /NANOTAM, Bilkent University -Computational Electromagnetics Research Center /BİLCEM, Bosporus University-Department of Computer Eng. /NETLAB-Computer Networks Research Laboratory , Bosporus University-Department of Electrical and Electronics Eng./BUMEMS Lab: Micro Electro Mechanical Systems Lab, Bosporus University-Department of Electrical and Electronics Eng./Beta Lab., Istanbul Technical University-Department of Physics, Istanbul Technical University-National Center for High Performance Computing, Istanbul University-Department of Physics, Izmir Institute of Technology- Department of Electrical and Electronics Eng., Koç University-Dep. Of EEE/ Optical Microsystems Lab., Koç University-Department of Physics/Nano-Optics Research Laboratory, Koç University-Dep. Of Physics/ Micro photonics Research Laboratory, Koç University-Micro / Nanotechnologies Research Center , METU-Department of Electrical and Electronics Eng./MMRG, METU-Department of Electrical and Electronics Eng., METU-MEMS, METU-Kovan Research Lab, Sabancı-University- Department of Electronics Eng. , Sabancı-university- Department of Mechatronics, Yeditepe University- Department of Computer Eng. Cybersoft, Intro Information and Communication, Mobilera, Simsoft Computer Technologies, VESTEL Electronics AS

number of publications in applied areas of ICT (the last four challenges) compared to basic research areas, despite the huge potential in basic research (first three challenges) can be interpreted as "insufficient university industry relationship" in the field of ICT. This relationship should be enhanced by various policy tools through both national and international channels.

In addition to patent and publication figures, as we analyze Turkey's performance in EU IST RTD, it demonstrates that *Turkey is performing under its potential*. Although Turkey has gained R&D funds and know-how via knowledge flows, Turkish organizations are still relatively less successful in participating in proper winning consortia.

While ERA model emphasizes exchange and forming networks with corresponding institutions, Turkish researchers have limited personal contacts with EU researchers. Strong ties with their European counterparts are important, since the structure of EU ICT RTD is based on preferential attachment rather than self-organizing networks. Therefore, the strength of links with hub organizations directly affects the success of organizations participating in FPs. Findings of this study on Turkish ICT sector implies that lack of networking of Turkish organizations with the EU ICT hubs[13] inhibited achieving success in FP6 ICT Thematic Area. Therefore, the level of networking of Turkish organizations with EU ICT Hubs should be improved.

Turkish researchers have limited personal contacts with EU researchers while the structure of EU ICT RTD is based on preferential attachment rather than self-organizing networks. The fact that Turkish organizations were relatively less successful in participating in winning consortia can be an indicator of the weakness of ties for Turkish organizations with their European counterparts. Around 90% of the participation in submitted projects resulted with an unsatisfactory performance. This indicated that national interest to take part in EU ICT RTD was not reflected with more involvement in funded projects. In that sense, also accompanying actions aiming to facilitate more enhanced participation in EU ICT RTD were not effective enough to trigger Turkish participation since the emphasis in those supportive actions was given to awareness raising and informing activities. As a result it can be stated that; *weak integration of Turkish organizations in official and non-official EU networks is the main reason of underperformance in ICT projects.* Our observations on Turkish ICT sector imply that lack of international networking ability of Turkish organizations with EU ICT Hubs

[13] EU IST RTD funded under FPs is highly dominated by a small number of hub institutions like Fraunhofer, CNRS, the Ecole Polytechnique Federale de Lausanne, Philips, Nokia, Siemens, France Telecom etc (Johnson et al. 2002, Wagner et al 2004, Malerba et al. 2006).

inhibited achieving success in FP6 ICT Thematic Area. On the other hand*, Turkish sub-branches of main European ICT hubs like Siemens, Philips, Nokia, Ericsson, Alcatel-Lucent have showed very limited action as potential intermediary institutions in moving some of their stakeholders from Turkish ICT sector into the European Framework Programmes.*

While the share of Turkish private sector organizations in FP6 IST participations is 45%, this ratio decreases to 33% in funded IP, STREP and NoE type projects which indicates the lack of integration of Turkish private sector in prominent EU ICT RTD networks. It is also interesting to see that none of Turkish private sector partners who received funding from DG INFSO in FP6 succeeded to take part in winning projects under FP7 when first four calls of FP7 ICT are considered.

It is important to activate the hidden potential of Turkish Research Area in ICT field with the aim to enhance competitiveness and to meet the challenges of the 21st century. While the existence of sufficient academic research potential and interest to European ICT RTD programmes are considered, there is room for improvement while Europeanization of ICT research strategies of Turkish institutions is taken into account.

In the analysis of ICT RTD Infrastructure, both soft and physical infrastructure are examined. The universities, research institutions and governmental bodies are most successful in *The network of the future, Networked Media* and *Computing Systems* in funded FP6 IST/FP7 ICT projects. There are many factors contributing to this outcome such as *research infrastructure, human capital and networking capability*. By taking all these dimensions into account, the strongest research fields are *Digital libraries and technology-enhanced learning, Photonic components and subsystems, ICT for environmental management and energy efficiency, Network of the Future Cognitive systems, interaction, robotics* for universities, research institutions and governmental bodies.

However, when the infrastructure in private sector is analyzed, it is seen that there exist powerful traces of competence behavior of private sector actors in the areas like *Digital libraries and technology-enhanced learning, Intelligent content and semantics, The Network of the Future and Service and software architectures, infrastructures and engineering*. In this scheme, it can be claimed that Turkish industrial organizations focused on and develop competencies in *applied* ICT research.

In the analysis of Turkey's performance in FP, it was denoted that the successful projects with Turkish participants were clustered in *Challenge 1 and Challenge 4.* Additionally, in line with same results, there is a strong pattern of domination of *Ankara and Istanbul*, since the total research infrastructure potential is concentrated in these cities.

From the detailed list of universities, research institutes and governmental bodies, it is seen that the most active departments in ICT RTD in Turkish Universities are *Department of Electrical and Electronics Engineering, Department of Computer Engineering and Department of Physics.* Especially, in top universities which are derived from publication analysis, so to say *Middle East Technical University (METU),Istanbul Technical University(ITU) ,Bosporus University, Sabancı University, Bilkent University and Koc University,* all these three departments can be seen as active actors in ICT RTD and constitute an important part of research infrastructure in Turkey. As consistent with results of patent and publication data and Turkish FP performance, the most powerful research infrastructure potential for participation to FP in Turkish Universities are found in these universities and in these departments. These are also main actors in the major and potential centers of excellence. In addition to universities, the most active public organization in ICT RTD is seen as TUBITAK with its ICT related departments and Research Institutes.

For planned research infrastructure, in physical infrastructure resources there are some ongoing studies which are organized by SPO and TUBITAK, but we could not reach these sources to determine exact planned physical research infrastructure. Due to this reason we asked by phone calls about their planned research infrastructure to each center that has potential in challenges of ICT WP. According to the answers of the contact person of these actors, the planned physical infrastructure investments are derived. These planned infrastructures are mainly the needs of the centers. However, *more detailed Physical Infrastructure Examination should be done* and for effective participation to FPs, R&D Based Cooperation between Turkish Universities and Private Sector.

All the centers that are detected according to their expertise in challenges are asked whether their current RTD infrastructure meets with the needs of researchers for an effective participation in the FP7 – ICT Theme. Most of the persons that answered our phones about research infrastructure claimed that there is no such a serious problem about the physical infrastructure for effective participation to FPs. But again, for a detailed and more comprehensive physical research infrastructure map of Turkey ICT RTD Realm, more detailed inventory study should be conducted to see the whole picture of physical infrastructure in Turkey. Because due to confidentiality reasons and unwillingness to provide information, we could not identify whole physical infrastructure.

In addition to the physical infrastructure, the problems that are related to effective participation to FPs also have roots in other areas. As can be seen from the physical infrastructure study, there are strong physical infrastructure in major/potential centers of excellence in ICT RTD and

important know how in applied science in private sector. Despite the fact that there are common objectives in strongest research areas for private sector and universities, research institutes and governmental bodies, the figures in this report indicate the *absence of R&D-based cooperation* between Turkish universities and private sector actors within the context of EU FP. Because the strongest research fields for Turkish universities and research institutions differ from the research fields where Turkish private sector partners participated in funded projects. Due to this fact, these actors do not meet in the same objective to cooperate. This leads absence of R&D Based Cooperation. To meet the needs of researchers in terms of infrastructure, *R&D based cooperation between private organizations and universities and research institutions should be promoted* to create complementarities between them.

