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## Article

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RESEARCH

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# A study on the accountability of the regional R&D program: the case of APCTP

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## Abstract

In order to develop Asia-Pacific Center for Theoretical Physics (APCTP), it is necessary to respond various kind of accountabilities around research environment as well as research capacity and international reputation. APCTP, the case of this research, has achieved its goal through proper handling of managerial and institutional problems. Simplifying complicated program structure and enhancing efficiency in the managerial level and the stable position of secretary being able to exercise practical authority in the institutional level have been based for the sustainable development. While the lack of legal support limited to enhance international reputation, bottom-up building of APCTP and volunteer participations and efforts of researchers made good performance as a research platform considering its budget. The previous and present government's emphases on basic research and regional government's support took positive effects to the development of APCTP as international research institute and will provide real help for international reputation in the near future. This paper investigated difficulties around APCTP and their solutions for the sustainable development in terms of technical, managerial and institutional level regarding the open innovation aspect.

**Keyword:** Regional R&D program, Accountability, Basic research, APCTP

## Introduction

After Korea experienced rapid growth through imitation, She is struggling to find the new creative development strategy for the new growth. The portion of applied research and development research has been high and Public Research Institutes and universities still have similar trends of research as well as firms. It is time for creative research based on basic research so as to get the new growth. The goal of theoretical physics is the understanding of natural law, which is a starting point of development of technology and this field has high efficient among basic science regarding research expenses.

Theoretical physicist, Maxwell's discovery of electric magnetic wave directly affected the invention of generators and motors. The research about wireless telegram in 1909 took a effect to radio, TV, smart-phone and wireless internet, so on. Quantum physics, aiming to understand 'atom' gave influences on the inventions of transistor, DVD player, laser and MRI so on. The research about gravity by Albert Einstein also affected the development of GPS.

In this circumstances, APCTP, built bottom up way and aiming for basic research and research network, introduced Max-plank’s Junior Research Group into Asia Pacific area at first time and provided young scientists with ground for growing up to the next leaders. APCTP also supplied the latest research information and then the role and importance of APCTP is getting bigger. APCTP appointed Yang (Nobel Prize Winner) as the 1st president, Robert and Peter (Max Planck president) as presidents and currently Korean scientist as president for the first time. It has been 18 years since APCTP was hosted in Korea. It is also time for new jump for the another development. While Korea’s economy and global role is getting more important in the world, Korea needs to increase basic research capacity, lead development of basic science in the Asia Pacific region and enhance international reputation in the basic science fields. These are goals of APCTP as international basic research institute. The regional location of APCTP (in Pohang) and its regional contribution can give a good regional case to check the performance of APCTP in the perspective of accountability and show the implication for the further development.

The theoretical background of accountability will be reviewed in section 2, the main issues of APCTP in section 3, the accountability about APCTP in Section 4 and the conclusion in section 5.

**Theoretical background<sup>1</sup>**

According to Behn (2001), since the meaning of “accountability” depends on its context, it is difficult to define, but it is an important concept. Mulgan (2000) says that since the concept of “accountability” is complicated and ambiguous, it is difficult to define accurately, and its concept is not only changeable like a chameleon, but also expanding. Generally, even though “accountability can be interpreted in various ways according to different aspects, it can be defined as social relations in which an actor is under obligation that he should explain and justify his action related to transfer of authority to another important object, based on a basic concept that various stakeholders’ expectations should be met. More simply, it can be defined as “response to demand of a person who assigns a mission”.

**Level of accountability**

With respect to accountability, Thompson (1967) applies Parsons (1960)’s theory that accountability is classified as technical, managerial, and institutional level, arguing organization’s responsibility and control. Thompson’s summary is as follows. Also, he argues that each level has a mutually hierarchical structure and the upper level embraces the lower level. Table 1 shows the summary of his argument.

