Facilitating Innovation: Government support for independent research and supplementing technical capabilities for innovators via Independent Research Support Center

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Ⅰ. Introduction

The economic transformation over the last several decades had urged the shift into a new development paradigm, which is often referred to as the "New Growth" theory. This theory holds that technological progress and innovation are no exogenous variables: instead, these are resulted from endogenous factors such as accumulated investment in human capital and the spill-over effect of the derived knowledge in the economy. Now, it has been widely acknowledged that the turn of 20th and 21st century marked the beginning of the era of information technology and the world economy is in transition into knowledge economy, in which human capital and knowledge is at the heart of economic development. This knowledge economy is led by innovation, a process that transform research results into improvements in product or process, or even introduction of new products in the market. As such, innovation is propelled by entrepreneurship, the capacity and willingness to take risks and the capacity to discover market opportunities where an innovative initiative can be translated into economic goods.

Being aware of the importance of innovation, governments have been increasing their efforts in facilitating innovation in the economy through diverse initiatives. In South Korea, last year the government initiated Creative Economy Town, a platform where people from all walks of life can share their ideas which they have come up with as solutions to some problems they were faced with. This is an example among many initiatives recognized as active in supporting innovation and encouraging entrepreneurship across the economy. In addition, R&D investment of South Korea has been increasing continuously every year.

However, the current innovation promotion systems are subject to several limitations. The current paper discusses these limitations including bureaucracy that filters ideas, the need of technical capability supplement for innovators in need not yet being satisfied, and the lack of investment from private sector for sponsoring development of innovative ideas that serve social causes. Base on these limitations, the

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paper presents an initiative to uncover ideas, give them more opportunities for further development, and support innovation by social groups that lack technical skills to realize their innovations, and those being less advantaged in accessing resources. The ultimate outcome of this initiative is, hopefully, to uncover and encourage technological innovation across all social groups in the economy.

Ⅱ. Current situations: The need of government support for independent research and technical capability supplement for non-professional innovators

1. The need of independent research fund

Research and development (R&D) is a key component of innovation. At present, most R&D activities are carried out in either enterprises or public sector, i.e. universities and institutes. In the current system, R&D funds are mostly provided to research groups through formal institutions, which requires that the researchers need to belong to certain organization to be eligible for research funding. The discussion in this paper is focused on R&D funding in public sector.

There are several unmet gaps in the current system, due to which great ideas are being left behind because of limited resources for further development. Consider the case of a farmer who has invented a simple robot pesticide sprayer. Or a group of students who have found a way to better filter river water. These may be great innovative ideas, yet further development is needed to make them more attractive to investment and commercialization. However, due to the current system of research funding, it is difficult for them to apply for funding to aid their further research unless they can attract investors. In addition, many of these, though may have great potential benefit to society and do not require large investment, but the expected returns on investment are relatively small so they hardly can attract investors. Here, there is a need to provide financial support for these innovative ideas to increase their chance of being developed and commercialized.

Another gap is derived from research funding bureaucracy. Students, who are a critical force in R&D activities, often can only obtain funding for their research through their professors. As a result, professors may become an “idea filter”, which signifies that many potential innovative ideas seen as unfit or simply going unnoticed by professors may be left behind. In addition, after graduation, the students may longer have access to funding to refine their research outcomes for commercialization. Last but not least, when participating in a funded group research project, they may not be entitled to full ownership of their own research outcomes, hence having great difficulty in commercializing such outcomes. Thus, there is a need to provide direct research funding to actual idea holders so as to uncover these potentials and encourage students to further develop their innovative ideas.

All in all, the subjects who need independent research funding include two groups, whose characteristics are described below.

Students including undergraduate and graduate students are those well equipped with fundamental

knowledge, coupled with their young energy and enthusiasm and more flexibility in time. Students in science, technology and engineering fields are those who are familiar with R&D and are likely to generate research outcomes as part of their graduation requirements.

Free innovators are those among the firsts to introduce into reality something better than before, yet their innovative ideas are not limited to their respective organization or they simply don't belong to any organization at all. These people are characterized by strong motivation to realize their ideas.

