SCIENCE DIPLOMACY:
A PROACTIVE POLICY APPROACH FOR INTERNATIONAL COOPERATION IN SCIENCE AND TECHNOLOGY AND AN ALTERNATIVE MODEL FOR TURKEY

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ZAFER UYGUN

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Approval of the Graduate School of Social Sciences

_____

Prof. Dr. Meliha Altunışık
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

_____

Prof. Dr. Teoman Pamukçu
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

_____

Assist. Prof. Dr. İ. Semih Akçomak
Supervisor

Examining Committee Members (first name belongs to the chairperson of the jury and the second name belongs to supervisor)

Prof. Dr. Erkan Erdil	(METU, STPS)	_____
Assist. Prof. Dr. İ. Semih Akçomak	(METU, STPS)	_____
Prof. Dr. Erol Taymaz	(METU, ECON)	_____

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name: Zafer Uygun

Signature :

ABSTRACT

SCIENCE DIPLOMACY: A PROACTIVE POLICY APPROACHE FOR INTERNATIONAL COOPERATION IN SCIENCE AND TECHNOLOGY AND AN ALTERNATIVE MODEL FOR TURKEY

Uygun, Zafer

M.S., Department of Science and Technology Policy Studies

Supervisor: Assist. Prof. Dr. İ. Semih Akçomak

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The main objective of this thesis is to analyse the mechanisms and the methods followed by the countries having "good practice" in efficient utilization of science diplomacy (SD) as international cooperation policy measure for national capacity building in science, technology and innovation (STI) and economic development. This aim will be achieved by answering the main research questions "What activities do countries perform under SD; how they are different from each other?" and "In comparison to other countries, how should Turkey structure the activities for successful SD?" By using qualitative data collected from 55 expert interviews with science counsellors, policy makers, academicians, and representatives of STI network, and comparative analysis of country case studies, this study analyses different models for SD and then proposes a model for the Turkish case. This thesis synthesizes best practices for feeding scientific advice to governments, universities and industry. Introductory research is needed to inform the design and implementation of the SD network as a tool for a proactive policy approach. It is found that countries which have clear and coherent overall strategy for SD leverage the impacts of SD on sustainable development. Governments require evidence-based practice on designing of policies and programmes. SD network of Turkey would allow better forecasting and inform responses to identified risks. As final remarks, it is recommended that Turkey should design SD strategies and policies in order to manage the nation branding and reputation, and to achieve sustainable competitiveness and long run growth.

Keywords: science diplomacy, collaborative research, evidence-based practices, Turkey

ÖZ

BİLİM DİPLOMASİSİ: BİLİM VE TEKNOLOJİ ALANINDA ULUSLARARASI İŞBİRLİĞİ İÇİN PROAKTİF POLİTİKA YAKLAŞIMI VE TÜRKİYE İÇİN ALTERNATİF MODEL ÖNERİSİ

Uygun, Zafer

Yüksek Lisans, Bilim ve Teknoloji Politikaları Çalışmaları Bölümü

Tez Yöneticisi: Yrd. Doç. Dr. İ. Semih Akçomak

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Bu çalışmanın en temel amacı; uluslararası bilim, teknoloji ve yenilik (BTY) alanında yeni bir işbirliği politika aracı olan bilim diplomasi (BD) alanında iyi uygulama örneklerine sahip ülkelerin takip ettikleri mekanizmaları incelemek ve ulusal politikaların geliştirilmesinde tatbik edilebilecek dersler çıkarmaktır. Bu amaca; "Ülkelerin BD alanında hangi aktiviteleri yaptıkları ve birbirlerinden nasıl farklılık gösterdikleri ve de Türkiye'nin BD politika aracından başarılı şekilde faydalanabilmesi için nasıl bir yapı oluşturması gerektiği" ile ilgili araştırma soruları cevaplandırılarak ulaşılacaktır. Çalışmada politika yapıcılar, akademisyenler ve BTY danışmanlarından oluşan 55 kişilik uzman grubu ile gerçekleştirilen görüşmeler ve örnek ülke incelemeleri ile elde edilen bilgiler incelendikten sonra Türkiye için model önerisinde bulunulmaktadır. Yenilikçi bir yaklaşım olarak özellikle iyi planlanan ve tutarlı bir BD stratejisine sahip ülkelerin sürdürülebilir bir rekabet ve gelişim aracı olarak bu girişimden daha fazla faydalandıkları sonucuna varılmıştır. Ayrıca, araştırma sonuçlarında elde edilen bilimsel bilgilerin kullanıldığı bir politika oluşturma sürecindeki paydaşlar olan kamu kurumları, üniversiteler ve özel sektörün birlikte daha gerçekçi, etkili ve uzun vadeli politikalar geliştirilebilmesine katkı sağlayacaktır. Devletler kanıta dayalı uygulamalara ihtiyaç duymaktadırlar. Türkiye'nin BD ağı, ülkemizin karşılaşacağı küresel risklerin önceden tahmin edilebilmesine ve zamanında tedbirler alınabilmesine imkan sağlayacaktır. Türkiye; marka ve itibar yönetimi ile küresel rekabet edebilirlik ve uzun dönemde büyüme konularında istikrar yakalamak için BD konusunda strateji ve politikalar geliştirmelidir.

Anahtar kelimeler: bilim diplomasisi, işbirlikçi araştırmalar, kanıta dayalı uygulamalar, Türkiye

To my beloved family and to my dear friend Ali KARAYAZI

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LIST OF ABBREVIATIONS

AAAS	American Scientific Progress Association
ADIT	Agence pour la diffusion de l'information technologique
AIRD	Institutional Development Researches Institute
BIS	Department for Business, Innovation & Skills
BTYK	The Supreme Council for Science and Technology
CERN	The European Organization for Nuclear Research
CIRAD	French Agricultural Research for Development
CNRS	The French National Centre for Scientific Research
CRDF	Civilian Research and Development Foundation
CSAP	Centre for Science and Policy
CSTP	The Council for Science and Technology Policy
DAAD	German Academic Exchange Service
DFG	German Research Foundation
DIHK	German Chambers of Commerce and Industry
DOS	U.S. Department of State Foreign Affairs
DRG	Center of Excellence on Democracy, Human Rights and Governance
ERA	European Research Area
FCO	Foreign & Commonwealth Office
HRK	The German Rectors' Conference
IFRE	The network of French Research Institutes Abroad
JSF	Jefferson Science Fellowship

MAE	The French Ministry of Foreign affairs
MEXT	Ministry of Education, Culture, Sport, Science and Technology
MOFA	Ministry of Foreign Affairs
MOSIT	Ministry of Science, Industry and Technology
NSTC	National Science and Technology Council
ODA	Japan Official Development Assistance
OES	U.S. Department of State
OSTP	The White House Office of Science and Technology Policy
PCAST	President's Council of Advisors on Science and Technology
SCST	Supreme Council for Science and Technology
SD	Science Diplomacy
SERI	The State Secretariat for Education, Research and Innovation
SET	Science, Engineering and Technology
SIN	Science and Innovation Network
SPRU	Science and Technology Policy Unit
TUBITAK	The Scientific and Technological Research Council of Turkey
NSTIS	National Science, Technology and Innovation Strategy
UMIFRE	Foreign Mutual Research Units
UNESCO	The United Nations Organization for Education, Science and Culture
USAID	US Agency for International Development
WR	German Science and Natural Sciences Council

CHAPTER 1

INTRODUCTION

Today, we witness an increasing trend towards internationalization of science, technology and innovation (STI) and cross-country differences in the extent of internationalization. Countries construct or restructure cross border joint operations through inventing, patenting, publications, mobility of human resources, outsourcing and offshoring of corporate research and development (R&D) activities, developing foreign funding for joint projects, and establishing R&D centres abroad. Organizations entail to locate the various stages of production across different countries.

Research, innovation, production and value added takes place in different locations. The information and knowledge used to comprehend, enhance and generate innovations are provided from global sources (Karlsson, ed., 2006). Moreover, differences in R&D costs, increased flexibility in handling cross-border R&D projects and major policy changes have also all favoured globalization (Edler and Boekholt, 2001).

Meanwhile, the global R&D landscape dominated solely industrialized and developed countries having majority of R&D investments and human resources for STI for a long time has been incrementally challenged directly linked to the growing and transition economies supplying and demanding more for knowledge and innovation.

In particular, high-mobility of researchers, employees with students and public-private investments in R&D in China, Brazil and India, are growing dramatically. These countries are having a strategic location in producing knowledge resources and as "innovation drivers, both because of their growing technology strength and their large and growing markets" (Battelle, 2011). Moreover, these countries' market are captivating or stimulating foreign direct investment in the field of STI and R&D. European, Japanese and U.S. companies have also implement and stimulate the cooperation activities related capacity building for STI in these countries (European Commission, 2009).

New knowledge and innovation geography are under the thumb of various factors. The changing of innovation process in terms of "more open and user driven approach with communications technologies, the increased international mobility and networking activities and the global challenges have favoured internationalization of STI. These factors have led to a more common practice of linking local innovation hubs within global knowledge networks.

Ability to take advantage of internationalization of STI for producing economic and social value is critical requirement of pre-requisites for the competitiveness and prosperity of countries (Auerswald and Branscomb, 2008).

Strengthening technological competencies and absorptive capacities, designing policies and other measures, providing optimal conditions favouring the attractiveness of constituencies such as firms and human resources to knowledge and innovation resources, and preserving a significant part of the value creation" arising from R&D and innovation are challenging aspects for governments (Archibugi, 1999).

Combined with global opportunities and challenges, a number of barriers currently prevents deeper international STI cooperation and hampers development of innovation capacities in many countries. These are inadequacies in the following subjects: communication channels between government, industry and universities; firms' capacity for absorption; approaches of firms in developing corresponding innovation and acquisition of foreign countries' technology; understanding of the working with foreign country's instruments, strengths and complementarities; culture for working effectively together, good quality national data, internationally comparable data and ex-ante ex-post evaluation studies respect to R&D/STI for evidence based policy making, insufficient government commitment and infrastructure for STI; organizational capacities (human resources, existence of duplications in policy instruments, poorly designed national STI policies, administrative burden).

Accordingly, promoting research commercialisation arising from universities; supporting to develop high growth of entrepreneurs such as start-ups; stimulating and supporting industry in terms of capacity and capability building in STI and R&D, concentrating on priority and thematic, or tailored based sectors; and developing critical mass comprising

researchers and institutions in STI and R&D in terms of quality and quantity be called structural barriers of Turkish national STI system (Erawatch Turkey, 2013).

Recently, Turkey has successfully participated in international STI cooperation by introducing specific STI and R&D mechanism and measures for priority areas in Turkey. The government's intensive efforts are unable to go beyond the national contexts and drivers. There are no comprehensive or tailor made research fields focusing on meeting global challenges through cross-border knowledge circulation. Hitherto, the mechanisms prioritized for international STI cooperation is generally implementing bilateral agreements and participating to framework programmes. That means only these mechanisms are employed to meet grand challenges (Erawatch Turkey, 2013). Combined with this, evaluation studies on aforementioned specific STI and R&D measures in Turkey have not been done yet.

In today's complex and dynamic international environment, Turkey obviously needs a clear international strategy in STI. This strategy and new policy measure must respond to these challenges in a coherent, practical and effective way. With regard to national capacity building for international STI cooperation and policy making, an evaluation mechanism having internationally recognized criteria is needed to establish as a part of policy making and programme design. Moreover, special policy instrument and tools initiating into internationalization and capacity building in a more systematic manner are incorporated to enrich existing policy instruments.

Many countries have recently initiated programmes international STI cooperation and have tried to design and implement a "SD Network" facilitating development, strategic management in new public administration, evidence-based policy making, increasing the return on their investment, implementing and evaluating of the international dimension of STI policies". Within a set of policy tools in international cooperation for STI, SD Network has emerged to be one of the most innovative and proactive intermediary tools in global governance of STI policy.

Within the scope of new public administration, governments try to adapt method and approaches pertaining to private sector. This transformation has featured prominently in Turkey's recent administrative reform efforts with the purpose of increasing efficiency to

the operation of public administration, and making possible to fulfil the duties of public administration in the best way (Görün and Emini, 2011).

In this context, having recognized the importance of designing international STI policies, developed countries and developing countries such as Turkey have nowadays attempt to revitalize their STI policies and take a number of major initiatives. Turkey has added to schedule to establish a SD Network with the intention of proactive policy approach to public administration within the scope of internationalization of STI policy as one of the most important steps.

Recently, a cooperation protocol on SD of Turkey between The Ministry of Science, Industry and Technology (MoSIT) and The Ministry of Foreign Affairs (MoFA) has been signed for collaborative research on common tasks and deepening reciprocal corporate affairs. According to the protocol, the necessary support and guidance to staff including science attachés, minister counsellors and science envoys of MoSIT will be provided by MoFA. Staff of MoSIT will perform these activities at diplomatic missions of Turkey to establish the necessary infrastructure for the benefit of SD.

> *Deadlocked Turkey's recent efforts of introducing specific policy measures to internationalization of STI can find new impetus. Now, the establishment and reinforcement of the SD Network for enhancing the learning capabilities, absorptive capacity, R&D and innovation capabilities of stakeholders in the country can be alternative policy measure for Turkey. Countries usually continue to learn from each other by networking mechanisms. The aim is not to create an unnecessary new global entity, but rather to provide a virtual hub and an 'umbrella' or 'brand' with which subsequent events and initiatives could be associated, whether through shared contacts, expertise, resources, or other means*[1].

With regard to adopt and design suitable strategies of the successful countries in building capacity in scientific and technological knowledge, managing structural transformation and sustainable development, the aim of this thesis is to investigate the mechanisms and

[1] Uygun, Z, Synthesis Report, Science Advice to Governments Conference, 28-29 August 2014, Auckland, New Zealand

patterns of operation followed by the countries having "good practice" in implementation, management and efficient utilization of STI network, and to recommend SD network for Turkey as a proactive international policy approach within the scope of STI.

This aim will be achieved by answering the main research questions:

- What activities do countries perform under SD; how they are different from each other?
- In comparison to other countries, how should Turkey structure the activities for successful SD?"

Specific objectives are defined to give sense to the overall research:

- At first a critical review of literature and country experiences in terms of national policy measures and policy implementation for international cooperation in STI will be undertaken. Moreover, any existing relationship between foreign branches or subsidiaries running by internationalisation strategy and policy implications for national STI systems will be examined through understanding the rationales of governments intervention into internationalization of STI policies,
- The second objective is to examine differences in approaches of the countries to internationalization of STI policy.
- The third objective is to find out the implications and perceived benefits stemming from of science diplomacy initiative to international STI cooperation and how the scientific results obtained from international network mechanisms used as a policy measure,
- The fourth objective is discussing the SD network experiences of countries with an expert panel comprising representatives from the government, universities and industry to develop the conceptual model for Turkey,
- The final objective is offering an insight to the methodology for internationalisation strategy for Turkey's STI cooperation by synthesising best practices into designing and implementing the "SD Network" responsible for feeding scientific advice to policy stakeholders.

According to interviews and comprehensive literature review realized in this study, international STI cooperation and internationalization of policies are eminently focused up to the present. The studies including knowledge or comparative findings providing recommendations about international governance of STI, and instrument employed to promote capacity are insufficient.

There is no comprehensive study as theoretical, conceptual and practical in Turkey to design internationalization strategies and policy instrument. Meanwhile, limited countries have specific internationalization strategies and foreign branches or networks. Introductory research is needed to inform the design and implementation of SD network as a tool for a proactive policy approach.

To address this gap, this thesis contributes to the international cooperation in STI literature in along four novel ways.

First, this thesis is the first study in Turkey to comprehensively investigate the SD and SD Networks with regards to stimulate international STI cooperation and national capacity building.

Second, the methodological design in conducting this study is novel. Important insights into the internationalization STI cooperation for Turkey have been successfully generated from this study using different methods to gather and analyse the data.

These methods include comprehensively document studies, in-depth interviews with 55 key informants (science counsellors, policymakers, academics, senior advisors and industry positions), and comparative analysis of ten case studies having “good practice” in efficient usage of SD Network for national capacity building in STI and economic development.

The study offers important insights into methodology for internationalisation strategy for Turkey’s STI cooperation by synthesising best practices of the most active countries into designing and implementing the SD network responsible for feeding scientific advice to policy stakeholders.

In order to identify the most active countries based on wide range of policy tools to international STI cooperation, this study applies additional proxies including "located of the target region of Turkey, existence of a dedicated formalised internationalisation strategy, operation infrastructure, employment policy, types of staff, approaches to SD, foreign branches, geographical, and thematic priorities for cooperation" etc.

Third, this thesis presents novel taxonomies of the critical of policy domains, drivers, goals, and instruments of STI policy actions of international STI cooperation. Any existing relationship between foreign branches or intermediaries as strategic intelligence unit running by internationalisation strategy and policy implications for national STI systems are examined through understanding the rationales of government's intervention into internationalization of STI policies.

Lastly, the study provides an alternative model for international cooperation in STI through the right sequencing of design and implementation of the SD network of Turkey.

This study is organized as follows. Chapter 1 outlines background, rationale, novelty and contribution, research objectives and research questions of this thesis. Chapter 2 provides brief descriptions of some of the major terms and concepts highlighted in this study regarding countries' motives for international STI cooperation. Following, departing from theoretical perspectives having rationales for policy measure within the scope of STI policies, the grounds for science diplomacy is presented. Chapter 3 clarifies the research methods in performing this study. It also gives information approaches and techniques to collect and analyse the data, limitations, ethics and nature of verification. Chapter 4 provides country case studies portraying implementation, management and efficient utilization of STI network in priority areas directly linked to the SD, policy making, capacity building, and sustainable growth, etc. Chapter 5 presents overall findings of our qualitative analysis including comparative analysis of country case studies, and in-depth and open-ended interviews. Chapter 6 gleans useful lessons from the findings of the preceding chapter for effective and efficient utilization of worldwide network It describes the importance and contribution of this study for national capacity building. Lastly, it provides an alternative model toward the establishment and reinforcement of the national SD network.

CHAPTER 2

LITERATURE REVIEW AND THEORETICAL PERSPECTIVE

This chapter provides brief descriptions of some of the major terms and concepts highlighted in this study regarding countries' motives for international STI cooperation. Departing from synthesis of theoretical rationales for public intervention into internationalization of STI policies, an insight is offered into the methodology for SD Network as a new policy measure within the scope of STI.

2.1. OVERVIEW OF INTERNATIONAL STI COOPERATION

In the last decade, countries increasingly need to different mechanisms employed in international STI cooperation. Accordingly, we witness an increasingly trend towards internationalization of STI and cross-country differences stemming from approaches and strategies followed by countries.

2.1.1. International STI cooperation

International STI cooperation is a long term and comprehensive process or mechanism that comprises a wide range of activities involving "creating of knowledge, developing national capacity enhancing innovations, designing and implementing policy measures strategies, and programmes, joint initiatives serving geographic and thematic policy objectives and expectations, knowledge transfer, integration of policy and funding bodies, regulatory issues, eliminating barriers to internationalization, inward and outward investment, international use and cost sharing of data and infrastructure.

Moreover, the cooperation between countries having owned priorities comprises "joint publications, research and calls for new investment projects, and the international mobility of students and researchers".

Another important issue is the location (at home or abroad) where aforementioned activities related to cooperation are realized. At home, countries can develop and put on

the market their innovation output stemming from R&D efforts by taking advantage of foreign input such as know-how, human resources or infrastructure. However, countries might prefers to make use of only local resources. In this case, the "licensing necessity or selling pressure" make countries to exploit/ look for global markets. These actions realize in the scope of internationalisation of technology development and innovation.

Consequently, the process of internationalization of STI indicates that while obtaining unavailable resources from cross border to exploit in terms of national capacity building or taking advantage of them is realized on the input side, outputs acquired by joint-initiatives, research, and sharing know-how, etc. form on the output side (European Commission, 2012).

2.1.2. The Drivers for International STI Cooperation

The internationalization process for STI policies is under the thumb of various drivers. In the field of STI, higher dependence on external sources, international collaboration, and networking activities are occurred (CREST Working Group, 2007). Departing from countries' perspectives having rationales for policy measure within the scope of STI policies, "narrow STI cooperation paradigm" and the "broad research cooperation paradigm" can be differentiated (European Commission, 2009).

In the "narrow STI cooperation paradigm", promoting quality and capabilities of critical mass comprising researchers and institutions in STI and R&D by networking resources and knowledge between countries, and increasing the scale and scope of the research activities are the main drivers. Home country aims to attain the cutting edge knowledge and technology abroad, critical mass and expertise.

Alongside the intrinsic drivers in the narrow paradigm, non-science policy objectives are followed in the broad paradigm. These are contributing "national competitiveness and innovation, building capacity for less developed countries by developing STI capabilities, meeting global societal challenges, and creating good and stable diplomatic relationships" as well.

Along these lines, in 2012, the report of the expert group working for European Commission on the purpose of supporting "EU international STI cooperation strategy"

states that drivers and challenges encountered differs from industry to general cooperation in STI. According to the report, firms increasingly access scientific sources outside due to the globalisation of the economy, reduction of communication expenses, and progressive cross-border exchange in knowledge related to R&D and STI, the growth in transport systems and reduction in transport cost.

Combined with these trends, advances in ICT allows government and business to orchestrate the international STI cooperation activities by employing new mechanisms such as knowledge transfer. Recently, global governance of research agendas of countries are intensified by policy makers to stimulate internationalisation of industry, education, and research. Lastly, many countries have initiated to develop business environment to attract foreign direct investment related to STI and R&D (Kaiser, 2010). Consequently, firms and countries build STI and R&D networks allowing to obtain distributed know-how, experiment and expertise more favourable conditions (European Commission, 2012).

2.1.3. Policy Rationales / Goals for International STI Cooperation

A general economic rationale for STI policies including scientific invention, technological innovation, technological diffusion, convergence, successive catch-up and growth is that lead to technological progress as a crucial determinant of economic growth.

The rationales as the broad policy goals including "achieving research excellence; attracting/retaining/developing human resources for science & technology; improving competitiveness and innovation; science diplomacy; STI capacity building; tackling societal issues and challenges; support to policy dialogue and priority setting; networking and partnership building; set common rules and regulations; assessment and monitoring; dissemination and outreach" underlie international STI cooperation (Edler and Boekholt, 2001). A range of objectives for policies will be detailed mapped onto goals in Chapter 5: Findings and Analysis.

2.1.4. Policy tools for international STI cooperation

International STI cooperation is accommodate with a wide range of instruments including "bilateral and multilateral agreements, joint thematic research programmes, joint funding of research infrastructures, exchange programmes, grant and fellowship programmes,

participation in the framework programmes by member or joint consortium, joint funding of physical research centres in a particular location, specific collaboration programmes aimed at creating market opportunities for innovation and/or commercialisation of domestic technologies in a particular country, opening up of national programmes to attract STI investment/ collaboration of foreign public or private research organisations, technology foresight programme", international science year, information and brokerage services abroad including science and technology attachés, collaboration with trade agencies, international network, foreign branches or subsidiaries" (European Commission, 2009).

2.1.5. Science Diplomacy (SD): Characterizing the Phenomenon

Begin with development a working definition of SD, specify tangible initiatives, enhancing the common language between policy makers and scientists, and persuade stakeholders to gain favour with using SD policy measure in international STI cooperation in the long-term are the first and foremost challenges of SD include.

SD already facilitates to be informed of country specific strategies, programmes and policies related to STI, initiates and implements good relations with countries having problems (Fedoroff, 2009).

SD has the critical potential to encounter the national scientific climate in partner countries as well as to gain an additional foreign policy instrument. Moreover, designing and implementing SD policy instrument in international STI cooperation provide consistency within the countries having a wide range of motivations and political conditions (Fedoroff, 2009).

SD Network, performing the activities under SD, concentrate on building capacity in developed or developing countries to meet more effectively global concerns. Particularly, the Network performs three main activities including policy analysis; capacity enhancement, promoting quality and capabilities of critical mass comprising researchers and institutions in STI and R&D (UN, 2003).

Meanwhile, it is more proper to define SD is an international policy instrument executed at three different dimensions “science in diplomacy, diplomacy for science, and science for diplomacy”.

The first dimension of SD, “science in diplomacy” can be explained by policy and decision making through using scientific evidence. This can be enabled by attaching importance to the recommendations of scientific experts to policymakers. Policy makers can benefit from scientific community to get updated information on various issues such as economic systems or social structures of different countries. Additionally, experts can also inform and warn the policymakers of the existing uncertainties and of the background of the existing situations in order to prevent policy makers making bold decisions (The Royal Society, 2010).

The first dimension of SD requires building capacity at personal and institutional level to enable efficient delivery of scientific advice from the scientific expert to the policymakers. It means that the policy makers should have the capacity to understand the focus of the recommendations made by the scientific experts and scientific experts should have the necessary channels of communication to have access to policy makers. In addition to the use of scientific information for the policy-making, that form of SD contributes to the creation of a real understanding about the limits of science for policy making. In accordance with this, it helps policy makers to design policy not including unreal expectations stemming from both the groundless perception about the limits of science and about the debasing attitude towards the contribution of science to policy making (The Royal Society, 2010).

The second dimension of SD, “diplomacy for science”, serves for establishing international STI and R&D cooperation” through a much easier way. This dimension provides researchers with many opportunities to establish new partnerships, conduct projects having high level budget, and enhance infrastructure. It allows for the creation of new networks among foreign researchers and research institutions. In order to create new partnerships, scientific community is in the need of working communication channels and diplomacy facilitates their getting into interaction with each other through several instruments, such as contract negotiations or bilateral and multilateral S&T agreements for joint research projects (The Royal Society, 2010).

In addition to the benefits for the scientific community, partnerships established through SD efforts also enable countries attain the "researchers, research findings, facilities, natural resources, and capital". This contributes to capacity enhancement for STI since they get the opportunity of following international research and development activities, learning about new technologies, having access to new markets, and attracting new brains (Flink and Schreiterer, 2010).

Moreover, establishing scientific relationships with different nations allows countries to ameliorate their image due to their success in science and technology. As the states promote their achievements in R&D, they become centres of attraction for international scientific community and it leads to new incentives among states to cooperate. With the awareness of the abundance of their gains through having access to others' research and development capabilities and through promoting a positive image based on its level of development in science and technology, states get motivated to establish scientific and technological relationships (Flink and Schreiterer, 2010).

The third dimension of SD, "science for diplomacy, concentrate on using science cooperation to improve relations between countries (The Royal Society, 2010). It is not being too distinct from the second dimension of SD, this dimension functions through the attractive power of science for the countries as a necessary asset for achieving their development. Since states have become aware of the role of science for their development in several aspects from economics to industry, from social structure to political culture establishing scientific and technological cooperation has become essential (Sütçü, 2013).

Science for diplomacy operates through the mechanisms established by the diplomacy for science. With the establishment of cooperation mechanisms between scientific people from different nations in order to pursue scientific and technological goals, science for diplomacy starts to function. Through the interaction between scientific communities of countries, people from different countries encounter with each other and get the possibility to learn about each other on a real ground.

In addition to the opportunity of knowing the other within a cooperative relationship, scientific and technological partnerships also allow the global spread and assertion of civic values. Sharing a common goal under the umbrella of R&D activities without considering the national interests or cultural differences, scientific people learn to respect each other, consider transparency, attach importance to rationality, show tolerance towards each other, and make assessment on merit-based rather than making biased evaluations (Brookings Institution, 2005).

Embracing such values as a result of the scientific research conducted in an international manner offers a departure point to find a common position regarding conflictual issues (Flink and Schreiterer, 2010). As science favours a non-ideological environment for the participation and free exchange of ideas between people , regardless of cultural, national or religious backgrounds" (The Royal Society, 2010), finding a common ground on which negotiation becomes possible is much easier.