In live interviews, the main aim was to understand the sector in detail through face-to-face interaction with main players. In the analysis of organizational SWOT as a part of live intervies, it is determined that organizations in Turkey have *human resources-specific strengths* and *establishment level-establishment specific strengths* in participating/applying FPs in ICT theme. Apart from the best of the best RTD performers, organizations in general cannot conclude that they have international-level strengths and technology-specific strengths. In this sense, in relation to strengths, organizations in Turkey set *national level weaknesses* and *international level weaknesses* which are challenging establishment-specific strengths of organizations in participating into FPs in ICT theme. In consistency with strengths and weaknesses, organizations evaluate *opportunities which are mainly international level and establishment level.* The nature of opportunities in these levels is *technology-specific.* Consistently, *threats for organizations are evaluated as international level and national level* which hinder utilization of opportunities in participating/ applying for FP in ICT.

Therefore, to improve the situation at a national and EU level, academic institutions, at internal level, expect the EU FP projects to contribute their academic achievements; however, in the current case such regulations are not being implemented for academic personnel in universities. At regional/national level, academic institutions expect governmental bodies to create specific platforms to share the experience of EU FP active and experienced organizations operating in academia and in industry. Another main point according to the results, at international level, is mobility of academic researchers. Researchers experience difficulties in attending or participating EU level actions and activities, since financial coverage and repetitive visa constraints are evaluated as problematic. Most of the researchers consider these limitations as barriers preventing them to

establish personal, informal connections and negatively affecting individual or institutional visibility for the EU networks.

Similarly, commercial entities also experience difficulties in participating in top consortiums due to low visibility and closed nature of top EU ICT RTD scene. To resolve that issue, commercial entities expect to be supported in strengthening establishment level visibility for either human resources-specific or technology-specific visibilities by national and international lobbying activities. Moreover, commercial entities experience difficulties in matching FP7 ICT RTD objectives and their organizational visions and targets. Under competitive pressure, commercial entities prefer TÜBİTAK-TEYDEB programmes in which 1-2 years projects are executed or establishing international business relations not necessarily in the context of programme-based ICT RTD. In the context of programme-based ICT RTD, expectations vary from financial timing, inclusion of new subtopics to experimental projects calls in terms of short duration and limited work load to gain experience and visibility. Commercial entities also point projects which are desired as providing learning by doing opportunity, knowledge transfer and exchange in the field of ICT RTD.

Additionally, governmental bodies, at internal level, mobilize their human and financial resources to support and promote ICT RTD activities in line with policy documents. In regional and national level promoted industry and academic institutions relations are confronted with administrative and implementation level barriers. Governmental bodies, therefore, at regional and national level expect more effective coordination between different public agencies to set and deliver best services to academic institutions and commercial entities and govern relations between industry and academic institutions. At international level, expectations point out more focused attention and supportive regulations by EC in participation to ICT RTD programmes for new member states and candidate countries, like Turkey.

In this sense, related actions, to utilize opportunities and translate present strengths into international level and to achieve international level and technology specific- strengths which can also contribute avoiding threats and hindering weaknesses, have to be performed and supported at various levels. In addition to national level and international level actions, there are establishment (stakeholder) level actions required. Due to cross-disciplinary and collaborative nature of ICT in FPs, accessing complementary resources of different kinds, bases such as human resources, knowledge, technology, and infrastructure are not straightforward. Therefore, these stakeholder level, national

level and international level actions have temporally equal prioritization and preferably considered as required to be handled in a higher level synchronized agenda.

These synchronized actions are logical and operational pieces of a higher level synchronized agenda consisting of both stakeholder level actions in Turkey and amongst RTD networks in the EU, and national and EU level actions in terms of legal, institutional, policy and financial infrastructures, to set associated policy differentiation, policy integration, the mixes, and policy communication which can contribute into seamless policy cohesion, such that these actions can contribute into resolution of conflict and raise of consensus on both policy-level, in how to resolve policy complexities, and in implementation-level of international cross-disciplinary and collaborative RTD in the field of ICT. In accordance, most of the organizations consider science and technology base and innovative outcome in ICT RTD, requiring social and cultural compatibility, awareness and promotion under the guidance of well defined, clear regional, national and international ICT RTD policies. Therefore, as a holistic result of live interviews other than listed national and international level actions above, a higher level of action has to be governed, namely*, "Europeanization of RTD in Turkey".* As the live interviews cannot cover the whole ICT community in Turkey, the survey is extended to cover maximum number of stakeholders using the Delphi survey process to identify latent ICT-RTD potential in Turkey.

In Delphi Survey, the main results in identification of barriers are analyzed. Experts in Turkey evaluate that closed nature of European networks is a main barrier in participating into FPs in ICT theme, in general. It is also supported with the argument that Turkey can contribute into different stages of top consortia RTD processes within expected levels of quality. However, closed nature of European networks does not allow utilizing these mutual opportunities more, which is also reducing spillover effect of international RTD experience to other establishments performing RTD in Turkey. For scrutinizing analysis, expert evaluates that another most important barrier is low visibility of Turkish Institutions. However, experts are not optimistic about the reasons of closed nature of European networks that whether it is due to low visibility of Turkish institutions or exclusion. In this sense, international level RTD experience is insufficient, and evaluation bias on the behalf of EU is considered to do exist, however not as a very indicative strong barrier. To remind, there are opinions on closed nature is not driven only by low visibility since contrasting examples of best performers with high visibility are also not active in top consortia.

At internal level, we see noteworthy differentiation on competencies of universities and industry in Turkey in participation into FPs. In general, innovative companies exist but level of innovativeness is insufficient for participating into FP ICT theme. In contrast, universities have knowledge stock and associated researcher potential. Level of innovative companies exceeds knowledge stock in universities. Therefore, these findings justify that university and companies have potential complementary resources, but these resources cannot be utilized completely.

We see that individual R&D stocks by universities and industry in general, are insufficient for participating into FP ICT theme. R&D infrastructure follows same trend in that sufficiency level. These are also contributing factors into lack of sharing FP experience either at information level or collaborative work experience level. This situation prevents complementary resources to be utilized into a common national R&D stock by academia-industry collaboration in participating in FPs. Cross-disciplinary nature and, collaborative requirements emanating from cross-disciplinary nature are insufficiently utilized to participate in FPs. Low degree of financial benefits for researchers and lack of short term commercial opportunities are as barriers challenging the formation of best practice networks in general.

Besides in collaboration of different knowledge bases, intermediary organizations such as consultancy services and university project offices are found to be insufficient and this contributes to general disconnection between academia and industry. In turn, these dynamics contribute the low visibility of Turkish institutions and participation into high value added European networks.

Finally, all these barriers in interaction contribute low degree of Europeanization of ICT RTD in Turkey. Moreover, these serious processes have interacting dynamics to be taken into consideration of stakeholder, national and EU levels.

9.12. WHAT TO DO TO REMOVE BARRIERS? FURTHER RECOMMENDATIONS

Mainstream mutual actions detected in the *"Analysis of the ICT-RTD capabilities in Turkey and the measures to maximize Turkey's potential in the FP7-ICT Theme – Live Interviews"* are fine tuned by *"Delphi survey to identify latent ICT-RTD potential in Turkey"* and "*SWOT Analysis for Identification of Opportunities and Barriers for Successful Participation and Integration of Turkey in the FP7 ICT-Theme"* in relation with the opinions of more wider participants from ICT Community in Turkey. There are mutual and interacting actions expected to be performed at stakeholder level, national level and EU level.

At EU Level:

- *Promoting being open to new participants from new member states and candidate countries in FPs projects of top consortia*
- *Redefinition of currently low material gains and academic career contribution of FP7 projects in universities in new member states and candidate countries*
- *Establishing new programme approaches for organizations in new member states and candidate countries,*
- *Defining short term (1-1.5 years) projects to gain experience,*
- *Defining small scale projects to gain experience, being learning partner, RTD observer.*
- *Providing support for more equal participation,*
- *Reducing bureaucratic workload and paperwork for application processes, online access for strengthening transparency in evaluation of projects*

At National Level:

- *Promoting academy-industry relations in Turkey in terms of effective and cross disciplinary collaborations for participating into FPs- level ICT RTD*
- *Developing policies for academic career contribution of FP projects by new regulations in universities, supporting organizational innovation*
- *More active lobbying activities, support for attending international actions increasing establishment level visibility*
- *Support for clustering activities, research institutes, high-tech SMEs and start-ups. Resolution of cultural incompatibilities of Turkey in the field of ICT RTD*

At Stakeholder Level:

- *Defining organizational strategies parallel to priorities of Framework Programmes and defining road map coherently*
- *Prioritization of knowledge transfer and exchange in the field of ICT RTD by FP,*
- *Projects, focusing on learning by doing activities in FP7 ICT RTD*
- *Organizational innovation to be adaptable into international environment,*

Three specific, supporting mechanisms: *Social, Socio-technical and Technical* (see Table 9.16, 9.17 and 9.18) can be defined to assist removal of barriers and to assist increase of the participation of Turkey in the FP7 ICT Theme (see Table 9.18 for specific recommendations). These mechanisms are not structurally different than the present mechanisms however their content and designs are totally new. This is to state; these mechanisms are not necessarily to be implemented by new budget allocations, though shifting present resources within existing or non-increasing budget packages are essential.

