

Israel's Technological Innovation System



I. Introduction

Recently, many countries have attracted by Israel's technology innovation, and wonder how Israel, resource-deficiency and enemies-around, has the capacity to enrich the environment for innovative startups, innovative R&D and other innovative activities. At the same time, several cross-border enterprises hunger to establish research centers in Israel, and positively recruits Israel high-tech engineers to make more innovative products or researches. However, there is no doubt that Israel is under the spotlight in the era of innovation because of its well-shaped national technology system framework, innovative policies of development and a high level of R&D expenditure, and there must be something to learn from. Also, Taiwanese government has already commenced re-organization lately, how to tightly connect related public technology sectors, and make the cooperation more closely and smoothly, is a critical issue for Taiwanese government to focus on. Consequently, by the observation of Israel's national technology system framework and technology regulations, Israel's experience shall be a valuable reference for Taiwanese government to build a better model for public technology sectors for future cooperation.

Following harsh international competition, each country around the world is trying to find out the way to improve its ability to upgrade international competitiveness and to put in more power to promote technology innovation skills. Though, while governments are wondering how to strengthen their countries' superiority, because of the differences on culture and economy, those will influence governments' points of view to form an appropriate national innovative system, and will come with a different outcome. Israel, as a result of the fact that its short natural resources, recently, its stunning performance on technology innovation system makes others think about whether Israel has any characteristics or advantages to learn from. According to Israeli Central Bureau of Statistics records, Israel's national expenditures on civilian R&D in 2013 amounted to NIS 44.2 billion, and shared 4.2% of the GDP. Compared to 2012 and 2011, the national expenditure on civilian R&D in 2013, at Israel's constant price, increased by 1.3%, following an increase of 4.5% in 2012 and of 4.1% in 2011.

Owing to a high level of national expenditure poured in, those, directly and indirectly, makes the outputs of Israel's intellectual property and technology transfer have an eye-catching development and performance. Based on Israeli Central Bureau of Statistics records, in 2012-2013, approximately 1,438 IP invention disclosure reports were submitted by the researchers of various universities and R&D institutions for examination by the commercialization companies. About 1,019 of the reports were by companies at the universities, an increase of 2.2% compared to 2010-2011, and a 1% increase in 2010-2011 compared to 2008-2009. The dominant fields of the original patent applicants were medicines (24%), bio-technology (17%), and medical equipment (13%). The revenues from sales of intellectual property and gross royalties amounted to NIS 1,881 million in 2012, compared to NIS 1,680 million in 2011, and increase of 11.9%. The dominant field of the received revenues was medicines (94%). The revenues from sales of intellectual property and gross royalties in university in 2012 amounted to NIS 1,853 million in 2012, compared to NIS 1,658 million in 2011, an increase of 11.8%. Therefore, by the observation of these records, even though Israel only has 7 million population, compared to other large economies in the world, it is still hard to ignore Israel's high quality of population and the energy of technical innovation within enterprises.

II. The Recent Situation of Israel's Technology Innovation System

A. The Determination of Israel's Technology Policy

The direction and the decision of national technology policy get involved in a country's economy growth and future technology development. As for a government sector deciding technology policy, it would be different because of each country's government and administrative system. Compared to other democratic countries, Israel is a cabinet government; the president is the head of the country, but he/she does not have real political power, and is elected by the parliament members in every five years. At the same time, the parliament is re-elected in every four years, and the Israeli prime minister, taking charge of national policies, is elected from the parliament members by the citizens.

The decision of Israel's technology policy is primarily made by the Israeli Ministers Committee for Science and Technology and the Ministry of

Science and Technology. The chairman of the Israeli Ministry Committee for Science and Technology is the Minister of Science and Technology, and takes charge of making the guideline of Israel's national technology development policy and is responsible for coordinating R&D activities in Ministries. The primary function of the Ministry of Science and Technology is to make Israel's national technology policies and to plan the guideline of national technology development; the scope includes academic research and applied scientific research. In addition, since Israel's technology R&D was quite dispersed, it means that the Ministries only took responsibilities for their R&D, this phenomenon caused the waste of resources and inefficiency; therefore, Israel government gave a new role and responsibility for the Chief Scientists Forum under the Ministry of Science and Technology in 2000, and wished it can take the responsibility for coordinating R&D between the government's sectors and non-government enterprises.

The determination of technology policy, however, tends to rely on counseling units to provide helpful suggestions to make technology policies more intact. In the system of Israel government, the units playing a role for counseling include National Council for Research and Development (NCRD), the Steering Committee for Scientific Infrastructure, the National Council for Civil Research and Development (MOLMOP), and the Chief Scientists Forums in Ministries. Among the aforementioned units, NCRD and the Steering Committee for Scientific Infrastructure not only provide policy counseling, but also play a role in coordinating R&D among Ministries. NCRD is composed by the Chief Scientists Forums in Ministries, the chairman of Planning and Budgeting Committee, the financial officers, entrepreneurs, senior scientists and the Dean of Israel Academy of Sciences and Humanities. NCRD's duties include providing suggestions regarding the setup of R&D organizations and related legal system, and advices concerning how to distribute budgets more effectively; making yearly and long-term guidelines for Israel's R&D activities; suggesting the priority area of R&D; suggesting the formation of necessary basic infrastructures and executing the priority R&D plans; recommending the candidates of the Offices of Chief Scientists in Ministries and government research institutes.