Nevertheless, witnessing the benefits of this form of SD takes much longer time than the other forms of SD. Besides establishing collaborative relationships based on science and technology, development of lasting and stable relationships between foreign publics necessitates the presence of various activities and in a continuous manner. It is to say that presence of outreach mechanisms such as "training, seminars, conferences, language teaching, scholarships as well as international scientific, educational and cultural exchanges" (De Lima, 2007) between nations does not suffice. Their continuity does also matter.

Therefore, rather than short-term interactions, international scientific, technological, cultural, and educational relations are vital to enable foreign publics get unbiased perspective about each other's values, beliefs, and attitudes.

2.1.6. Networking

Networking, the fundamental subject or mechanism encountered by governments during this study, is institutionalization and orchestration how "to conceptualise, configure and manage nodes including public, private and non-profit providers" (OECD, 2003). The use

of network structures is increasing as sources of knowledge in themselves, as organisational structures to improve effectiveness, and as sources of innovation.

> *More and more of the innovation process takes place in networking as opposed to hierarchies and markets… only a small minority of firms and organisations innovate alone, and… most innovations involve a multitude of organisations*[2]

Recently, international networks have dramatically produced new knowledge. Within the scope of knowledge creation networks provide learning abilities. Networks work as a mechanisms producing and evaluating tacit knowledge. Moreover, the networks intervene codified knowledge by developing the needed complementary tacit knowledge and explicative meanings (OECD, 2003).

The issue of quality and quantity of a country's networks in terms of quality and quantity has the critical importance for generating competitive advantage in STI and increased value added. Linking stakeholders including experts, organizations, public and private providers from a prioritized or thematic sector provide individual companies to raise the efficiency and performance at their personal activities, with lower production cost, more opportunities for STI and outputs, barriers reduction for new entrepreneur's participation.

International activities and strategic approaches such as "branding, marketing, distribution, advanced production processes, and the production of sophisticated products" realized in international STI cooperation by business sector diffuse the overall economy in significantly different ways including specializing in technology and learning smart business models across the country's business sectors (World Economic Forum, 2014).

2.2. THEORETICAL PERSPECTIVE

Revealing economic rationale for government intervention underlies in designing policy measures (Salmenkaita and Salo, 2002). A general economic rationale for STI policies including scientific invention, technological innovation, technological diffusion,

[2] Lundvall and Borrás, 1997

convergence, successive catch-up and growth is that lead to technological progress underlying of “economic growth”. STI policies and innovation systems as an important tool for countries trying to foster economic growth rest on a set of policy tools initiated by the government that aims to affect the process of technical change by intervening in the path and diffusion of technical change.

> *For the technology development and assimilation capacity of economy to be improved, comprehensive industry, STI policies are needed as well as an efficiently working national innovation system. The attempts, which are made for developing the STI infrastructure and technologic innovation capacity to secure the long-term economic development, must be sustained in a successful way by supporting with new policies and tools[3].*

This section focuses two theories having different rationales of economic growth. They are “neoclassical” and “evolutionary” (Lipsey and Carlaw, 1998). This study does not include all of the background information about these theories of STI. Therefore, this part generally presents the rationales of government intervention into internationalization of STI policies and the synthesis of rationales for informing the design and implementation for SD Network.

2.2.1. The Neoclassical Rationale for Public Intervention in STI Policy

First and foremost argument, the neoclassical market failure theory has simplicity characteristics. The general policy implications generating from the theory is “abstract” enhancing the policy design of STI or R&D. According to these implications, government have no idea how to intervene and which area (Edquist, Malerba et al. 2004). While the economic structure or institutional frameworks enabling STI activities are overlapped in the theory, developed policies are implemented for the economy as a whole.

Another basic assumption in neoclassical approach is perfect information. Due to having perfect information by all parties in the economy, it is believed that all parties are able to enrich the rate of return themselves. Depending upon specific conditions of firms,

[3] Evenson and Westphal, 1995

knowledge might be "codified, generic, accessible and easily adaptable" (Nelson, 1959 and Arrow, 1962).

Along with the perfect information, equilibrium is essential in this approach. Under the conditions of "perfect information, perfect competition and profit maximization", market is in tendency to achieve equilibria. On the purpose of reducing undesired "externalities and asymmetries in information", the interventions concentrate on inefficient market structures for adjustment or removing the barriers to market entry aiming to reach targeted equilibrium are intervened by the government (Lipsey and Carlaw, 1998).

According to the neoclassical theory, the reason of under-investment in STI infrastructure is knowledge acquiring from the research. These knowledge is "uncertainty, inappropriability and indivisibility" (Nelson, 1959).

The interventions primarily concentrate on market failure (under-investment in STI infrastructure). Therefore, the resources cannot be allocate optimal to develop technology and innovation (Chaminade and Edquist, 2006). The theory assumes that new research efforts enhancing technology and innovation is under the assumption of "a fixed sequence of phases", and a new products can be obtained by the result of research efforts. How to transform the results of the research activity into products or processes that can be used in the economy is a black box[4].

2.2.2. The Evolutionary Rationale for Public Intervention in STI Policy

Whereas the neo-classical view takes the technological resources and capabilities of the firm as given and proposes policy tools to maintain efficient resource allocation, the evolutionary view concentres on enhancing capacity and capability of the firm and the system as a whole. In this view, the interventions primarily effort to create an infrastructure and knowledge capacity enabling the market (Schumpeter, 1934).

The basic assertion of the evolutionary view is that the process of technical change is not linear. It is established more on a complex system composed of different firms and

[4] Rosenberg, 1982

related economic agents interacting with each other. It is this complex system that is in the core of the evolutionary view on technology policy.

In this sense the following policy objectives are raised (Taymaz, 2001):

- Setting the environment for entrepreneurship and innovation,
- Encouraging firms and economic agents to interact with each other,
- Increasing the capability of the firms,
- Enabling the transfer of knowledge through network type organizations.

While information asymmetries account for market failure in the neoclassical rations, but, the essential in the evolutionary approach is asymmetric information enabling novelty and variety (Chaminade and Edquist 2006).

The evolutionary theory puts the emphasis on "innovation and diffusion are collective, cumulative, path and context-dependent processes" (Metcalfe, 1995).

The cycle of designing and exploiting any kind policy measure is a complex and interactive process with different implications within the organisations. These implications underlie in designing policy measures' focus (Chaminade and Edquist, 2006). Policy measures and interventions have critical role within the scope of catalyse learning processes and experimental behaviour. Different authors determine and state specific expressions including "system dysfunctions, lock in situations, technology or knowledge gaps, to denote problems that limit the cognitive capacity of agents" (Lundvall and Borras, 1997, Teubal, 1998).

Various authors, Carlsson and Jacobsson (1997), and Smith (2000) paid attention to these system dysfunctions covering infrastructure and investment problems (the physical infrastructure, the scientific infrastructure, and the network infrastructure), transition problems (technological problems exceed firms' current capabilities), lock-in / path dependency problems, hard and soft institutional problems, network problems (weak linkages or blindness to what happens outside), capability and learning problems failure, unbalanced exploration-exploitation mechanisms, complementarity problems .

2.2.3. Systemic Policy Instruments

To improve the functioning of entire systems, systemic policy instruments are applied. Systemic instruments are “methods and mechanisms used by governments to organize, coordinate and direct innovation systems”.

In line with evolutionary perspective, these systemic instruments contribute to the following conditions the non-existence of which causes innovation system dysfunction. These conditions are boosting the participation of various actors; enhancing conditions for learning and experimenting; triggering interaction between actors; building interfaces; taking measure for lock in; strengthening the existence of (hard and soft) institutions; triggering physical, financial and knowledge infrastructure; and enhancing adequate infrastructure (Wieczorek, Hekkert, Smits, 2010).

2.2.4. From Rationales to Instruments: Synthesis of Rationales for Public Intervention for SD Network

Within a set of policy tools in international cooperation for STI, SD Network has emerged to be one of the most innovative and proactive tools in global governance of STI policy. Many countries have established international network for certain aims, which will be discussed in detail in the next chapters. This policy instrument is rooted from both neo-classical and evolutionary perspectives.

The rationale of intervention is to optimise “the contributions of innovation and technology diffusion” for the economy as a whole (OECD, 1998). As an example, building networks aims to advance the transfer of knowledge and technology between institutions, government, and industry, and to exploit the agglomeration economics. This aim apparently conforms to the evolutionary view. Another aim is to support the firm with both direct subsidies to R&D and indirect forms of subsidies like tax-exemptions. This is nothing but increasing the private return over social return, which is in line with the neo-classical view.

In terms of the “foresights and trend policy studies; roadmaps; intelligent benchmarking; SWOT analyses; sector and cluster studies; problem/needs/stakeholders analyses; consultancy services; knowledge management techniques and tools; knowledge transfer

mechanisms; policy intelligence tools, stimulating and supporting cooperation projects in the area of university or industry research and development with a special focus on the transfer of technology and the mobility of the researchers, building and maintain institutional networks, and implementing the systematic external representation to foresight the emergence of new pervasive technologies or significant changes in the market" apparently conforms to the evolutionary view.

Furthermore, reducing uncertainty and asymmetries for diffusion of information, supporting the industry and academia producing of output as scientific public good, boosting capacity and infrastructure to learn, assimilate, or generate new technologies with both direct subsidies to R&D, and indirect forms of early identification of issues that require specialist advice emanated from scientific advisory system for the soft institutional problems. This is nothing but increasing the private return over social return, which is in line with the "neo-classical view".

Policy measures and interventions developed in SD Network, are utilized in terms of the system of innovation approach. Policy measures including concentrating on "capacity building and social nature of innovative process"; providing conditions for "acquiring, adapting, using and exploiting knowledge (i.e. learning)" within/ between organizations conform to the evolutionary view.

Table 2.2 in the next page summarizes the two approaches and synthesis of rationales for SD Network as a public intervention.

Table 2.2: Synthesis of theoretical rationales for STI policy and SD Network

	Neo-Classical Theory	SD Network	Evolutionary Theory
Fundamental Assumptions	» Perfect competition market environment » Production technology with constant returns to scale » Optimum equilibrium » Complete information	» Not only one equilibrium point » Asymmetric information » Tacit knowledge	» Monopolistic competition » Not only one equilibrium point » Asymmetric information » Tacit knowledge
Focal Point	» Optimal allocation of resources	» Creating a framework providing evidence based consulting	» Creating information sources, interaction and networks in innovation processes » Creating the legal and institutional framework that regulate the market
Fundamental policy fields	»Science policy (research)	»STI, R&D policies, programmes, incentives, consulting	»Technology and innovation policies, national innovation capacities
Consideration of technology	» Technology as information incorporated in capital investment »Linear process of innovation	»A complicated process when all the phases are engaged	»Broad. Technology as applied knowledge »A complicated process when all the phases are engaged
Rationale for public intervention	» Market failures » Information transmission failures » Appropriability failure » Procurement of (radical) technologies » Creating the legal and institutional framework for the market economy	» System failure » Institutional failures » System dysfunctions » Learning failures » Cognitive gaps	» System failure » Institutional failures » System dysfunctions » Learning failures » Cognitive gaps » Blockin » Lack of diversity
Objective of intervention	» Substitute for less than optimal use of resources » Lower the costs of innovation (invention) , » Facilitate the exploitation of existing knowledge » Strengthen capacities of knowledge creators (universities, public R&D institutes, human resource development)	» Strengthen capacities of knowledge creators Networking » Creating institutional framework » Strategic perception management and promoting country brand	» Overall coherence of the system, roles and function of actors » Avoid lock-in » Increase cognitive capacity » Improve diversity and selectivity » Support capability building of actors » Networking especially enhancing knowledge flows, » Creating institutional framework facilitating collective learning of actors
Level of Public Interventions	» Centralised - national level	» Multilevel	» Multilevel
Role of Policy Makers	» Compensate for less than optimal private investment » Optimise resources	» Advise, » Assist, » Negotiate » Strategic intelligence unit » Observation and foresight service	» Coordinating the innovation system, help in networking » Identification of technology specific failures » Design of segmented targeted intervention- adaptive role
Example for Policy Instruments	» Supply side policies supporting the firms » Subvention and tax incentives in R&D activities » Science and technology parks » Installing the local advance technology infrastructures	» Policy intelligence tools (policy monitoring » Awareness building measures » Information and education campaigns » Lobbying	» Systemic policy approach depending on removing the structural problems and operation of system in a harmony » Subsidies and tax incentives to R&D » Technology infrastructures » Extension services » Proactive intermediation brokerage (translation of implicit knowledge)

CHAPTER 3

RESEARCH METHODOLOGY

This chapter clarifies the research design and the research methods employed in this study. It also gives information approaches and techniques to collect and analyse the data, limitations, ethics and nature of verification.

3.1. Research Design: Qualitative Research Approach

This study has a research design comprising five components for the coherent research management: research goal, conceptual framework, research questions, methods, and validity. Illustrating the research approach is as an effective strategy to increase the validity of social research (Cresswell, 2007).

As a qualitative study, activities influencing all of the research comprises of "collecting and analysing data, developing and modifying theory, elaborating or refocusing the research question, and enhancing the validity and reliability" are realized in this study. Moreover, the research design are modified or the research questions are reconsidered in line with the requirement of researcher (Maxwell, 1992).

As explained in the previous section, different drivers have led to the increasing internationalization of STI policies have been arisen from a wide range of drivers. SD networks has emerged to be one of the most innovative and proactive tools in global governance of STI policy. There are limited countries having specific internationalization strategies and few publications providing insights on the global governance of international STI network as well as the neglected integrative approach to the relationship between foreign branches or subsidiaries and policy implications for capacity building.

Introductory research is needed to inform the establishment of SD Network as a tool for a proactive policy approach as inputs in capacity building in scientific and technological knowledge and economic development. To address this gap, this study will contribute to the methodology for internationalisation strategy of Turkey's STI cooperation by

synthesising best practices into designing and implementing the SD Network responsible for feeding scientific advice to policy stakeholders including governments, universities and industry.

Because of such reasons, the qualitative data analysis is configured in this research in order to develop understanding on the issues discussing in the study by benchmarking country case studies and gathering in depth meanings. Meanwhile, the research questions and sub-questions were developed to find out the answers in the analysis of findings from comparative analysis of case studies and interview.

The aim of the study is to investigate the mechanisms and patterns of operation followed by the countries having "good practice" in implementation, management and efficient utilization of STI network, and to recommend SD network for Turkey as a proactive international policy approach within the scope of STI.

This aim will be achieved by answering the main research questions:

- What activities do countries perform under SD; how they are different from each other?
- In comparison to other countries, how should Turkey structure the activities for successful SD?"

Specific objectives are defined to give sense to the overall research:

- At first a critical review of literature and country experiences in terms of national policy measures and policy implementation for international cooperation in STI will be undertaken. Moreover, any existing relationship between foreign branches or subsidiaries running by internationalisation strategy and policy implications for national STI systems will be examined through understanding the rationales of governments intervention into internationalization of STI policies,
- The second objective is to examine differences in approaches of the countries to internationalization of STI policy.
- The third objective is to comprehend the implications and perceived benefits of exploiting the science diplomacy initiative to international STI cooperation and

how the scientific results obtained from international network mechanisms used as a policy measure,

- The fourth objective is discussing the SD network experiences of countries with an expert panel comprising representatives from the government, universities and industry to develop the conceptual model for Turkey,
- The final objective is offering an insight to the methodology for internationalisation strategy for Turkey's STI cooperation by synthesising best practices into designing and implementing the "SD Network" responsible for feeding scientific advice to policy stakeholders.

In total, 55 key informants ranging from science counsellors, policymakers, academics, senior advisors and industry positions, took part in this study. The interviews were conducted in 2014 from January till September.

3.2. Data Collection Process – Instruments

There are many approaches to conducting qualitative research. In this research, case study and grounded theory approaches have been adopted in order to analyse the qualitative data. These approaches enhance a richer "contextual insight and an in-depth understanding of processes" in disregarded in previous studies (Strauss & Corbin, 1994, Rothaermel et al., 2007).

3.2.1. Case Studies

Case study research allow researchers to comprehend issues in the study and to strengthen the present findings stemming from previous research by detailed contextual analysis of a limited number of initiations, systems and their relationships.

By studying multiple case studies, the differences and similarities between cases can be determined to attain the richest possible understanding of approaches (Yin, 2014). Document analysis or website analysis, semi-structured interviews, observation (direct and participant), archival records, and focus groups are applied to provide robust and reliable analysis for comparative case studies.

Within the context of the adoption of the case study approach to this research, ten countries exploiting the policy instruments and strategies in internationalise of STI policies are presented. In this research, the phases "determining the research questions, selecting the cases, determining data gathering and analysis techniques, collecting data, evaluating and analysing, and preparing the report" were followed the step by step organizing and conducting the research. Combined with summary results from methods used in comparative analysis of case study research, distinct characteristics of each country and policy recommendations are implemented.

3.2.2. Selection process for the most active countries

On the purpose of identification of the most active countries, "a preliminary screening" was performed in this study. There are only a few countries that have developed specific internationalisation strategies. Therefore, additional criteria were needed to determine the most active countries in STI internationalization are proposed:

- located of the target region of Turkey,
- existence of a dedicated formalised internationalisation strategy,
- operation infrastructure,
- types of staff career diplomats, seconded staff, or recruited staff
- locally engaged experts for international network
- approaches to science diplomacy,
- foreign branches of international network
- management structure international network,
- geographical and thematic priorities for cooperation.

In order to select the most active countries in terms of SD, the STI cooperation characteristics for the countries were screened. Moreover, additional sources were applied to obtain more findings of the county case studies. The available official governmental, ministerial databases that give an overview of key policy documents, programmes and instruments, strategy papers, specific sectorial studies, actors, agreements, outputs, and progresses in international STI cooperation, web sites of networks and institutions, publication including the books, bulletin, magazines,

notifications, official and semi-official documents were used as the main secondary data sources.

With the intent of labelling trends in international STI cooperation, an in-depth analysis of most active countries are realized based on “collation and analysis of documentation, official databases, and interviews with key informants” in these countries. Moreover, in line with new inputs and comments provided by the additional experts, data, anticipated impacts and perceived benefits, understandings, relations, questions, and evaluations are modified and refocused to final study.

Table 3.2 summarizes the information retrieved from the above-mentioned sources. This table will be discussed in more detail in Chapter 5.

The selected countries are France, Germany, Netherlands, United Kingdom, Switzerland, Denmark, Finland, Hungary, United States, and Japan.

Table 3.2: Selection process for the most active countries

	DK	FI	FR	DE	HU	JP	NL	CH	UK	US
Located of the target region of TR	O	O	O	√	O	√	O	O	O	√
Formalised internationalisation-focused STI cooperation strategy	O	√	√	√	√	√	O	√	√	√
Specific Identified Agency in Charge of International Cooperation Activities	√	√	√	√	√	√	√	√	√	√
Strategic partnerships with key countries, accompanied by significant budgets	√	√	√	√	√	√	√	√	√	√
Foreign branches	√	√	√	√	√	√	√	√	√	√
Operation Infrastructure	OP + E	OP	E	OP	E	E	E	OP	E	E
Management Structure	Multiple actors	Multiple actors	Multiple actors	Multiple actors	Multiple actors	Multiple actors	Multiple actors	Multiple actors	Multiple actors	Multiple actors
Types of Staff career diplomats / seconded staff / recruited staff	Seconded /recruited staff	career diplomats / seconded / recruited staff	Seconded /recruited staff	career diplomats / seconded / recruited staff	Seconded & recruited staff	seconde d staff	career diplomats / seconded / recruited staff	career diplomats / seconded / recruited staff	career diplomats / seconded / recruited staff	career diplomats/ seconded / recruited staff
Locally engaged experts	O	O	√	√	O	O	√	√	√	√
Approaches to SD	DfS-SiD	DfS-SiD	DfS-SiD-SfD	DfS-SiD	DfS-SiD	SiD-SfD	DfS-SiD	DfS-SiD-SfD	DfS-SiD-SfD	SfD
Geographical-Thematic priorities for cooperation	√	√	√	√	√	√	√	√	√	√
Outreach activities	√	√	√	√	√	√	√	√	√	√
O = not existing or explicit √ **=** existing OP=Own Premises E=Embassy DfS= Diplomacy for Science SiD= Science in Diplomacy SfD= Science for Diplomacy										

3.2.3. Conducting Interviews

One of the main types of qualitative data collection methods is the interviews (Bless & Higson-Smith, 2000). During the comparative analysis for multiple case studies, the series of interviews conducted with the key informants (Appendix A) including science counsellors, policymakers, academics, senior advisors and specialists, exclusive agents of private sector, and researchers in S&T centres in the selected countries were applied as the main data source.

The bulk and backbone of data in this study derived from more than 55 semi structured, in-depth and open-ended expert interviews with key informants having a wide range of experience in both STI policy, networking, and decision-making at universities, selected countries' embassies, liaison officers or representatives of S&T agencies in Turkey's target regions.

The interviews included entirely open and close ended questions comprises three phases:

- Interviews with policy makers and advisers to policy makers: A total of 19 interviews were conducted. The subjects of these interviews roughly were: evidence based policy making, strategic approach to international STI cooperation, policy measures utilized to trigger international STI cooperation and impacts assessment , rationales and targets of policies.

- Interviews with academicians and universities network: A total of 9 interviews were conducted. The subjects of these interviews roughly were: evidence based policy making, participative and proactive policy approach, appropriate intermediary bodies between government and universities, creating networks of researchers, policy officers, practitioners and representatives from civil society in order to encourage a participative and proactive approach

- Interviews with diplomatic missions for science and international networks for STI: A total of 27 interviews were conducted. The subjects of these interviews roughly were: worldwide networks mechanisms, actors responsible for management and governance structure, profile of the employees, employment

strategy, policy priorities, geographic priorities, thematic priorities, main activities of networks, foreign branches or subsidiaries

In interview sessions, notes were taken and these notes were systematically edited and interpreted. When needed the interviewees were contacted a second time for clarification and having ideas which helped informing a well-structured analysis. Along with the interview questions covering topics discussed above (Appendix B), relevant new questions were incorporated naturally into the flow of the interview.

Interviews highlights some of the key issues which need to be considered in the internationalization process of the STI policy. The actions needed to support the strengthening of dialogue between researchers, policy-makers and private sectors' representatives to implement a "SD Network" working worldwide were identified.

3.3. Data Analysis, Limitations and Ethics

Firstly, according to main research objectives and questions, each interview have been processed on draft finding and analysis report to categorize. Within the context of the adoption of the grounded theory approach to this thesis, the research intensively began to forms preliminary categories of information about the activities for SD. Then, these categories were brought together into groupings. These groupings allow the researcher to generate similar themes and to comprehend the policy tools. Lastly, "the categories and themes were organized and integrated in a way that articulates a coherent understanding" of the SD Network.

In the data analysis process, in terms of verifying information and receiving feedback from informant, findings and analyses prepared by using the data obtained from the research methods applied were sent to the interviewees through implementing an electronic mail group. Enhancing partially findings for experts to critique was largely benefited.

The major limitation during the interview and case study research was not able to get for the answer desired or unanswered question for the country specific.

In terms ethical conveniences of the research, all the participants were informed with all necessary information about the research regarding, background, goals, interview methodology. After the interview process, the document was sent to the participants to adjust and complete for their review.

3.4. Reliability and Validity

All studies must provide the conditions in terms of reliability and validity. "The accuracy, dependability, and credibility of the information depend on it" (Simon, 2006, p. 39).

While reliability in quantitative research means to the ability to reproduce the same result, this rationale is inappropriate for the qualitative research. Moreover, “quality, rigor or trustworthiness” constitute the basis for validity”, and “dependability” constitute the basis for reliability (Davies &Dodd, 2002).

When researchers design a research study, obtain data, investigate result and evaluate the quality of the study, they applied qualitative studies should be concerned about reliability and validity should be taken into consideration throughout the research. The quality of a research is related to generalizability of the result. “Generalizability of findings to wider groups and circumstances” is in line with the validity for qualitative studies. The same rationale is also met in as well as quantitative research (Patton, 2002).

First and foremost, findings should been obtained by “sufficient - compelling evidence, rigour of data collection, and analysis” for the reliability and validity of a research. Enhancing validity and reliability in qualitative studies, there are various approaches. “Triangulation of information among different sources of data, receiving feedback from informant, expert review, and the researcher solicits participants’ views of the credibility of the findings and interpretations” are exemplified.

In this research, “triangulation, peer review or debriefing, and the researcher solicits participants views of the credibility of the findings and interpretations” were especially adopted to monitor prejudices and recommend researchers to develop the study.

The triangulation is a process aiming “convergence among various multiple and different sources of information to form themes or categories” in a study (Denzin, 1978).

Within the context of the “researcher solicits participants’ views of the credibility of the findings”, an international conferences called “Internationalization of STI: Politics, Cooperation and Competition, The 2014 University-Industry Interaction Conference, and Science Advice to Governments: An emerging network for leading practitioners” was participated to get more feedback from the experts to increase research’s credibility by Support for Attending to International Scientific Activities in Abroad Programme of TUBITAK.

In terms of verifying information and receiving feedback from informant, findings and analyses prepared by using the data obtained from the research methods applied were sent to the interviewees through implementing an electronic mail group. It allows experts to review all of the research dimensions.

Furthermore, to double-check and hone the conclusions, some of the preliminary findings of the thesis were discussed at a one-day an expert workshop with science attachés, academicians, government officials from the selected countries at the end of May 2014,

Last but not least, compelling evidence with rigorous data collection and analysis was achieved through undertaking appropriate qualitative methods including semi-structured interview with key informants (face to face, telephone and e-mail interviews), comparative case studies, comprehensively document studies (archival records, document studies) within the conduct of this research.

CHAPTER 4

COUNTRY CASE STUDIES

This chapter provides a snapshot of the policy domains, drivers, goals, instruments, and strategies of the selected countries for STI cooperation. Specific emphasis is given in the thesis to France, Germany, Netherlands, United Kingdom, Switzerland, Denmark, Finland, Hungary, United States, and Japan because these countries have created formal international network.

4.1. France (FR)

France has viewed scientific cooperation that contributes dialogue between peoples and a means of developing and strengthening national excellence for many decades. Through the major partners' recognition of the role of science in diplomatic action bolstered by the emergence of the "SD" concept, France needs to reaffirm the exemplary nature of the approach and look at how to increase interaction between France's scientific community and her diplomatic network.

Ministry of Foreign Affairs (MAE) is the primary responsible body for conducting SD actions with Ministry for Higher Education and Research (MESR), institutions, and networks. Liaising directly with MESR, MAE participates through its network, in the deployment abroad of the thematic and geographic priorities of France's National Research and Innovation Strategy. These priorities are reflected in the cooperation projects implemented by embassies' science departments.

In this respect, the MAE's action complements the MESR's efforts to enhance the qualification of the academic research & industry collaboration and institutions, and to optimize the structural factors which make France an attractive country for research activities (quality of research infrastructures and facilities, excellent reputation and international ranking of institutions, employment conditions for researchers). In daily contact with contributors to research and innovation in their countries of residence and aware of their needs and spheres of excellence, these departments ensure that account

is taken both of the partner countries' expectations and of the segments which French laboratories and companies can capitalize on.

Within Directorate-General for Global Affairs, Development and Partnerships (DGM) of MAE, the Mobility and Attractiveness Policy Directorate implements "SD", managing and mobilizing a network composed in 2012, of 255 expatriate staff (counsellors, science attachés and international volunteers), around 60 technical assistants, 27 French social sciences and humanities research institutes bringing together 146 researchers, 161 archaeological missions abroad, lots of scientific cooperation and research programmes subsidized by the MAE.

"The Network of Counsellors and Science Attachés" provides an entry point for the cooperation partners; advising them on the relevant operators; and encouraging them to structure and place their exchanges on long term cooperation framework agreement.