**Table 1** Level of accountability according to organization’s responsibility

Level	Focus	Remark
Technical level	Specialized functional result	-
Managerial level	Coordination with organization’s customers	-
Institutional level	Legal meaning and the implementation of organizational goals	This level covers technical and managerial level

**Table 2** The main projects of APCTP in the stages

Stage	Year	Objective	Main projects
Establishment	1996. 6	Establishment of center	<ul style="list-style-type: none"> <li>• hosting demonstration academic conference</li> </ul>
Foundation furtherance	1997–2004	Academic exchange	<ul style="list-style-type: none"> <li>• infrastructure building</li> <li>• theme research project</li> <li>• international joint research</li> </ul>
	2005–2006	International joint research	<ul style="list-style-type: none"> <li>• science communication project</li> <li>• science popularization system building</li> <li>• establishment of Asia Pacific national cooperation system</li> </ul>
		Science communication	<ul style="list-style-type: none"> <li>• mid/long term research visiting and staying activities</li> </ul>
		Research infra building	<ul style="list-style-type: none"> <li>• sharing operating cost between member countries</li> <li>• research and visit infrastructure expansion</li> <li>- visiting research room, seminar room so on</li> </ul>
Development	2007–2012	Globalization of projects	<ul style="list-style-type: none"> <li>• expansion of disciplinary and confusion research fields support</li> <li>• strengthening of basic science international cooperation through international joint research</li> </ul>
Maturity	After 2013	International institute	<ul style="list-style-type: none"> <li>• establishment of confusion international research institute status</li> <li>• Mecca of theoretical physics in Asia Pacific area</li> </ul>

First, the technical level is the lowest level of accountability among all of three accountabilities and focuses on effectively achieving results of organization-specialized detailed functions. The accountability in such a viewpoint can be applied to a cooperation process with other people because of the technical nature of the work. Based on these discussions, this paper analyzes the technical level, focusing on problems arising from the uniqueness of science and technology field.

Second, the managerial level includes technical sub-organization and procurement of resources for the implementation of technical functions and coordination among its customers, suppliers, and work environment. Thus, the managerial level includes technical work, scope of work, recruitment and procurement policies. This paper analyzes the managerial level, focusing on how organization, staffing, budget, resources, motivation, performance are managed.

Third, the institutional level refers to a broader concept which includes both technical and managerial level. The institutional level deals with high level of support realizing fundamental or organization's goals regarding organization's legal meaning and

**Table 3** Result of evaluation of APCTP

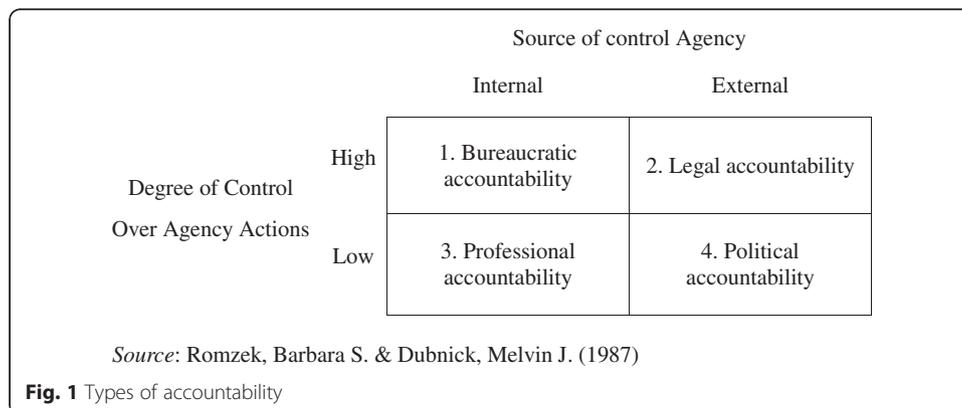
	05	06	07	08	09	10	11	12
Academic research activities	A	A	Excellent	Excellent	Excellent	Avg	Excellent (90)	Excellent (85)
International cooperation exchange and training	A	A	Excellent	Excellent	Good			
Establishment of scientist network	B	B	Good	Avg	Avg			

accountability partially needed in the social system, in a broader sense. The institutional level can identify underlying causes unnoticed the managerial level.

**Institutional accountability**

Romzek & Dubnick (1987) put more emphases on the institutional level than the technological and managerial level, analyzing the cause of the Space Shuttle *Challenger* disaster in 1986. They categorize accountability as four different types, indicated in Fig. 1, including bureaucratic, legal, professional, and political accountability according to the source of control agency and the degree of control over agency actions. They also argue that the executive branch in the United States should be matched with not only the technological and managerial problems but also two or more institutional accountabilities because of the institutional conditions of the environment. They empirically suggest a decline of professional accountability resulting from an increase in political and bureaucratic accountability through the National Aeronautics and Space Administration (NASA)’s the Space Shuttle *Challenger* disaster.