Table 9. 16. Social Mechanism - Vision & Share Sub-Programme, Code: VSP

Type of Mechanism	Name & Code of Mechanism Programme	Definition & Levels of Action	Rationale
Social Mechanism	**Vision & Share Sub-Programme** **Code: VSP**	**Definition:** Organizing periodical, well-designed, clear "official" events (conferences, workshops… etc.) specific to each challenge. Not all-in-one, but for each challenge and associated objective sets, a specific event. Not only for information purposes but also for clarifications on technical requirements, standards, technological status and capability expectations to be able to participate into international ICT RTD networks. Presentations/Speeches on, who chooses working with whom, why? national and International Experiences. **Events funding & Level:** 50% Turkey- EU 50% , International & National Levels **Participants:** EU DG INFSO personnel, Member firms/universities and/or people in top/medium level European Networks, participated in EU FPs. (International) EU level key participants to be arranged and promoted by EU DGINFSO **National:** TÜBİTAK personnel, Universities, Labs. Industry, consultancy firms, University support offices participated in EU FPs. National Level key participants to be arranged and promoted by TÜBİTAK **Audience:** Ranges from students/entrepreneurs to major organizations **Solid Output:** WHO IS WHO Database registration in each challenge Solid Output to be assisted by TÜBİTAK technical personnel **Aim:** Introduction of supports and promotions Mediating Prospective Visions and sharing International R&D Experience.	**Associated Findings of Live Interviews:** *Socio-cultural Awareness and Practices Required: For the sustainability of RTD capabilities, technological expertise and human capital in Turkey, most of the organizations, consider actual and prospective science and technology base and innovative outcomes in ICT sector and in the field of ICT RTD, require social and cultural compatibility, awareness and promotion under the guidance of well defined, clear regional, national and international ICT RTD policies. Therefore, a higher level of action has to be governed, namely, "Europeanization of RTD in Turkey". *Mutual Barriers require Mutual Actions to overcome: There are expectations, list of international level actions to be evaluated by the EC in terms of structures, processes and approaches of Framework Programme in the field of ICT RTD in the case of new member states and associated countries. In order to operate potential and mutual actions to increase integration of Turkey into the FP7 ICT Theme; at national level, self evaluation and inter-organizational relations evaluation are initially required as actions by academic institutions, commercial entities and governmental bodies in the field of ICT RTD in Turkey. *At international level: Promoting being open to new participants from new member states and candidate countries in FPs projects of top consortia. In order to deliver appropriate services to academia and industry in the field of international RTD, effective synchronization with the EC is desired. *At national level: Promoting academy-industry relations in Turkey in terms of effective and cross disciplinary collaborations for participating into FPs- level ICT RTD. National coordination between different public agencies is desired. Visibility. Expectations point out TÜBİTAK to perform more lobbying activities and introduce their RTD capabilities and technological expertise to EU networks formed in EU Framework Programmes in the field of ICT RTD. Low visibility of academic institutions is considered as a main barrier hindering participation in top consortia. **Associated Findings of Delphi Analysis:** *Difficulty in finding correct partners due to low visibility of Turkish institutions *Difficulty in finding correct partners due to closed nature of European networks to Turkish institutions *Insufficient consultancy services (such as consultancy firms and university support offices etc.) *Lack of long term technology vision *Lack of sharing framework Programme experience among universities and industry in Turkey. *Negative past experiences avoid motivation for application *Evaluation bias on behalf of the EU **Associated Findings of SWOT Analysis:**

		Establishing Informal Connections (National and international)	***Insufficient presence of Turkish organizations within established EU R&D and innovation networks *Lack of international project experience for most of Turkish Research *Capacity in ICT RTD themes and focus on individual studies *Lack of technology vision in firms present in ICT themes. Focus on short-*term applications rather than technology development *Despite the existence of policies and plans in ICT, insufficiency of *incentives and enforcements in application and monitoring of the results *Insufficiency in management knowledge, especially technology *management, and management application practices in industry and academy *Lack of R&D Investment of multi-national corporations (MNCs) (the main actors in participation to FP) in Turkey and their passivism in participation to FP in Turkey *Lack of periodical conduct of monitoring exercises in ICT**

Table 9. 17. Visibility & Consultancy Sub-Programme, Code: VCP

Type of Mechanism	Name & Code of Mechanism Programme	Definition & Levels of Action	Rationale
Socio-technical Mechanism	**Visibility & Consultancy Sub-Programme** **Code VCP**	**Definition:** Services-projects driven by Universities, university support offices and Industry , consultancy firms aiming at increasing visibility and consultancy services on solid grounds specific to each challenge in the field of ICT RTD. Not all-in-one, but for each challenge, and associated objective sets. **Services-projects funding & Level:** 50% Turkey- EU 50% , International & National Levels **Examples of Services-Projects:** Online Access to project proposals preparations, standards, contact points, registration for events… Web-based Visualization of European networks in the field of ICT RTD. Project information and contact access. Web-based Visualization of who is who in Turkey in the field of ICT RTD. Project information and contact access. Web-based Geographical Information systems and EU FP ICT RTD. Video information/ editorial advertisement of	**Associated Findings of Live Interviews:** *At International Level, Providing support for more equal participation, Reducing bureaucratic workload and paperwork for application processes, online access for strengthening transparency in evaluation of projects **Associated Findings Delphi Analysis:** *Difficulty in finding correct partners due to low visibility of Turkish institutions *Difficulty in finding correct partners due to closed nature of European networks to Turkish institutions *Insufficient consultancy services (such as consultancy firms and university support offices etc.) *Lack of qualified personnel to create and prepare projects *Lack of long term technology vision *Lack of sharing framework Programme experience among universities and industry in Turkey. *Negative past experiences avoid motivation for application **Associated Findings of SWOT Analysis:** Closed networks in EU FP. Difficulty of participating for newcomers Nonexistence of project support mechanisms for consortiums with many partners Insufficiency in management knowledge, especially technology management, and management application practices in industry and academy

		firms/universities, Digital libraries of Professional databases (Soft/hard infrastructures data etc), Multilingual support, Other services-projects of consultancy firms, remote lobbying firms and university support offices, in which solid socio-technological services providing innovative consultancy are offered to increase visibility national and international level.	Existence of problems in transferring accumulated knowledge from universities in ICT to industry *Insufficient presence of Turkish organizations within established EU R&D and innovation networks *Lack of international project experience for most of Turkish Research *Capacity in ICT RTD themes and focus on individual studies *Lack of technology vision in firms present in ICT themes. Focus on short-*term applications rather than technology development *Despite the existence of policies and plans in ICT, insufficiency of *incentives and enforcements in application and monitoring of the results *Insufficiency in management knowledge, especially technology *management, and management application practices in industry and academy *Lack of R&D Investment of multi-national corporations (MNCs) (the main actors in participation to FP) in Turkey and their passivism in participation to FP in Turkey *Lack of periodical conduct of monitoring exercises in ICT