This network also provides a highly-rated STI watch service. The product of the watch carried out by French Embassy science departments and personnel (electronic newsletters and reports) is circulated, through the French Agency for the Dissemination of Technological Information (ADIT) to public and private French research bodies, companies and competitiveness clusters in order to help them develop their international strategies. The watch also extends to protection of France's scientific and technological assets. Every year, 7.5 million people visit ADIT's website, 231,000 of whom subscribe to the electronic newsletters sent out by the embassies.

The MAE identifies areas of scientific excellence and innovative initiatives abroad so as to encourage French teams at diplomatic post to develop promising areas of collaboration. The science departments in the Embassies are also encouraged to maintain with the relevant institutions in their countries of residence a regular institutional dialogue on the respective research strategies and priorities, as well as on cross-cutting issues such as protecting intellectual property and innovation.

Moreover, the network of French Research Institutes Abroad (IFRE), National Center for Scientific Research (CNRS), French Development Agency, Institut français, the Scientific Exchanges and Research Department, Development Research Institute, the International Centre for Agricultural Research for Development, and Ambassador Delegate for

"Science, Technology and Innovation" contribute to manage "the network of counsellors and science Attachés" under cover of MAE.

CNRS, under the responsibility of the MESR, provides the visibility support for "French research worldwide" through offices based in "Belgium, Brazil, China, India, Japan, Malta, Russia, South Africa, Vietnam, Turkey, and USA". Through analysis of the national and international scientific environment, CNRS contributes to develop a national policy.

Moreover, IFRE offers a remarkable vantage point from which to observe the political, economic and social transitions affecting the regions in which they are located. The IFRE network enriches the understanding of partner countries and strengthens the relationship of trust established with them.

The basic motivations and priorities behind the approach of France's SD[5]:

- contributing to increasing France's attractiveness: by enhancing perception of the French research system abroad, improving admission conditions and facilities for foreign researchers in France, promoting a culture of S&T, step up French network's efforts to encourage large-scale research facilities to be established in France and access by French researchers to such facilities abroad through the MAE's participation in the French governance mechanism alongside the Alliances, managed by the MESR,
- mobilizing the scientific cooperation network to take up the challenges of science diplomacy: by strengthening the strategic mentoring of the work of France's diplomatic posts by producing country strategies, producing roadmaps for counsellors and scientific attachés, increasing the coordination of the bilateral cooperation with European programmes and contributing to the building of a European Research Area (ERA), intensifying French diplomatic and scientific network's support for innovation and the achievement of scientific and economic positions by French research community and companies
- creating the conditions for establishing networks and partnerships offering French researchers opportunities for international career development,

[5] Directorate-General of Global Affairs, Development and Partnerships, France

- raising the profile of French action to promote research for development and bolster France's scientific and political positions and optimize her support for the enhancement of the partner countries' scientific capacity,
- maintaining French scientific research performances in cutting-edge sectors and to support French companies' export competitiveness",
- raising researchers' awareness in development issues by building and leveraging the target countries' scientific capabilities.

Moreover, France also needs to engage the research stakeholders and foster their involvement in international cooperation networks to improve the understanding of global issues, to inform international debates through globalized or multilateral scientific bodies. Concurrently, hosting in France science-based international organizations and France's large-scale research infrastructures is also an essential component of the SD effort to enhance country's influence abroad and to generate significant economic and financial spin-offs for the local employment areas.

4.2. Germany (DE)

Germany adopts the "Strategy for the Internationalization of Science and Research". The strategy allows stakeholders participating in STI system how they can cooperate and generate value added by continuous international benchmarking. This strategy enhances coordination and exchanges of information for intermediary and counterparts organizations related to STI in international business environment (Federal Minister of Education and Research, 2008).

The rationales behind the government support in internationalization of STI and R&D with this strategy;

- strengthening STI cooperation with the best scientists,
- promoting Germany having optimal operating environment in terms of offering opportunities for foreigner firms and researchers
- establishing and intensifying collaborations with "leading and emerging high technology locations and research centres",

- enhancing long-term collaboration with emerging scientific and economic centres in developing countries in education, research and development,
- solving global challenges by using national capacity.

Furthermore, the strategy underlines the requirement for systematic external representation in response to internationalization of science policy such as global centres or missions. By the external representation, stakeholders in Germany STI system can reach to markets and centres having potential in terms of business, partner, funding, know-how, etc. German science centres can optimize and orchestrate of the Germany's presence and promotion abroad through forming strategic networks and alliances.

In this framework, *"The German Houses of Research and Innovation and The German Center for Research and Innovation"* has been implemented to serve as systematic external representation.

4.2.1. The German Houses of Research and Innovation (DWIHs)

DWIHs are part of the Internationalization Strategy of the German federal government and the Federal Foreign Office (FFO)'s Research and Academic Relations Initiative. The FFO is implementing this project in cooperation with the Federal Ministry of Education and Research (BMBF) and in close collaboration with the alliance of German science organizations including "the Alexander von Humboldt Foundation, German Academic Exchange Service (DAAD), German Research Foundation (DFG), Fraunhofer-Gesellschaft, Helmholtz Association, German Rectors' Conference (HRK), Max-Planck-Gesellschaft and the Association of German Chambers of Industry and Commerce (DIHK)" (The German Center for Research and Innovation New York, 2013).

DWIHs enable a platform bringing researchers, policy-makers, research-based companies close together in an effort to showcase the potential and competencies of the German companies, and to trigger new cooperation on behalf of Germany and innovative local organizations through 5 offices based in "São Paulo (Brazil), New Delhi (India), Tokyo (Japan), Moscow (Russia), and New York (US)".

4.2.2. The German Center for Research and Innovation (GCRI)

GCRI as one of five DWIHS worldwide is a joint initiative of FFO and BMBF. GCRI provides information and networking platform for collaborative projects between North America and Germany. Under the joint leadership of the "DAAD and the DFG", the GCRI obtains its funding through "the German Federal Foreign Office's Research and Academic Relations Initiative" (GCRI, 2013). German science organizations and Chambers of Industry and Commerce also support the activities of GCRI. With "Germany's High-Tech Strategy", the GCRI carries on the activities in emerging and evolving areas including "climate and energy, health and nutrition, mobility, security, and communication",

> *GCRI has organized more than 105 events in the U.S. and Canada with leading experts from science and industry. To date, GCRI has participated in 84 conferences, published 51 editions of its newsletter E-nnovation Germany, increased its website reach in the past year by 83%, developed a significant social media presence on Twitter, and appeared over 790 times in the media*[6]

4.3. Switzerland (CH)

In 1958, Switzerland sent its first science attaché, Urs Hochstrasser, to the US. His main task was to observe and report back to Bern on the development and potential use of nuclear technology by the US. Switzerland has international strategy for the "Promotion of Education, Research and Innovation (ERI) for 2013-2016". Over the past fifty-five years, Switzerland maintains the initiative enhancing opportunities "STI and higher education environment" through "a worldwide science diplomacy network including "*swissnex Network* and *The Network of Science and Technology Counsellors"*, called short ERI-Network" managed by "Swiss State Secretariat for Education, Research and Innovation (SERI)" and "the Federal Department of Foreign Affairs (FDFA)".

4.3.1. The swissnex Network

Switzerland has an innovative and targeted instrument to further its scientific foreign policy objectives. The SERI orchestrates "the swissnex network" including six knowledge outposts: "Boston, San Francisco, Singapore, Shanghai, Bangalore, and Rio de Janeiro".

[6] Joann Halpern, Director, GCRI, New York, USA

Each swissnex as a subsidiary capacity primarily allows "Swiss university and research institutions" to advance their international activities. The swissnex is managed based on "a performance policy by mutual agreement" with the SERI.

Operational project funding is partially obtained from SERI for each swissnex. While one third of funding is sourced by SERI, the rest of funding is provided from service or sponsorship agreements.

> *Each swissnex is responsible for establishing an extensive network of contacts at universities, research institutions, and companies in the host region and making this network available to interested Swiss institutions and individuals. In order to draw greater attention to Switzerland as a location, Swissnex organise scientific and cultural activities for specific invitees who may be interested in developing new bilateral cooperation programmes. The overall mission of swissnex is 'connecting the world and Switzerland in science, education, art, and innovation*[7]*"*

The components of this mission are (swissnex Mission Statement, 2013):

- creating and continuing an intense network of contacts with "highly educated and technology-savvy peers, academic and business leaders, universities, research institutions, companies, scientists, researchers, entrepreneurs, policy-makers, and other organizations" in home and host country,
- structuring and strengthening the national interests and the presence in the host country,
- strengthening "brand-building and public relations in the host regions, as well as media coverage" in Switzerland.
- strengthening the national profile in terms of "leading-edge research, quality, innovation, and openness" to cooperate and develop business,
- facilitating academic and bilateral research cooperation programs, transdisciplinary public and private events and projects, global innovation strategies, independent analysis, knowledge exchange, study tours, social media consulting, and press outreach,

[7] Sebastien Hug, Swiss S&T Counsellor, swissnex Mission Statement, 2013

- supporting the internationalisation of academic institutions and companies in foreign market “with a special focus on R&D based start-ups”,
- developing a mechanism enabling exchange of “scientific and technological knowledge”, open innovation and benchmarking.

4.3.2. The Network of Science and Technology Counsellors

A network positioning at “science sections of embassies” having S&T counsellors or career diplomats was established by SERI. S&T counsellors are either experts from the SERI or are career diplomats from the FDFA. All Swiss embassies that have a scientific desk have its own S&T counsellors. “Switzerland has a network of 23 S&T counsellors working in 19 different countries including Australia, Austria, Brazil, Brussels, Canada, Chile, China, France, Germany, India, Italy, Japan, Russia, Singapore, South Africa, South Korea, Spain, the UK, and the US”.

The main activities of the entire network including S&T counsellors include the following:

- monitoring and anticipating developments in science policy in the host region and sending reports to corresponding federal agencies and other interested parties in Switzerland,
- establishing and maintaining personal and institutional networks with representatives of the administration, universities, research institutes, scientists, policy makers, and the private sector in the host country,
- stimulating and supporting cooperation projects in the area of university or industry R&D with a special focus on the transfer of technology and the mobility of the researchers,
- providing coverage of science policy matters in the host region through the use of newsletters, internet sites and conference reports,
- organising events and multidisciplinary activities in the fields of education, research, technology and culture in order to increase the level of awareness of Switzerland as a science location.

Moreover, Switzerland develops bilateral research cooperation programmes are based on the principle of scientific excellence and are in-tended to establish long-term partnerships. (Overview of Swiss scientific foreign policy for 2012 and 2013-2016).

4.4. United Kingdom (UK)

Findings based on the history of UK's SD indicate that the details of the scientific developments in the foreign countries were transferred to UK through “military, agricultural or commercial attachés” before World War II. Britain's first official “scientific representative abroad, Sir Charles Galton Darwin”, was assigned to the Center Science Office in Washington in the year 1941 for easing the exchange of scientific information and the cooperation between the research institutions in USA (The Royal Society, 2010).

Soon after, from 1942 until 1946, Joseph Needham was assigned to the diplomatic agency on UK in China and he made "Science and Civilization in China" studies as the science attaché and he effected for the natural sciences developed the "International Science Cooperation Services" enter the activity area of UNESCO Pugwash Science and International Conferences, which are held by Pugwash International since 1957 and which is attended by the leader scientists, academicians and social leaders, is one of the most important examples for how the science diplomacy is used in the international area.

In 2001, the “Department for Business, Innovation and Skills (BIS) and the Foreign & Commonwealth Office (FCO)” constituted “the Science and Innovation Network (SIN)” in an attempt to benefit from science/ scientific evidence for policy making.

> *STI policies of governments, businesses and academia are influenced to benefit the UK through lobbying and deployment of robust scientific evidence. UK policy development is informed through identifying good practice internationally. International STI collaboration of best with best is facilitated to the benefit of the UK and to augment UK capabilities*[8]

SIN is a first point of contact and gateway to STI opportunities for UK and host country research institutions, universities and research and development (R&D) intensive business. SIN offers policy insight into two-way flow of ideas to improve STI policies in the UK and partner countries. SIN also provides new international partnerships opportunities by acting as a catalyst for new projects through events and networking.

[8] Department for Business, Innovation and Skills, 2011

The network is jointly supported, funded and managed by the UK FCO and the UK BIS". The network initiates the collaboration between UK and international research partners across a wide variety of policy and scientific agendas, including energy, climate change and innovation. SIN works closely with a wide range of partners from government, business and academia. It aims to complement the work of other key partners such as UK Trade & Investment (UKTI), The British Council, Research Councils UK (RCUK), Technology Strategy Board, the Royal Society, and the Department for International Development (DFID)[9]

SIN experts work at the heart of the UK's overseas Posts and closely with UK partner organisations to promote coherent UK engagement. SIN tailors its priorities to the local context. Its delivery model varies from small posts with one officer working across portfolios, often as part of a regional network, to large teams with individual sector specialists in places like China, India and the US.

SIN has 93 staff, based in 28 countries and territories and 47 cities around the world. These are typically located in UK embassies, high commissions or consulates, and work alongside other diplomats and representatives of bodies such as UK Trade and Investment[10]*.*

SIN Officers are based in "Australia, Brazil, Canada, China, Czech Republic, Denmark, France, Germany, India, Israel, Italy, Japan, Malaysia, Netherlands, New Zealand, Nigeria, Poland, Qatar, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Turkey and the USA" (UK Science and Innovation Network Report, 2013).

Officers in SIN produces country specific analysis by using delivery mechanism such as report, trend analysis. These efforts generates action plans to exploit the opportunities. "The priorities and activities of SIN teams vary from country to country, but main responsibilities include" (UK Science and Innovation Network Report, 2013):

- Identifying, reporting and providing intelligence (opportunities and developments in STI, and leading edge capabilities overseas) for major stakeholders or beneficiaries in the network,

[9] UK Science and Innovation Network Report, 2013

[10] Andrew Jackson,Head of SIN Network,

- Supporting “overseas” visits by ministers and senior officials,
- Hosting and supporting conferences, seminars and workshops,
- Mediating to access to foreign funding for UK researchers;
- Stimulating and strengthening the national capacity with intent to enhance “international R&D investment, R&D partnerships and technology transfer” for the public and private-sector counterparts in both countries,
- Supplying expert advice and mentorship in coordinating international R&D projects,
- Enabling national companies to “access and benchmark overseas technologies”,
- Enhancing and sharing of “scientific expertise, resources and facilities” stemming from international cooperation,
- Informing and helping policymakers, industry, and academia through “gathering and disseminating best practice in STI and international policies” to benefit the UK and deliver wider policy goals,
- Stimulating the use of STI for evidence-based policy-making,
- Lobby activities for national UK aims and priorities in STI”,

In 2009, “a chief scientific adviser to the FCO was appointed as a direct counterpart to the Science and Technology Adviser to the US Secretary of State” on the same date. In autumn 2012, the UK government highlighted 8 Great Technologies where the UK can lead the world, announcing an additional £600m investment to support their development. The identified technologies are “areas in which the UK has world-leading research, have a range of applications across a spectrum of industries and have the potential for the UK to be at the forefront of commercialisation”. SIN works in these technologies.

In 2013, the UK government also published an industrial strategy covering 11 sectors. This is designed to develop long-term strategic partnerships in sectors that can have the most impact on UK growth, including by developing and supporting innovative products and technologies. SIN has a number of years’ experience in many of the sectors covered, and is using the strategy to sharpen the UK focus and increase work in areas new to the network. This work cuts across new research or technology collaborations for UK

organisations, helping attract inward research investment, or working with partners on regulatory or other measures to support growth in these areas.

In addition to specific determined goals in specific sectorial or thematic collaborations, SIN's role is continually evolving to support government and UK research priorities. SIN is active across a wide spectrum of UK research strengths. This ranges from SIN's aim to help support the science goals of all the UK government departments, to the wide range of work with researchers from British universities. SIN coordinates locally with UK organisations who have a base in the countries where the UK works, and assists others working from the UK.

4.5. United States (US)

Underlying motivation of the in the U.S. science diplomacy approach is enhancement for countries having insufficient infrastructure to develop technology and innovation, and to trigger of understanding by enabling adoption of U.S. values and business practices". These efforts concentrate on meeting with global challenges and national capacity resources (US Department of State, & US Agency International Development, 2010).

The following institutions have active role in the governance of SD strategy: "The Department of State (DOS), The Office of Science and Technology Cooperation (STC), Bureau of Oceans and International Environmental and Scientific Affairs (OES), the White House Office of Science and Technology Policy (OSTP), President's Council of Advisors on Science and Technology (PCAST), National Science and Technology Council (NSTC), National Science Foundation (NSF), the U.S. Agency for International Development (USAID), The U.S. Civilian Research and Development Foundation (CRDF Global), Jefferson Science Association (JSF), American Association for the Advancement of Science (AAAS)", and other federal agencies are assigned.

The US performs SD strategy through a wide range of tool including "formal bilateral S&T cooperation agreements, promotion and support of S&T entrepreneurs and innovators, scientist and student exchanges, workshops, conferences, and meetings, public-private partnerships, seed funding for scientific programs and innovation activities, and production of educational materials, including films, websites, posters, and cards".

OES/STC is responsible for over 50 binding bilateral and multilateral S&T Agreements that provide the framework for international collaboration. These agreements provide a mechanism for critical R&D efforts that improve the human condition, facilitate the exchange of scientific data and results, provide for protection and allocation of intellectual property rights and benefit sharing, facilitate access for researchers, address taxation issues, and respond to the complex set of issues associated with economic development, domestic security and regional stability, and establish partnerships with counterpart institutions[11].

Dating back to the 1700s, "Benjamin Franklin and Thomas Jefferson are thought of as the nation's first scientific diplomats. As scientists and inventors, they corresponded with colleagues and brought knowledge back from their visits to Europe to enhance the development and policies of the very young the US Today, the U.S. serves the same role for other countries that are in the early stages of development or at the point of transition" (Stine, 2009).

The U.S. has recognized S&T's importance for improving relations with foreign countries since the 1990s, when the idea of integrating S&T with foreign policy was already on the government's agenda. Stressing the role of science for major U.S. foreign policy objectives, the idea of increasing science capacity within the U.S. Department of State by creating new positions such as science advisory positions was an example of the initiatives taken by the government (Flink & Schreiterer, 2010). In accordance with the integration of S&T with diplomatic efforts contributing to establishing peaceful interaction with foreign publics, especially with those that have strained or weak relations (Flink & Schreiterer, 2010), the U.S. has adopted the very same policy toward the Middle East.

There are about 260 diplomatic and consular posts including "the U.S. science specialist, diplomats, civil servants, "Environment, Science and Technology and Health (ESTH)" officers, and Foreign Service staff" are located in U.S. embassies and consulates in 163 countries.

[11] Prof. Bernard Amadei, US Science Envoy, University of Colorado

To illustrate, in China, the U.S. has six State Department ESTH officers who work on bilateral cooperation in Beijing and four additional Foreign Service officers who cover ESTH issues in Shanghai, Chengdu and Guangzhou. These diplomatic positions are supplemented by more than 20 employees of U.S. technical agencies like NSF, and Department of Energy who focus on specific collaborative programs with China. These personnel are supported by a further 150 staff who comprise the OES[12]

Besides those newly established mechanisms, President Obama stated that:

Several international S&T diplomacy programs in Muslim-majority countries including a new fund for technological development in these countries, establishing centres of scientific excellence, and appointing new science envoys. This is the re-orientation of U.S. foreign policy for the use of S&T in foreign policy, especially toward the Middle East. STI will be as the key for a sound and inclusive policy of cooperation in order to have a peaceful international environment and have stable relationships with the Middle East[13]

Following the speech, Secretary of State Hillary Clinton (2009) stated that the initiation of the U.S. Science Envoy Program in November 2009. Within this framework, three prominent U.S. scientists were appointed to encourage collaboration with Muslim countries.

In the coming months, the first science envoys will travel to countries in North Africa, the Middle East, and South and Southeast Asia. They will engage their counterparts, deepen partnerships in all areas of science and technology, and foster meaningful collaboration to meet the greatest challenges facing the world today in health, energy, the environment, as well as in water and resource management. Additional U.S. scientists and engineers will be invited to join the science envoy program to expand it to other Muslim countries and regions of the globe. The envoys will be supported by new embassy officers who will also engage with international partners on the full range of environmental, scientific and

[12] Prof. Susan Hockfield, US Science envoys, Massachusetts Institute of Technology

[13] Obama, B. (2009), "Remarks by the president on a new beginning", Speech in Cairo

health issues, from climate change and the protection of oceans and wildlife to cooperation on satellites and global positioning systems. They will work with multilateral institutions, non-governmental organisations and private sector partners to promote responsible environmental governance, foster innovation, promote university-industry partnerships, highlight the value of science-based decision-making, and increase public engagement on shared environmental and health challenges[14]

The US initiative in the use of SD to establish cooperative relationships with Middle Eastern countries illustrates both this change in the use of diplomacy and the prospect that SD offers for establishing and maintaining stable relationships. Furthermore, the U.S. case also underscores that foreign policy makers should consider a variety of issues in the implementation of SD in order to increase the U.S. credibility, and hence power in the targeted regions.

Moreover, performing SD requires the establishment of a number of new mechanisms and continuous allocation of human and financial resources in addition to policy makers and scientists. With the establishment of new institutions and launching of new programs with the existing programmes, US has attained necessary capacity for establishing daily communications, strategic communications, and long-term relationships (Leonard, Smewing, & Stead, 2002, p. 8; as cited in De Lima, 2007, p. 237) with the Middle Eastern countries' publics through the conduct of science diplomacy in all of its three dimensions.

DOS performs the overall policy management for SD. DOS and USAID determine "the key S&T diplomatic strategies" according to the following rationale [15] (U.S. Agency for International Development, 2007):

- improving understanding by other nations of U.S. values and ways of doing business,
- increasing the U.S. national security and economic prosperity by fostering the improvement of conditions in host countries through increased technical capability,

[14] Clinton, 2009

[15] U.S. Department of State, 2007

- strengthening the U.S. prestige and influence on other nations,
- ensuring a baseline of STI literacy among all appropriate Department personnel and expanding the Department's engagement within global STI networks through the presence overseas of personnel with significant STI expertise, exchanges, assistance, and joint research activities addressing key global issues,
- encouraging the departments and agencies to orient their S&T developing country programs to support the development priorities of the host countries;
- maintaining and continually improving the quality and productivity of the U.S. science through collaborations, visits, exchanges, applying global standards of excellence, and sponsoring programs to connect the U.S. researchers with host country researchers, discuss the specific science policy priorities and access the U.S. scientists to the frontiers of science,
- promoting sharing of knowledge in the international scientific community, establishing of science-based industries and using of science for decision making that will enhance the efficiency and hasten the fruition of the U.S. research efforts,
- contributing to ensure that the U.S. scientific standards and practices play a substantial role in the establishment of international benchmarks,
- assisting the U.S. agencies and non-governmental organisations to establish partnerships with counterpart institutions by accessing to new resources, information, and research in high priority areas, and supporting their efforts by raising key issues at the diplomatic level,
- facilitating the U.S. industrial competitiveness by providing outreach to key communities in the private sector of the U.S. and the host countries and reporting on important STI developments through initiatives enhancing the U.S. access to host country technology,
- representing U.S. positions in multilateral forums at the U.S. missions to the United Nations, and at the U.S. mission to the European Union

4.6. Japan (JP)

S&T SD approach for Japan is newly emerging issue encountered in terms to international relations. In the paper, "The Potential of Science and Technology Diplomacy, the characteristics and starting points of this new diplomacy are described and discussed future issues and prospects for Japan's continuing efforts to formulate and implement S&T diplomacy as part of Japan's government policy.

> *The new policy concept of S&T diplomacy has been to introduce S&T as a diplomatic resource for the first time, and to open up new diplomatic frontiers. At the same time, this has also opened up new frontiers of Japanese S&T as well. Although it is customary for the Ministry of Foreign Affairs to formulate and implement diplomatic policy, S&T diplomacy policy has been drawn up through extremely close cooperation between the Ministry of Foreign Affairs (MOFA), Minister of Education, Culture, Sports, Science and Technology (MEXT), and the prime minister's Council for Science and Technology Policy (CSTP)[16]".*

Development regarding S&T diplomacy activities became publicly available through "The Reinforcement of Science and Technology Diplomacy" written by CSTP provides recommendations to Japanese ministries for promoting S&T diplomacy. It defines S&T diplomacy "as any steps taken to link S&T with foreign policy so as to achieve their mutual development" and "to utilize diplomacy for the further development of S&T and promote efforts to utilize S&T for diplomatic purpose" (CSTP, 2008)

Recently, on the purpose of the strategic development of globally integrated activities, the government determines the following measures focusing on S&T diplomacy (CSTP, 2008):

- supporting cooperation activities to boost capacity building efforts in newly emerging countries,
- improving international STI networks incorporating with high level countries,
- establishing a system, run by overseas centres of government diplomatic missions, universities, researchers, and institutions, for collecting,

[16] Prof. Dr. Taizo Yakushiji, Member, Council for Science and Technology Policies, Japan

accumulating, analysing, exchanging "overseas information cross-sectional, consistently, and systematically in order to utilize such information for policy decisions, and foster human resources",

- developing large-scale international projects enhancing Japanese expertise,

Additionally, CSTP Report (2008) reveals that Japanese actions can be classified into three pillars as follows:

- invigorating cooperation with developing countries by capacity development,
- implementing of joint research under Japan's initiative by utilising advanced research infrastructure of Japan,
- Consolidating the basis for SD diplomacy

Moreover, the MOFA has assigned S&T officers to "27 overseas diplomatic missions that do not have a science attaché from MEXT". These officers are in charge of linking local communities with counterpart in the host country (Sunami et al., 2013).

4.7. Denmark (DK)

Denmark has initiated to establish innovations centres abroad in line with "Danish Government's "Globalization Strategy". The strategy reveals that these centres aim "to contribute to internationalisation of Danish research and enhance the innovative and competitive strength of Danish business by assisting Danish research fora and knowledge-intensive enterprises seeking access to network, knowledge, technology, markets and capital abroad.

> *Denmark aims to be among the best countries at transforming new research results and knowledge generated by research and educational institutes into new technologies, processes, goods and services.*[17]

To this end, "*Innovation Centre Denmark (ICDK)"* in "Silicon Valley (USA), Shanghai (China), Munich (Germany), São Paulo (Brazil), New Delhi-Bangalore (India) and Seoul (South Korea) are established in collaboration with the Danish Ministry of Foreign Affairs, the Danish Ministry of Business and Growth, the Ministry of Higher Education and Science

[17] The Danish Ministry of Science, Technology and Innovation, 2006

(MOHES), the Trade Council, and the Danish Agency for Science, Technology and Innovation".

Moreover, "Danish start-ups, corporates, researchers and public institutions" are the natural partners. The ICDK idea has three components including "strengthening the innovation, knowledge and competitiveness of Denmark by facilitating and creating networks and partnerships for Danish knowledge-intensive institutions and enterprises seeking access to network, knowledge, technology, markets and capital abroad with leading foreign research and innovation environments, an advisory board that directs the centre's activities, offerings and projects, and leading facilitators of innovation, common challenges, updates and import of knowledge to Denmark through the joint projects: market screenings, government priorities, talent hunting and development" (ICDK, 2008).

S&T attachés are appointed to the centres by MOHES. "Each attaché provides services to Danish researchers, universities, institutions and innovative environments and forms part of a team of other advisers posted by the Trade Council of Denmark. The overall strength of the S&T attachés is their local presence, which is decisive to be able to set up a solid network of key persons in the relevant research, innovation and business environments"

Furthermore, at ICDKs, there are strong teams of consultants from commercial innovation, research and science, and investment promotion. The team supports Danish companies for the commercial R&D and innovation by improving their business plan through "scouting/analysis, sourcing for innovation talent, connecting to new partners or helping to establish a platform" in the host country. Besides, the team evaluates the market potential for the beneficiaries' invention, and promotes research projects through connecting to the right foreign investors or research and development partners. Lastly, the ICDKs carry on the activities by attracting foreign companies to invest in Denmark.