The contents and features of each type of accountabilities are as follows (Romzek & Dubnick 1987; Eom 2009; Cho et al. 2012; Gormley & Balla 2013). First, bureaucratic accountability refers to abiding by supervision of superiors over subordinates, orders or instructions, and standard operating procedures and disciplines in an organization. It is the most widely used form for a control of accountability after priority is determined by hierarchy. Bureaucratic accountability occurs inside an organization and has a high degree of control. It is also expressed as obedience to supervisor’s instructions or compliance with rules in an organization. Bureaucratic accountability has a low level of autonomy since a supervisor can impose penalties based on supervisor’s rewards and punishments for a subordinate in hierarchical relationships. Second, legal accountability indicates one that appears in relationships between enacting legislators and officials implementing enacted laws and in the principal and agent relationship through contracts. It appears in obligatory relationships with an external individual or group legal sanctions and contractual liability. Legal accountability is distinguished from bureaucratic accountability in that legal accountability is based on official or implicit fiduciary relationships between autonomous both parties. Legal accountability has a wider area of administrative activities than bureaucratic accountability, is based on a relationship between external groups (legislators, policy coordinators, etc.) and members of a group,



and is expressed as implantation of legislators' acts. Specifically, the mechanism of ensuring legal accountability is Constitutional and legislative structure, judicial judgement, an audit, control from Congress, and etc. Third, professional accountability reflects a circumstance in which a staff with relevant skills and expertise provides solutions to technical and complicated policy issues, having the discretion and autonomy in their work. According to profession accountability, a staff makes a decision, based on internalized norms. The internalized norms are based on socialization as a profession, personal beliefs, training and education, and work experience. Professional accountability has a characteristic that decisions are made on the inside and external opinions are passed indirectly and reflected only in a defensive form. Public administrators solely rely on the solutions provided by staffs with a high level of expertise, and professional accountability is expressed as a form that the staffs themselves have responsibility of performances. Respect for professionalism is the key of professional accountability and it is based on trust that professions will do their best as much as possible on the basis of their expertise. Fourth, political accountability means officials' response to the needs of external stakeholders such as elected politicians, customer groups, and the general public. Political accountability is a 'reactive' form which arises due to the pressure on the democratization of the public administrative area and expressed as a form that public administrators are responsive to groups (the general public, officials, representative of related institutions, and special interest groups) for which they should be responsible. A high level of control does not happen in political accountability since its sanctions are indirect. While emphasis on political accountability has a high possibility to promote favoritism and corruption, it can also contribute to establishment of open and strong representative government. Among four types of institutional accountability, legal and political accountability are related to open innovation in terms of source of control agency. Continuous interaction with external organizations is for important for sustainable innovation of APCTP (Chesbrough 2006, Chesbrough and Appleyard 2007, Dahlander and Gann 2010).

This study analyzes the relevant ministry, activities of a local government, and the internal structure of the center for bureaucratic accountability and examines national law, international agreements, and etc. for legal accountability. This study also analyzes autonomy of researchers, leadership, professionals, and etc. and examines relations with concerned countries, attention of the President and politicians, parliamentary support, and etc.

## **The case of APCTP**

### **The characteristics of basic research institute**

Similar institutes like APCTP with characteristics of international research institutes can be summarized as follows. First, they are operated by small group of best researchers not by large group of researchers. Second, they support young scientist's independent research with limitation of their research period and then intake new scientists continuously for the researchers circulation. Examples of these kind of institutes are MGP in German, IAS in US, PI in Canada, ECT in Europe. Third, the securement of visiting researchers through hosting of academic activities including diverse conferences enables scientists to be exposed to the latest research trends and information and to

build up researchers' network. These kind of institutes contain ICTP in Italy, PI, in Canada, IAS and KITP in US and ECT in Europe. Fourth, they pursue international role in the theoretical physics fields through international cooperation and development cooperation with developing countries. This type research institutes are ICTP in Italy, PI in Canada, MPI-PKS in German, IAS in US. Last, they operate outreach program using research performance and human resources and pursue to harmonize and support regional societies. MPI-PKS in German and PI in US correspond to this type of institutes (Kang et al. 2014).