Table 9. 18. (Prepatory) Competition & Cooperation Sub- Programme, Code: CCP

Type of Mechanism	Name of Mechanism Programme	Definition	Level & Funding
Technical Mechanism	**Competition & Cooperation Sub-Programme** **Code: CCP-U** **Code: CCP-UI** **Code: CCP-I** **Code: SST**	**Definition:** **Competition & Cooperation Programme - University CCP-U** Preparatory partial funding. Where knowledge in universities supersede innovative firms University as hub, also support university-industry cooperation in case of spillover from university to industry Researcher supports, researcher mobility supports are included. R&D Infrastructure (Soft & Hard) support is included. **Competition & Cooperation Programme – University-Industry CCP-UI** Preparatory partial funding. Where knowledge level of universities are relatively in balance with innovative firms Consortium as hub. Researcher supports, researcher mobility supports are	**Associated Findings of Task 5 (Live Interviews):** *At: International Level: Establishing new programme approaches for organizations in new member states and candidate countries , Defining short term (1-1.5 years) projects to gain experience, Defining small scale projects to gain experience. Promoting being open to new participants from new member states and candidate countries in FPs projects of top consortia. Redefinition of currently low material gains and academic career contribution of FP7 projects in universities in new member states and candidate countries. *At National level: Support for clustering activities, research institutes, high-tech SMEs and start-ups. Promoting university-industry relations in Turkey in terms of effective and cross disciplinary collaborations for participating into FPs- level ICT RTD. Developing policies for academic career contribution of FP projects by new regulations in universities, supporting organizational innovation **Associated Findings of Task 6 (Delphi Analysis):** *Lack of financial benefits for researchers in commercial entities *Lack of qualified personnel to create and prepare projects *Lack of short-term commercial opportunities for commercial entities

		included. R&D Infrastructure (Soft & Hard) support is included. **Competition & Cooperation Programme – University-Industry CCP-UI** Preparatory partial funding. Where innovative firms supersede knowledge in university Firms as hub, also support industry-university cooperation in case of field spillover from industry to university in terms of professional applied specialization, basic/applied research and infrastructure funding for university/labs. Researcher supports, researcher mobility supports are included. R&D Infrastructure support (Soft & Hard) is included. **Small Scale & Short Terms Projects: SST** Establishing new programme approaches for organizations in new member states and candidate countries, Defining short term (1-1.5 years) projects to gain experience, Defining small scale projects to gain experience by EC. **Competition & Cooperation Programme funding & Level:** 50% Turkey- EU 50% , International & National Levels **Example Criteria:** Being participated into EU FPs (major / potential) or at least being an approved prospective partner of one the organizations to be participated into EU FPs. Establishing organizational innovation to be adaptable into international environment, (university-industry linkage formation and networking included, presence and visibility by registration in official databases.) Proposal of defining organizational strategies parallel to priorities of Framework Programmes and defining road map coherently Prioritization of knowledge transfer and exchange in the field of ICT RTD by FP Projects, Focusing on learning by doing activities in FP7 ICT RTD. Partial funding payback if not participated in FPs for 2-3 years. If participated, no partial funding payback.	*Lack of sharing framework Programme experience among universities and industry in Turkey. **Enhancing technological capabilities of Turkish institutions in relation to participating to FP7 ICT Theme for each objective with respect to:** *Existence of potential researchers *Research infrastructure like laboratories, equipments etc. *Level of knowledge capacity in universities *Existence of innovative commercial entities *National R&D stock *Project experience of doing international R&D **Associated Findings of Task 7 (SWOT Analysis):** *Existence of problems in transferring accumulated knowledge from universities in ICT to industry, *Non-existence of autonomous ICT related institutes in financial issues and human resources, *Lack of R&D Investment of multi-national corporations (MNCs) (the main actors in participation to FP) in Turkey and their passivism in participation to FP in Turkey, *Lack of national clusters, *Inadequate level of efficiency in national networks of the active universities in international research networks, *The slow implementation by universities even though the preparation of legal infrastructure is accomplished by the public sector *Brain drain in ICT sector, *R&D Support in ICT is provided for all software activities without discrimination for R&D in software

These mechanisms are in “highly required” or “required” conditions for each of the FP7 ICT challenges and objectives. However specific attention and priority need to be paid in High competence / Low share and Low Competence/ Low Share FP7 ICT Objectives of Turkey :

To increase Share in

High competence – low share: 1.4 Trustworthy ICT (High Competence and low share), 3.5 Networked embedded and control systems (High Competence and low share), 5.1 Personal health systems for monitoring and point-of-care diagnostics (High Competence and low share), 1.2 Service and software architectures, infrastructures and engineering (High Competence and no share), 2.1 - 2.2 Cognitive systems, interaction, robotics (High Competence and low share), 3.7 Photonic components and subsystems (High Competence and no share), 6.3 ICT for environmental management and energy efficiency (High Competence and no share) , 7.1 ICT and ageing (Medial Competence and low share), 7.3 ICT for Governance and Policy Modeling (Medial Competence and no share), 4.1- 4.3 Digital libraries and technology-enhanced learning (High Competence and low share)

To increase Competence and Share in

Low competence – low share 3.3 Embedded systems design (low share), 1.6 New paradigms and experimental facilities (low share), 1.7.Critical Infrastructure Protection (no share), 3.1 Next generation nanoelectronics components and electronics integration (no share), 3.4 Computing systems (no share), 5.3 Virtual physiological human (no share), 6.1 ICT for the intelligent vehicles and mobility services (no share), 6.2 ICT for cooperative systems (no share) , 7.2 Accessible and inclusive ICT (no share).

Table 9. 19. Specific Recommendations for Challenges and Objectives

Priority 1 CCP-UI: Applications from University-Industry is prioritized (Red ones)

Priority 2 CCP-U or CCP-I: Industry and University alone applications is prioritized according to knowledge stock or innovative sufficiency of firms.

Name of Challenge / Objective	Social Mechanism Implementation Priority	Socio-Technical Mechanism Implementation Priority	Required Technical Mechanism Implementation Priority Sequence
Pervasive and Trustworthy Network Service Infrastructures			
The Network of the Future	Highly required	Highly required	CCP-UI, CCP-U
Internet of Services, Software and Virtualization	*Highly required*	*Highly required*	CCP-UI, CCP-I
Internet of Things and Enterprise environments	*Highly required*	*Highly required*	CCP-UI, CCP-I
Trustworthy ICT	Highly required	Highly required	CCP-UI, CCP-U
Networked Media and 3D Internet	Highly required	Highly required	CCP-UI, CCP-U
Future Internet experimental facility and experimentally driven research	Highly required	Highly required	CCP-UI, CCP-U
Towards sustainable and personalized healthcare			
Personal Health Systems	Highly required	Highly required	CCP-UI, CCP-U
ICT for Patient Safety	Highly required	Highly required	CCP-UI, CCP-U
Virtual Physiological Human	Highly required	Highly required	CCP-UI, CCP-U
International Cooperation on Virtual Physiological Human	Highly required	Highly required	CCP-UI, CCP-U
Cognitive Systems, Interaction, Robotics			
Cognitive Systems and Robotics	Highly required	Highly required	CCP-UI, CCP-U
Language-Based Interaction	Highly required	Highly required	CCP-UI, CCP-U
Components, systems, engineering			
Nanoelectronics Technology	*Highly required*	*Highly required*	CCP-UI, CCP-I
Design of Semiconductor Components and Electronic Based Miniaturized Systems	Highly required	Highly required	CCP-UI, CCP-U
Flexible, Organic and Large Area Electronics	*Highly required*	*Highly required*	CCP-UI, CCP-I
Embedded Systems Design	Highly required	Highly required	CCP-UI, CCP-U
Engineering of Networked Monitoring and Control systems	Highly required	Highly required	CCP-UI, CCP-U
Computing Systems	Highly required	Highly required	CCP-UI, CCP-U
Photonics	*Highly required*	*Highly required*	CCP-UI, CCP-I
Organic Photonics and Other Disruptive Photonics Technologies	Highly required	Highly required	CCP-UI, CCP-U

Microsystems and Smart Miniaturized Systems	Highly required	Highly required	CCP-UI, CCP-U
Digital Libraries and Content			
Digital Libraries and Digital Preservation	*Highly required*	*Highly required*	CCP-UI, CCP-I
Technology-Enhanced Learning	Highly required	Highly required	CCP-UI, CCP-U
Intelligent Information Management	Highly required	Highly required	CCP-UI, CCP-U
ICT for Mobility, Environmental Sustainability			
ICT for Safety and Energy Efficiency in Mobility	Highly required	Highly required	CCP-UI, CCP-U
ICT for Mobility of the Future	Highly required	Highly required	CCP-UI, CCP-U
ICT for Energy Efficiency	Highly required	Highly required	CCP-UI, CCP-U
ICT for Mobility, Environmental Sustainability and Energy Efficiency	Highly required	Highly required	CCP-UI, CCP-U
Novel ICT Solutions for Smart Electricity Distribution Networks {Joint call between the ICT and Energy Themes)	Highly required	Highly required	CCP-UI, CCP-U
ICT for Independent Living, Inclusion and Governance			
ICT& Ageing	Highly required	Highly required	CCP-UI, CCP-U
Accessible and Assistive ICT	Highly required	Highly required	CCP-UI, CCP-U
ICT for Governance and Policy Modeling	Highly required	Highly required	CCP-UI, CCP-U
Future and Emerging Technologies			
FET-Open: Challenging Current Thinking	Required	Required	CCP-UI, CCP-U
FET proactive 1: Concurrent Tera-device Computing	Required	Required	CCP-UI, CCP-U
FET proactive 2: Quantum Information Foundations and Technologies	*Required*	*Required*	CCP-UI, CCP-I
FET proactive 3: Bio-chemistry-based Information Technology	Highly required	Highly required	CCP-UI, CCP-U
FET proactive 4: Human-Computer Confluence	Highly required	Highly required	CCP-UI, CCP-U
FET proactive 5: Self-Awareness in Autonomic Systems	Highly required	Highly required	CCP-UI, CCP-U
FET proactive 6: Towards Zero-Power ICT	Highly required	Highly required	CCP-UI, CCP-U
FET proactive 7: Molecular-Scale Devices and Systems	Highly required	Highly required	CCP-UI, CCP-U
FET proactive 8: Brain-Inspired ICT	Highly required	Highly required	CCP-UI, CCP-U
Coordinating Communities, Plans and Actions in FET Proactive Initiatives	Highly required	Highly required	CCP-UI, CCP-U
Identifying new research topics and Assessing emerging global S&T trends in ICT for future FET proactive initiatives	Highly required	Highly required	CCP-UI, CCP-U
ICT RTD IN GENERAL	Highly required	Highly required	CCP-UI, CCP-U