4.8. Finland (FI)

"The Team Finland (TF) network" promotes Finland and its interests abroad: Finland's external economic relations, the internationalisation of Finnish enterprises, investments in Finland and the country brand. The TF operating model brings together key actors in these fields both at home and abroad. The aim of cooperation is to create a clear, flexible

and customer-oriented operating model where projects falling under the scope of the TF activities are carried out in cooperation between state and private actors.

The TF network has own annual strategy containing prioritised actions and issues for the each next year. This strategy was implemented by "the steering group for external economic relations, headed by the Prime Minister and adopted as a Government Resolution. Preparation involved extensive consultation with network participants, stakeholder groups and nongovernmental organisations". Government attaches importance to updating the strategy without reinvention.

> *The TF network is merely bringing existing publicly funded activities together under a simpler umbrella. The TF network is "a joint initiative of the Ministry of Employment and the Economy, Ministry for Foreign Affairs, Ministry of Education and Culture, together with the publicly funded bodies and Finnish offices abroad including Finland's diplomatic missions, FinNode innovation network, the Finpro network-Foreign Trade Association, Tekes-the Finnish Funding Agency for Technology and Innovation, and national culture and science institutes" operating under the ministries' guidance*[18].

The TF network is formed "70 local teams" mainly based on "Europe, Asia and Oceania, North, Central and South America, Africa and Middle East Abroad". Each team has a "coordinator with information on the local network activities and contacts to the right services". Moreover, the FinNode and the Finpro are also a globally operating innovation networks connecting local "experts, companies and the know-how" with counterpart in the host countries.

"FinNode" is a "global network of Finnish innovation organizations". This network operating in global advance nodes, offers new and strategic opportunities for "local business and research organizations" to catalyse their internationalisation. The network establishes connections with national and international experts.

[18]Team Finland: Strategy 2014

"Finpro" is formed globally 200 professionals in 64 offices in 44 countries. The network is positioned at "US, China, Russia, Japan and India as gateways to the whole Finnish innovation ecosystem". Experts in "global locations of FinNode and Finpro" supports national companies in terms of "obtain information about target markets, enter selected markets and network with local actors, control risk by ensuring that they do the right things at the right time". Lastly, the networks initiate "joint projects in the focus areas to foster collaboration, evaluate opportunities and identify new business models and opportunities, trends in selected countries, foreign partners can also engage with Finland's central public innovation organizations" (Prime Minister's Office of Finland, 2014).

4.9. The Netherlands (NL)

"The Netherlands Office for Science and Technology (NOST)" is in charge with enhancing "information and assistance to the private sector, research institutions, universities and government" by scouting, obtaining, examining and reporting data and information on trends and developments in S&T of host country. The goal is identifying opportunities for high-tech R&D and innovation in up and coming markets and sectors, and fostering R&D and innovation collaborations between international counterparts. Furthermore, the network implements seminars, events, regular publications, workshops, and seminars to stay up to date together with contributing to the branding of the Netherlands as a high tech country.

The NOST conducts the SD approach by the way of "a worldwide network run by 40 Counsellor for S&T, senior advisor / senior S&T officer, working in 16 different countries including France, Germany, EU, US, Canada, Japan, Taiwan, Singapore, China, India, South Korea, Brazil, Russia, Israel, Turkey, Malaysia supported by 5 at home office. Staff are "typically located in embassies, high commissions or consulates, and work alongside other diplomats and representatives of bodies".

S&T officers are expected to work independently, however in close cooperation with the Counsellor for S&T based in host country and other members of the network of Dutch

science, technology and innovation officers. The S&T officers carry to work as part of the NOST team within the Dutch diplomatic network[19]".

4.10. Hungary (HU)

In Hungary, "*The Science and Technology Attachés Network*" implemented in 1992 is in charge with handling international scientific relations. The network carries on the operation in embassies. Along with international science relations, the network also contributes European integration process through "acquiring and disseminating information, and building connections between institutions". The Network is formed in "Beijing, Berlin, Brussels (for the S&T relations with the EU Commission), London, Moscow, New York, Paris, Tel Aviv and Tokyo" (Ministry of Education of Hungary , 2002).

The network maintains its operations by the efforts of "the National Innovation Office and the Ministry of Foreign Affairs". The National Innovation Office supplies funding for the Network operations. "The basic tasks of the S&T attachés are;

- *monitoring, analysing and reporting on significant S&T policies, developments, and the international relations of the host country, thereby assisting to the design and implementation of the R&D policy;*
- *giving information in the host country about the Hungarian R&D policy, its implementation and opportunities for cooperation;*
- *identifying S&T areas for S&T cooperation and exchanges through assisting Hungarian R&D institutions and organisations in establishing contacts;*
- *Representing Hungary at S&T meetings and similar activities; and serving as coordinator for significant S&T visits and missions[20]".*

4.11. Preliminary Findings from the Case Studies

The implications for policymakers are as follows:

- Policymakers must set specific / thematic objectives for policy measures in international STI cooperation

[19] The Netherlands Office for Science and Technology, www.IAnetwerk.nl

[20] Ministry of Education of Hungary , 2002, http://nkfih.gov.hu/english

- Policymakers need to situate policy within the context of national characteristics
- Single policy interventions will not address all dimensions of international STI policies.
- It is key for policymakers to know which types of interventions affect which dimension.
- Designing interventions targeted towards the intended outcomes, rather than a loose collection of measures purporting to support international cooperation in general, is essential to avoid programs that lack impact.
- Alongside this interventions, it is imperative to adopt evaluation methodologies for an understanding of medium- and long-term outcomes.

CHAPTER 5

FINDINGS AND ANALYSIS

This chapter presents concise findings of the qualitative analysis performed in the study including comparative analysis of country case studies, and in depth interviews to design, stimulate and manage SD Network as a policy instrument for international STI cooperation. Additionally, departing from synthesis of policy practices, objectives, rationales, policy domains, strategies, key actors, instrument, and specific priorities (thematic or geographic) that interact in shaping international STI cooperation policies, the thesis provides a number of concise novel taxonomies based on the distinct characteristics for each country.

5.1. Comparative Analysis of Country Cases

5.1.1. Most Active Countries

As described in the selection process of the most active countries in SD in Chapter 3, on the purpose of identification of the most active countries, "a preliminary screening" was performed in this study. There are only a few countries that have developed specific internationalisation strategies. Therefore, additional criteria were needed to determine the most active countries in STI internationalization are proposed

> *located of the target region of Turkey; outreach activities; existence of a dedicated formalised internationalisation strategy; specific identified agency in charge of international cooperation activities; strategic partnerships with key third countries; accompanied by significant budgets; operation infrastructure; types of staff career diplomats; seconded staff; or recruited staff; locally engaged experts; approaches to science diplomacy; foreign branches, management structure, geographical and thematic priorities for cooperation*

The available official governmental, ministerial databases that give and overview of key policy documents, programmes and instruments, strategy papers, specific sectorial

studies, actors, agreements, outputs, web sites of networks and institutions, publication including the books, bulletin, magazines, notifications, official and semi-official documents were used as secondary data sources.

The findings obtained by aforementioned sources, the selected countries are France, Germany, Netherlands, United Kingdom, Switzerland, Denmark, Finland, Hungary, United States, and Japan.

A framework for constructing a taxonomy of SD networks was constructed based on managerial, operational and structural similarities and differences. This framework will be referred in across the study. Furthermore, different patterns, critical and distinct characteristics followed by each network are interpreted under different headings below.

5.1.2. Domains, Drivers and Goals of STI Policy Actions

Combined with the insights are identified from the in-depth interviews, comparative analysis of country cases, and a review of the literature on the international cooperation for STI, we develop a novel taxonomy of the critical policy domains, drivers, goals, and instruments regarding international STI cooperation.

Figure 5.1 displays the main ingredients of STI cooperation paradigm. It is a simplification of reality. While some countries are affected more than one ingredients, expectations of some countries are different from each other in some ways.

Various policy domains including tackling global challenges, development aid, diplomacy, intrinsic STI and R&D drivers, higher education, and national competitiveness canalize the selected countries to STI cooperation.

Main drivers are separated out based on the interview, comparative analysis of country cases, and a review of literature relating the international STI cooperation; “achieving research excellence, attracting/retaining/developing human resources for S&T, improving competitiveness and innovation, science diplomacy (furthering foreign policy goals through the use of S&T, maintaining good and stable diplomatic climate), STI capacity building (domestic or development aid), tackling societal issues and challenges, support

to policy dialogue and priority setting, networking and partnership building, set common rules and regulations, assessment and monitoring, dissemination and outreach".

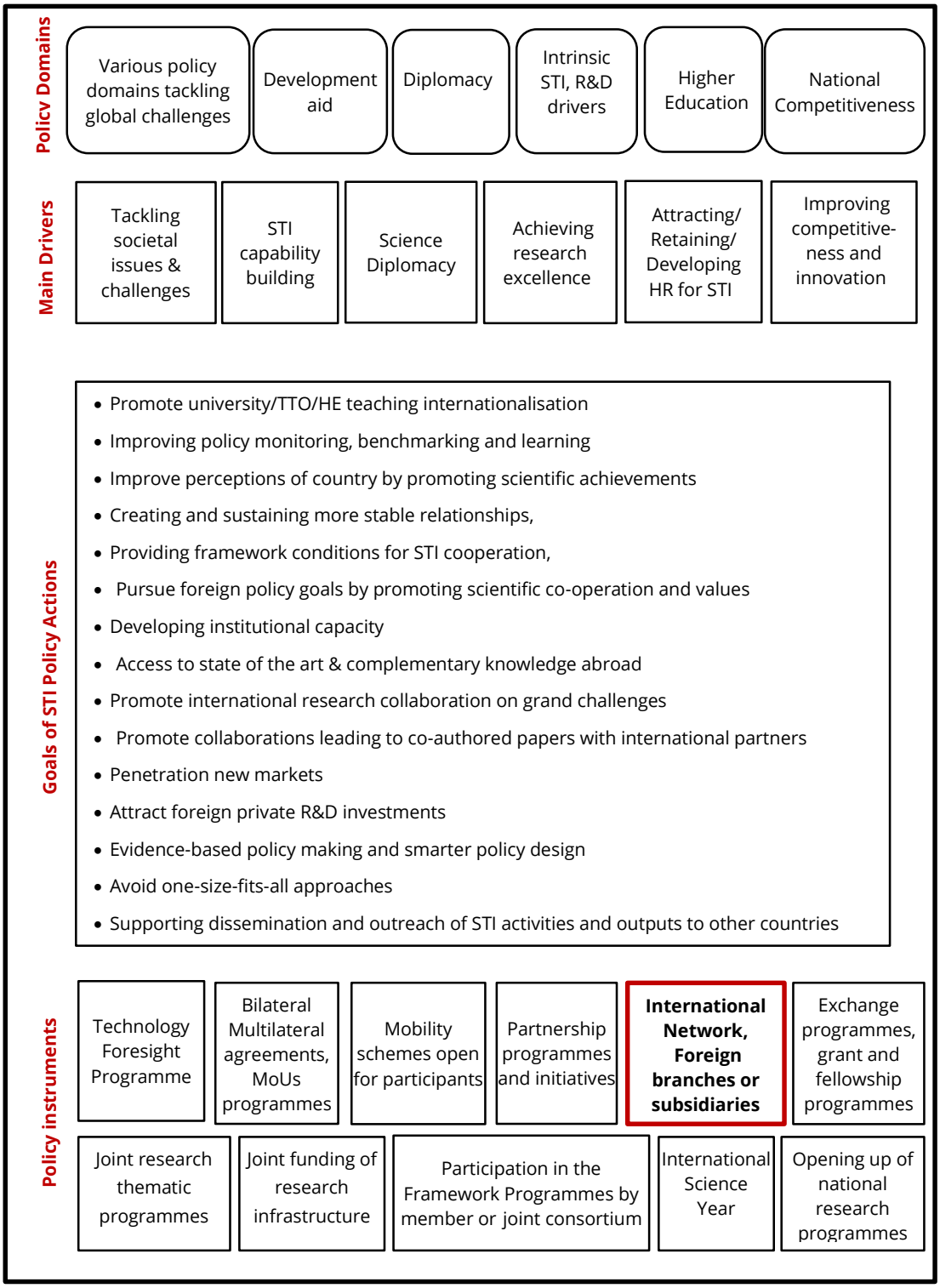

Figure 5.1: The Taxonomy of domains, drivers, goals, instruments of STI policy actions

Lastly; we can understand from the Figure that "particular policy actions can serve more than one driver". When a country makes an effort "to attract foreign-based researchers" , this efforts support both "the research excellence in the host country and alleviation the shortage of researchers in academia and in industry". Consequently, these actions allow country to strengthen competitiveness.

5.1.3. Expected Benefits of International STI Cooperation

For the policy makers in selected countries there are many expected benefits of international STI cooperation:

- ability to evidence based policy making and policy learning (scientific knowledge is integrated into each step in relevant policy development at the international and national level,
- promoting policy and research networks and partnerships,
- maintenance of historic ties by improving mutual trust and relations,
- more efficient and effective tailored based cooperation processes between countries and organisations,
- leveraging co-investment in R&D and STI, opening up of markets for innovations,
- enhancing national capacity building within the scope of quality of national research base and sector,
- providing better insights into best and worst practices of countries, and broad uptake of STI outcomes.

Meanwhile, from the point of researchers and research organisations, there are also many expected benefits of international STI cooperation:

- decreasing cognitive distances between partners,
- accessing to better "complementary knowledge, expertise, skills, research subjects, foreign markets for knowledge and innovation dissemination, funding, and scientific labour market",
- improving mutual trust and shared costs and risks, faster and better tackling of complex scientific and technical problems,

- increasing number of co-authored papers, and impact and visibility of one's research or organisation.

5.1.4. Policy Instruments for International STI Cooperation

Figure 5.1 portrays the types of policy instruments in international STI cooperation. The selected countries benefit from a wide range of instruments with a different rationale. This study does not include all of the detailed information about these instrument of STI. This study will further elaborate on the "Science Diplomacy (SD) and Networking" instruments that specifically focus on international network, foreign branches or subsidiaries, and intermediaries.

If necessary to rehearse the instruments supporting international STI cooperation as explained in Chapter 2, all instruments employed in cooperation by the countries include "bilateral and multilateral agreements, joint thematic research programmes, joint funding of research infrastructures, strategic cooperation between the governments or counterpart institutions, exchange programmes, grant and fellowship programmes, opening up of national research programmes, participation in the framework programmes by member or joint consortium, joint funding of physical research centres in a particular location, joint strategic fora and agenda setting committees, specific collaboration programmes aimed at creating market opportunities for innovation and/or commercialisation of domestic technologies in a particular country, opening up of national programmes to attract STI investment/ collaboration of foreign public or private research organisations, technology foresight programme, international science year, information and brokerage services abroad (science and technology attachés, collaboration with trade agencies), international network, foreign branches or subsidiaries".

5.2. Network Overview

5.2.1. Management

The analysis of the ten countries reveals that a number of policy actors are participated in the establishment and implementation of SD networks. These actors have own policy goals, objectives, and business manner. The selected countries have similarities in the

types of actors and governance for international network and internationalization of STI policies.

These actors comprise of “ministries directly responsible for STI and R&D; ministries responsible for a particular policy domain that apply international STI collaboration as one of the instruments to achieve their policy missions (foreign affairs, economy, agriculture, energy, environment, foreign affairs, development aid, health, etc.); funding and multilateral research organisations; universities; research centres; embassies and foreign representative organisations” shaping international STI cooperation.

Table 5.2 reveals that for utilizing SD effectively “the policies and strategies in each country” are a combination of many actors’ rationales. According to different approaches to SD, activity density differs from one ministry to another. In all countries, the ministries responsible for STI and R&D have the highest activity density in the internationalization process of STI. When “other non-science policy objectives (creating good and stable diplomatic relationships, science for diplomacy, etc.)” become part of an SD efforts, the ministries responsible for foreign affairs, education, culture, business, growth are involved in the internationalization process of science.

The networks in Germany, UK, Finland, Denmark and Netherland work “closely with a wide range of partners from the government, business and academia”. Hungary, Japan, Netherland, US, France, UK carry on the activities by taking advantage of science sections at embassies. Staff are “typically located in embassies, high commissions or consulates, and work alongside other diplomats and representatives of bodies”.

In the case of Switzerland, swissnex, one of the SD network, sets up and maintains a several of activities in their own premises. Moreover, “the network of science and technology counsellors”, second of the SD network, has a “worldwide network of science sections at embassies with S&T counsellors or career diplomats. Distinctive feature in Denmark, Finland, and Germany set up and maintains a dense of activities in their own premises. Countries have diverse models for how to connect scientist and policy makers. The majority of countries in this study have diplomats, officers and experts on secondment or specifically recruited staff of ministries and institutions in their network.

Table 5.2: Insights from Benchmarking of International of STI Networks

	Network & Actors	Job title	Objectives and Activities	Offices Abroad
DK	**Innovation Centre Denmark (ICDK)** "Ministry of Foreign Affairs" "Ministry of Business and Growth" "Ministry of Higher Education and Science" Trade Council Danish Agency for STI Danish Council for Research Policy, Strategic Research, Technology and Innovation, Danish National Research Foundation	▪ Attaché for S&T ▪ Consulting Teams	▪ Promoting and supporting the national companies in international markets ▪ Promoting international partnerships and investments to increase the national technological learning and innovation capacity ▪ Creating network with the representatives of policy stakeholders ▪ Preparing and delivering reports which include assessments, forecasting and suggestions	"Brazil, China, Germany, India, South Korea, USA"
FI	**The Team Finland (TF) Network: FinNode Innovation Network, The Finpro Network** "Ministry of Employment and the Economy" "Ministry for Foreign Affairs" "Ministry of Education and Culture" "Publicly funded bodies" Finland's diplomatic missions "Tekes-the Finnish Funding Agency for Technology and Innovation" National culture and science institutes	▪ Program Coordinator ▪ Expert Local Teams ▪ STI Consultants ▪ Experts	▪ External economic relations, ▪ Internationalisation of local enterprises, and FDI, ▪ Promoting country brand, ▪ Creating "a clear, flexible and customer-oriented operating model" ▪ Obtaining information about target markets for Finnish companies, ▪ Networking with local actors, ▪ Initiating "joint projects in the focus areas to foster collaboration", ▪ "Identify new business models", opportunities, and trends	"China, India, Israel, Japan, Russia, USA (local teams in "Europe, Asia and Oceania, North, Central and South America, Africa and Middle East Abroad)"
NL	**The Netherlands Office for Science and Technology (NOST)** "Ministry of Education, Culture and Science" "Ministry of Foreign Affairs" "Netherlands Organization for Scientific Research" "KNAW (Royal Netherlands Academy of Arts and Science)" The Dutch diplomatic network	▪ Counsellor for S&T ▪ Senior advisor ▪ Senior S&T officer	▪ Report on new trends and make oversight articles and reports for stakeholders in the Netherlands ▪ Distribute information on S&T developments ▪ Organize workshops, seminars and other meetings ▪ Plan and organize incoming and outgoing missions and delegations ▪ Answer incoming questions and requests ▪ Initiate new contacts with organisations "in the field of S&T" ▪ "Contribute to the branding of the Netherlands as a high tech Country"	"Brazil, Canada, China, EU, France, Germany, India, Israel, Japan, Malaysia, Russia, Singapore, South Korea, Taiwan, Turkey, USA"

Table 5.2 (Continued) : Insights from Benchmarking of International of STI Networks

	Network & Actors	Job title	Objectives and Activities	Offices Abroad
DE	**"The German Houses of Research and Innovation, German Center For Research and Innovation"** Science and Technology Departments of Embassies "Ministry of Federal Education and Research" "Ministry of Federal Foreign Affairs"	▪ Senior Science Staff ▪ Program Directors ▪ Academicians ▪ Officers ▪ Experts of Ministries	▪ Promoting Germany as the research centre to world markets ▪ Developing the information platform communication, business development ▪ Providing assistance to stakeholders (mentoring on international researches, organizing the educational activities, creating the opportunities for cooperation)	Brazil, India, Japan, Russia, USA
US	**Network of Science Envoys** "Ministry of Foreign Affairs" "The Bureau of Oceans- International Environmental and Scientific Affairs (OES)" "White House Office of Science and Technology Policy (OSTP)" "National Science and Technology Council" "The President's Council of Advisors on Science and Technology (PCAST)" "U.S. Agency for International Development (USAID)"	▪ "Science Envoys" ▪ Science Ambassador ▪ Advisors for S&T ▪ Directors ▪ Officers	▪ Ensuring the access of American scientists to international work environments ▪ Strengthening the scientific working capacity by providing the opportunities for visitor scientists who are best in their fields (By exchange programs and residence permit permission) ▪ Providing positive participation to national security and economic welfare ▪ Tracking the implementation of liabilities negotiated within the scope of bilateral and multilateral agreements ▪ Ensuring the perception – management of US in other countries	**"Asia** (Madagascar Bangladesh, Brume, Cambodia, India, Indonesia, Nepal, Philippines, Sri Lanka, Vietnam, Papua New Guinea) **Africa(**Angola, Benin, The Democratic Republic of Congo, Ethiopia, Ghana, Kenya Liberia, Angola, Mozambique, Nigeria, Senegal, Tanzania, Uganda, Zimbabwe, Sudan, Ghana) **Europe** (Hungry, Albania, Armenia, Azerbaijan, Bosnia Herzegovina, Cyprus, Kosovo, Georgia, Russia, Macedonia, Serbia, Ukraine, Ireland) **Latin America** (Caribbean, Cuba, Venezuela) **Middle East** (Egypt, Iraq, Jordan, Libya, Lebanon, Moroccan, Yemen, Tunis)"
JP	**Network For S&T Diplomacy** "The National Institute of S&T " "Ministry of Education, Culture, Sport, Science and Technology (MEXT)" "The Council for Science and Technology Policy(CSTP)" "Ministry of Foreign Affairs (MOFA)"	▪ Attaché for S&T ▪ Officers ▪ Experts of Ministries and Institutions	▪ Developing international scientific researches ▪ Early-Career Awards Giving New Researchers ▪ Promoting the cooperation projects between universities and private sectors ▪ Policy advice & technology forecasting ▪ Reporting and delivering scientific developments	Belgium, Brazil, Canada, UK, Switzerland, France, Germany, India, Italy, Russia, Spain, USA

Table 5.2 (Continued) : Insights from Benchmarking of International of STI Networks

	Network & Actors	Job title	Objectives and Activities	Offices Abroad
FR	**Counsellor and Science Attaché Network** International Research Network Center For National Scientific Research "Ministry of Higher Education and Research" "Ministry of Foreign Affairs" "The French National Research Agency"	▪ Attaché for S&T ▪ Advisors for S&T ▪ Policy Expert ▪ Interns	▪ "Contributing to the application and promotion of research" ▪ "Developing scientific information" ▪ "Supporting research training" ▪ "Participating in the analysis of the national and international scientific meetings and reporting in order to develop a national policy", ▪ Raising the profile of French action in scientific and political positions	"Belgium, Brazil, China, India, Japan, Malta, Russia, South Africa, USA, Vietnam, Turkey"
CH	**ERI-Network: S&T Advisors Network, Swissnex** "The State Secretariat for Education, Research and Innovation (SERI)" "Federal Department of Economic Affairs, Education and Research" "Federal Department of Foreign Affairs"	▪ Advisors for S&T ▪ Consultants ▪ Specialist ▪ Secondment, ▪ Interns	▪ Monitoring and reporting the developments in the field of science policies and giving insights ▪ Creating network with the representatives of policy stakeholders ▪ Organizing events which contribute to raise awareness about the Switzerland for science studies ▪ Encouraging and supporting the cooperation projects	"Brazil, Belgium, Canada, Chili, China, UK, France, Germany, India, Italy, Japan, Russia, Singapore, South Africa, South Korea, Spain, USA"
UK	**Science and Innovation Network (SIN)** "Ministry of Business, Innovation and Skills (BIS)" "Foreign & Commonwealth Office" Research Councils The Royal Society	▪ Attaché for S&T ▪ Directors ▪ Head of Department ▪ Science and Innovation Managers ▪ Officers	▪ Developing STI policy & programs by strengthening the cooperation between public, private sector and university ▪ Analysing the international experiences opportunities ▪ Increasing international technology partnerships and investments in order to increase national innovation capacity	"Czech Republic, Denmark, France, Germany, Italy, Netherland, Belgium, Poland, Russia, Spain, Sweden, Switzerland, Turkey, Australia, China, Japan, Malaysia, New Zealand, Singapore, South Korea, Taiwan, India, Israel, Nigeria, Qatar, South Africa, Brazil, Canada, USA"
HU	**Science and Technology Attaché Network** National Innovation Office Ministry of Foreign Affairs Ministry of Education	▪ Attaché for S&T	▪ Monitoring and reporting on significant S&T policies, and developments ▪ "Maintaining the international relations of the host country" ▪ "Contributing to the formulation of the R&D policy" ▪ promoting for Hungarian R&D opportunities for cooperation; ▪ representing Hungary at S&T "meetings and similar activities" ▪ serving "as coordinator for significant S&T visits-missions"	"China, Germany, Belgium, UK, France, USA, Japan"

However, networks of UK, Germany, Switzerland, France, and Denmark benefit from scientists' experiences by employing researchers and academicians form universities. Their networks serve as a formal channel of science advice to government as well as informal channels of science advice to business and universities. Particularly, Switzerland, The Netherland, and Finland also benefit from executives from industry in their network.

5.2.2. Policy Priorities

Chapter 4 shows that some countries already have a well-structured national or federal strategy on internationalisation of STI and R&D. These counties are Switzerland, France, Japan, Denmark, U.S., UK, Finland, and Germany. Moreover, "UK, Finland, and German have a comprehensive STI collaboration strategy within a wider R&D internationalisation strategy".

Depending on the "type of actor, policy domains and its related rationales" explained, countries are affected by many "geographical and thematic priorities" in international collaborations. Geographical prioritization is mostly precondition in selected countries. More importantly is that "theme and problem-oriented prioritization is needed rather than geographic". Meanwhile, countries needs to new policy mechanisms serving to the inadequate or underutilized areas of national capacities. Therefore, government are in tendency to policy design comprising of "targeted initiatives for strengthening cooperation in selected (prioritized) areas". One cannot deduce from this study "which drivers define the geographic direction" of the STI cooperations. All countries have set geographic priorities that depend largely on the drivers and rationales for putting policy in place for international STI cooperation. The interviews with key actors in the selected countries showed a coherent picture of the major geographical priorities .

By competitiveness drivers, Europe, Japan and U.S. having world-class R&D infrastructure have shifted to implement and stimulate the cooperation activities related capacity building for STI in "Brazil, China, Russia, India, and South Africa". Countries such as "front-runners and emerging economy countries" like Turkey, are preferred to cooperation with "competitiveness policy rationale". Likewise, France, UK, and Netherland have a representative of their network in Turkey.

The same countries aiming excellence in STI and R&D enhances chances for the "co-development of innovation in large potential markets, especially, the newly emerging economies".

Distinctive feature of the selected countries that were examined, is the path dependence. Countries are affected from path dependence modes during the "geographical priority-setting". These modes might be "cultural aspects (including language), accumulated bodies of knowledge, diplomacy, etc." France, UK, and Germany are given an example within the scope of the historical partners. Noteworthy is the strong focus on neighbouring countries as Japan's approach to cooperation.

In terms of thematic priorities, "sustainable development, including environmental technologies and research, clean technologies, renewable energy, sustainable climate mitigation/renewable energy, health, including medicine, biotechnology, ICT, innovation energy, nanotechnology", etc. are observed in selected countries.