APCTP does not have the only one type, but the diverse shapes as other institutes. Therefore, strategic consideration about the type to be focused and pursued is requested.

### **Outline of APCTP**

APCTP is international institute aiming for performing leading edge research, training young scientists and enhancing international cooperation between physicists in Asia Pacific member countries and non-member countries as well.

The establishment of APCTP was firstly suggested on the February in 1989. For this IPC (international promotion committee) was made up on the February in 1993 and they decided Korea is hosting country in the first meeting of IPC on April in 1994. Korea was approved as hosting country in the 13th conference of ASCA (Asia Science Cooperation Association) on November in 1994 and the 1st board meeting was held on April in 1995 in Seoul. President of Korea confirmed Korea hosted APCTP and announced government would support it in the APEC meeting on November in 1996. APCTP selected as a demonstration project in the APEC meeting was registered to ministry of science and technology as a foundation in Seoul.

APCTP was moved to Pohang on August in 2001 and strengthened basic science international cooperation through joint research with MP. APCTP has 14 member countries and 22 cooperation institutes on May in 2013 now and specific process was shown as Table 2.

### **Studying accountability**

#### **Technical level**

APCTP is operating with characteristics of international basic research institute and the technical level of accountability about APCTP can be described as follows. First, APCTP was pivoted on internationally famous theoretical physicists including Nobel prize winner operated from the beginning. 1957 Nobel prize winner, Yang Chenning was appointed as the first president and was propagated the importance of theoretical physics and basic science into Korean society. The second president Robert Replein (Nobel prize winner in 1998), served as the president of KAIST, led globalization of domestic basic research and activated popularization of science. As a result of these efforts, APCTP hosted R&D investment for young scientist groups from MP and enhanced the Korea's level of basic science.

Second, Junior Research Groups (JRG), first adopted 'human centralized' residing research program, were made up for the excellence of joint research regarding characteristics of theoretical physics. APCTP has fully supported young scientists' independent

research through JRG and limitation of support period for individual researchers made new researchers in-tok and circulated continuously and now total 35 researchers (Korean 16, foreigner 19) have been participated until 2013 now. Providing the beneficial with research immersed environment and international research network led production of best research performance and through its support, giving independent role of their research to young and promising scientists in basic science fields led them to do creative research and become next generation leader. Excellent research papers are produced through international joint research group. Despite being young scientists under 40 year old, they produced excellent results which are better than national average and the main R&D program performance (MEST 2012). On the base of these results, the leaders of these research group held good position such as tenured professors in Chinese Science Foundation Graduate School and in Germany Alexander Friedrich University, principal researchers in IBS and heavy ion accelerator research institute and so on. That means APCTP contributed to the raising the next generation researchers in the theoretical physics fields.

Third, APCTP contributed to training young scientists from South-east Asian developing countries and raising next generation basic science researchers in Asia Pacific area and cooperating with South-east Asian countries through the Young Scientist Training Program. As a result of these efforts, continuously the member countries are getting increased and Kazakhstan currently jointed and many other countries expressed their intention of participation to APCTP.

Fourth, outreach program separated from academic activities enabled physicists to meet scientists and the public and performed scientific communication using physics. These activities of APCTP as the supreme Asia Pacific physicist network contributed to the expansion of ground of theoretical physics and disseminated the importance of basic science and secured communication channels with scientists, pre-scientists, youngsters and the public in cooperation with the regional governments and the public organizations.

### **Managerial level**

The accountability of managerial level faced by APCTP is as follows. First, it related to identity and portfolio of programs. APCTP has characteristics as basic research institute and international cooperation agency supporting developing countries as well. This mixed characteristics caused the confusion in the identification of status and then the clearance of this confusion and expansion of international joint research were recommended in the external evaluation (MOSF 2011). Along this, the legal status of APCTP has been unstable since it was established because of absence of the qualification process. Therefore, in the parallel with strengthening basic science supported by government policy, APCTP needs to identify himself as basic research institute and enhance its reputation in basic research area. Related to this problem, the mixture of research and cultural activity programs in the structure of programs is another problem. There are too many kind of programs in this center regarding the designated budget. Self evaluation indicated AP scholar and chair professor program need to be merged to the academic program in higher level (MEST 2011b). APCTP defined its identity as a research oriented organization and restructured programs with putting an emphasis on research program rather than science culture activities.