APPENDIXES

Appendix 1: FP 7 ICT Work Program-Challenges and Objectives:

Challenge 1: Pervasive and Trustworthy Network and Service Infrastructures
Objective ICT-2009.1.1: The Network of the Future
Objective ICT - 2009.1.2: Internet of Services, Software and Virtualization
Objective ICT-2009.1.3: Internet of Things and Enterprise environments
Objective ICT-2009.1.4: Trustworthy ICT
Objective ICT-2009.1.5: Networked Media and 3D Internet
Objective ICT-2009.1.6: Future Internet experimental facility and experimentally driven research
Objective ICT-2009.1.7: Critical Infrastructure Protection
Challenge 2: Cognitive Systems, Interaction, Robotics
Objective ICT-2009.2.1: Cognitive Systems and Robotics
Objective ICT-2009.2.2: Language-Based interaction
Challenge 3: Components, systems, engineering
Objective ICT-2009.3.1: Nanoelectronics Technology
Objective ICT-2009.3.2: Design of Semiconductor Components and Electronic Based Miniaturised Systems
Objective ICT-2009.3.3: Flexible, Organic and Large Area Electronics
Objective ICT-2009.3.4 Embedded Systems Design
Objective ICT-2009.3.5 Engineering of Networked Monitoring and Control systems
Objective ICT-2009.3.6 Computing Systems
Objective ICT-2009.3.7: Photonics
Objective ICT-2009.3.8 Organic Photonics and Other Disruptive Photonics Technologies
Challenge 4: Digital Libraries and Content
Objective ICT-2009.4.1: Digital Libraries and Digital Preservation
Objective ICT-2009.4.2: Technology-Enhanced Learning
Objective ICT-2009.4.3: Intelligent Information Management
Challenge 5: Towards sustainable and personalized healthcare
Objective ICT-2009.5.1: Personal Health Systems
Objective IST-2009.5.2: ICT for Patient Safety
Objective ICT-2009.5.3: Virtual Physiological Human
Objective ICT-2009.5.4: International Cooperation on Virtual Physiological Human
Challenge 6: ICT for Mobility, Environmental Sustainability and Energy Efficiency
Objective ICT-2009.6.1: ICT for Safety and Energy Efficiency in Mobility
Objective ICT-2009.6.2: ICT for Mobility of the Future
Objective ICT-2009.6.3: ICT for Energy Efficiency
Objective ICT-2009.6.4 ICT for Environmental Services and Climate Change Adaptation
Objective ICT-2009.6.5: Novel ICT Solutions for Smart Electricity Distribution Networks (Joint call between the ICT and Energy Themes
Challenge 7: ICT for Independent Living, Inclusion and Governance
Objective ICT-2009.7.1: ICT & Ageing
Objective ICT-2009.7.2: Accessible and Assistive ICT
Objective ICT-2009.7.3: ICT for Governance and Policy Modeling

Appendix 2: Table of Policy Network Analysis Data

ID	ORGANIZATION NAME	ORGANIZATION TYPE	LINK ID	RESEARCH PARTNER ORGANIZATION(S) NAME	RESEARCH PARTNER TYPE
1	"Baskent University Computer Eng. Dep."	University Research Group	57	"MANTIS Software and Consultancy Company"	Industry
2	"Bilkent University Computer Eng. Dep."	University Research Group	28	"Middle East Technical University Computer Eng. Dep."	University Research Group
			34	"Middle East Technical University Kovan Research Lab."	University Research Group
			39	"TOBB University Swarm Systems Research Lab."	University Research Group
			42	"TURKCELL Communication Services Inc."	Industry
			49	"METEKSAN Defense Industry Inc."	Industry
			56	"SEBIT Education and IT Inc."	Industry
			95	"TUBITAK ULAKBIM Turkish Academic Network and Information Center"	Public Research & Application Center
3	"Bilkent University Electrics Electronics Eng. Dep."	University Research Group	26	"Koc University Optical Microsystems Lab."	University Research Group
			27	"Koc University Electrics Electronics Eng. Dep."	University Research Group
			34	"Middle East Technical University Kovan Research Lab."	University Research Group
			38	"Sabanci University Electrics Electronics Eng. Dep."	University Research Group
			42	"TURKCELL Communication Services Inc."	Industry
			47	"ASELSAN Electronics Industries Inc."	Industry
			55	"BASARI Mobile IT Inc."	Industry
			88	"Undersecretariat of Defense (SSM)"	Public Sector
			95	"TUBITAK ULAKBIM Turkish Academic Network and Information Center"	Public Research & Application Center
			F1	*Nokia (Finland)*	*Foreign – Industy*
			F2	*Telefonica (Spain)*	*Foreign – Industry*
			F3	*Fraunhofer Institutes (Germany)*	*Foreign – Research Center*
4	"Bilkent University Mechanical Eng. Dep."	University Research Group	42	"TURKCELL Communication Services Inc."	Industry
5	"Bogazici University Computer Eng. Dep."	University Research Group	61	"BIZITEK Computer Software and Internet Technologies"	Industry (Bought by Ericsson)
			95	"TUBITAK ULAKBIM Turkish Academic Network and Information Center"	Public Research & Application Center
6	"Bogazici University Chemical Eng. Dep."	University Research Group	95	"TUBITAK ULAKBIM Turkish Academic Network and Information Center"	Public Research & Application Center
7	"Bogazici Information Management Dep."	University Research Group	61	"BIZITEK Computer Software and Internet Technologies"	Industry (Bought by Ericsson)
8	"Bogazici Mechatronics Research and Application Center"	University Research Group	34	"Middle East Technical University Kovan Research Lab."	University Research Group
9	"Ege University International Computer Institute"	University Research Group	95	"TUBITAK ULAKBIM Turkish Academic Network and Information Center"	Public Research & Application Center
10	“Gazi Uni Computer Eng. Dep."	University Research Group	55	"BASARI Mobile IT Inc."	Industry
11	“Gebze Institute of Technology Electrics Electronics Eng. Dep."	University Research Group	58	"C2TECH IT Ltd. Co."	Industry
12	"Hacettepe University Computer Eng. Dep."	University Research Group	49	"METEKSAN Defense Industry Inc."	Industry
			56	"SEBIT Education and IT Inc."	Industry
			57	“MANTIS Software and Consultancy Company"	Industry