5.2.3. Approaches to SD

Depending on the type of actors, rationales, instruments of STI policy actions, geographical and thematic priorities, approaches to SD of countries differ at three different dimensions "science in diplomacy, diplomacy for science, and science for diplomacy".

Combined with the responses are identified from in-depth interview (especially science attaches or counsellor, officers in network), comparative analysis of country cases, and a review of literature relating approaches to SD, it is made a sense that aims of SD networks performs a wide range of various actions such as "facilitating academic collaboration".

First and foremost, SD networks implement and stimulate communications enhancing tailored made report related to the STI topics. Moreover, these networks contribute to the country in multiple ways including "develop specific cooperation programmes, government liaison, mobility of students or researchers and often contacts with business".

Underlying motivation in SD approach of the US, Japan, and partially UK, France is "to enhance another country's development and to improve understanding by other nations of national values and ways of doing business" as a diplomatic tool. It reflects the science for diplomacy.

On the other hand, France, Germany, Netherlands, United Kingdom, Switzerland, Denmark, Finland, Hungary mainly focus on getting access to promising markets and developments in R&D and on promoting their S&T, research and higher education on the global marketplace, with trailblazing high-tech products in the first place (diplomacy for science). Additionally, UK, Germany, Finland and France stimulates the use of STI indicators for evidence-based policy-making (science in diplomacy).

5.2.4. Operating Structure: Offices Abroad & Profile of Staff

SD networks studies in this research have generally benefited from embassies. Recently, they have performed the activities "by establishing additional hubs abroad which operate independently of the diplomatic missions". Switzerland, Denmark and Finland establish centres that operate in their own offices in locations chosen for vicinity to the most relevant high-tech areas rather than to national or regional capitals and which serve as national hubs for different stakeholders in the areas of research, industrial R&D, innovation, technology transfer and mobility of students or researchers .

More recently, Germany and France have added new one in US to existing hubs. These hubs in networks can produce an impactful and tailor made analysis and knowledge for national capacity building as well as providing image "as a professional player in the host country's innovation market. Moreover, networks may offers more direct support for the private sector than "Embassy based S&T offices" could by implementing "tailor-made advice and incubator space, linking related and interesting stakeholders" in favour of national firms in global markets.

However, some countries have difficulties in international cooperation for the "independent STI hub". In these circumstances, "Embassy label" can be useful as the valuable door opener in certain countries. Again, a structure embodied "both Embassies and innovation hubs" may serves the purposes.

Traditionally, "scientific and educational aspects of international relationships have been managed by diplomats as part of their portfolio of tasks". The appointment of dedicated Science Counsellors at Embassies since the 1950s has led to the employment of specialists from outside the diplomatic service, both representatives of other parts of the civil service on temporary secondment and experts (often scientists) who are specifically recruited for each post. Over the last ten years, countries have increasingly formulated international S&T policies and developed linked-up networks abroad to pursue their objectives more systematically; as a result, the number of S&T staff has risen dramatically for many countries[21].

The majority of countries in this study hire specifically recruited experts. Recruited experts are generally be "local employees of the respective Embassy". This study cannot provide additional data "to distinguish between subtypes of recruited experts", but it is clear that "many of these are former scientists who already lived in the host country, sometimes host country nationals".

Local employees enhance the maintenance of the network in term of "continuity and cost".

These employees can often build deeper knowledge and longer relationships with the host country as a result of their prior career in that country and because they are likely to remain in post longer than traditional rotation periods for diplomats or secondments[22].

Expatriated personnel including diplomats, experts on secondment or specifically recruited staff sent to the host country" may establish links between counterparts at both countries. In this study, "most countries have a mix of different staff types within their network.

[21] Lutz Peter Berg, Science and Technology Counselor at the Embassy of Switzerland in London since 2002.
[22] ibid

Moreover, some countries shown in the Table, hire “interns or “science fellows”. These countries utilise their S&T network “as a resource for people to gain experience in the field of international science relationships”. The initiatives for specific training reflects a “growing demand for the interdisciplinary skills in both science and diplomacy”.

As admonitory in employment policy, policy makers or beneficiaries underline that the representatives to be assigned in Network must be selected from academicians, private sector or public officers who have sufficient information on STI, R&D and international cooperation, who can develop social connections and potential cooperation and who know the language spoken in the host country. Actually, the continuity and maintainability of knowledge and experience obtained are vital importance for the sustainability of the Network and national capacity building. Otherwise, accumulation of knowledge and maximum utilization will be lost in the case of termination of the job.

SD networks of USA, France, and Finland are formed by “full time S&T offices in 35 or more foreign countries”. The highest number of dedicated staff are located in U.S. and France. This conditions make the networks in US and France the most extensive networks.

Concurrently, some countries have more than one office in certain countries “to cover specific high tech clusters (e.g. Silicon Valley, Boston, and Bangalore) or international organisations (e.g. New York, Geneva)”.

Another matter for networks is “the posts which are responsible for more than one country”. Like Science Envoys of U.S. and local teams of Finland shown in Table 5.2 are in charge with many countries in one region.

When SD network are compared with each other, one can classify “dedicated S&T staff”. The staff works abroad under the auspices of a national authorities such as “the respective ministry for science, industry, technology and foreign affairs”.

To clarify this comparison, staff are categorized as following:

Some countries have “career diplomats who cover S&T issues as their major task during their temporary stay in the foreign country”. Additionally, some countries assign the

representatives as a seconded staff from “secondment from ministries or related organisations” or hire “specifically recruited staff” for the network hubs.

Comparative country cases realized within the scope of this study, most Networks have staff as “temporarily seconded or specifically recruited” for their hubs. These may have “temporary diplomatic status” like career diplomats. While most of selected countries have “full time S&T” staff composed of “seconded or recruited staff”, especially taking advantage of specifically recruited staff.

It is summarised as following:

- career diplomats (e.g. Switzerland, Germany, UK and the Netherlands)
- mainly seconded experts from ministries / universities (e.g. Germany, Japan)
- mainly recruited & seconded experts (e.g. Finland, France, Netherlands, Denmark)
- mainly recruited experts and diplomats (e.g. USA, UK, Hungary, Switzerland, Germany)

Locally engaged experts as recruited staff are generally encountered in France, Germany, Netherland, Switzerland, UK, and USA. Especially, Switzerland and Germany have career diplomats.

In terms of stressing the role of science for major U.S. foreign policy objectives, it has been offered to increase science capacity within the U.S. Department of State by creating new positions such as science advisory positions

In France; within Directorate-General for Global Affairs, Development and Partnerships (DGM) of MAE, the Mobility and Attractiveness Policy Directorate implements “science diplomacy”, managing and mobilizing a network composed in 2012, of 255 expatriate staff (counsellors, science attachés and international volunteers), around 60 technical assistants, 27 French social sciences and humanities research institutes bringing together 146 researchers, 161 archaeological missions abroad, lots of scientific cooperation and research programmes subsidized by the MAE.

In Denmark S&T attachés posted to the centres are in charge of advising and canalising for “Danish researchers, universities, institutions and innovative environments” in company with Trade Council of Denmark. In Japan, S&T officers to “27 overseas diplomatic missions that do not have a science attaché from the MEXT”. In Finland, The TF network is formed “70 local teams orchestrated by a coordinator with information on the local network activities and contacts to the right services”. In Netherland, The NOST conducts the SD approach by the way of a worldwide network run by 40 Counsellor for S&T, senior advisor / senior S&T officer, working in 16 different countries supported by 5 at home office. Staff are “typically located in embassies, high commissions or consulates, and work alongside other diplomats and representatives of bodies”. S&T officers are expected to work independently, however in close cooperation with the Counsellor for S&T based in host country and other members of the network of Dutch science, technology and innovation officers. The S&T officers carry to work as part of the NOST team within the Dutch diplomatic network.

5.2.5. Financial Structure

Almost all networks are funded by publicly members. Distinctively, In Switzerland,. The swissnex is managed based on “a performance policy by mutual agreement” with the SERI. Operational project funding is partially obtained from SERI for each swissnex. While one third of funding is sourced by SERI, the rest of funding is provided from service or sponsorship agreements (swissnex Mission Statement, 2013).

Operational project funding is partially obtained from SERI for each swissnex. While one third of funding is sourced by SERI, the rest of funding is provided from service or sponsorship agreements.

5.3. Highlights in the Interviews

The bulk and backbone of data in this study derived from 55 in-depth and open-ended interviews conducted with the key informants (science counsellors, policymakers, academics, senior advisors and specialists, exclusive agents of private sector, and researchers in S&T centres) in the selected countries.

Interview included entirely open and close ended questions comprises three phases. The subjects of interviews with policy makers and advisers to policy makers roughly were evidence based policy making, strategic approach to international cooperation in STI existing policy instruments to boost “international STI cooperation” and impacts assessment, rationales and targets of policies.

The subjects of interviews with academicians and universities network roughly were usefulness of “scientific evidence in policy decision-making”, participative policy approach, appropriate intermediary bodies between related parties such as “researchers and policy-makers, creating networks of researchers, policy-makers, practitioners and representatives” from civil society in order to encourage a participative and proactive approach.

Lastly, the subjects of interviews with academicians and universities network roughly were worldwide networks mechanisms, actors responsible for management and governance structure, profile of the employees, employment strategy, policy priorities, geographic priorities, and thematic priorities, main activities of networks, foreign branches or subsidiaries.

Interviews highlights some of the key issues, and interviewees suggest the critical actions which need to be considered in internationalization process in STI policy. This categorisation of key issues and actions will be used in the designing of national model for SD Network by providing extra information for comparative analysis of country cases.

- In the design and implementation stage on public policies, especially STI Policies; it is emphasized that there is a real gap of collaboration activities between policy-makers, the scientific community and industry. The actions are needed to build capacity by the strengthening of dialogue between these stakeholders. This gap might be bridged cooperative and participatory policies and programs.

- Interviewees emphasize possible objectives boosting “capacity building for integrated policy design and implementation”:

    - Strengthening national capacities to develop mutually supportive scientific, technological and economic policies,

- Building of institutions and "centres of excellence" at national and international levels to facilitate inter-agency coordination essential to the effective design and implementation of cross-cutting sustainable development strategies and integrated, mutually supportive policies
- Developing programmes and policies in STI by "enhancing the active participation and involvement of stakeholders",

Policy makers and other parties should embed aforementioned objectives for capacity building in integrated policy cycle from "the assessment of existing policies, to the identification, design and implementation of new policies, to the monitoring and evaluation of the reformed policies",

- The following elements were recognised by interviewees as essential to ensure that "capacity building programmes for integrated policy design and implementation".

In terms of needs assessment and priority setting, accurate, carefully performed needs assessments reflecting the specific conditions and priorities of beneficiary countries are critical to priority setting and programme design. Then, broad multi-stakeholder participation enhances its legitimacy, transparency and accountability and increase the chances that it result in changes in policies or the way they are implemented[23].

Countries designing policy with multi-stakeholder accurately can meet with "new challenges in the future by generating the critical mass of experts and institutions at different levels and in varied sectors needed for policy development and implementation".

Meanwhile, sharing experiences, enhancing "technical and operational support", and getting the results of activities across to related parties should be performed by networking and mechanisms for information exchange. The essential issue, "ensuring country ownership", actors or providers should keep in their mind that they should

[23] Marlit Hayslett, Office of Policy Analysis and Research ,Georgia Tech Research Institute

incorporate country's' needs and priorities during design and implementation of capacity building strategies and target.

Last but not least, another essential issue is that each country should provide "adequate and sustained funding, and evaluation mechanism ensuring adjustment" for the effectiveness the effectiveness of the capacity building efforts.

- Importance of the scientific information: The scientific information obtained as result of the international research cooperation will be useful in design of policy decisions and strategies. The scientific evidence have critical impact on the policy-decisions at each stages of development of policy especially during "ex-ante in the definition of policy and ex-post in the evaluation" of policy choices. It will be useful to utilize from the scientific information obtained the SD activities on the stage of assessment of policy's impact and before identifying the problems in the policy development.

> *Evidence based decision making" allow beneficiaries to make well informed decisions about policies, programmes and projects by putting the best available evidence from research at the heart of both in developing policy and in evaluating its effect once implemented*[24]*.*

Evidence based policy making have additional advantages highlighted by interviewees. These advantages are "developing policies responding to the real needs of the countries, leading to better outcomes in the long term, determining the critical issue which requires immediate attention, lessening government expenditure", etc.

- The Interviewees underlined the importance of indicators for policymaking activities. Before initializing to develop indicators, countries primarily should a "status quo analysis" enhancing a clear picture of existing supporting structures and instruments for international activities. Then, these indicators should configure based on national targets. At third stage, indicators are needed to understand the international opportunity environment. Lastly, indicators are

[24] Sir Peter Gluckman, Prime Minister's Chief Science Advisor, New Zealand

needed to monitor and evaluate the advancements of specific measures how internationalisation of the system can be developed.

- Intermediaries as strategic intelligence units: Especially, policy makers state a need for a special systematic mechanisms body or structure such as STI networks, centres, scientific consultancy systems, advisors or diplomatic representative offices which would be responsible for a continuing feeding scientific evidence to policy-makers, international developments, evidences analysis and foresighting works. Strategic intelligence units within the ministries and foreign agencies as an alternative model could present opportunities for the performance of unique, effective and long term policy designs.

Intermediaries, researchers, academic journals, think-tanks, lobby organizations informs policy-makers on scientific evidence. The appropriate bodies acting as an intermediary between stakeholders are scientific committees, professional associations, and specialists in knowledge transfer, international networks, NGOs and other civil society organizations.

Recently, intermediation are formed public-private partnerships provide opportunities for beneficiaries to stimulate “innovation outputs as well as providing the necessary technological and scientific instruments” to develop and create new technologies

- Mutual working culture: A participative and proactive approach through the creation of networks involving researchers, policy-makers, practitioners and representatives from civil society offers the possibility of a continuing cooperation with perspective on action, and mutual working culture based on trust-based relations.

A number of proactive mechanisms for an efficient knowledge transfer includes policy dialogue panels which provide a context for sharing ideas between the scientific community and policy-makers, conferences and other large public meetings, small scale seminars with researchers and policy-makers, participative approaches like consultations, professional publications, academic journals, policy briefings, newspapers,

multilingual websites, secondment or other people transfer mechanisms to allow researchers to directly collaborate with policy-makers, co-production of research.

- Interviewees underlined the importance of knowledge management. Knowledge management composed of the following activities "identifying, capturing, evaluating, retrieving, and sharing all of information assets including databases, documents, policies, procedures, and previously un-captured expertise and experience in individual workers".

The information management in diplomatic centres avails in many ways including accelerating the learning process, enabling the right information reach to the right people on the right time, utilizing from the intellectual capital, promoting the information transfer and providing the information sharing. For the international STI network to perform efficient information management, it is suggested to firstly adopt an organization culture that evaluates, uses and continuously develops the information. In addition to this, it must perform flexible, participatory and shared operations which will create base for the emergence of various ideas and applications in the decision making mechanisms.

- Strategic management is "the art and science of formulating, implementing, and evaluating cross-functional decisions". This management approach allow organization or network to realize their objectives, producing new and tomorrow opportunities for tomorrow.

The efforts of networks and centres which were planned to make international cooperation and long-term relations must be planned and managed strategically. The importance of determination of the vision and mission of the network, determination of its purposes, determination of its competitive position, creation of the strategy, selection of the strategy and application of the strategy and the assessment of the results is emphasized, just as a business network.

- Country Brand Management: Countries, like companies, are beginning to use branding to "help them market themselves for investment, infrastructure for STI and R&D; achieving research excellence; attracting/retaining/developing human resources for S&T; furthering foreign policy goals". Nation branding is the process

of applying corporate branding techniques to promote countries. It has the capacity to builds, improve and manage country image abroad and promote trade, tourism and direct investment. National branding is also an important part of diplomacy and of a country's development. Countries have started to work together with their international STI network to help them launch sophisticated branding campaigns.

- In the process of trying to find an accurate definition for SD, almost all the interviewees state that it is more proper to define SD is an international policy instrument executed at three different dimensions “science in diplomacy, diplomacy for science, and science for diplomacy” as mentioned literature review.

Combined with the responses in the interview and comparative analysis of best practices, following noticeable goals and envisaged impacts direct or indirect are identified to characterize the Network’s approaches in international STI cooperation and dimensions for SD. Countries aims to build national innovation capacity and competitiveness. With regards to accessing, through networks, they benchmark the international STI trends and policies, spotting new technologies and potentials, adopting new markets, knowledge, accessing research findings, facilities and cutting edge technologies, and attracting foreign talents and investment. Networks provide opportunities for internationalization of companies, researchers, or national capacity for STI. With regards to promotion of a country’s achievements in STI, networks attract the world’s best students, researchers and companies. Moreover, they prompt the country’s academic capacities, reputation and performance, enhance its innovative capacities. Lastly, networks influence the other countries’ public opinion and decision-makers. This facilitates EU integration for associated countries or cooperation with cutting edge infrastructure and potentials for other countries

- Meanwhile, it is stated that SD Network have three goals to characterize different varieties of policies and strategies to promote international cooperation in STI. They are “accessing to researchers, research findings and research facilities, natural resources and capital; Promotion of a country’s achievements in R&D;

influence on other countries' public opinion, decision-makers and political or economic leaders".

- Lastly, delivery mechanisms for outputs from SD Network and other international actions in STI are critical to benefit effectively. Outreach activities are conferences, seminars, briefing for policy makers, policy briefs, e-bulletin in-depth reports, listservs, and multilingual websites serving as portals for access to information on STI. It acts as a source of high quality targeted information on STI by supporting through a regular journal, analytical studies and reports and directories.

Moreover, delivery mechanism for outputs and other services provided by network are vital to create and disseminate knowledge. For example, web site and e-bulletin with up to date information can make the network operating as an information platform. This platform matches the users having similar needs or provides reference information for STI. Networks can provide national organizations or firms with "relevant information and contacts in host countries" in finding contact in global market. Additionally, networks could enhance STI and R&D related foreign direct investment.

- Creation of supporting team being responsible for a continuing feeding scientific evidence for Network Staff and establishment and reinforcement of information flow planning for counterparts at home & host country are vital for sustainability of network activities.

- The operations and strategies specialized by STI networks, and firms of countries enhance "business sophistication". This is essential for development. "When companies and suppliers from a particular sector are interconnected in geographically proximate groups, called clusters, efficiency is heightened, greater opportunities for innovation in processes and products are created, and barriers to entry for new firms are reduced. Individual firms' advanced operations and strategies (branding, marketing, distribution, advanced production processes, and the production of unique and sophisticated products) spill over into the economy and lead to sophisticated and modern business processes across the country's business sectors".

CHAPTER 6

CONCLUSIONS

The aim of this chapter is to glean useful lessons from the findings of the preceding chapter for effective and efficient utilization of worldwide network, policy making and internationalization strategy for STI to meet global challenges.

6.1. Summary- Novelty of The Thesis

The aim of this thesis is to investigate the mechanisms and patterns of operation followed by the countries having "good practice" in implementation, management and efficient utilization of STI network, and to recommend SD network for Turkey as a proactive international policy approach within the scope of STI.

The main research questions are “What activities that are performed by the successful countries in international cooperation in STI for developing their national capacities for SD activities?” and “How will Turkey benefit from this policy measure? How should the structure and activities of SD network, which shall be operated in Turkey in international arena, be? What should be complementary targets?”

According to interviews and comprehensive literature review realized in this study, international STI cooperation and internationalization of policies are eminently focused up to the present. The studies including knowledge or comparative findings providing recommendations about international governance of STI, and instrument employed to promote capacity are insufficient.

There is no comprehensive study in the theoretical, conceptual and practical sense in Turkey to design internationalization strategies as a policy instrument. Meanwhile, limited countries have specific internationalization strategies and foreign branches or networks. Introductory research is needed to inform the design and implementation of SD network as a tool for a proactive policy approach. To address this gap, this thesis contributes to the international cooperation in STI literature in along four novel ways.

First, this thesis is the first study in Turkey to comprehensively investigate the SD and SD Networks with regards to stimulate international STI cooperation and national capacity building.

Second, the methodological design in conducting this study is novel. Important insights into the internationalization STI cooperation for Turkey have been successfully generated from this study using different methods to gather and analyse the data.

These methods include comprehensively document studies, in-depth interviews with 55 key informants (science counsellors, policymakers, academics, senior advisors and industry positions), and comparative analysis of ten case studies having "good practice" in efficient usage of SD Network for national capacity building in STI and economic development.

The study offers important insights into methodology for internationalisation strategy for Turkey's STI cooperation by synthesising best practices of the most active countries into designing and implementing the SD network responsible for feeding scientific advice to policy stakeholders.

In order to identify the most active countries based on wide range of policy tools to international STI cooperation, this study applies additional proxies including "located of the target region of Turkey, existence of a dedicated formalised internationalisation strategy, operation infrastructure, employment policy, types of staff, approaches to SD, foreign branches, geographical, and thematic priorities for cooperation" etc.

Third, this thesis presents novel taxonomies of the critical of policy domains, drivers, goals, and instruments of STI policy actions of international STI cooperation. Any existing relationship between foreign branches or intermediaries as strategic intelligence unit running by internationalisation strategy and policy implications for national STI systems are examined through understanding the rationales of government's intervention into internationalization of STI policies.

Lastly, the study provides an alternative model for international cooperation in STI through the right sequencing of design and implementation of the SD network of Turkey.

6.2. Main Findings

Internationalization of STI policies has many policy implications. Within this scope, governments should optimize their "absorptive capacity and networking with multinational firms" in order to exploit this process.

"High educational level of the local labour force and a well-developed technological capacity of domestic firms" are the main factors that improve absorptive capacity. Countries' networks allow their stakeholders or beneficiaries to link with counterpart in the host region, develop technology and address the grand challenges as an infrastructure, etc.

Eventually, it is found that countries which have clear and coherent overall strategy for SD leverage the impacts of SD on sustainable development. Governments require evidence-based practice on designing of policies and programmes. SD network of Turkey would allow better forecasting and inform responses to identified risks. As final remarks, it is recommended that Turkey should design SD strategies and policies in order to manage the nation branding and reputation, and to achieve sustainable competitiveness and long run growth.

At this stage, indicators are important tools for decision making in STI policy and international STI. Before initializing to develop indicators, countries primarily should do a "status quo analysis" enhancing a clear picture of existing supporting structures and instruments for international activities. Then, these indicators should configure based on national targets. In the third stage, indicators are needed to understand the international opportunity environment. Lastly, indicators are needed to monitor and evaluate the advancements of specific measures on how internationalisation of the system can be developed.

Currently there is a dominance of geographical prioritization through comparative analysis of ten countries. Geographical prioritization is mostly preconditioned in the selected countries. More importantly is that "theme and problem-oriented prioritization is needed rather than geographic". Meanwhile, countries need to design new policy mechanisms serving to the inadequate or underutilized areas of national capacities.

Therefore, government are in tendency to policy design comprising of "targeted initiatives for strengthening cooperation in selected (prioritized) areas". One cannot deduce from this study "which drivers define the geographic direction" of the STI cooperations. All countries have set geographic priorities that depend largely on the drivers and rationales for putting policy in place for international STI cooperation. The interviews with key actors in the selected countries showed a coherent picture of the major geographical priorities .

Countries have diverse models for how to connect scientist and policy makers. The majority of countries in this study have diplomats, officers and experts on secondment or specifically recruited staff of ministries and institutions in their network. However, networks of UK, Germany, Switzerland, France, and Denmark benefit from scientists' experiences by employing researchers and academicians form universities. Their networks serve as a formal channel of science advice to government as well as informal channels of science advice to business and universities. Particularly, Switzerland, The Netherlands, and Finland also benefit from executives from industry in their network

As admonitory in employment policy, policy makers or beneficiaries underline that the representatives to be assigned in Network must be selected from academicians, private sector or public officers who have sufficient information on STI, R&D and international cooperation, who can develop social connections and potential cooperation and who know the language spoken in the host country.

Actually, the continuity and maintainability of knowledge and experience obtained are vital importance for the sustainability of the Network and national capacity building. Otherwise, accumulation of knowledge and maximum utilization will be lost in the case of termination of the job. Moreover, the decision for determining stakeholders in SD Network is a vital importance to international network with regards to continuity and operate effectiveness.

6.3. Policy Implications for International STI Cooperation

Turkey had policy documents by "the development of the framework for science & research policies with the Development Plans" which were incorporated into the "Mid-

term Programs and Annual Programs". Additionally, these execution process are reinforce by the implementation "action plans and detailed cooperation programs".

The first attempt towards explaining the role of technology for development, priority areas of technology, and critical technologies in Turkey is "Turkish Science Policy: 1983-2003". Along with this document, the "Supreme Council for Science and Technology (BTYK)" was created and its decisions has started to direct stakeholders related to "national S&T and innovation policy".

According to the first operational meeting of BTYK in 1989 the need for systematic and comprehensive institution for developing international relations was emphasized. In the second meeting of BTYK in 1993, the document entitled "Turkish Science and Technology Policy: 1993-2003" an integral part of Development Plan was approved. The Government's "first industrial technology and innovation strategy" was articulated in the policy document, "Turkish Science and Technology Policy: 1993-2003" as the component of the "7th Five-Year Development Plan".

In the fourth meeting of BTYK, the decision including "getting involve more in international joint research program and projects, networking with counterparts institutions related STI in home and host countries, and assignment of science and technology advisor, attaches, or policy officer to industrialized countries and permanent representatives of OECD, EU within the scope of monitoring more closely STI developments in host countries" were taken.

In 2010, the 22th meeting of BTYK, the decision - initiating and extending the activities for science diplomacy within the scope of "Activation of International STI Cooperation in the Mutual Interest of the Country", was taken along with "National Science, Technology and Innovation Strategy (2011-2016) document" has been approved.

Recently, a cooperation protocol on SD of Turkey between "The Ministry of Science, Industry and Technology (MoSIT) and The Ministry of Foreign Affairs (MoFA)" has been signed for collaborative research on common tasks and deepening reciprocal corporate affairs.

Turkey faces the structural challenges and national barriers in international cooperation and developing national capacity for STI. As mentioned in the introduction part of this study, these challenges exist in various forms ranging from promoting research commercialisation from universities such as “university start-ups and spin-off, mobility of researchers and students, mutual working culture, under-developed venture capital and business angels market, as well as limited number and variety of policy measures for start-up creation, the low levels of absorptive capacity of the business sector to human resources intensity”.

These challenges call for urgent and effective international responses by research and innovation systems, for well-informed policy making and broad-based deployment of knowledge-based solutions in the government, business sector and the society. International cooperation is increasingly seen as vital to exploit the benefits of STI and R&D in order to address global challenges.

Through proactive and innovative intelligence in policy making, Turkey can focus on specific and thematic sectors enhancing “national capacities and abilities” to meet the challenges. Therefore, Turkey needs special and tailor made instruments or mechanisms in these areas. In Turkey, there exist various instruments including bilateral and multilateral agreements, joint research programmes and funding of research infrastructures, exchange programmes, grant and fellowship programmes , international science year, and foreign branches or subsidiaries of some institutions to tackle structural and international challenges and support international STI cooperation as summarized preceding chapters.

There is a clear trend for establishing international networks producing new knowledge. International cooperation and exchanges with foreign partners are essential in ensuring that knowledge is shared and in enabling countries to become even more competitive in the area of STI. International cooperation is increasingly seen as vital in order to reap the benefits of STI and R&D in order to address global challenges. These challenges call for urgent and effective international responses by research and innovation systems, for well-informed policy making and for broad-based deployment of knowledge-based solutions in the government, business sector and the society. Networks allow their stakeholders to obtain the best STI opportunities and partner companies in similar sector

abroad. This approach catalyses to “a thematic approach to international STI relationships”.