As for the Steering Committee for Scientific Infrastructure, the role it plays includes providing advices concerning budgets and the development framework of technology basic infrastructures; providing counsel for Ministries; setting up the priority scientific plans and items, and coordinating activities of R&D between academic institutes and national research committee. At last, as for MOLMOP, it was founded by the Israeli parliament in 2002, and its primary role is be a counseling unit regarding technology R&D issues for Israel government and related technology Ministries. As for MOLMOP's responsibilities, which include providing advices regarding the government's yearly and long-term national technology R&D policies, providing the priority development suggestion, and providing the suggestions for the execution of R&D basic infrastructure and research plans.

B.The Management and Subsidy of Israel's Technology plans

Regarding the institute for the management and the subsidy of Israel's technology plans, it will be different because of grantee. Israel Science Foundation (ISF) takes responsibility for the subsidy and the management of fundamental research plans in colleges, and its grantees are mainly focused on Israel's colleges, high education institutes, medical centers and research institutes or researchers whose areas are in science and technical, life science and medicine, and humanity and social science. As for the budget of ISF, it mainly comes from the Planning and Budgeting Committee (PBC) in Israel Council for Higher Education. In addition, the units, taking charge of the management and the subsidy of technology plans in the government, are the Offices of the Chief Scientist in Ministries. Israel individually forms the Office of the Chief Scientist in the Ministry of Agriculture and Rural Development, the Ministry of Communications, the Ministry of Defense, the Ministry of National Infrastructures, Energy and Water Resources, the Ministry of Health and the Ministry of Economy. The function of the Office of the Chief Scientist not only promotes and inspires R&D innovation in high technology industries that the Office the Chief Scientist takes charge, but also executes Israel's national plans and takes a responsibility for industrial R&D. Also, the Office of the Chief Scientist has to provide aid supports for those industries or researches, which can assist Israel's R&D to upgrade; besides, the Office of the Chief Scientists has to provide the guide and training for enterprises to assist them in developing new technology applications or broadening an aspect of innovation for industries. Further, the Office of the Chief Scientists takes charge of cross-country R&D collaboration, and wishes to upgrade Israel's technical ability and potential in the area of technology R&D and industry innovation by knowledge-sharing and collaboration.

III.The Recent Situation of the Management and the Distribution of Israel's Technology Budget

A.The Distribution of Israel's Technology R&D Budgets

By observing Israel's national expenditures on civilian R&D occupied high share of GDP, Israel's government wants to promote the ability of innovation in enterprises, research institutes or universities by providing national resources and supports, and directly or indirectly helps the growth of industry development and enhances international competitiveness. However, how to distribute budgets appropriately to different Ministries, and make budgets can match national policies, it is a key point for Israel government to think about. Following the Israeli Central Bureau of Statistics records, Israel's technology R&D budgets are mainly distributed to some Ministries, including the Ministry of Science and Technology, the Ministry of Economy, the Ministry of Agriculture and Rural Development, the Ministry of National Infrastructures, Energy and Water Resources, the Israel Council for Higher Education and other Ministries. As for the share of R&D budgets, the Ministry of Science and Technology occupies the share of 1.7%, the Ministry of Economy is 35%, the Israel Council for Higher Education is 45.5%, the Ministry of Agriculture and Rural Development is 8.15%, the Ministry of National Infrastructures, Energy and Water Resources is 1.1%, and other Ministries are 7.8%

From observing that Israel R&D budgets mainly distributed to several specific Ministries, Israel government not only pours in lot of budgets to encourage civilian technology R&D, to attract more foreign capitals to invest Israel's industries, and to promote the cooperation between international and domestic technology R&D, but also plans to provide higher education institutes with more R&D budgets to promote their abilities of creativity and innovation in different industries. In addition, by putting R&D budgets into higher education institutes, it also can indirectly inspire students' potential innovation thinking in technology, develop their abilities to observe the trend of international technology R&D and the need of Israel's domestic industries, and further appropriately enhance students in higher education institutes to transfer their knowledge into the society.

B.The Management of Israel's Technology R&D Budgets

Since Israel is a cabinet government, the cabinet takes responsibility for making all national technology R&D policies. The Ministers Committee for Science and Technology not only has a duty to coordinate Ministries' technology policies, but also has a responsibility for making a guideline of Israel's national technology development. The determination of Israel's national technology development guideline is made by the cabinet conference lead by the Prime Minister, other Ministries does not have any authority to make national technology development guideline.

Aforementioned, Israel's national technology R&D budgets are mainly distributed to several specific Ministries, including the Ministry of Science and Technology, the Ministry of Economy, the Ministry of Agriculture and Rural Development, the Ministry of National Infrastructures, Energy and Water Resources, the Israel Council for Higher Education, and etc. As for the plan management units and plan execution units in Ministries, the Office of the Chief Scientist is the plan management unit in the Ministry of Science and Technology, and Regional Research and Development Centers is the plan execution unit; the Office of the Chief Scientist is the plan management unit in the Ministry of Economy, and its plan execution unit is different industries; the ISF is the plan management units in the Israel Council for Higher Education; also, the Office of the Chief Scientist is the plan management unit in the Ministry of Agriculture, and its plan execution units include the Institute of Field and Garden Corps, the Institute of Horticulture, the Institute of Animal, the Institute of Plan Protection, the Institute of Soil, Water & Environmental Sciences, the Institute for Technology and Storage of Agriculture Products, the Institute of Agricultural Engineering and Research Center; the Office of the Chief Scientist is the plan management unit in the Ministry of National Infrastructures, Energy and Water Resources, and its plan execution units are the Geological Survey of Israel, Israel Oceanographic and Limnological Research and the Institute of Earth and Physical. As for other Ministries, the Offices of the Chief Scientist are the plan management units for Ministries, and the plan execution unit can take Israel National Institute for Health Policy Research or medical centers for example.

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