			62 64	"NETCAD Inc." "SIMSOFT Computer Technologies Ltd. Co."	Industry Industry
13	“Hacettepe University Math. Inf. Man. Dep."	University Research Group	57	"MANTIS Software and Consultancy Company"	Industry
14	"Hacettepe University Applied Biology Dep."	University Research Group	98	“Ministry of Agriculture Agricultural Research Directorate”	Public Sector
15	"Hacettepe University Mining Eng. Dep."	University Research Group	62	"NETCAD Inc."	Industry
16	"Istanbul Technical University Control Eng. Dep."	University Research Group	20 51 63 66 67 68 86 94 F4 F5 F6 F7	"Isik University Informatics Research and Application Center" "FORD OTOSAN Inc." "GENETLAB Information Technologies” "TEMSA Inc." "SIEMENS Turkey Inc." “KALEALTI ROBOTICS Company" "Turkey State Railways" "TUBITAK MAM Information Technologies Institute" *Siemens (Germany)* *Robosoft (France)* *University of Alaska (US)* *Mitsıbishi (Japan)*	University Research Group Industry Industry Industry Industry Industry Public Sector Public Research Institute *Foreign – Industry* *Foreign – Industry* *Foreign – University* *Foreign – Industry*
17	"Istanbul Technical University Computer Eng. Dep."	University Research Group	61 63 95	"BIZITEK Computer Software and Internet Technologies Inc." "GENETLAB Information Technologies” "TUBITAK ULAKBIM Turkish Academic Network and Information Center"	Industry Industry Public Research & Application Center
18	“Istanbul Technical University Geomatics Eng. Dep."	University Research Group	62	"NETCAD Inc."	Industry
19	"Istanbul Technical University Industrial Eng. Dep."	University Research Group	61	"BIZITEK Computer Software and Internet Technologies Inc."	Industry
20	"Isik University Informatics Research and Application Center"	University Research Group	16 F8 F9 F10 F11 F12	"Istanbul Technical University Control Eng. Dep." *Austria ZCI (Austria)* *Liester University (UK),* *Madrid Technical University (Spain),* *Kaunas Tech. University (Lithuania)* *Joseph Stephan Institute (Slovenia)*	University Research Group *Foreign – University* *Foreign – University* *Foreign – University* *Foreign – University* *Foreign – University*
21	"Izmir High Technology Institute"	University Research Group	42 95	"TURKCELL Communication Services Inc." "TUBITAK ULAKBIM Turkish Academic Network and Information Center"	Industry Public Research & Application Center
22	“Kadir Has University EEE Dep."	University Research Group	42	"TURKCELL Communication Services Inc."	Industry
23	“Kadir Has University Computer Eng. Dep."	University Research Group	42	"TURKCELL Communication Services Inc."	Industry
24	"Kadir Has University Mechanical Eng. Dep."	University Research Group	42	"TURKCELL Communication Services Inc."	Industry
25	“Karadeniz Technical University Comp. Eng. Dep."	University Research Group	61	"BIZITEK Computer Software and Internet Technologies Inc."	Industry
26	"Koc University Optical Microsystems Lab."	University Research Group	3 47	"Bilkent University Electrics Electronics Eng. Dep." "ASELSAN Electronics Industries Inc."	University Research Group Industry

			65	"ARCELIK Inc."	Industry
27	"Koc University Electrics Electronics Eng. Dep."	University Research Group	3 95 F13 F14 F15 F16	"Bilkent University Electrics Electronics Eng. Dep." "TUBITAK ULAKBIM Turkish Academic Network and Information Center" *Vigo Systems (Poland)* *Masaryk Uni (Czech Rep.)* *EPTC (Switzerland*) *Teknion (Israel)*	University Research Group Public Research & Application Center *Foreign – Industry* *Foreign – University* *Foreign – Research Center* *Foreign – Industry*
28	"Middle East Technical University Computer Eng. Dep."	University Research Group	2 41 47 48 49 54 55 56 57 58 61 63 64 87 88 95	"Bilkent University Computer Eng. Dep." "TURKSAT Satellite Comm. Cable TV Inc." "ASELSAN Electronics Industries Inc." "HAVELSAN Inc." "METEKSAN Defense Industry Inc." "INTRO IT Systems Ltd. Co." "BASARI Mobile IT Inc." "SEBIT Education and IT Inc." "MANTIS Software and Consultancy Company" "C2TECH IT Ltd. Co." "BIZITEK Computer Software and Internet Technologies Inc." "GENETLAB Information Technologies" "SIMSOFT Computer Technologies Ltd. Co." "Ministry of Defense" "Undersecretariat of Defense (SSM)" "TUBITAK ULAKBIM Turkish Academic Network and Information Center"	University Research Group Industry Industry Industry Industry Industry Industry Industry Industry Industry Industry Industry Industry Public Sector Public Sector Public Research & Application Center
29	"Middle East Technical University Industrial Eng. Dep."	University Research Group	52 86 F17	"TOFAS Turk Automobile Factory Inc." "Turkey State Railways" *Eindhoven University of Technology (The Netherlands)*	Industry Public Sector *Foreign – University*
30	"Middle East Technical University Geodetic Geographic IT Dep."	University Research Group	62	"NETCAD Inc."	Industry
31	"Middle East Technical University Electrics Electronics Eng. Dep."	University Research Group	33 34 58 63 95	"Middle East Technical University Brain Research Center" "Middle East Technical University Kovan Research Lab." "C2TECH IT Ltd. Co." "GENETLAB Information Technologies" "TUBITAK ULAKBIM Turkish Academic Network and Information Center"	University Research Group University Research Group Industry Industry Public Research & Application Center
32	"Middle East Technical University Mechanical Eng. Dep."	University Research Group	34	"Middle East Technical University Kovan Research Lab."	University Research Group
33	"Middle East Technical University Brain Research Center"	University Research Group	31	"Middle East Technical University Electrics Electronics Eng. Dep."	University Research Group
34	"Middle East Technical University Kovan Research Lab."	University Research Group	2 3 8	"Bilkent University Computer Eng. Dep." "Bilkent University Electrics Electronics Eng. Dep." "Bogazici Mechatronics Research and Application Center"	University Research Group University Research Group University Research Group

			31 32 37 39 F18 F19 F20 F21	"Middle East Technical University Brain Research Center" "Middle East Technical University Mechanical Eng. Dep." "Sabanci University Mechatronics Dep." "TOBB University Swarm Systems Research Lab." *EMbodied COgnition (EMco) lab. University of Bologna (Italy)* *Department of Neuroscience, University of Parma, (Italy)* *Sensorimotor Integration group, University of Lubeck (Germany)* *Intelligent Robotics Group (IRG), Aberystwyth University, Wales, (UK)*	University Research Group University Research Group University Research Group University Research Group *Foreign – University Res. Group* *Foreign – University Res. Group* *Foreign – University Res. Group* *Foreign – University Res. Group*
35	"Mimar Sinan University Statistics Dep."	University Research Group	61	"BIZITEK Computer Software and Internet Technologies Inc."	Industry
36	"Sabanci University Information Technologies Dep."	University Research Group	41	"TURKSAT Satellite Comm. Cable TV Inc."	Industry
37	"Sabanci University Mechatronics Dep."	University Research Group	34	"Middle East Technical University Kovan Research Lab."	University Research Group
38	"Sabanci University Electrics Electronics Eng. Dep."	University Research Group	3 63	"Bilkent University Electrics Electronics Eng. Dep." "GENETLAB Information Technologies"	University Research Group Industry
39	"TOBB University Swarm Systems Research Lab."	University Research Group	2 34	"Bilkent University Computer Eng. Dep." "Middle East Technical University Kovan Research Lab."	University Research Group University Research Group
40	"Uludag University Industrial Eng. Dep."	University Research Group	84 85	"OYAK RENAULT Turkey Inc." "TURKTICARET.Net"	Industry Industry
41	"TURKSAT Satellite Comm. Cable TV Inc."	University Research Group	28 36 77	"Middle East Technical University Computer Eng. Dep." "Sabanci University Information Technologies Dep." "BASARSOFT Company"	University Research Group University Research Group Industry
42	"TURKCELL Communication Services Inc."	University Research Group	2 3 4 21 22 23 24 53 55 58	"Bilkent University Computer Eng. Dep." "Bilkent University Electrics Electronics Eng. Dep." "Bilkent University Mechanical Eng. Dep." "Izmir High Technology Institute" "Kadir Has University Electrics Electronics Eng. Dep." "Kadir Has University Computer Eng. Dep. "Kadir Has University Mechanical Eng. Dep." "MOBILERA Company" "BASARI Mobile IT Inc." "C2TECH IT Ltd. Co."	University Research Group University Research Group University Research Group University Research Group University Research Group University Research Group University Research Group Industry Industry Industry
43	"TURK TELEKOM Inc."	Industry	58	"C2TECH IT Ltd. Co."	Industry
44	"TTnet"	Industry	56	"SEBIT Education and IT Inc."	Industry
45	"AVEA Telecomm. Operator"	Industry	55 56	"BASARI Mobile IT Inc." "SEBIT Education and IT Inc."	Industry Industry
46	"VODAFONE Turkey"	Industry	55	"BASARI Mobile IT Inc."	Industry
47	"ASELSAN Electronics Industries Inc."	Industry	3 26	"Bilkent University Electrics Electronics Eng. Dep." "Koc University Optical Microsystems Lab."	University Research Group University Research Group