Recently, Turkey has successfully participated in international STI cooperation by introducing specific STI and R&D mechanism and measures for priority areas in Turkey. The government’s intensive efforts are unable to go beyond the national contexts and drivers. There are no comprehensive or tailor made research fields focusing on meeting global challenges through cross-border knowledge circulation. Hitherto, the mechanisms prioritized for international STI cooperation is generally implementing bilateral agreements and participating framework programmes. That means only these mechanisms are employed to meet grand challenges (Erawatch Turkey, 2013). Combined with this, evaluation studies on aforementioned specific STI and R&D measures in Turkey have not been done yet.

Up to the present, Turkey has participated in international cooperation activities through mechanisms and measures. These mechanisms and measures with well-functioning worldwide STI network, will make Turkey’s effort for internationalization in STI gathered under a single roof. In today’s complex and dynamic international environment, Turkey obviously needs a clear international strategy in STI. This strategy and new policy measure must respond to these challenges in a coherent, practical and effective way by building national science diplomacy system.

Deadlocked Turkey’s recent efforts of introducing specific policy measures to internationalization of STI can find new impetus. Now, the establishment and reinforcement of the SD Network for enhancing the learning capabilities, absorptive capacity, R&D and innovation capabilities of stakeholders in the country will be alternative policy measure for Turkey. In general, the findings based on good practices and successful methodologies underline the distinctive contribution of SD network as a new policy mechanism to strengthen international cooperation in STI. Therefore, creating and stimulating “knowledge diffusion mechanisms” is necessity to empower the infrastructure of countries having aforementioned challenges.

Countries usually continue to learn from each other by networking mechanisms. The aim is not to create an unnecessary new global entity, but rather to provide a virtual hub and

an ‘umbrella’ or ‘brand’ with which subsequent events and initiatives could be associated, whether through shared contacts, expertise, resources, or other means.

Networks provides an ecosystem and favourable conditions for investment of international firms in R&D. Along with a well structure “academic and industrial research base, efficient protection of intellectual property rights and a well-trained workforce” will contribute the foreign direct investment in R&D, but will also enhances the growth of domestic enterprises.

Moreover, SD Network will work as “an effective mechanism for systematic evaluation of the policies and policy measures” regarding to universally accepted criteria. Prerequisite for the spillover benefits of network need to be adequately resourced to attain expected goals particularly in terms of time, financing, human capital, support from high political level, technical level, and flexibility in business manner.

6.4. Toward the Establishment and Reinforcement of the SD Network Model

6.4.1. Background and Rationale

Turkey needs national capacities in internationalization of STI policy design, implementation, and evaluation. Meanwhile, it is needed to establish an information support system for government in action process as well as industry and universities. As is shown in Figure 6.4-1, it presents a snapshot for the orchestrating SD network. The project for “Turkish SD Network” as an international platform will bring together enterprises, universities, research institutes, and the government. Network can be funded and performed by public-private members.

Turkey has the domains, drivers, goals, instruments of STI policy actions like selected countries. But there is no internationalization strategy or policy objectives towards internationalisation of STI and R&D But, Turkey has already a comprehensive national specific strategy on STI. It includes the expected benefits of international cooperation with a broader vision including “objectives defines the framework conditions” for meeting the national challenges.

Turkey has projected the SD Network as a joint initiative of the Ministry of Science, Industry and Technology and Ministry of Foreign Affairs like other selected countries.

Meanwhile, a cooperation protocol on SD of Turkey between two ministries has been signed for collaborative research on common tasks and deepening reciprocal corporate affairs. According to the protocol, the necessary support and guidance to staff including science attachés, minister counsellors and science envoys of MoSIT will be provided by MoFA. Staff of MoSIT will carry on the activities at diplomatic missions of Turkey till establishing the necessary own infrastructure and premises.

Turkey like Switzerland, Denmark, Finland, and Germany should set up and maintains a dense of activities in their own premises along with embassies. Furthermore, Turkey as the others, has "a number of geographical and thematic priorities" for international cooperations driven by national STI strategies and foresight activities by the Network.

Depending on the type of actors, rationales, instruments of STI policy actions, geographical and thematic priorities, approaches to SD of countries differ at three different dimensions "science in diplomacy, diplomacy for science, and science for diplomacy". From the point of view of MoSIT, the dimensions (science in diplomacy - diplomacy for science) will be vital to cooperate. On the other hand, science for diplomacy will be in the forefront for MoFA.

SD Network will be a platform acting as "a strategic forum and an advisory body" to the Ministry in the field of international STI cooperation. Public authorities, universities and industry are the main members of the Network (Figure 6.4-1).

This framework has the rationality in line with the challenges and barriers in National STI Strategy. SD Network will play an essential role in driving forward on international STI cooperation mainly by providing strategic advice to the privileged stakeholders.

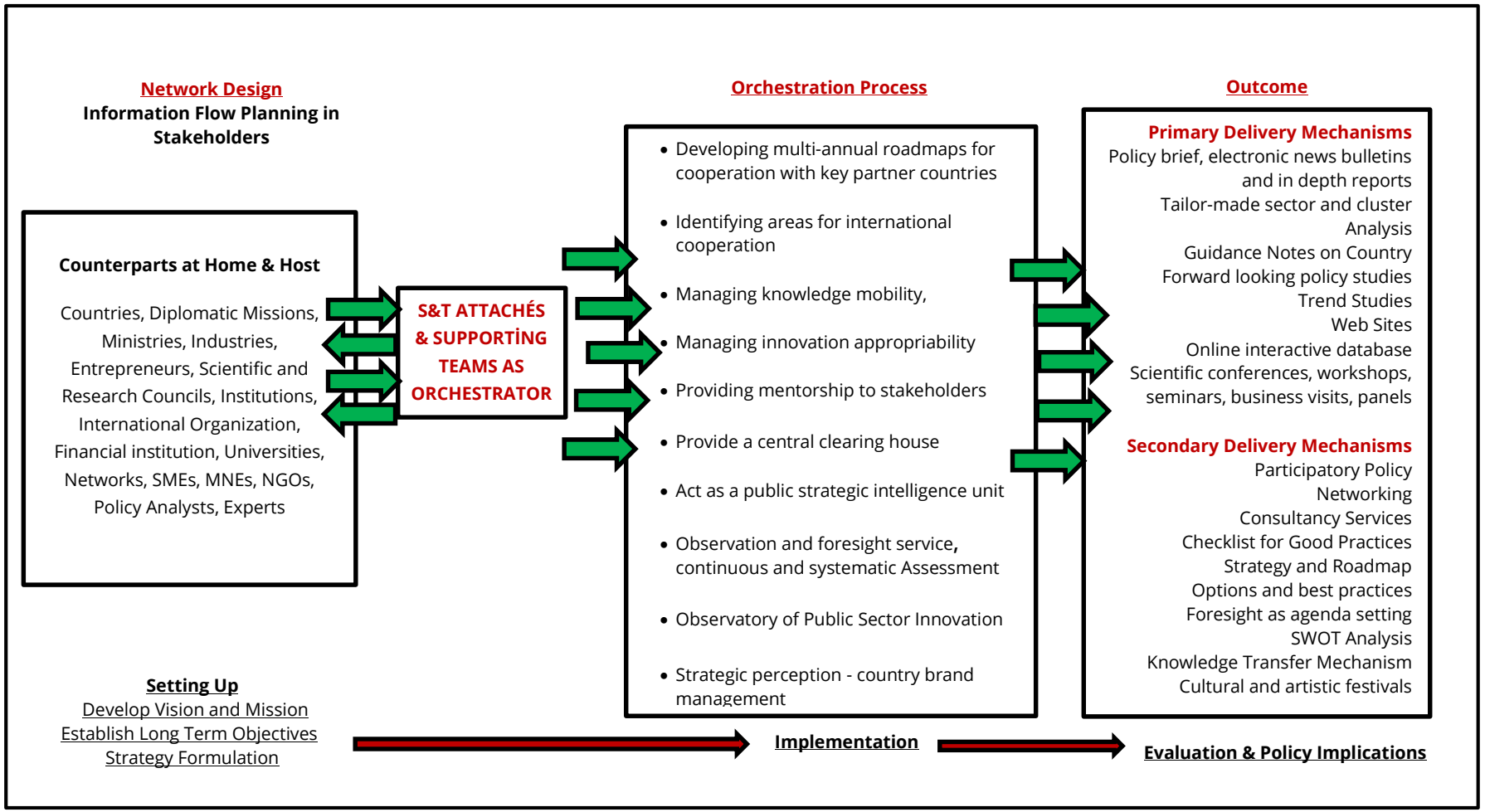

Figure 6.4-1: Conceptual Model for Turkey: Designing and Orchestration in SD Network

6.4.2. Structure and Implementation of the Work Programme in Turkey

First and foremost, having a comprehensive knowledge of "country-specific factors" is essential due to the developing national technological and competitive advantage. The overall strength of the representatives of the SD Network is their local presence. They have a chance to establish a network including "relevant research, innovation and business environments". The SD Network composes of S&T Attachés and their supporting teams (officials, scientific advisory committees).

The SD Network Work Programme is based on the national strategy, development, vision papers, and internationalisation strategy for STI. The work programme with the findings from policy discussions with stakeholders, strategic workshops as well as from the Network exercises will be carried out in the context of the international cooperation.

Along with the priority areas concentrate by the Network coincide with national initiatives, new developments and programmes will be incorporated into the work programme (e.g. further development of national STI strategy, development plan, implementation of international cooperation activities in Horizon 2020).

The SD Network concentrates on the following different priorities and areas of action (Figure 6.4-2). Each one of action has specific activities in detail in Appendix C.

- Strategic advice on international S&T cooperation

The Network will provide "strategic advice and evidence for policy formulation" on international STI cooperation and the external dimension of national STI strategy. Meanwhile, the network will share "opinions/advice" to the Ministry and the specific target group. The Network will also intensify its role in giving early strategic advice to the target group and will continuously search for synergies with counterparts in the host country.

- Contribution to the further development and implementation of "the National STI Strategy"

The Network will contribute to realization of "the National STI Strategy". The Network activities will therefore be in line with priority actions of the Strategy. A strategic approach

will be developed in close with related groups, on how to strengthen and streamline the external dimension of national activities. In the context of the monitoring mechanism, the Network will set up the complementarity indicators with existing sets of planned or current indicators covering various aspects of international cooperation in operation within Turkey and host countries.

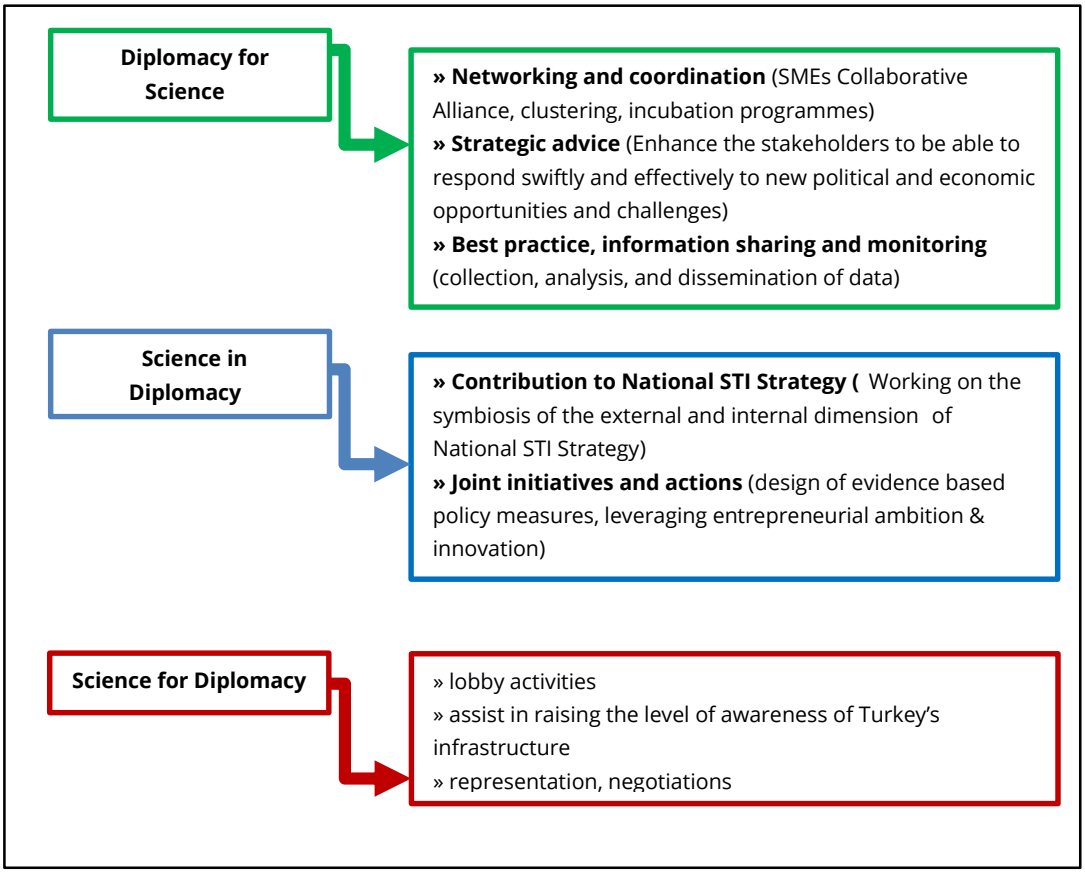

Figure 6.4-2: Priorities and Areas of Action

- Joint initiatives and actions

The Network will work on the different country initiatives with Brazil, China, United States and Russia, etc. In this respect, the Network will work towards the implementations for "principles and guidelines for international STI cooperation" on behalf of the actors and stakeholders. With the intent of potential work on specific thematic areas, the Network will also analyse and focus on the countries.

- Best practice, information sharing and monitoring

For managing and sharing information effectively, the actors of the Network will contribute to peer-learning activities and exchange of best practices The Network will also promote presentations, reports, and analysis on strategies, initiatives and projects related STI.

The Network will performs essential activities including “monitoring and mapping of international policies and activities” enhancing data for the definition of indicators for international STI cooperation. With regards to enhance the visibility, the Network will use some deliver mechanisms such as regularly reports and results of activities, and specific webpages. Moreover, bi-weekly information e-mails with relevant documents and information will be shared to the target groups.

- Networking and coordination

The Network will implement cross-cutting and horizontal activities covering all other priority areas with intent to “assure the visibility and the effectiveness of the work”. The Network will closely liaise with the relevant counterparts and other stakeholders to network-organised events or meetings. Actors in the Network will endeavour to coordinate at the national and international level on issues relevant to STI cooperation and the external dimension of national strategy through linking with global networks and benefiting from consultations and workshops.

Appointing experts for specific events, themes or regional initiatives will be considered, with the purpose of exchanging information and having an up-to-date follow-up on initiatives in these areas. The network will continue liaising more closely with science counsellors in other countries.

6.5. Final Remarks: Future Studies

Furthermore, in September of 2015, a joint future initiative "Science Diplomacy Symposium in Istanbul” between Bogazici University and MoSIT has been designed as an opportunity for the world’s leading practitioners of SD to meet and discuss the key

challenges and good practices of their task, together with scholars having expertise in the field.

The practitioners are individual science advisors to the highest levels of governments, heads of academies, and the representatives of Swissnex (CH), German Houses for Research and Innovation (DE), and Science Innovatıon Network (UK), and policy makers and researchers will participate in the workshop. It is a work in progress.

The workshop aims at developing recommendations for international STI cooperation programme design and implementation in Turkey. Collaboration with such experts enhances to gain depth for the study by identifying the broader themes and future drivers for the global governance of international SD network and helping Turkey identify and implement its very own SD strategy.

The workshop will deliver policy implications for orchestrating international effective network and overcome the obstacles to improve competitiveness.

REFERENCES

AOSTI (African Observatory of Science, Technology and Innovation) (2013), "Science, Technology and Innovation Policy-Making in Africa: An Assessment of Capacity Needs and Priorities", AOSTI Working Papers No.2, (http://aosti.org/index.php/working-papers/finish/6-working-papers/10-aosti-workingpapers2-executivesummary) accessed on 10.03.2014

Archibugi, D. and Iammarino, S. (1999), "The policy implications of the globalization of technology", Research Policy, 28(2-3), 317-336

Archibugi, D. and Iammarino, S. (2002), "The globalization of technological innovation: definition and evidence" Review of International Political Economy, 9 (1), 98-122

Archibugi, D., J. Howells, et al. (1999), "Innovation Systems in a Global Economy", Technology Analysis & Strategic Management, 11(4), 527-539

Argyrous, G. (2009), "Evidence for Policy and Decision-Making: a practical guide", Public Organisation Review, 10(2), 191-194

Arrow, K. (1962), "Economic welfare and the allocation of resources for invention", in: Nelson, R. (Ed.). The rate and direction of inventive activity, Princeton: Princeton University Press, 609-629

Audretsch, D. B. (1998), "Agglomeration and the location of innovative activity", Oxford Review of Economic Policy, 14(2), 18–29

Auerswald P. and Branscomb L. (2008), "Research and Innovation in a Networked World", Technology in Society 30, 339-347.

Australian Academy of Science (2010). Internationalisation of Australia science: position paper. Australian Academy of Science, Canberra

Australian Bureau of Statistics (2010). A guide for using statistics for evidence based policy. Australian Bureau of Statistics, Canberra

Banks, Gary & Australia. Productivity Commission (2009). Evidence-based policy making : what is it? how do we get it?. Productivity Commission, Melbourne, Vic

Battelle (2011), "2012 Global R&D Funding Forecast", (http://battelle.org/docs/r-d-funding-forecast/2012_r_d_funding_forecast.pdf?sfvrsn=0), accessed on 10.08.2014

Berg L. P. (2010), "Science Diplomacy Networks", Politorbis 49(2), 69-74.

Best, M. H. (2001), "The New Competitive Advantage: The Renewal of American Industry", Oxford University Press: New York

Bless, C., & Higson-Smith, C. (2000), "Fundamentals of social research methods, an African perspective (3rd ed.)" Lansdowne, South Africa: Juta

Carlsson, B. and Jacobsson, S. (1997), "In search of a useful technology policy - general lessons and key issues for policy makers", in Carlsson, B, (ed.) Technological systems and Industrial Dynamics, Boston, Dordrecht and London, Kluwer Academic Publishers

Chaminade, C., and Edquist, C. (2006). "From theory to practice. The use of the systems of innovation approach in innovation policy". In Hage, J., and Meeus, M. (Eds.), Innovation, science and institutional change. A research handbook (17 pp.). Oxford, UK: Oxford University Press

Chesbrough, H. (2006), "Open Business Models: How to Thrive in the New Innovation Landscape", Harvard Business School Press

Clinton, H. (2009), "Secretary Clinton Announces New Initiatives to Bolster Science and Technology Collaboration with Muslim Communities around the World", (www.state.gov/r/pa/prs/ps/2009/nov/131299.htm), accessed on 10.08.2014

Council for Science and Technology Policy of Japan (CSTP) (2008), "Toward the Reinforcement of Science and Technology Diplomacy", 2(10), (http://www8.cao.go.jp/cstp/english/doc/s_and_t_diplomacy/20080519_tow_the_reinforcement_of.pdf), accessed on 10.08.2014

CREST Working Group (2007), "Analytical Report: Internationalisation of R&D – Facing the Challenge of Globalisation: Approaches to a Proactive International Policy in STI, Policy Approaches towards STI Cooperation with Third Countries", Brussels

Davies, D., & Dodd, J. (2002), "Qualitative research and the question of rigor", Qualitative Health research, 12(2), 279-289

De Lima, Jr. A. F. (2007), "The role of international educational exchanges in public diplomacy. Place Branding and Public Diplomacy", 3(3), 234-251

Denzin, N. K. (1978), "The research act: A theoretical introduction to sociological methods", New York: McGraw-Hill

Edler, J. and Boekholt, P., (2001), "Internationalization of S&T Benchmarking national public policies to exploit international science and industrial research: a synopsis of current developments" in Science and Public Policy, 28(4), 313-321.

Edquist C. et al., (1998), "The ISE Final Report: Scientific Findings and Policy Implications of the 'Innovation Systems and European Integration' (ISE) Research Project, Linköping: Linköping University

Edquist, C. 1947- (1997), "Systems of innovation technologies, institutions, and organizations". London Pinter

Edquist, C., Malerba, F., Metcalfe, S., Montobbio, F., and Steinmueller, E. (2004), "Sectoral systems: Implications for European innovation policy". In Malerba, F. (Ed.), Sectoral systems of innovation in Europe – Concepts, issues and analyses of six major sectors in Europe (pp. 427-461). Cambridge, UK: Cambridge University Press.

Erdil, E., Çetin, D. (2014), "ERAWATCH Country Reports 2013: Turkey", Publications Office of the European Union, Luxembourg: (http://erawatch.jrc.ec.europa.eu/erawatch/export/sites/default/galleries/generic_files/file_0539.pdf), accessed on 03.02.2015

European Commission (2009), "Drivers of international collaboration in research", Final Report of the Expert Group

European Commission (2011), "Innovation union competiveness report: 2011", (http://ec.europa.eu/research/innovation-union/index_en.cfm?section=competitivenessreport&year=2011), accessed on 10.11.2014

European Commission (2012), "International Cooperation in Science, Technology and Innovation: Strategies for a Changing World", (http://ec.europa.eu/research/iscp/pdf/publications/report-inco-web-4.pdf), accessed on 10.11.2013

European Commission (2013), "Overview of international science, technology and innovation cooperation between Member States and countries outside the EU and the development of a future monitoring mechanism", (http://ec.europa.eu/research/iscp/pdf/publications/study_cooperation_countries_outside_the_eu.pdf), accessed on 10.07.2014

Evenson, R. E. ve L. Westphal. (1995), "Technological Change and Technology Strategy". In Handbook of Development Economics, 3, ed. J. Behrman and T.N. Srinivasan, Amsterdam: North Holland.

Federal Minister of Education and Research (2008), "Strengthening Germany's role in the global knowledge society, Strategy of the Federal Government for the Internationalization of Science and Research" (http://www.bmbf.de/pubRD/Internationalisierungsstrategie-English.pdf) accessed on 10.07.2014

Fedoroff, N. V. (2009), "Science diplomacy in the 21st century. Cell", 136, 9-11.

Finland Prime Minister's Office (2014), "Team Finland: Strategy Update 2015", Prime Minister's Office Publications (http://vnk.fi/documents/10616/1098657/J0714_Team+Finland+Strategy+2015.pdf/19ff0f61-1f74-4003-8b7b-8b029ba00d8e?version=1.0) accessed on 10.05.2014

Flink, T., & Schreiterer, U. (2010), "Science diplomacy at the intersection of S&T policies and foreign affairs: Toward a typology of national approaches", Science and Public Policy, 37(9), 665-677

Göker, A. (2002), "Türkiye'de 1960'lar ve sonrasındaki bilim ve teknoloji politikası tasarımları niçin [tam] uygula[ya]madık ?", ODTÜ Öğretim Elemanları Derneği. "Ulusal Bilim Politikası" Paneli, ODTÜ, Ankara. Haziran 2002, Ankara, 17-18

Görün, M., Emini, F. (2011), "The Legal Framework of Strategic Management Implementations in Public Institutions in Turkey", British Journal of Arts and Social Sciences, 3 (2), 220-228

Hill, C. (2006), "Where Does Science and Technology Fit in Public Policy?", AAAS Leadership Seminar in Science and Technology Policy (http://www.aaas.org/programs/science_policy/leadership/hill1106.) accessed on 10.09.2014

Innovation Center Denmark (ICDK) (2008), "Minutes of the Breakfast Club Meeting" (www.shanghai.um.dk/en/servicemenu/Extranet/MINUTESOFTHEBREAKFASTCLUBMEETING) accessed on 10.04.2014

Kaiser L. (2010), "The Threat of Patent Infringement in IT-Business Operations", In ICMIT Management of Innovation and Technology, IEEE International Conference, 226-231.

Karlsson, M., ed., (2006), "The Internationalization of Corporate R&D: Leveraging the changing geography of innovation", Swedish Institute for Growth Policy Studies, Östersund

Leonard, M., Smewing, C., & Stead, C. (2002), "Public diplomacy", Foreign Policy Centre, London

Lipsey, R.G. and Carlaw, K. (1998), "A Structuralist Assessment of Technology Policies - Taking Schumpeter Seriously on Policy", Industry Canada Research Publications Program

Lord K. and Turekian V. (2007), "Time for a new era of science diplomacy", Science, 315(769), (www.sciencemag.org/cgi/content/summary/315/5813/769) accessed on 10.07.2014

Lundvall, B.-Å. (1988), "Innovation as an Interactive Process: from User-Producer Interaction to the National System of Innovation", in Dosi, G. et al. (eds.), Technical Change and Economic Theory (London: Pinter), 349-369

Lundvall, B.-Å. and Borrás, S. (1997), "The Globalising Learning Economy: Implications for Innovation Policy, Report from DG XII, Commission of the European Union, 34-39

Maxwell, J. A. (1992), "Understanding and validity in qualitative research", Harvard Educational Review, 62(3), 279-300

Meray S. (1956) “Diplomasi Temsilcilerinin Hukuki Statüsü”, Ankara Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 3, 79-117 (http://dergiler.ankara.edu.tr/dergiler/42/368/3861.pdf) accessed on 10,05,2014

Metcalfe, J.S. (1995), “Technology Systems and Technology Policy in Historical Perspective”, Cambridge Journal of Economics, 19, 25-47

Ministry of Education of Hungary (2002), Research and Development in Hungary, Budapest

Nelson, R. R. & Winter, S. G (1982), “An Evolutionary Theory of Economic Change”, Belknap Press of Harvard University Press, Cambridge, Mass

Nelson, R. R. (1959), “The Simple Economics of Basic Scientific Research”, Journal of Political Economy, 67, 297-306.

Obama, B. (2009), “Remarks by the president on a new beginning”, Cairo, (http://www.whitehouse.gov/the_press_office/Remarks-by-the-President-at-Cairo-University-6-04-09/) accessed on 10.05.2013

OECD (1998), “National Innovation Systems: Policy Implications”, OECD, Paris

OECD (2003), “Networks of Innovation, Networking in Society, Organisations and Education”, OECD, Netherlands

OECD (2008), “Science, Technology and Industry Outlook 2008”, OECD, Paris

OECD (2012)., “OECD Science, Technology and Industry Outlook 2012”, OECD, Paris

Patton, M. Q. (2002), “Qualitative research and evaluation methods (3 ed)”. Thousand Oaks, Calif Sage Publications

Rosenberg, N. (1982), “Inside the Black Box: Technology and Economics”, Cambridge: Cambridge University Press

Rothaermel, F. T., Agung, S. D. and Jiang, L. (2007), “University entrepreneurship: a taxonomy of the literature. Industrial and Corporate Change”, 16(4), 691-791.