In addition to these unmet gaps, the current systems of promoting entrepreneurship are subject to the following limitation. They tend to favour innovative ideas with market orientation – is the idea marketable, and can it bring satisfactory return on investment etc? Therefore, the ideas that cannot meet those expectations even despite its great potential benefit may be looked over by investors. Hence, there is a need of a regular funding organization that pays attention to such initiatives from social point of view and proactively reaches out to supporting those initiatives.

2. The need of supplementing the lack of technical capabilities among free innovators.

What if one comes up with an innovative idea but has no engineering knowledge to clarify how it works? This often happens to those who lack of high education, have non-science and technology background, or in the case when the development of the innovative idea requires multi-disciplinary engineering knowledge. Therefore, there is a need to provide supplement in technical skills to such innovators.

As the result of governmental effort in promoting innovation and entrepreneurship, there are a number of business incubation and support centers where technical consultation is provided. However, since this consultation service is provided by either people-in-charge at centers or expert mentors, who are often highly busy, the service can only provided briefly and it takes much waiting time to get feedback from the inquired people. Therefore, innovators must mainly rely on yourselves by self-studying, which is time-consuming and inefficient, to realize their ideas. Thus, to address this problem, there is a need to expand the pool of technical advisers and mentors. And student engineers and student researchers are a great source to provide such service, who have accumulated science and technology fundamentals yet not too busy to fit technical consultation service into their schedule.

III. Solution to unmet needs in innovation promotion: establishment of Independent Research Support Center

In order to meet the aforementioned needs to unleash innovation capabilities and aid the innovation process until commercialization stage, this paper proposes a model of an institution funded by the government in order to sponsor independent research, provide technical support for innovators, and aid the commercialization of the research outcomes, namely "Independent Research Support Center". This center acts as the hub to enable research activities that are independent of other formal institutions by individuals

with innovative applied ideas which have the potential to better the life of other people, provide a more time-efficient technical support and help commercialize the research outcomes by either transferring the technology to interested parties or translating them into commercial products via start-up ventures. The center is operated on non-profit basis, with major funding from the government particularly in the early stage, and earning some revenues in the commercialization service which will be explained in the later section.

1. Goals and scope

Based on the above, the goals of establishing centers are described as below:

- To provide research funds for independent research projects that are otherwise not eligible for applying for funds from formal organizations
- To provide technical support to free innovators in need from mentors largely comprised of student engineers and student researchers.
- To support the research outcomes from those independent research projects and free innovators in commercialization.

Due to the limited fund, the center focuses on innovations with great potential benefit to the society but may be less attractive to usual market investors, including the following characteristics:

- The innovations that can be realized in applications in forms of prototype or solution to a technical problem.
- The innovations that can be translated into products that brings greater benefit to the society than the current systems, including the less advantaged social groups such as the farmers, disadvantaged people etc, however, yet the expected returns on investment are relatively lower thus making it difficult to attract investors.
- The innovations that require small to moderate investment in R&D within the allowed budget of the center.
- Innovations from less advantaged innovators who have difficulty in accessing funding from other formal organization and investors, such as women, workers, farmers, the disabled etc are considered for funding with higher preference.
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2. Organization and functions

This Independent Research Support Center is primarily composed of 3 divisions: Independent Research Funding Division, Technical Support Division, and Commercialization Division. Each has a distinctive role in the path from idea to marketable products. The functions of each division are described below:

- The **Independent Research Funding Division** has the function to grant research funds to highly potential innovative ideas to independent researchers. Independent researchers fundamentally can be any people from all walks of life who have come up with innovative ideas that need further research to become a more meaningful findings and products, are strongly motivated and can demonstrate their capabilities to do so. These independent researchers can submit their research proposals to the Independent Research

Funding Committee who are in charge of screening these research proposals and deciding on which research proposals can receive funding from the center. The Committee should be comprised of highly capable academia and industrialists successful in their respective fields, who are willing to participate on a voluntary basis to share their wisdom like in the case of academic journal reviewers. This Committee may also act as mentors who give their advice in the process of research by independent researchers. The Committee evaluate the values and potentials of research proposals based on the funding scope of the center as mentioned in the previous section. In addition to screening and selection function, this Division is also expected to build a network of affiliated institutions in order to provide support in access to research facilities and consultation for independent researchers. Also, research funds are provided for independent research individuals or groups on the conditions that they would voluntarily contribute to the center as technical mentors willing to offer technical support for other researchers and innovators in need.