Second, it is related to operation of program. This could be reviewed in terms of overlapping, efficiency and propriety, monitoring system and governance.

In regard to overlapping, JRG and YST as residence researcher program have differences between former focused on excellence and latter as young scientists training program involved by member countries. In the case of academic activities program, 'theme research', 'season school', 'international academic conference and workshop', 'focus program' have different objectives, objects, the beneficial, and contents each other. Web journal 'cross road' aims to communicate with the public and has a structured differentiation with other programs and tries to expand the base and popularize science through scientific writing with diverse genres.

Regarding to efficiency and propriety, YST of residence researcher program needs to be changed into ODA training program for the member countries to secure budget and enhancement of competitiveness. There are differences between 'AP scholar' and 'chair-professor' within visiting program of academic activities program in terms of visiting period, supporting contents, inviting level, and so on. Operation of visiting programs are fragmented, it is necessary to integrate them for enhancing its efficiency and flexibility in budget usage and operation.

In the case of Physics Outreach Program, sharing budget with government, regional government, education organization, science related institute/party, publisher and increase of program implementation efficiency in the operation through cross support of administrative staff, exchange of information about program operation, expansion of PR effect and participants are requested.

Residence researcher program was monitored through regular review and advice of science committee involved world level researchers and its result was reflected to operation of this program. Academic program and international cooperation program of academic activities are deliberated and reviewed by representative members of theoretical physics communities, who conduct survey for the beneficial of main academic program. Physics Outreach Program is planned through regular review and advice in the meeting by members of group for science culture activities about web journal, science communication and regional science culture festival. 'Crossroad' is regularly reviewed and advised by members of science culture group and then is upgraded effectively in the operation of program.

In the reflection of simplification of program and focus on research program, the governance of APCTP needs to be changed for the efficient support to research and the strengthening of status. The delegated mission to Korean secretary general from foreigner president needs to be restored because of the election of Korean president in 2013.

Third, it is related to management of performance. Even though it is not perfect to evaluate performance of the theoretical physics using the general indicators, APCTP produced superior performances to those of other national R&D programs as shown in Table 3. According to the performance evaluation of S&T promotion fund program in 2011, this pointed out that APCTP achieved the designated goal but its goal seemed to lack challenge (MEST 2011). The evaluation in 2012 pointed out that the expansion of international joint research group for the jumping up to international research institute and the strengthening of academic program and cooperation in link with south east countries and under developed countries are requested and the approval method of objectivity for the measurement of satisfaction of its performance need to be established

(MEST 2012). Therefore the setting and operation of new indicators for the program performance are required.

Fourth, it is related to the budget. The implementation of budget was determined on the base of yearly plan and progressed under quarterly management. But the budget source change of APCTP program from S&T promotion fund to general budget account and securement of new budget with new growth strategy are needed.

*“Regarding the shortage of budget, the performance is good. While the fund is getting shorter, the budget source change into general budget account is necessary very soon to keep the current program scale” (interview with budget deliberation expert, June.19.2014)*

Government planned to enhance the effectiveness of S&T promotion fund source as focusing on the promotion of science culture and moved less relevant programs to the general budget account gradually. Ministry of Strategy and Finance (MOSE) also indicated it is necessary to classify the differences between the fund programs and general budget programs and move less relevant programs in the fund to the general budget account. APCTP was started in 1997 as a program in the general budget account and moved to that fund in 2003 for the flexibility of budget operation and the strengthening of science culture promotion. But it is a pressing situation to return to the general budget account for the shrinkage of the fund volume and strengthening of research program.

#### **Institutional level**

In the R&D program, institutional accountability appears as an institutional response embracing technical and managerial accountability, and has bigger causal effects on the performance of the program than accountabilities in other levels. The institutional accountability to the APCTP will be reviewed in terms of bureaucratic, legal, professional, and political accountability regarding open innovation aspect. The review of institutional accountability of APCTP contains monitoring and controlling the effect of external actors, regulation, law, institutions and circumstances.