Salmenkaita, J.-P. and Salo, A. (2002), “Rationales for government intervention in the commercialization of new technologies”, Technology Analysis & Strategic Management, 14(2), 183-200

Savaş A. İ. (2007), “Osmanlı Diplomasisi”, 3F Yayınevi, İstanbul

Schumpeter, J.A. (1934), “The Theory of Economic Development”, Cambridge, Mass: Harvard University Press

Simon, M. (2006), "Dissertation and scholarly research: Recipes for success. A practical guide to start and complete your dissertation, thesis, or formal research project", Kendall Hunt Publishing Company,

Smith, K. (2000), "Innovation as a Systemic Phenomenon: Rethinking the Role of Policy", Enterprise and Innovation Management Studies, 1(1), 73-102

Stine, D. (2009), "Science, Technology, and American Diplomacy: Background and Issues for Congress", Congressional Research Service Reports, (https://www.fas.org/sgp/crs/misc/RL34503.pdf) accessed on 10.05.2013

Strauss, A. and Corbin, J. (1994), "Grounded Theory Methodology". In NK Denzin & YS Lincoln (Eds.) Handbook of Qualitative Research, 217-285, Thousand Oaks, California: Sage Publications

Sunami, A., Hamachi, T. and Kitaba, S. (2013), "The Rise of Science and Technology Diplomacy in Japan", Science & Diplomacy, 2(1), (http://www.sciencediplomacy.org/article/2013/rise-science-and-technology-diplomacy-in-japan) accessed on 10.05.2013

Sütçü, G. (2013), "New Mode of Diplomacy in the 21st Century: Science Diplomacy", Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi, 13(2), 1-14

Swiss State Secretariat for Education, Research and Innovation (SERI) and Federal Department of Economic Affairs, Education and Research (EAER) (2012), "Overview of Swiss scientific foreign policy for 2012 and 2013-2016"

Swiss State Secretariat for Education, Research and Innovation (SERI) and Federal Department of Economic Affairs, Education and Research (EAER) (2013), "swissnex Mission Statement" (http://www.swissnex.org/wp-content/uploads/2014/05/swissnex_Mission_Statement_e.pdf) accessed on 10.01.2013

Taymaz, E. (2001), "Ulusal Yenilik Sistemi: Türkiye İmalat Sanayiinde Teknolojik Değişim ve Yenilik Süreçleri" Ankara: TUBITAK / TTGV / DIE.

Teubal, M. (1998), "Policies for Promoting Enterprise Restructuring in National System of Innovation: Triggering Cumulative Learning and Generating Systems Effects", OECD STI Review, 22, 137-170.

The Brookings Institution (2005), "Science and Technology in U.S. Policy towards the Islamic the Case of Least Developed Countries", (http://www.brookings.edu/fp/saban/analysis/darcy20050419.pdf), accessed on 10.08.2014

The Centre National de la Recherche Scientifique (National Center for Scientific Research) (2014), « CNRS Activity report, 2014", Directorate-General of Global Affairs, Development and Partnerships, France (http://www.cnrs.fr/en/science-news/docs/cnrsra2013/pubData/source/cnrs-ra2013.pdf), accessed on 10.08.2014

The Department for Business, Innovation & Skills (BIS) (2011), "Science and Innovation Network: Annual Report 2011–12", Annual Report

The German Center for Research and Innovation (2013), "The German Houses of Research and Innovation (DWIHs) Annual Report 2013", New York (http://www.germaninnovation.org/docs/GCRI-2013-Annual-Report-Web.pdf) accessed on 10.05.2013

The Royal Society (2010), "New Frontiers in Science Diplomacy: Navigating the Changing Balance of Power", London: Royal Society. (http://royalsociety.org/New-frontiers-in-science-diplomacy) accessed on 10.05.2013

Tuncer H. (2002), "Eski ve Yeni Diplomasi", s.13, Ümit Yayıncılık, Ankara

UK Department for Business, Innovation & Skills (2013), "UK Science and Innovation Network Report", Foreign & Commonwealth Office

United Nations (2003), "United Nations Conference on Trade and Development, Science and Technology Diplomacy, Concepts and Elements of a Work Programme", New York and Geneva.

United Nations Environment Programme (UNEP) (2005), "Enhancing Capacity Building for Integrated Policy Design and Implementation for Sustainable Development", Geneva.

US Department of State, & US Agency International Development (2010), "Leading through Civilian Power, The First Quadrennial Diplomacy and Development Review, (http://www.state.gov/documents/organization/153108.pdf) accessed on 10.10. 2014

Winch, G.M. and Courtney, R. (2007), "The organization of innovation brokers: An international review", Technology Analysis & Strategic Management, 19, 747-763.

World Economic Forum (2014), "The Global Competitiveness Report 2014-2015", New York, Oxford

Yakushiji, T. (2009), "The Potential of Science and Technology Diplomacy", Asia-Pacific Review, 16(1)

Yin, R. K. (2014), Case Study Research: Design and Methods, Sage Publications: Thousand Oaks USA

APPENDICES

A: INTERVIEWEES

Policy makers & Advisers	
Prof. Susan Hockfield	US Science envoys, Massachusetts Institute of Technology
Prof. Bernard Amadei	US Science Envoy, University of Colorado
Prof. Simon Anholt	Vice-Chair of the UK Government's Public Diplomacy Board
Dr. Vaughan Turekian	Director, Science Diplomacy Center, AAAS
Sebastien Hug	The coordinator of the Swiss S&T Counsellor and swissnex Network, Scientific Advisor, International Relations, SERI, Switzerland
Prof. Dr. Taizo Yakushiji	Member, Council for Science and Technology Policies, Japan
Andrew Jackson	Head of UK Science and Innovation Network, Counsellor Knowledge Economy, UK
Elizabeth Hogben	Head of Science and Innovation Network Japan, British Embassy Tokyo, Japan
Lutz-Peter Berg	Science and Technology Counsellor at the Embassy of Switzerland in London, UK
Sir Peter Gluckman	"Prime Minister's Chief Science Advisor, New Zealand"
Prof. Anne Glover	"Chief Scientific Counsellor, European Commission"
Sir Mark Walport	Government Chief Scientific Adviser and Head of the Office for Science, UK
Dr. John Boright	"Executive Director of International Affairs at US National Academies"

Dr. Başak Candemir	Science and Innovation Officer at British Embassy, FCO and Department for BIS
Dr. Güliz Sütçü	Scientific Programmes Expert, TUBITAK,
Alpaslan AKKURT	EU Expert, Department of S&T Policies, DG for EU and Foreign Affairs, Ministry of Science, Industry and Technology, Turkey
Andrea Noske	"Head of the Science and Technology Section, Embassy of Germany in Washington, D.C. ,USA"
Dr. Joann Halpern	Director, GCRI, New York, USA
Nina Lemmens	Director, DAAD, Germany
Academicians	
Prof. Andrew Stirling	S&T Policy, SPRU, University of Sussex, UK
Dr. Güliz Sütçü	Visitor Researcher, University of Sussex, SPRU, UK
Prof. Paul Nightingale	"SPRU, School of Business, Management and Economics, University of Sussex, UK"
Doç. Dr. Alfred Li-Ping Cheng	Department of Information and Financial Management, NCTU, and concurrently, Economic Policy Consultant at Chung-Hua Institution for Economic Research
Cooperation Network of Universities	
David Cleevely	Founding Director and Executive Committee member, CSaP, University of Cambridge, UK
Dr.Robert Doubleday	Director, CSaP, University of Cambridge, UK
Jackie Ouchikh	Head of Programmes, CSaP, University of Cambridge, UK
Marlit Hayslett	"Senior Manager for Program Development Georgia Tech Research Institute , Office of Policy Analysis and Research ,Georgia, USA"
Dr. Emma Terama	"Researcher, Centre for Engineering Policy, Faculty of Engineering Sciences, University of College London, UK"

Prof. Romain Murenzi	"Executive director of the Academy of Sciences for the Developing World (TWAS)"
Diplomatic Mission for Science & International Networks for STI	
Kerry Norton, Sarah Hokanson, Nicholas Hooper, Kathryn Brown, , Katy Fu, Bronte Zhang, Gareth Davies, Hyeyoung Kim, Ulrike Hillemann, Elisabeth Wallace, Başak Candemir	UK Science and Innovation Network: Counsellor for Science & Innovation (S&I), S&I Officer, S&I Manager, S&I Officers, Deputy Head S&I, Regional Director, USA, Japan, China, Korea, Germany, Switzerland, and Turkey
Matthias Frey, Andreas Ledergerber, Thomas Stählı, Nektarios Palaskas, Christian Schneider	"Switzerland, the network of science and technology counsellors: Science and technology counsellors, US, Japan, China, South Korea, Germany"
Pascal Marmier, Suzanne Hraba-Renevey, Balz Strasser, Christian Simm, Felix Moesner	Switzerland, the swissnex network, swissnexes: US, Singapore, China, India, Brazil
Andrea Adam Moore, Kurt H. Becker, Cathleen S Fisher, Nina Lemmens, Andrea Noske	"German Center for Research and Innovation (GCRI), German Houses of Research and Innovation: US, India, Brazil, Russia, Japan"

B: INTERVIEW QUESTIONS

	For Policy-Makers
1	Do you think that there is a real gap of collaboration between the scientific community and policy-makers? If so, how can this gap be bridged? What might be role of SD?
2	Do you consider that scientific evidence is useful for policy-decisions? a. Ex ante in the definition of policy b. Ex post in the evaluation of policy choices
3	How would you define science diplomacy (SD)?
4	Which criteria are used to determine the target country for assigning "science and technology envoys"?
5	How "science and technology" envoys are selected?
6	What policy considerations and goals are behind international of STI?
7	What factors shape the thematic/geographic focus of international cooperation of STI?
8	What instrument are used international of STI?
9	Policy makers typically use networks of experts, formal and informal. How does the structure and composition of such networks influence the outcomes of decision making?
10	"What actors are involved in launching STI co-operations?"
11	Which tasks are assigned to science envoy and centres? (if available country-specific)
12	What do you recommend organizing International Science Diplomacy Network of Turkey?
13	How does science, SD, research and obtained evidence contribute to science and technology policy making in your country? At what stages during the development of policy does scientific evidence have the greatest impact on the decisions made?
14	Who informs policy-makers on scientific evidence? a. Researchers b. Academic journals c. Intermediaries d. Think-tanks e. Lobby organizations f. General press g. Other media h. Other (please, specify)
15	What are the most appropriate bodies to act as an intermediary between researchers and policy-makers? a. Scientific committees b. Professional associations c. Specialists in knowledge transfer d. International Network e. NGOs and other civil society organizations f. Foundations g. Think-tanks h. Other (please, specify)

16	Do you think that a participative approach – through the creation of networks involving researchers, policy-makers, practitioners and representatives from civil society – could offer the possibility of a continuing cooperation with perspective on action?
17	Is there a need for a special body which would be responsible for feeding scientific evidence to policy-makers? (Networks, diplomatic missions)
18	Do you think that research findings on scientific, technological, economic, social and environmental matters are useful to policy-makers when they undertake an impact assessment, and if so, how?
19	Do policy-makers (in their decision-making) consult researchers directly and if so, how?
20	What are the most appropriate mechanisms for an efficient knowledge transfer? a. Policy dialogue panels which provide a context for sharing ideas between the scientific community and policy-makers b. Conferences and other large public meetings c. Small scale seminars with researchers and policy-makers d. Participative approaches (consultations) involving researchers, policy-makers, practitioners and representatives from civil society e. A proactive approach through which policy-makers meet researchers to discuss their policy requirements f. Professional and trade publications g. Academic journals h. Policy briefings i. Newspapers and other media j. Websites k. Secondment or other people transfer mechanisms to allow researchers to directly collaborate with policy-makers l. Co-production of research m. Other (please specify)
21	How should dialogue and cooperation between the scientific community and policy-makers be reinforced? a) Agreements at the highest level b) Placement schemes c) Advisory Boards d) Official and Unofficial Expert Group e) Scientific Advisory Body f) Policy Advisors g) Publications of press policies h) Other (please specify)
	For science, technology, innovation network
1	How would you define science diplomacy (SD)?
2	Which tasks are assigned to science envoy? (if available country-specific)
3	Which criteria are used to determine the target country for network?

4	What policy considerations and goals are behind international of STI?
5	What factors shape the thematic/geographic focus of international cooperation of STI?
6	What instrument are used international of STI?
7	"Policy makers typically use networks of experts, formal and informal. How does the structure and composition of such networks influence the outcomes of decision making?"
8	"What actors are involved in launching STI co-operations?"
9	How do you benefit from selected partner countries and other international engagement? "Institutional capacity development and reforming, internationalization of national science"
10	How does science, SD, research and obtained evidence contribute to science and technology policy making in your country? At what stages during the development of policy does scientific evidence have the greatest impact on the decisions made?
11	Do you measure the impact of assessment? Qualitative or quantitative assessment? (Official documents as online, hardcopy or softcopy)
12	Do you consider that scientific evidence is useful for policy-decisions? a) Ex ante in the definition of policy b) Ex post in the evaluation of policy choices
13	Do you think that there is a real gap of collaboration between the scientific community and policy-makers? If so, how can this gap be bridged?
14	Who informs policy-makers on scientific evidence? a. Researchers b. Academic journals c. Intermediaries d. Think-tanks e. Lobby organizations f. General press g. Other media h. Other (please, specify)
15	What are the most appropriate bodies to act as an intermediary between researchers and policy-makers? a. Scientific committees b. Professional associations c. Specialists in knowledge transfer d. International Network e. NGOs and other civil society organizations f. Foundations g. Think-tanks h. Other (please, specify)
16	Do you think that a participative approach – through the creation of networks involving researchers, policy-makers, practitioners and representatives from civil society – could offer the possibility of a continuing cooperation with perspective on action?
17	Is there a need for a special body which would be responsible for feeding scientific evidence to policy-makers? (Networks, diplomatic missions)
18	Do you think that research findings on economic, social and environmental matters are useful to policy-makers when they undertake an impact assessment, and if so, how?
19	Do policy-makers (in their decision-making) consult researchers directly and if so, how?

20	What are the most appropriate mechanisms for an efficient knowledge transfer? Policy dialogue panels which provide a context for sharing ideas between the scientific community and policy-makers, conferences and other large public meetings, small scale seminars with researchers and policy-makers, participative approaches (consultations) involving researchers, policy-makers, practitioners and representatives from civil society, a proactive approach through which policy-makers meet researchers to discuss their policy requirements, professional and trade publications, academic journals, policy briefings, Newspapers and other media, websites, secondment or other people transfer mechanisms to allow researchers to directly collaborate with policy-makers, co-production of research, Other (please specify)
21	How should dialogue and cooperation between the scientific community and policy-makers be reinforced? a) Agreements at the highest level b) Placement schemes c) Advisory Boards d) Publications of press policies e) Other (please specify)
	For Academicians
1	How would you define science diplomacy (SD)?
2	Do you consider that scientific evidence is useful for policy-decisions? Ex ante in the definition of policy Ex post in the evaluation of policy choices
3	Do you think that there is a real gap of collaboration between the scientific community and policy-makers? If so, how can this gap be bridged?
4	How does science, SD, research and obtained evidence contribute to science and technology policy making in your country? “At what stages during the development of policy does scientific evidence have the greatest impact on the decisions made?”
5	What policy considerations and goals are behind international of STI?
6	What factors shape the thematic/geographic focus of international cooperation of STI?
7	What instrument are used international of STI?
8	Is there a need for a special body which would be responsible for feeding scientific evidence to policy-makers? (Networks, diplomatic missions)
9	Do you think that research findings on economic, social and environmental matters are useful to policy-makers when they undertake an impact assessment, and if so, how?
10	Do policy-makers (in their decision-making) consult researchers directly and if so, how?
11	What are the most appropriate mechanisms for an efficient knowledge transfer? Policy dialogue panels which provide a context for sharing ideas between the scientific community and policy-makers Conferences and other large public meetings

	Small scale seminars with researchers and policy-makers Participative approaches (consultations) involving researchers, policy-makers, practitioners and representatives from civil society A proactive approach through which policy-makers meet researchers to discuss their policy requirements Professional and trade publications Academic journals Policy briefings Newspapers and other media Websites Secondment or other people transfer mechanisms to allow researchers to directly collaborate with policy-makers Co-production of research Other (please specify)
12	How should dialogue and cooperation between the scientific community and policy-makers be reinforced? Agreements at the highest level Placement schemes Advisory Boards Publications of press policies Other (please specify)

C : PRIORITIES AND AREAS OF ACTION - THE MAIN DUTIES OF THE SD NETWORK

Priority / Area of Action	**Activity**
Strategic advice on international STI cooperation	Propose strategic advice/opinions to the Ministry and the specific target group with the aim of evidence for policy formulation on international STI cooperation
	Alert policy makers to emerging trends, help them anticipate developments and ensure their decisions stay robust in the long. Early identification and assessment of opportunities and risks on a global scale such as leading-edge sectors are critical to address the societal challenges that lie ahead.
	Develop of a future monitoring mechanism giving STI observation and foresight service to the stakeholders via electronic news bulletins and reports or performing the international action plans
	Facilitate appropriate innovation ecosystems and technology foresight to support government, university, and industry with the information required for timely decisions and strategic planning.
	Enhance business advice to companies facing significant challenges in establishing successful international linkages, such as “finding suitable partners, financing international activities, protecting their intellectual property, and accessing new users and growth markets”.
	Acting as a strategic intelligence unit for analysing the lessons learnt from “experiences and good practices in governance of international cooperation” to develop scenarios for future multilateral approaches and building evidence based national instruments,
	By establishing a visible and accessible single point of contact, the Network serves both government seeking scientific expertise and the science community seeking to channel insight and evidence to government.
	Act as a networking and convening agent between various stakeholders at the science/policy/business interface, or convening ad hoc expert panels as the need arises
	Actively participate in discussions with decision-makers on matters of policy that could benefit from scientific input
	Share “more qualitative and policy related information to support the policy cycle” in STI cooperation
	Provide mentorship to stakeholders (mentoring on international researches, increasing the attendance rates to the international framework programs, organizing the educational activities, creating the opportunities for cooperation) to support the internationalisation and to remove the barriers to international markets by improving their business plan through “scouting/analysis, sourcing for innovation talent, connecting to new partners or helping to establish a platform in the host country”,

Priority / Area of Action	**Activity**
Contribution to further development and implementation of National STI Strategy	Setting up the complementarity indicators with existing sets of planned or current indicators covering various aspects of international cooperation in operation within Turkey and host countries.
	Develop "a policy "knowledge pool" covering the objectives of new policy projects; the results of impact assessments; relevant consultation documents and information about responses; details of evidence used; and of policy evaluation – to allow easier sharing of information about and experience of policy making and to create a more easily accessible source of evidence for future policy making",
	Conducting influential and forward looking policy studies, scientific conferences, workshops, seminars, business visits, panels etc. events to provide collective scientific advice and concrete actions, and to promote the use of quantitative and qualitative analysis with evidence in policy formation for users in the network,
	Develop a mechanism for the implementation of international S&T agreements and other international STI cooperation activities
	Support to strengthen national capacities in international STI policy making and for evidence informed decision making in public administration.
Joint initiatives and actions	Producing analysis of opportunities to streamline the international dimension in national priorities,
	Development a strategic planning of priorities for future cooperation allowing for an earlier identification of cooperation initiatives with appropriate scope,
	Analyse the need and possibilities for financial resources to support the initiatives and actions
	Development of each initiative by the respective SD Working Group via the activities highlighted in their efforts
	"Establish an effective mechanism for systematic evaluation of the policies and policy measures on the basis of internationally recognised criteria",
	Develop country specific action plans to "identify opportunities for Turkish scientists, universities and high-tech firms".

Priority / Area of Action	**Activity**
Best practice, information sharing and monitoring	"Science Counsellors or other staff in priority countries should share their "respective and forward-looking information on strategic issues, perceptions and analysis of a given country's STI agenda, key challenges that warrant STI policies and strategies, national priorities, initiatives, trends, market developments, and strategic intelligence developed at national level for international cooperation".
	Provide a unique operational and resource platform to share good practices across stakeholders and maximise the collective expertise of the network to identify and resolve cross departmental problems,
	Serving as a point of national and international reference centre: Provide "a central clearinghouse for the collection, analysis, and dissemination of data on international resources devoted to the interests and areas of activity of the stakeholders"
	Knowledge sharing both nationally and internationally based on internationally recognised criteria providing publicly available necessary guidance
	First contact point in issues such as activities for STI, investment opportunities, incentives in Turkey, especially regarding the latest statistical data and policy analysis to realistic country benchmarking and evidence based policy making,
	Support of sharing best practices and making information available through contact points or peer-learning activities with country-specific or thematic focus.
	Enable more relevant and country-specific data for informed decisions on the development of STI by launching multiple initiatives such as international observatory on STI policy instruments.
	"Monitoring and mapping of international policies and activities at national level is one of the core elements of The Network's work".
	Publication of reports and results of activities on specific webpages. Moreover, bi-weekly information e-mails with relevant documents and information will be shared to the target groups.

Priority / Area of Action	**Activity**
Networking and coordination	"Working on the symbiosis of the external and internal dimension of National STI Strategy" and develop "a step-by-step approach, starting with a geographic and a thematic pilot initiatives" on focused areas and bottom-up research providing added value,
	Establish "comprehensive and user-friendly knowledge-management system which can be accessed by all STI stakeholders in order to capitalise synergies between the different approaches and to avoid redundancies and contradictions",
	Act as a strategic international dialogue forum comprising hosting a series of regular public roundtables, ad hoc expert panels, workshops, seminars, exchanging information and views, elaborating recommendations, and coordinating needs, suggestions and proposals, especially regarding the priority areas,
	Liaise with the relevant counterparts and other stakeholders to network-organised events or meetings. Actors in the Network will endeavour to coordinate at national and international level on issues relevant to STI cooperation "by promoting links with networks of main stakeholders at home and host countries level while involving them through consultations and workshops".
	Appointing experts for specific events, themes or regional initiatives will be considered, with the purpose of exchanging information and having an up-to-date follow-up on initiatives in these areas. The network will continue liaising more closely with science counsellors in other countries.
Other Activities	Provide for "protection and allocation of intellectual property rights and benefit sharing"
	Coordinate a strategic perception and reputation management and promoting country brand through strategic communication action plan for the international profile of Turkey,
	Assist in raising the level of awareness of Turkey's activities and infrastructure through speeches, media presence, and other forms of outreach,
	Sustain the lobby activities for policymaking increasing the attendance rates to the international framework programs, and the other international activities,
	Make inventories for the Turkish and foreign scientists, researchers, entrepreneurs and public authorities in the host country,
	Orchestrate "the network activities to ensure the creation and extraction of value through knowledge mobility, innovation appropriability, and network stability",
	Plan of delegation visits to host country, to explore and strengthen major specific international collaborations on cutting-edge STI, R&D on the priority areas identified Turkey's strategic agenda and papers,
	Represent of Turkey and the MoSIT in the host country and performing the necessary contacts and negotiations.

D: TURKISH SUMMARY

Bilim, teknoloji ve yenilik (BTY) alanındaki yeteneklerin geliştirilmesi, düzenlenmesi ve kullanılması için hükümetler tarafından kabul edilen kararları ve eylemleri ifade eden BTY politikaları, aslında birçok politikadan oluşan bir rejime veya yapıya işaret etmektedir (African Observatory of Science, Technology and Innovation-AOSTI, 2013"). Daha açık bir ifadeyle, BTY politikaları; "sanayi, rekabet, eğitim ve öğretim, yabancı yatırım ve ticaret politikaları, mali ve düzenleyici politikaları" ile birlikte ele alınmalıdır (Göker, 2002).

Bu durum, BTY politikalarının belli bir sistematik plan içinde tasarlanmasını ve aynı zamanda etkin bir yönetim ve stratejik bakış açısı içerisinde yürütülmesini gerektirmektedir. Bu gereklilik ise birçok ülkenin Ulusal BTY Stratejilerini oluşturmaya başlamalarını beraberinde getirmiştir.

Öte yandan, BTY politikalarının içsel (internal) ve dışsal (external) olmak üzere iki boyutu bulunmaktadır. Bu iki boyut, birbirinden kesin çizgilerle ayrılabilir olmayıp, birbirini destekleyici ve tamamlayıcı özelliktedir. BTY politikalarının dışsal boyutunu "BTY Alanındaki Uluslararası İşbirliği Politikaları" oluşturmaktadır (European Commission, 2012).

Ülkeler, çoğunlukla maliyetleri paylaşmak; daha hızlı sonuçlar elde etmek; küresel veya bölgesel ölçekli sorunlarla daha etkin şekilde ilgilenmek ve bilginin, insan kaynağının ve büyük araştırma kuruluşlarının küresel havuzlarından istifade etmek maksadıyla, BTY alanında uluslararası işbirliği içine girmektedir. Ayrıca, şirketlerin uluslararası teknolojik işbirliği ihtiyacı içinde olması ve Küçük ve Orta Ölçekli İşletmelerin (KOBİ'lerin) uluslararası boyutta faaliyet gösterebilmek için gerekli parasal, işgücü ve diğer kaynaklardan yoksun olmaları, BTY alanındaki uluslararası bağlantıların güçlendirilmesine yönelik politikaların arkasındaki başlıca etkenler olmaktadır (Organisation for Economic Cooperation and Development (OECD), 2012).

Bu etkenlerin yanı sıra; çalışma kapsamında gerçekleştirilen kapsamlı literatür taraması, ikili görüşmeler, ve örnek ülke incelemelerinden sonra, BTY alanlarında geliştirilen işbirliği politikalarının tetikleyicisi olan unsurlar şöyledir (European Commission, 2009):

- Ulusal rekabet edebilirliğinin geliştirilmesi,
- Az gelişmiş ülkelerin gelişmekte olan ülkelerin tarafından desteklenmesi,
- Küresel ölçekte yaşanan problemlerin aşılması,
- Uluslararası dostane ve istikrarlı diplomatik ilişkilerin kurulması ve geliştirilmesi,
- Bilimsel ve teknolojik kapasitenin geliştirilmesi,
- Uluslararası çalışma gruplarının biraraya gelerek üzerinde çalışabilecekleri problemlere çözüm geliştirmek,
- Araştırmaların kapsamını (bilgi, insan kaynağı, ihtiyaç duyulan finansman kaynakları, riskin paylaşılması gibi unsurların biraraya getirilmesi) geliştirmek,
- Araştırmalar için kaliteli insan kaynağına erişmek,
- Akademik üretkenliği geliştirmek ve görünürlüğü artırmak,
- Araştırma kurumlarının kurumsal yapılarını geliştirmek.

Söz konusu bu etkenler "BTY Alanındaki Uluslararası İşbirliği Politikaları"nın, diğer bir ifadeyle "Uluslararası BTY Politikaları"nın önemini artırmıştır.

Tüm bu etkenler ve gelişmeler, BTY politikalarının dışsal boyutunu oluşturan Uluslararası BTY Politikalarının, stratejik bir yaklaşım çerçevesinde planlanmasını ve uygulanmasını gerekli kılmaktadır. Stratejik yaklaşım ayrıca, uluslararası işbirliği faaliyetlerinin gelişiminin izlenmesiyle birlikte, uluslararası işbirliğinin bilimsel iyileşmeye, teknolojik gelişmeye, toplumsal sorunların çözümüne ve siyasi hedeflere katkısının değerlendirilmesini beraberinde getirmektedir. (European Commission, 2009)

Belirli sayıda ülke başlattığı bilim diplomasisi faaliyetleri ve bu kapsamda oluşturdukları işbirliği ağları ile uluslararası BTY politikalarının geliştirilmesinde stratejik ve proaktif bir yaklaşım izleme imkanı bulmuşlardır.

Bu çerçevede, çalışmanın en temel amacı; uluslararası bilim, teknoloji ve yenilik (BTY) alanında yeni bir işbirliği politika aracı olan bilim diplomasi (BD) konusunda iyi uygulama örneklerine sahip ülkelerin takip ettikleri mekanizmaları incelemek ve ulusal politikaların geliştirilmesinde tatbik edilebilecek dersler çıkarmaktır.

Dolayısıyla, bu çalışma ile ülkelerin BTY alanındaki politikaları ve programlarını tasarlama ve uygulama sürecinde, bilimsel araştırma sonuçlarının bilim diplomasi faaliyetleri

aracılığıyla nasıl daha verimli kullanılabileceği hususunda politika yapıcılara, akademisyenlere, özel sektör ve diğer paydaşlara yol gösterici, aynı zamanda da daha önce çalışılmamış bir konu olması yönüyle de bundan sonraki çalışmalar için rehber olmayı amaçlamaktadır.