As the independent researchers have finally come up with the research outcomes which are ready for commercialization, they may come to Commercialization Division

- The **Technical Support Division** is to provide technical support to free innovators who seek technical advice. Unlike technical support service at other government agencies and e-platforms, the mentor pools are largely composed of student engineers and student researchers in R&D, part of whom are those who receive independent research funds from the center. These people with their accumulated knowledge in science and technology can be enough to provide support in simple to moderate technical support inquiries, and have more time available to respond to support inquiries in a more timely and detailed manner, compared to expert mentors who are often too busy with their own schedules. In particular, the center's policy regarding technical support service for the less advantaged social groups would ensure that these groups would receive more active support from the center's mentor network. Another function of this Division is to connect with government research institutions and universities to enable access by independent researchers and innovators to government owned research facilities to aid their R&D process.
- The **Commercialization Division** is for ones who look for interested partners to transfer their technologies. This Division acts as the intermediary who assists the independent researchers and innovators in finding those who may be interested in buying their technologies. In case the transaction is successful, the seller may be asked to donate 5% of the royalty to the independent research fund to support other independent research projects.

The configuration of the center organization is described briefly as in Fig. 1 below:

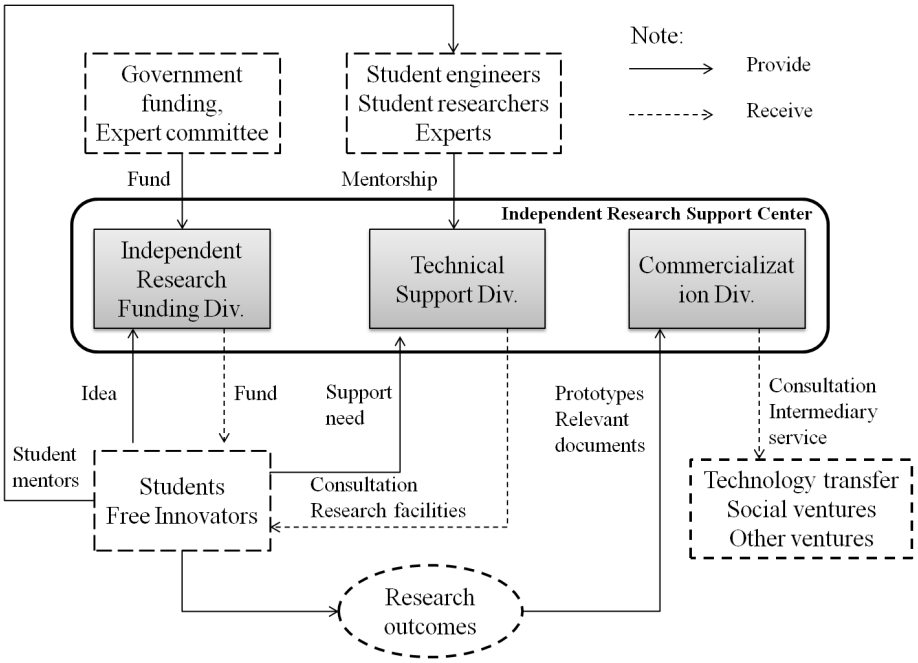

Figure 1. Model of Independent Research Support Center and operating mechanism

Ⅳ. Conclusion

In this paper, several unmet gaps in the current research funding system are identified, including the need of independent research funds to independent researchers and free innovators, and the need to provide technical support to supplement the lack of technical skills, if any, among these peoples with mentor force mainly comprised of student engineers and student researchers. In addition, current entrepreneurship promoting systems tend to favour innovative ideas with market-oriented approach. To address these unmet gaps and limitation in promoting innovation across the economy, a model of an Independent Research Support Center is proposed with the aim to expand the opportunities for boosting innovation in social groups with limited access to R&D funding such as students and free innovators, and in areas that are less attractive to usual market investors and help bring those innovations to life, which is more society-oriented. With the establishment of this Center, it is expected to uncover innovative ideas that may otherwise be filtered by the current systems and have them realized to better our society.