			28	"Middle East Technical University Computer Eng. Dep."	University Research Group
			58	"C2TECH IT Ltd. Co."	Industry
			64	"SIMSOFT Computer Technologies Ltd. Co."	Industry
48	"HAVELSAN Inc."	Industry	28	"Middle East Technical University Computer Eng. Dep."	University Research Group
			58	"C2TECH IT Ltd. Co."	Industry
49	"METEKSAN Defense Industry Inc."	Industry	2	"Bilkent University Computer Eng. Dep."	University Research Group
			12	"Hacettepe University Computer Eng. Dep."	University Research Group
			28	"Middle East Technical University Computer Eng. Dep."	University Research Group
			57	"MANTIS Software and Consultancy Company"	Industry
			64	"SIMSOFT Computer Technologies Ltd. Co."	Industry
			88	"Undersecretariat of Defense (SSM)"	Public Sector
			90	"Turkish Armed Forces (TAF) Land Forces"	Public Sector
			F22	*Motorola (US)*	*Foreign – Industry*
			F23	*Lockheed Martin (US),*	*Foreign – Industry*
			F24	*GEM Electronica (Italy)*	*Foreign – Industry*
			F25	*Embraer (Brazil)*	*Foreign – Industry*
			F26	*EADS (The Netherlands),*	*Foreign – Industry*
			F27	*Thales (Australia)*	*Foreign – Industry*
			F28	*Saab (Sweden)*	*Foreign – Industry*
			F29	*Finmeccanica (Finland)*	*Foreign – Industry*
			F30	*Raytheon (US)*	*Foreign – Industry*
			F31	*BAE Systems (UK)*	*Foreign – Industry*
50	"KOC Defense Inc."	Industry	64	"SIMSOFT Computer Technologies Ltd. Co."	Industry
51	"FORD OTOSAN Inc.",	Industry	16	"Istanbul Technical University Control Eng. Dep."	University Research Group
52	"TOFAS Turk Automobile Factory Inc."	Industry	29	"Middle East Technical University Industrial Eng. Dep."	University Research Group
			F31	*FIAT Engineering & Design and CRF (Italy)*	*Foreign – Industry*
			F32	*Torino Politecnico University (Italy)*	*Foreign – University*
53	"MOBILERA Company"	Industry	42	"TURKCELL Communication Services Inc."	Industry
53	"INTRO IT Systems Ltd. Co."	Industry	28	"Middle East Technical University Computer Eng. Dep."	University Research Group
			69	"SAYTEK Systems Company"	Industry
			70	"Istanbul Parkyeri Co."	Industry
			F2	*Telefonica (Spain)*	*Foreign – Industry*
			F26	*EADS (The Netherlands)*	*Foreign – Industry*
			F33	*T-Soft (Czech Rep.)*	*Foreign – Industry*
			F34	*INECS (Portugal)*	*Foreign – Industry*
			F35	*Cric (Spain)*	*Foreign – Industry*
			F36	*HFKK (Hungary)*	*Foreign – Industry*
			F3	*Fraunhofer Institutes (Germany)*	*Foreign – Research Center*
55	"BASARI Mobile IT Inc."	Industry	3	"Bilkent University Electrics Electronics Eng. Dep."	University Research Group
			10	"Gazi Uni Computer Eng. Dep."	University Research Group

			28	"Middle East Technical University Computer Eng. Dep."	University Research Group
			42	"TURKCELL Communication Services Inc."	Industry
			45	"AVEA Telecomm. Operator"	Industry
			46	"VODAFONE Turkey"	Industry
			60	"AGMLAB Information Technologies Ltd. Co."	Industry
			F37	*University of Carloss III (Spain)*	*Foreign – University*
			F38	*University of Muenster (Germany)*	*Foreign – University*
			F39	*Center for Research Technologies Hellas (Greece)*	*Foreign – University*
			F40	*Orca Interactive (Israel)*	*Foreign – Industry*
			F41	*Agencia EFE (Spain)*	*Foreign – Industry*
56	"SEBIT Education and IT Inc."	Industry	2	"Bilkent University Computer Eng. Dep."	University Research Group
			12	"Hacettepe University Computer Eng. Dep."	University Research Group
			28	"Middle East Technical University Computer Eng. Dep."	University Research Group
			44	"TTnet"	Industry
			45	"AVEA Telecomm. Operator"	Industry
			59	"INNOVA Technology Solutions Inc."	Industry
			71	"ENOCTA Com."	Industry
			72	"BILSA Company"	Industry
			73	"ARGELA Company"	Industry
			74	"SOBEE Company"	Industry
			75	"AssisTT Company"	Industry
			76	"SOFTAS Company"	Industry
			F4	*Siemens (Germany)*	*Foreign – Industry*
			F42	*The Center for Futurism in Education (Israel)*	*Foreign – Research Center*
			F43	*German AI Institute (Germany)*	*Foreign – Research Center*
			F44	*Trinity College (Dublin)*	*Foreign – University*
57	"MANTIS Software and Consultancy Company"	Industry	1	"Baskent University Computer Eng. Dep."	University Research Group
			12	"Hacettepe University Computer Eng. Dep."	University Research Group
			13	"Hacettepe University Mathematics and Information Management Dep."	University Research Group
			28	"Middle East Technical University Computer Eng. Dep."	University Research Group
			49	"METEKSAN Defense Industry Inc."	Industry
			62	"NETCAD Inc."	Industry
			68	"KALEALTI ROBOTICS Company"	Industry
			77	"BASARSOFT Company"	Industry
			78	"ZIRVE Company"	Industry
			79	"I3S International Software Solution Services Co."	Industry
			80	"AKIN Computer Company"	Industry
			81	"ESKOM Computer Company"	Industry
58	"C2TECH IT Ltd. Co."	Industry	11	"Gebze Institute of Technology Electrics Electronics Eng. Dep."	University Research Group
			28	"Middle East Technical University Computer Eng. Dep."	University Research Group
			31	"Middle East Technical University Electrics Electronics Eng. Dep."	University Research Group

			42	"TURKCELL Communication Services Inc."	Industry
			43	"TURK TELEKOM Inc."	Industry
			47	"ASELSAN Electronics Industries Inc."	Industry
			48	"HAVELSAN Inc."	Industry
			88	"Undersecretariat of Defense (SSM)"	Public Sector
			92	"General Directorate of State Airports Authority (DHLI)"	Public Sector
			96	"TUBITAK UEKAE"	Public Research Institute
			F45	*EADS Astrium (France)*	*Foreign – Industry*
			F46	*Ericsson (Sweden)*	*Foreign – Industry*
			F47	*Alvarion (US)*	*Foreign – Industry*
59	"INNOVA Technology Solutions Inc."	Industry	56	"SEBIT Education and IT Inc."	Industry
			F48	*Alcatel-Lucent (France)*	*Foreign – Industry*
			F49	*Indra (Spain)*	*Foreign – Industry*
			F50	*Philips (The Netherlands)*	*Foreign – Research Center*
			F51	*VTT Technical Research Center (Finland)*	*Foreign – Industry*
			F52	*Thales (Australia)*	*Foreign – Industry*
			F53	*Moviquity (Portugal)*	*Foreign – Industry*
			F54	*Nethawk (Finland)*	*Foreign – Industry*
			F37	*Univ. Politécnica de Madrid, Universidad Carlos III, (Spain)*	*Foreign – University*
			F55	*Vrije Universiteit Brussel, (Belgium)*	*Foreign – University*
			F56	*Universitat Autonoma de Barcelona (Spain)*	*Foreign – University*
60	"AGMLAB IT Ltd. Co."	Industry	55	"BASARI Mobile IT Inc."	Industry
61	"BIZITEK Computer Software and Internet Technologies Inc."	Industry	5	"Bogazici University Computer Eng. Dep."	University Research Group
			7	"Bogazici Information Management Dep."	University Research Group
			17	"Istanbul Technical University Computer Eng. Dep."	University Research Group
			19	"Istanbul Technical University Industrial Eng. Dep."	University Research Group
			25	"Karadeniz Technical University Comp. Eng. Dep."	University Research Group
			28	"Middle East Technical University Computer Eng. Dep."	University Research Group
			35	"Mimar Sinan University Statistics Dep."	University Research Group
			97	"TUBITAK Feza Gursoy Resarch Institute"	Public research Institute
62	"NETCAD Inc."	Industry	12	"Hacettepe University Computer Eng. Dep."	University Research Group
			15	"Hacettepe University Mining Eng. Dep."	University Research Group
			18	"Istanbul Technical University Geomatics Eng. Dep."	University Research Group
			30	"Middle East Technical University Geodetic Geographic IT Dep."	University Research Group
			57	"MANTIS Software and Consultancy Company"	Industry
			89	"Ministry of Environment"	Public Sector
63	"GENETLAB Information Technologies Industry and Trade Inc."	Industry	16	"Istanbul Technical University Control Eng. Dep."	University Research Group
			17	"Istanbul Technical University Computer Eng. Dep."	University Research Group
			28	"Middle East Technical University Computer Eng. Dep."	University Research Group
			31	"Middle East Technical University Electrics Electronics Eng. Dep."	University Research Group
			38	"Sabanci University Electrics Electronics Eng. Dep."	University Research Group