#### ***Bureaucratic accountability***

First, the support of the relevant ministry in charge of the APCTP seemed to be negligible meanwhile. During last government, since Ministry of Science and Technology, which was dedicated to Science and Technology, was merged to Ministry of Education, Science and Technology (MEST) focused on the education, the APCTP like other S&T programs was not supported appropriately. Even though the change of APCTP's budget source was suggested in 2010 and 2013 by Parliament, The veto of MOSE made it failed. Thus, this case clearly shows a lack of support from the relevant ministry. However, since the role of Ministry of Science, ICT and Future Planning (MSIP), which focuses on Science and Technology, came to be highly conspicuous during the Park Geun-hye government and Fundamental Technology Division, which is in charge of this program, is working actively, it is expected that the support from MSIP will be done significantly contrary to a relatively lack of support.

Second, even though the APCTP is a kind of international organization, most funding came from MSIP except for contributions of developing countries and support from local governments. In addition, the budget for the APCTP is not an institutional base but as a program so that APCTP program has many projects and activities. Thus, the operation of the APCTP in project level is not influenced by government officials, but the key factor influencing its operation is the internal structure of the APCTP including the president of the center, the secretary general and the administration bureau, and so on. The reason why the APCTP was able to develop sustainably in this structure is that many roles of the center was entrusted to Korean secretary general during foreign President's incumbency and long-term tenure of the secretary general enabled the center to be operated consistently without frequent replacement. In addition, appointing a person of high reputation such as a Nobel Prize laureate as president of APCTP facilitated the funding from the government and the direction of the program was evolved into strengthening not only regional cooperation but also research capacity. Moreover, its contribution to popularization of science in the local community led to funding<sup>2</sup> from related local governments, Gyeongsangbuk-do and Pohang-si.

Third, work to be endorsed by APEC is in progress. APEC's endorsement is one of the diplomatic activities so that the support of governments and public institutions is important. Consequently, cooperation among MSIP (Fundamental Technology Division and Multilateral Cooperation Division), Gyeongsangbuk-do, and Pohang-si is required. The APCTP needs to present national importance through the mid and long-term development plan and its specific effects.

#### ***Legal accountability***

This section examines legal accountability as below. First, the APCTP was established as a private institution, a form of a member country centered foundation, under Civil Code Section 32. Then, private-governmental partnership was established as the government started to support the program. A private research center can be operated flexibly unlike government-affiliated research institutes. In addition, a private research institute has advantages in that it keeps a favorable position for benefits from international organization and international human resource network can be constituted freely from government's interference. This gives an implication of desirable conciliation of private and government as a part of open innovation.

Second, it can be concerned with status as an international organization. Without any specific legal support to date, the APCTP has functioned as a research and innovation platform for theoretical physicists (approximately 3000 of total visiting researchers, etc.) and a great deal of achievement including cooperation in Asia-Pacific region seemed to be accomplished. Recent reinforcement of budget accountability and change of the division managing APCTP from cooperation division to a basic research division in ministry caused more difficulty in an increase of APCTP's budget. The strengthening of domestic legal footing can help to obtain more budget but be likely to hinder privately led development of APCTP. As a consequence, if the establishment of the APCTP is legally supported by an agreement with international organizations such as APEC rather than domestic laws, it will secure budget more easily and achieve private-led development sustainably.

Third, there are many difficulties in securing additional budget because the budget is funded from S&T Promotion fund. It is a recent trend that the government is transferring projects, which are less relevant to creation of scientific culture, into the general account to improve the effectiveness of limited fund resources, focusing on creation of scientific culture.

*“It is a recent trend that the budget of Science and Technology Promotion Fund is reduced every year. Thus, it is virtually impossible secure additional budget since the APCTP compete with representative science and technology organization such as the Korean Federation of Science and Technology Societies and the Korean Academy of Science and Technology to secure more from limited budget.”(Interview with the President of the APCTP, July 9, 2014)*

However, the APCTP is the only major R&D program among programs that requested a change of a budget source in 2015. In addition, while ‘Northeast Asia R&D hub establishment project’ which aims at invitations of excellent international organizations such as Max Planck POSTECH/Korea Research Initiative and ‘the establishment of global cooperation foundation’ which aims at support for developing countries’ science and technology are funded from the general account, the APCTP is the only program that is funded from S&T promotion Fund. It is expected that the completion of Max Planck project will cause pressure on budget. However, since the APCTP is funded from S&T Promotion Fund, it has difficulty with budget increase. In addition, its evaluation for the fund program does not match with APCTP characteristics so that it can act as impediments to strengthening research capabilities. The budget for creation of scientific culture accounts only for 17% for the APCTP so that it is required to be transferred into the general account and to secure a new budget source.