Bu amaca; "Ülkelerin BD alanında hangi faaliyetleri yürüttükleri ve birbirlerinden nasıl farklılık gösterdikleri ve de Türkiye'nin BD politika aracından başarılı şekilde faydalanabilmesi için nasıl bir yapı oluşturması gerektiği" ile ilgili araştırma sorularına cevap arayarak ulaşılmaya çalışılmıştır.

Birçok politika alanını kapsayan bir rejimi ve yapıyı işaret eden BTY politikalarının, içsel (internal) ve dışsal (external) olarak iki boyutunun olduğu görülmektedir. Uluslararası işbirliğinin ilk düzeyinde bireysel araştırmacılar ve araştırma kuruluşları arasındaki işbirliğine; ikinci düzeyde ise BTY alanında uluslararası işbirliğinin desteklenmesine ilişkin politikalara odaklanılmaktadır. BTY politikalarının dışsal boyutunu oluşturan uluslararası BTY politikaları, "sınır ötesinde kamu ve özel sektörde araştırma faaliyetleri yürüten aktörler arasındaki işbirliğinin yoğunluğunu, yönünü ve içeriğini etkilemek amacıyla hükümet yetkililerinin/karar vericilerin (düzenlemeler, programlar, resmi anlaşmalar ve mutabakat zabıtları, mali yatırımlar vb.) kararları ve eylemleri" olarak tanımlanabilmektedir. (European Commission, 2009)

BTY alanında uluslararası işbirliği politikalarının arka planında yer alan etkenler iki paradigmaya ayrılarak analiz edilmektedir. Bunlardan biri "Dar BTY işbirliği paradigması", diğeri ise "Geniş BTY işbirliği paradigması"dır (European Commision, 2009).

Özetle, BTY alanında işbirliği faaliyetlerinin özünü oluşturan Dar BTY işbirliği paradigmasının temel rasyonaliteleri; bilimsel etkinliği yükseltmek, araştırma faaliyetlerinin ölçüsünü ve kapsamını artırmak, araştırmacıların ve kuruluşların yeteneklerini geliştirmek, en ileri düzey bilgiye erişim sağlamak ve dışarıdaki araştırmacı insan kaynağını çekmektir (European Commision, 2009).

İçsel etkenlerin yanı sıra BTY işbirliğinin arkasında dört temel dışsal etkenin olduğu öne sürülmektedir. Ulusal rekabet edebilirliği geliştirmek, BTY kabiliyetlerini geliştirerek daha az gelişmiş ülkeleri desteklemek, küresel toplumun sorunlarının üstesinden gelmek, iyi ve

istikrarlı diplomatik ilişkiler kurmak ve dolaylı olarak uluslararası güvenliği sağlamaktır (European Commision, 2009).

Bu çalışma kapsamında tespit edilen BTY alanındaki uluslararası işbirliğine ilişkin politika araçları ve tedbirleri; "İkili ve çok taraflı anlaşmalar, ortak araştırma programları (genellikle tematik alanlarda), araştırma altyapılarının ortaklaşa fonlanması, değişim programları, hibe ve burs programları, ulusal araştırma programların yabancıların başvurularına açılması, belli bir bölgede fiziki araştırma merkezilerinin ortaklaşa fonlanması, ortak stratejik forumlar ve gündem oluşturma komiteleri, teknoloji öngörüsü çalışmaları, uluslararası bilim yılları, yurtdışında bilgi sağlama ve aracılık hizmetleri (Bilim ve Teknoloji Ataşeleri, Ticaret Ajansları ile işbirliği yapılması gibi), yerli teknolojilerin ve/veya yeniliklerin ticarileştirilmesine ilişkin pazar fırsatlarını ortaya çıkarmayı hedefleyen belli işbirliği programları, işbirliği ağları kurmak, araştırmacıların hareketliliği için araştırma ve burs programları ile BTY yatırımlarını çekmek ve de yabancı özel veya kamu araştırma kuruluşlarıyla işbirliğini geliştirmek amacıyla ulusal programları yurtdışından yapılan başvurulara açmak" şeklinde sıralanabilmektedir.

Bilim diplomasisi alanında örgütlenme çalışmaları kapsamında öncelikli olarak diplomasi sözcüğünün kökeninin Eski Yunan'da "ikiye katlamak" anlamındaki "diploma" sözcüğünden türediğini görmekteyiz (Tuncer, 2002, Savaş, 2007). Devlete ait "resmi belgelere, bazı ayrıcalıklar dağıtan ve yabancı topluluklarla ilişkileri düzenleyen belgelere" katlanış biçimlerinden ötürü "diploma" adı verilirdi (Meray, 1956). Söz konusu belgelerin korunması, düzenlenmesi ve çözümlenmesi işlemlerini yapabilecek kişilere ihtiyaç duyulması ile katiplere gereksinim duyulmuştur. Böylece diplomasi, 18.yy'a kadar "belgeleri inceleme bilimi" olarak kullanılmıştır (Meray, 1956).

İlk kez 1796 yılında diplomasi kelimesi "belgeleri inceleme bilimi" olarak değil de "Uluslararası İlişkileri Yürütme Sanatı" olarak Edmund Burke tarafından kullanılmıştır. Uluslararası ilişkilerin ve dış politikanın yürütülmesi için bilimsel çalışma alanlarının önemli hale gelmesi, politika yapıcıların yeni stratejiler geliştirmesini ve uygulamasını zorunlu hale getirmektedir. Bilim diplomasisi de söz konusu stratejilerden biridir.

Bilim diplomasisi, milletler arasında gerçekleşen tüm bilimsel faaliyetleri insanlığın ortak problemlerini çözmek ve yapıcı, bilgi temelli uluslararası ortaklıklar inşa etmek için değerlendirmek çabası olarak tarif edilebilir. Gıda, su ve enerji güvenliği, fakirlik ve

hastalıklarla mücadele, iklim değişikliği ve nükleer silahsızlanma gibi bilimsel ve teknolojik derinliği olan küresel sorunlar, bilim diplomasisini kaçınılmaz şekilde uluslararası yapıcı gündemin tam merkezine yerleştirmektedir.

Bilim diplomasisi üç farklı koldan yürütülen faaliyetleri kapsamaktadır: Bu faaliyet alanları (1) Tüm dış politikaların ve uluslararası ilişkilerin bilimsel, rasyonel bir zeminde yürütülmesi manasında diplomaside bilim, (2) uluslararası bilimsel işbirliği imkanları aranması anlamında bilim için diplomasi ve (3) diplomatik ilişkilerin kurulması ve güçlendirilmesi için bilimsel işbirliği zemininden yararlanılması manasında diplomasi için bilim (The Royal Society, 2010).

Dar anlamda "ülkeler arasındaki ilişkilerin geliştirmesi için bilimsel işbirliğinden faydalanılmasını" anlatan "bilim diplomasisi" kavramı, günümüzde bu tanımlamadan öteye giderek bir çerçeve kavram haline gelmektedir. Bu çalışmada ise "bilim diplomasisi" geniş anlamda, "uluslararası BTY politikalarını uygulama yöntemi veya yaklaşımı" olarak tanımlanmıştır. Bilim diplomasisinin "Bilim için diplomasi ve diplomaside bilim" boyutları, bu araştırma çalışmasının çerçevesini belirlemiştir. Bilim diplomasisi çalışmaları, uluslararası bilimsel araştırma grupları oluşturulması ve desteklenmesi, kamu birimlerinde bilimsel kapasite oluşturulması ve ulusal menfaatleri etkiyebilecek bilimsel gelişmelerin takip edilmesi ve değerlendirilmesi açısından önem taşımaktadır.

Bilim, teknoloji ve yenilik politikalarının tasarlanmasında ve yürürlüğe konulmasında kamu müdahalelerinin tasarımını, miktarını ve nerede kullanılacağını açıklayan iki kuram ele alınmıştır. Kamunun gerekli ulusal kapasitenin oluşturulmasında, bilgi ve becerilerin geliştirilmesinde esas teşkil edecek olan bilim, teknoloji, yenilik, araştırma ve geliştirme politikalarının değerlendirilmesinde yetersiz kalan "Neo-klasik kuram", iktisatta baskın eğilim olmasına karşın, 1980'lerden sonra üstünlüğü "Schumpeterci/evrimci yaklaşıma bırakmıştır (Evenson ve Westphal, 1994).

Söz konusu kuramların varsayımları, odak noktaları ve örnek politika tedbirleri incelenmiştir. Bilim diplomasisi politika aracı kapsamında; firmalar, bilgi kurumları ve kamu kurumları arasındaki işbirliği ve ortaklığın teşvik edilmesi ve yenilikçi aktörler arasındaki ağ yapının kurulmasının desteklenmesi (Andersson ve Karlsson, 2006), misafir olunan ülkedeki yenilikçi aktörler ile işbirliği içerisinde hareket edilmesi, pazardaki önemli gelişmeler ya da yeni teknolojilerin izlenmesi ve öngörünün geliştirilmesi, yenilik alt

yapısının ve kapasitesinin geliştirilmesi, Ar- Ge faaliyetlerinin desteklenmesi, teknolojik yeniliklerin yaygınlaştırılması, sanayi ve üniversite işbirlikleri projeleri geliştirilmesi, politika oluşturulmasındaki bütün aktörlerin yer aldığı bilgi paylaşım ağ yapıları kurulması, araştırma faaliyetlerinin teknolojik yeniliğe yönlendirilmesi, öğrencilerin ve araştırmacıların mobilitesinin arttırılması, yenilik kültürünün oluşturulması, yenilik faaliyetlerinin finansmanının geliştirilmesi, yenilik için fikri ve sınai mülkiyet gibi yasal ve düzenleyici çerçeve oluşturulması ve özellikle KOBİ'lerde yenilik faaliyetlerinin özendirilmesi ve desteklenmesi ve de belirlenecek diğer amaçlarıyla yurtdışı diplomatik temsilciliklerin altyapısından faydalanılarak bir ağ kurulması gibi için bazı tedbirler geliştirilmiştir.

Bu politika tedbirlerinden de anlaşılacağı üzere bilim diplomasisi yaklaşımı her iki iktisat kuramından da etkilenmesine rağmen öngördüğü politika önerileri daha çok yenilik için ağ-tipi örgütlenmelerin yaygınlaşmasını desteklemek ve işletmeler arası işbirliğini destekleyen çerçeve programlarına katılım gibi uygun bir ortam oluşturmak üzerine odaklanmıştır. Bu nedenle söz konusu girişimde evrimci yaklaşımın giderek daha önem kazandığı görülmektedir.

Diğer taraftan mevcut bilgi hakkında asimetriyi azaltmak, bilgi alt yapısının geliştirilmesi, firmaların dışsal bilgi kaynaklarına ulaşmalarının kolaylaştırılması, firmalar, bilimsel bilgi üretimini artırmak için üniversite ve sanayi işbirliğini desteklemek, öğrenme kapasitesini artırmak, hem Ar-Ge desteği yoluyla hem de bilimsel danışmanlık sistemi aracılığıyla oluşan uzmanlığı ilgili taraflara devlet adına iletme hususlarında neo-klasik yaklaşımdan etkilenilmiştir.

İyi uygulama örneklerine sahip ülkelerin söz konusu uluslararası ağlarının başarısını etkileyen iç ve dış faktörleri tanımlayabilmek, mevcut durumunun genel bir görünümünü oluşturmak ve de Türkiye için önerilerde bulunabilmek için uygun yöntemlere ihtiyaç duyuldu. Bu çalışmanın başlıca araştırma yöntemi olarak nitel araştırma yöntemi benimsenmiştir.

Bu çalışmada hem birincil hem de ikincil veri kaynaklarından yararlanılmıştır. Bilim ve teknoloji politikalarını oluşturma sürecinde ve kapasite geliştirmede bilimsel bilgilerin nasıl kullanıldığını, ülkelerin bilim diplomasi faaliyetleriyle ilgili ne şekilde çalışmalar yürüttüğünü ve kendilerine özgü yöntem ve yaklaşımlarını hangi unsurların

belirlediklerini anlayabilmek için, konuyla ilgili kitap, dergi, bildiri, resmi, yarı resmi belgeler ve örnek ülke çalışmaları ikincil veri olarak incelenmiştir.

Kapsamlı bir literatür taraması ve teorik incelmelerden sonra tez çalışmasına konu olan araştırma sorularına cevaplar aramak ve çözüm önerilerinde bulunabilmek için ayrıca birincil veri kaynakları olarak ise ikili görüşmeler gerçekleştirilmiştir.

Araştırma konusuna ilişkin daha iyi bir anlayışa sahip olabilmek ve kapsamlı bir tecrübe paylaşımında bulunabilmek amacıyla söz konusu ülkelerdeki politika yapıcılar, akademisyenler, bilim ve teknoloji danışmanları, araştırma merkezlerindeki temsilciler ve araştırmacılardan oluşan ve Ek-1'de yer alan 55 kişilik uzman grup için elektronik posta grubu hazırlanmış, yüz yüze ve e-posta aracılığıyla görüşmeler gerçekleştirilmiştir.

Ülkelerin konu ile ilgili politika araçlarını ve etkilerini anlayabilmek, yaşanan sıkıntıları ve alınması gerekli önlemleri belirlemek ve Türkiye'nin mevcut kapasitesinin güçlendirilmesi amacıyla Ek-2'de yer alan soru seti ve anketi geliştirilmiştir.

Tez kapsamında gerçekleştirilecek araştırmanın amacı hakkında mülakat yapılacak kişilere soru anketi uygulanmadan ve yüz yüze görüşmeden önce ön bilgilendirme maili ile kendilerinin bu araştırmaya katılımları için onayları sorulmuştur. Mülakatlar ve soru setleri yüz yüze ya da cevaplayacak kişilerle temasa geçmenin mümkün olmadığı durumlarda e-posta yoluyla yürütülmüştür.

ABD, Almanya, Birleşik Krallık, Fransa, İsviçre, Macaristan, Finlandiya, Danimarka, Hollanda ve Japonya'ya ait uluslararası bilim, teknoloji ve yenilik ağları ile bilimsel danışmanlık sistemleri örnek yapılar olarak incelenmiştir.

Araştırma kapsamında, "Türkiye Bilimsel ve Teknolojik Araştırma Kurumu'nun (TÜBİTAK)" "2224-A - Yurt Dışı Bilimsel Etkinliklere Katılma Desteği Programı" ve Bakanlığımızın yurtdışı görevlendirmeleri aracılığı ile bilim diplomasisi konusunda iyi uygulama örneklerine sahip Almanya, İngiltere, İsviçre'ye çalışma ziyaretleri gerçekleştirilmiş, İspanya'da ise "Kanıta Dayalı Politika Yapımına Yeni Bir Yaklaşım: Bilimsel Danışma Yöntemi Olarak Bilim Diplomasisi" başlıklı uluslararası tebliğ sunulmuştur.

Çalışmada politika yapıcılar, akademisyenler ve BTY danışmanlarından oluşan 55 kişilik uzman grubu ile gerçekleştirilen görüşmeler ve örnek ülke incelemeleri ile elde edilen

bilgiler analiz edildikten sonra ülkelerin uluslararası işbirliklerindeki amaçları, öncelikleri, yaklaşım şekilleri, kullandıkları politika mekanizmalarında yola çıkılarak taksonomi tabloları oluşturulmuştur.

Ülkelerin uluslararası alanda faaliyet gösterecek girişimlerinin arkasında yatan temel nedenlere baktığımızda, ABD ve Japonya; uluslararası ilişkiler boyutunda özellikle de istikrarsız ilişki içinde oldukları diğer devletlerle ilişkilerinin geliştirilmesinde diplomatik ilişkilerin kurulması ve güçlendirilmesi için bilimsel işbirliği zemininden yararlanılması manasına gelen diplomasi için bilim yönüyle bilim diplomasisinden yararlanmaktadır. İncelenen diğer ülkelerde ise bilim, teknoloji, yenilik ve dışişleri politikalarının ve uluslararası ilişkilerin bilimsel bulgulara dayalı yaklaşımlarla yürütülmesi ve de bilimsel işbirliği imkanları aranması ve kapasite geliştirme anlamında bilim için diplomasi boyutlarıyla bilim diplomasisinden faydalanılmaktadır.

Ülkelerin BTY, Ar&Ge ve uluslararası işbirlikleri konusunda yeterli bilgiye sahip, girişimci, sosyal bağlantılar geliştirebilen, potansiyel işbirlikleri kurabilecek, görev yapacağı ülkede konuşulan dile hakim akademisyen, özel sektör veya kamu çalışanları istihdam edilmektedir.

Ancak önemli olan; görev süresi bitiminde elde edilen bilgi birikimin, tecrübenin ve iş yapış şeklinin ağ bünyesinde korunması ve sürdürülebilir olması gerektiğidir. Akademisyen ya da özel sektör temsilcisi görev süresinin bitiminden itibaren eski işine döndüğü zaman bu birikim kaybolacaktır. Bu kapsamda uygun bir veri tabanı ya da bilgi havuzu oluşturularak görev süresi boyunca yeni kurulan ya da geliştirilen işbirliği ve iletişim sisteminin aksamaması için tedbir alınabilir. Ayrıca daha doğru ve güvenilir bilgilere erişme, verimli işbirliklerini geliştirme ve maliyet avantajı gibi hususlar gereği, faaliyet göstereceği ülkenin vatandaşlarından da çeşitli uzmanlık alanlarına istihdam edilmesi gerekmektedir.

Ülkelerin hepsinde de Dışişleri Bakanlıkları, bilim, teknoloji, yenilik, eğitim, araştırma ve yükseköğrenim alanlarında faaliyet gösteren diğer Bakanlıklar ile ortam girişimler halinde bilim diplomasisi faaliyetlerini planlamaktadırlar.

Bilim diplomasisi girişimden faydalanan ülkeleri ve ikili görüşmelerden elde ettiğimiz verileri incelediğimizde, ülkelerin ulusal yenilik sistemlerinde iyileşmeler tespit edilmiştir. Bu iyileşmelerin uzun dönemde daha fazla gözlemleneceği çıkarımda bulunulmuştur.

Uluslararası alada yönetilecek olan işbirliği ağlarında etkili bir bilgi yönetiminin sağlanabilmesi için "bilgiyi değerlendirme, kullanma ve geliştirme" kabiliyetlerini hakim kılan bir örgüt kültürünün benimsenmelidir. Ayrıca örgüt yapısında "esnek, katılımcı ve paylaşımcı" yaklaşımları hayata geçirilmelidir. Bir yandan etkili program geliştirme etkinlikleri ile bilginin kendi kurumlarında en iyi şekilde özümsenmesini ve geliştirilmesini sağlarken, diğer yandan toplum ve dış dünya ile iletişim ve etkileşim içinde, yeni teknolojiler, yöntem ve tekniklerden yararlanmanın yollarını araması, toplumun aydınlatılmasında etkin rol alması gerekmektedir.

Ülkemizde diplomasi kavramı yoğunlukla uluslararası ilişkiler alanında incelenmeye çalışılmıştır. Ancak bu çalışma ile BTY alanında uluslararası işbirliği için geliştirilen BD politika aracı girişimindeki tetikleyici unsur, uluslararası bilimsel faaliyetlerin artmasına ve etkili politikaların oluşturulmasına yönelik olarak bilim için diplomasi anlayışına dayanan uluslararası bir ağ oluşturmaktır.

Türkiye, bilgi temelli ekonomik dönüşüm sürecinde, yurt içindeki insan kaynağı ve bilgi üretim mekanizmalarına olduğu kadar yurt dışındaki kaynaklara da ihtiyaç duymaktadır. Bu noktada, uzun yıllar yurt dışında araştırma ve yenilik faaliyetleri yürüten Türk bilim insanlarımız ülkemiz için stratejik öneme sahiptir. Tersine beyin göçü ve beyin dolaşımında kayda değer bir aşama kaydeden ülkemiz için, kariyerine yurt dışında devam eden Türk bilim insanları ile kalıcı ve sürdürülebilir işbirlikleri kurmanın ulusal hedeflere giden yolda oldukça önemli olduğu düşünülmektedir.

"Dünya teknolojisini edinebilmek, öğrenip özümsemek, ekonominin ilgili etkinlik alanlarına yayarak kullanır hale gelebilmek; bu teknolojiyi bir üst düzeyde yeniden üretebilme becerisini kazanabilmek ve bu beceriyi teknolojinin kaynağı olan bilimi üretebilme yeteneğini kazanma yönünde derinleştirebilmek için, bu süreci bir bütün olarak düzenli ve sistemli bir temel üzerine oturtabilmeyi mümkün kılacak, uluslararası hizmet verecek bir sistemin geliştirilmesine ve bununla tümleşik olarak özel sektör ve kamu sektörünün Ar-Ge kurumlarıyla üniversiteleri içine alacak", uluslararası ağların kurulmasına öncelik verilmelidir.

Yenilikçi bir yaklaşım olarak özellikle iyi planlanan ve tutarlı bir BD stratejisine sahip ülkelerin sürdürülebilir bir rekabet ve gelişim aracı olarak bu girişimden daha fazla faydalandıkları sonucuna varılmıştır. Ayrıca, araştırma sonuçlarında elde edilen bilimsel

bilgilerin kullanıldığı bir politika oluşturma sürecindeki paydaşlar olan kamu kurumları, üniversiteler ve özel sektörün birlikte daha gerçekçi, etkili ve uzun vadeli politikalar geliştirilebilmesine katkı sağlayacaktır. Devletler kanıta dayalı uygulamalara ihtiyaç duymaktadırlar.

Türkiye'nin BD ağı, ülkemizin karşılaşacağı küresel risklerin önceden tahmin edilebilmesine ve zamanında tedbirler alınabilmesine imkan sağlayacaktır. Türkiye; marka ve itibar yönetimi ile küresel rekabet edebilirlik ve uzun dönemde büyüme konularında istikrar yakalamak için BD konusunda strateji ve politikalar geliştirmelidir.

Çalışmada ülkelerin sahip oldukları benzer ve farklı olan yönlerinden yola çıkılarak Türkiye'nin uluslararası arenada verimli ve etkili şekilde hareket edebilmesine aracılık edecek model önerisinde bulunulmaktadır.

Modele göre, öncelikli amaç, ilgili paydaşlar arasında ihtiyaç duyulan bilgiyi sağlamak ve danışmanlık yapmaktır. Ayrıca Türkiye'nin BTY stratejisinin hem ulusal hem de uluslararası boyutlarını geliştirme, uygulama ve değerlendirme süreçlerinde aracılık etmektir.

Türkiye için kurgulanan model için birtakım önkoşullar belirlenmiştir:

- Hem diplomatik temsilciliklerimizin altyapısının hem de kendi merkezlerimizin kullanıldığı bir ağ oluşturmak,
- Ağın oluşturduğu bilgilerden faydalanacak ilgili paydaşların belirlenmesi,
- Öncelikli faaliyet alalarının belirlenmesi,
- Faaliyetlerin sonuçlarına ilişkin uygun dağıtım mekanizmalarının belirlenmesi,
- Orta ve uzun vadede amaçlanan hedeflerin değerlendirilmesi için gösterge setlerinin oluşturulması.

Türkiye'nin BD Ağı'nda; bakanlıklar, diplomatik temsilcilikler, diğer uluslararası ağlar, üniversiteler, teknoparklar, teknoloji geliştirme merkezleri, sanayi ve ticaret odaları, ve de start-up, KOBİ, ya da büyük ölçekli firmaların yer alması planlanmaktadır.

Ağda görev alacak kişilerin, belirli periyotlarda ya da özel talebe yönelik raporlar, görev yaptıkları ülkedeki BTY alanlarındaki gelişmelere yönelik politika analizleri ve öngörü

çalışmaları, çok dilli web siteleri ve bültenler, konferanslar, çalıştaylar ve iş gezileri planlamaları ve geliştirmeleri beklenmektedir.

Son olarak model ağın gerçekleştirmesi istenilen görevleri bilim diplomasisi tanımından yola çıkılarak aşağıdaki şekilde gruplandırılabilir:

Bilim için diplomasi anlayışı çerçevesinde ağ oluşturma ve koordinasyon faaliyetleri, stratejik danışmanlık etmek, iyi uygulama örneklerinin ve bilginin paylaşımı ile gözlemleme aktivitelerinin gerçekleştirilmesi öngörülmektedir.

Diplomaside bilim anlayışı çerçevesinde ise ulusal BTY stratejisinin uluslararası politika önceliklerinden istifa edilerek geliştirilmesi, ortak araştırma ve yenilik projelerinin geliştirilmesi, öncelikli sektörlerde ortak çağrılara çıkılması, göstergeler oluşturularak, sistematik ve kanıta-dayalı politikaların oluşturulması ve özellikle de politika uygulamalarının etkisinin değerlendirilmesi için istifa edilmesi faaliyetlerinin gerçekleştirilmesi planlanmaktadır.

Diplomasi için bilim anlayışı çerçevesinde ise uluslararası çerçeve programlarına ve diğer uluslararası faaliyetlere katılım oranının artırılması, çok taraflı programlarının tasarlanması, projelerin oluşturulması ve uygulamaya konması ve de eylem planlarının geliştirilmesinde Türk bilim insanlarına daha fazla yer verilmesi için lobi faaliyetleri sürdürmek, bilgilendirme ve teşvik faaliyetleri gerçekleştirmek, Türkiye'nin uluslararası ülke profilinin iyileştirilmesi, çalışma kültürünün dünyaya tanıtılmasına yönelik stratejik bir algı yönetimi koordine etme faaliyetleri örnek olarak verilebilir.

Yapılan literatür taramasında, BTY politikalarını konu alan kitap, makale, rapor, yüksek lisans tezi gibi çok sayıda kaynağın bulunduğu fakat uluslararası BTY politikalarına odaklanan analitik çalışmaların az sayıda olduğu anlaşılmıştır. Uluslararası BTY politikaları konusuna eğilen sınırlı sayıdaki çalışmaları ise daha çok Avrupa Komisyonu adına hazırlanan raporların ve OECD kaynaklarının teşkil ettiği görülmüştür.

Türkiye'de bugüne kadar "Uluslararası BTY Politikaları" alanına odaklanan sistematik veya analitik herhangi bir çalışmanın ve özellikle bilim diplomasisi alanında herhangi bir karşılaştırmalı çalışmanın yapılmadığı anlaşılmıştır. Bu bakımdan, çalışmamızın öncül bir araştırma olarak ülkemizde bu alanda yapılacak yeni çalışmalara ışık tutması beklenmektedir.

Çalışma kapsamında on ülkenin detaylı incelenmesi ve elli beş kişi ile gerçekleştirilen ikili görüşmeler göz önünde bulundurulduğunda araştırma yöntemleri açısından da bu çalışmanın özgünlüğü ortaya çıkarmaktadır.

Ayrıca incelene ülkelerin birbirlerinden farklılık gösterdikleri konulardan yola çıkılarak özgün taksonomiler oluşturulmuştur. Ülkelerin ekosistemleri farklılık göstermelerine rağmen bu taksonomiler yeni bir model oluşturulurken kısa kestirmeleri sağlamıştır.

Çalışmamızın uluslararası işbirliği alanında ulusal literatürü en büyük katkılarından biri de, Türkiye'nin sürdürülebilir büyümesine hizmet etmesi amacıyla faydalanılmak istenilen bilim diplomasisi politika aracının örgütleme çalışmalarına katkı sağlamak amacına yönelik özgün model ve görev tanımları önerilerinde bulunulmaktadır.

Bilim diplomasisi alanında ulusal kapasitenin geliştirilmesi kapsamında Eylül 2015 tarihinde Boğaziçi Üniversitesi ile birlikte "Bilim Diplomasisi Sempozyumu" etkinliği gerçekleştirilecektir. Bilim diplomasisi konusunda faaliyet gösteren İsviçre, Almanya, ABD ve İngiltere gibi uluslararası iyi uygulama örneklerinin temsilcilerinin ülkemize davet edilerek söz konusu ülkelerin tecrübelerinin politika yapıcılara, akademi ve özel sektör temsilcilerine aktarılması amaçlanmaktadır.

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