			F57 F58 F59 F60	*Twente University (The Netherlands)* *NATO Submarine Research Center (International)* *Black Sea Security Studies Center, (Italy)* *Thales(Norway)*	*Foreign – University* *Foreign – Int'l Research Center* *Foreign – Int'l Research Center* *Foreign – Industry*
64	"SIMSOFT Computer Technologies Ltd. Co."	Industry	12 28 47 49 50 83 82 91 F61 F62 F63 F64 F65	"Hacettepe University Computer Eng. Dep." "Middle East Technical University Computer Eng. Dep." "ASELSAN Electronics Industries Inc." "METEKSAN Defense Industry Inc." "KOC Defense Inc." "CITO Turkey" "GATE Electronics" "Ministry of Culture (e-Library)" *FH Joanneum Gesellschaft (Austria),* *3 MRT Ltd. (UK)* *Stuttgart Media University (Germany),* *Karl Franzens University-Graz, (Austria)* *University of Tampere (Finland)*	University Research Group University Research Group Industry Industry Industry Industry Industry Public Sector *Foreign – University* *Foreign – Industry* *Foreign – University* *Foreign – University* *Foreign – University*
65	"ARCELIK Inc."	Industry	26	"Koc University Optical Microsystems Lab."	University Research Group
66	"TEMSA Inc."	Industry	16	"Istanbul Technical University Control Eng. Dep."	University Research Group
67	"SIEMENS Turkey Inc."	Industry	16	"Istanbul Technical University Control Eng. Dep."	University Research Group
68	"KALEALTI ROBOTICS Company"	Industry	16	"Istanbul Technical University Control Eng. Dep."	University Research Group
69	"SAYTEK Systems Company"	Industry	54	"INTRO IT Systems Ltd. Co."	Industry
70	"Istanbul Parkyeri Co."	Industry	54	"INTRO IT Systems Ltd. Co."	Industry
71	"ENOCTA Com."	Industry	56	"SEBIT Education and IT Inc."	Industry
72	"BILSA Company"	Industry	56	"SEBIT Education and IT Inc."	Industry
73	"ARGELA Company"	Industry	56	"SEBIT Education and IT Inc."	Industry
74	"SOBEE Company"	Industry	56	"SEBIT Education and IT Inc."	Industry
75	"AssisTT Company"	Industry	56	"SEBIT Education and IT Inc."	Industry
76	"SOFTAS Company"	Industry	56	"SEBIT Education and IT Inc."	Industry
77	"BASARSOFT Company"	Industry	41 57	"TURKSAT Satellite Comm. Cable TV Inc." "MANTIS Software and Consultancy Company"	Industry Industry
78	"ZIRVE Comp."	Industry	57	"MANTIS Software and Consultancy Company"	Industry
79	"I3S International Software Solution Services Co."	Industry	57	"MANTIS Software and Consultancy Company"	Industry
80	"AKIN Computer Company"	Industry	57	"MANTIS Software and Consultancy Company"	Industry
81	"ESKOM Computer Company"	Industry	57	"MANTIS Software and Consultancy Company"	Industry
82	"GATE Electronics"	Industry	64	"SIMSOFT Computer Technologies Ltd. Co."	Industry
83	"CITO Turkey"	Industry	64	"SIMSOFT Computer Technologies Ltd. Co."	Industry
84	"OYAK RENAULT Turkey Inc."	Industry	40	"Uludag University Industrial Eng. Dep."	University Research Group

85	“TURKTICARET.NET”	Industry	40	"Uludag University Industrial Eng. Dep."	University Research Group
86	"Turkey State Railways"	Public Sector	16 29	"Istanbul Technical University Control Eng. Dep." "Middle East Technical University Industrial Eng. Dep."	University Research Group University Research Group
87	"Ministry of Defense"	Public Sector	28	"Middle East Technical University Computer Eng. Dep."	University Research Group
88	"Undersecretariat of Defense (SSM)"	Public Sector	3 28 49 58	"Bilkent University Electrics Electronics Eng. Dep." "Middle East Technical University Computer Eng. Dep." “METEKSAN Defense Industry Inc." "C2TECH IT Ltd. Co."	University Research Group University Research Group Industry Industry
89	"Ministry of Environment"	Public Sector	62	"NETCAD Inc."	Industry
90	"Turkish Armed Forces (TAF) Land Forces"	Public Sector	49	"METEKSAN Defense Industry Inc."	Industry
91	"Ministry of Culture (e-Library)"	Public Sector	64 95	"SIMSOFT Computer Technologies Ltd. Co." "TUBITAK ULAKBIM Turkish Academic Network and Information Center"	Industry Public Research & Application Center
92	"General Directorate of State Airports Authority (DHLI)"	Public Sector	58 95	"C2TECH IT Ltd. Co." "TUBITAK ULAKBIM Turkish Academic Network and Information Center"	Industry Public Research & Application Center
93	"Turkish Atomic Energy Institution (TAEK) "	Public Sector	95	"TUBITAK ULAKBIM Turkish Academic Network and Information Center"	Public Research & Application Center
94	"TUBITAK MAM Information Technologies Institute"	Public Research Institute	16 F3 F66 F29 F67 F68 F69 F70	"Istanbul Technical University Control Eng. Dep." *Fraunhofer Institute (Germany)* *EADS (Germany),* *Finnmechanica (Finland),* *Aermacchi (Italy),* *NLR - DutchSpace (The netherlands),* *INETI (Portugal)* *OGMA (Portugal)*	University Research Group *Foreign – Research Center* *Foreign – Industry* *Foreign – Industry* *Foreign – Industry* *Foreign – Industry* *Foreign – Industry* *Foreign – Industry*
95	“TUBITAK ULAKBIM Turkish Academic Network and Information Center"	Public Research & Application Center	2 3 5 6 9 17 21 27 28 31 91 92 93	"Bilkent University Computer Eng. Dep." "Bilkent University Electrics Electronics Eng. Dep." "Bogazici University Computer Eng. Dep." "Bogazici University Chemical Eng. Dep." "Ege University International Computer Institute Dep." "Istanbul Technical University Computer Eng. Dep." "Izmir High Technology Institute" "Koc University Electrics Electronics Eng. Dep." "Middle East Technical University Computer Eng. Dep." "Middle East Technical University Electrics Electronics Eng. Dep." "Ministry of Culture (e-Library)" General Directorate of State Airports Authority (DHLI)" "Turkish Atomic Energy Institution (TAEK) "	University Research Group University Research Group University Research Group University Research Group University Research Group University Research Group University Research Group University Research Group University Research Group University Research Group University Research Group Public Sector Public Sector Public Sector
96	"TUBITAK UEKAE"	Public Research Institute	58	"C2TECH IT Ltd. Co."	Industry
97	“TUBITAK Feza Gursoy Research Institute"	Public Research Institute	61	"BIZITEK Computer Software and Internet Technologies Inc."	Industry
98	“Ministry of Agriculture Agricultural Research Directorate”	Public Sector	14	"Hacettepe University Applied Biology Dep."	University Research Group

QUALITY CONTROL PAGE

Project Quality Control/QA Signature Sheet

Contract Number: 30-CE-0262072/00-15

Project Title: Turkey - RTD Technological audit

Task Number: 9

Task Title: Public Version of the Summary Report

Planned Delivery Date: 13.11.2009

Actual Delivery Date: 31.12.2009

Tasks for this report	**Status of validation**
• To produce public version of the conclusion report that summarizes and derives conclusions from the findings according to the objectives of the project	(S)D,L,M,H, N/A

Key:

S	Meets standards according to the contract, no revisions required
D	Discussion needed
L	Low degree of revision required
M	Moderate degree of revision required
H	High degree of revision required
N/A	Not applicable

Evaluation & Quality Assurance Officer	Name:	Signature:	Date:
ASSOC. PROF. M. TEOMAN PAMUKÇU			31.12.2009

PROJECT INFORMATION PAGE:

Project name	**ICT – RTD TECHNOLOGICAL AUDIT**	
Project №	30-CE-0262072/00-15	
Country	**TURKEY**	
	Client	**Contractor:**
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