#### ***Professional accountability***

First, the APCTP was established not in a top-down approach by APEC but in a bottom-up approach by leading participation of theoretical physicists. The field of theoretical physics requires a high level of expertise and its research is carried out by researchers’ autonomy so that professional accountability is strongly realized in this field than any other fields., the APCTP, originated autonomously from this field, has been operated by professional accountability. The APCTP is not long-term resident cooperation research using research equipment, but rather it carries out cooperation research through constant meetings without requiring any specific equipment. Thus, the APCTP, a form of a platform, could achieve relatively great performance considering its budget by deriving voluntary cooperation among researchers.

Second, the APCTP has continuously grown through private leadership. Through scientists’ autonomous activities and cooperation, a role of the APCTP as a platform has been maximized, so that many achievements have been accumulated. The first and second presidents of the APCTP as Nobel Prize laureates disseminated the importance theoretical physics and basic science to Korea and actively promoted globalization of Korea’s basic science and popularization of science. The third president of the APCTP as the president of the Max Planck Institute strengthened research capabilities and enhanced the status of basic science including creation of emerging research groups

through cooperation with Germany. The new president as the first Korean president (Term: from July, 2013 to July, 2016) served as a secretary general for many years and was elected as the president of the Association of Asia Pacific Physical Societies (AAPPS) so that a favorable environment for Asia-Pacific academic collaborative research and international cooperation projects was created.

*“The APCTP seems to enter a adulthood period, passing through an adolescent period. The new president of the APCTP was elected in return for leadership and trust that Korea has showed the international society. However, we feel burdensome because it is very hard to build trust, but it can be gone like a flash. We are going to do our utmost to establish the foundation for the world-leading research institute in theoretical physics.”(Interview with the President of the APCTP, July 9, 2014)*

Since present member countries consist of not only Australia, China, and Japan but also developing countries such as Laos, Malaysia, the Philippines, Mongolia, Vietnam, and Thailand, the APCTP has grown sustainably, playing leading roles such as training emerging workforce based on Korea's expertise.

Third, in addition to scientists and engineers who were in charge of leading roles, professional accountability of secretary general and staffs of the administration bureau functioned as important roles in the development of the APCTP. The role of the APCTP includes a supporting activity with understanding research administration, school administration, and international cooperation. Both the secretary general, who manages APCTP's activities like a responsible prime minister, and staffs of the APCTP played the following important roles. Even though the APCTP is located within Pohang University of Science and Technology (POSTECH), it maintains independence and completes 'Pohang System' through cooperation with universities and nearby Pohang Accelerator Laboratory (PAL).

#### **Political accountability**

First, let's examine the hosting of the APCTP. The APCTP was established with the desire of counteracting absence of world-class theoretical physics research institute in Asia-Pacific region, conducting world-class research, and cultivating competent human resources through international cooperation among 10 countries including Korea, China, and Japan. Establishing APCTP was a remarkable executive case of open innovation in the Asia-Pacific region. In addition, it was established in Korea because China wanted to check Japan's sole lead, Australia has a geographical disadvantage, and Vietnam and the Philippines, which consider Korea as a role model, supported actively. The APCTP was located in Seoul when established, but the crisis of leadership caused it to move from Seoul to inside of POSTECH through open invitation for a new place. Compared to Seoul and Daejeon, Pohang is similar to the case of International Centre for Theoretical Physics (ICTP), which is located in Trieste, Italy. In addition, Gyeongsangbuk-do and Pohang-si's promise of active support caused favorable results.

Second, let's examine political support from a national ultimate decision maker. President Kim Young-sam's commitment caused the APCTP to secure official support when established. In the Lee Myung-bak government, one of the main science and technology policy was that basic research occupied 50% of R&D budget and

establishment of Institute for Basic Science and installation of heavy ion accelerator were progressed. The Park Geun-hye government set up Basic Research Promotion Master Plan ('13~'17)' and made clear that they will strengthen support for promising new researchers of basic research and revitalize international cooperation. The APCTP will be able to exploit such will to promote basic research for strengthening its status.

Third, let's look at political accountability in the level of National Assembly. In National Assembly, Education and Science Technology Committee's review report on 'Agenda of 2010 Settlement of Accounts and Approval for Reserve Fund Expenditure' said that since the APCTP program is similar to another program transferred into the general accounts in 2010, it is necessary to examine whether to transfer the APCTP program into the general accounts ('11. 8.). In 2013, through a relevant permanent committee, Science, ICT, Future Planning, Broadcasting, and Communications Committee's resolution ('13.12.10.), the agenda was submitted to Special Committee on Budget and Accounts, but MOSE, a budget department, did not accept the transference. For the transference, there is a need to actively assert that they should screen programs and support intensively the program in accord with fund's purpose, highlighting that S&T promotion Fund is deteriorating, and transfer programs which do mainly aim science and technology promotion including the APCTP into the general budget account in cooperation with amicable politicians.

Forth, let's examine political accountability regarding local government or local politicians. The APCTP is funded directly from Pohang-si and Gyeongsangbuk-do and it does not seem to have any problems with increasing budget because of its regional characteristics as a political support base of both President Lee Myung-bak and Park Geun-hye. A wise role of local politicians is important to develop the APCTP since spread of awareness that the APCTP is a local program tends to make central government's interest distracted. This advocative atmosphere of central and local government enabled APCTP as a hub of open innovation among industry, academia and local government.

Finally, in the level of an international organization, for agenda-setting to be an APEC endorsed specialized institute, a process securing understanding and cooperation of other member countries is more important than an official procedure. Consequently, to draw support and participation of APEC member countries and neighboring countries, it is necessary to make the best use of APEC's official project. In addition, MSIP's practical cooperation is required in this process.

## **Conclusion**

As reviewed in this paper, diverse accountabilities around research environment as well as strengthening of research capacity, enhancement of international status, contribution to regional society should be responded in order to develop the APCTP in the open innovation perspective. A case in this research, the APCTP, has achieved the goal of the program, responding properly to many problems in a managerial and institutional level with technical problem. In the managerial level, efficiency of the program was enhanced by simplifying the complicated program and in the institutional level, a long-term role of the secretary general, who exerts real authority, was foundations for a sustainable development. Even though enhancement of its status was limited by the lack of legal support, voluntary participation and endeavor, because the APCTP was

established in a bottom-up approach, made good performance as a research and innovation platform considering its budget. In addition, the Lee Myung-bak government and the Park Geun-hye government's strong will for basic research and support from local government will play a positive role in development of the APCTP as an international research institute and it is expected to be real help for enhancement of international status for the future.

The following conclusion can be drawn from summarizing institutional accountability of the APCTP regarding the open innovation aspect. Regarding bureaucratic accountability, the status of MOST, the relevant ministry of the APCTP, was weakened during the last government and then active support was not given. Moreover, a budget ministry's lack of understanding and interest about the program caused a lot of difficulties. In the field of theoretical physics, trust in professionals' capability, which is based on the high level of expertise, and professional vocation should be fully used, but minimum regulation should be applied so that efficiency of policies can be enhanced. Thus, legal accountability is crucial in this field with political accountability in the open innovation aspect. However, the APCTP has been operated by internationally prestige scientists and vocation of both secretary generals and staffs of administration bureau, but it lacked legal accountability backing them. Fortunately, the APCTP realized such circumstance and is actively promoting endorsement as an international specialized organization. It is required to draw relevant ministry's support in addition to restoration of relevant ministry's power in government. While the transference of its budget into the general account is preponderantly being carried, it seems to need endeavor to secure separate budget to support the APCTP rather than oscillating between fund and the general account. Regarding political accountability, political circles strongly seem to support the APCTP on the surface, but practical achievements are not accomplished in the open innovation aspect. It is necessary to draw practical effects from political support of central and local governments.

## Endnotes

<sup>1</sup>Note: Cho, Seongsick & Kwon, Gihoon & Kim, Donghyun. (2012). Used with modifying and supplementing the part of theoretical background (pp. 166–169).

<sup>2</sup>The budget of the APCTP (₩3,864 million) in 2013 comprises central government budget (₩2915 million), local government budget (Gyeongsangbuk-do & Pohang-si, ₩318 million), MPG (Germany, ₩175 million), other budget (₩456 million).

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