The scientific technique ODA cooperation model: The research equipment and the operation technology support

Donghun Yoon

Abstract: This paper is discussed and presented for the scientific technique official development assistance (ODA) cooperation. The three factors of the scientific technique are the research cost, the research personnel, and the research equipment. In this study, we focused on the scientific technique ODA cooperation for the research equipment. Actually, research institutes have been continually supported for the scientific technique ODA cooperation of the research equipment. However, the government lead ODA for the research equipment has been rarely implemented. In this paper, we attempted to study the scientific technique ODA cooperation model for the research equipment. First, we discuss and present for the scientific technique ODA cooperation. Then, we discuss the scientific technique ODA cooperation for the research equipment and operation technology. Also, we analyzed the expected effectiveness of the scientific technique ODA cooperation model for the research equipment. The expected effectiveness is classified as qualitative effectiveness and the quantitative effectiveness. In this paper, the scientific technique ODA cooperation model and expected effectiveness are examined for the first time.

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PUBLIC INTEREST STATEMENT

Official development assistance (ODA) has been recognized as a government strategy for realizing a country’s international economic policy and support policy for overseas expansion of enterprises. In general, the ODA is the public fund transfer mechanism of advanced countries, and supports the economy and the social development of developing countries. In this paper, the scientific technique for ODA cooperation model for research equipment and operations technology is discussed and presented. The scientific technique for ODA cooperation model is very important in the scientific technique for ODA policy because it determines the ODA effectiveness. In this paper, we attempted to study the scientific technique ODA cooperation model for the research equipment. Also, we analyzed the expected effectiveness of the scientific technique ODA cooperation model for the research equipment. This study is deemed very useful for scientific technique for ODA policymaking and for scientific technique for ODA cooperation among all research institutes around the world.
We think this study is very useful for the scientific technique ODA policymaking and the scientific technique ODA cooperation of all research institutes around the world.

Subjects: Globalization; Global Governance; International Relations Theory; Public Diplomacy; Sociology of Science & Technology

Keywords: research equipment; official development assistance; scientific technique; cooperation

1. Introduction
Overseas aid is a very important strategy for members of the international community to perform their humanitarian responsibility and role, and to achieve economic cooperation among nations (Farrington, 2006; Metts & Metts, 2000). Around the world, official development assistance (ODA) has been recognized as a government strategy for realizing a country’s international economic policy and support policy for overseas expansion of enterprises (Addison, 2005; Edmonds, 2003; Watson, 2012). In general, the ODA is the public fund transfer mechanism of advanced countries, and supports the economy and the social development of developing countries (Saungweme, 2013, p. 26). It refers to the development cooperation efforts of the government, local governments, and public institutions in developed countries to achieve poverty reduction, welfare promotion, and economic development in developing countries (Blunt, Turner, & Hertz, 2011; Iimi, 2006; Wijkman, 1996). In the Organization for Economic Cooperation and Development (OECD), the ODA is defined as the fund transfer mechanism of the designated developing country and the designated international organization from the Development Assistance Committee (DAC). It includes the concepts of grant-type aid and long-term capital transactions of DAC member-country governments and the public sector, long-term capital transactions of DAC member-countries for the private sector, and grant-type aid of DAC member-countries for non-governmental organizations (NGOs) (Ellerman, 2004; Laarman, 2001; Nowak, 2014).

In this paper, the scientific technique for ODA cooperation model for research equipment and operations technology is discussed and presented. The scientific technique for ODA cooperation model is very important in the scientific technique for ODA policy because it determines the ODA effectiveness (Clark, 1992; Dutschke, 2006). The scientific technique for ODA cooperation model of the donor country needs to be systematized from the plan to the action for the aid of the recipient country (Keijzer, 2014; Ono, 1990; Vollmer, 2014). This is very important in the scientific technique for ODA system research. Also, policy coherence is an important issue in the role of the donor country (Cardenas, 1995; Davis, 2010; Ellerman, 2001). It influences the policy decision and the scientific technique execution mechanism of the donor country (Gabas & Ribier, 2013; Mai, 1996). In policy coherence, conflicting interests cannot be avoided by the donor country. Also, it is difficult to be consistent in carrying out a policy (Ayers & Huq, 2009; Little, 2010). In the donor country, effectiveness is very important in the scientific technique for ODA system (Brzoska, 2008; Gough, Bradshaw, Ditch, Eardley, & Whiteford, 1997). The scientific technique for ODA cooperation model has minimized the duplication of the scientific technique for ODA. Also, it has efficiently managed the scientific technique for ODA budget (Clunies, 2004; Codding, 1989; Moe, 2008).

In this study, the scientific technique for ODA cooperation model for research equipment and operations technology is studied for the first time. Its expected effectiveness was also studied. However, it was difficult to calculate in the scientific technique for ODA. The scientific technique for ODA is not for profit but rather is a non-profit undertaking. Its expected effectiveness and its economic analysis are very difficult and convoluted because it is not a capital investment or an assessment of a payback.

The expected effectiveness of the scientific technique for ODA cooperation model for research equipment is analyzed. Such expected effectiveness is classified into qualitative effectiveness and quantitative effectiveness. This study is deemed very useful for scientific technique for ODA policymaking and scientific technique for ODA cooperation in all research institutes worldwide. In this
paper, the scientific technique for ODA cooperation model and its expected effectiveness are examined for the first time.

2. The scientific technique for ODA cooperation

The importance of manpower, resources, and energy is growing more and more due to the recent opening of the global marketplace and competition reinforcement. The scientific technique for cooperation demand of developing countries is also increasingly growing. Advanced countries have been aiding developing countries for the maintenance and enhancement of their competitive advantage (Chew, 2009; La, 2004; Nachmias, 1999). Developing countries have been requesting technology development for their economy, society, and manpower, and the demand for a scientific technique for cooperation to achieve technology transfer is increasing. In the past, the aid of advanced countries to developing countries has focused on the construction of infrastructure and the advancement of economic development. In recent years, the OECD started actively discussing and presenting the scientific technique solution for the societal problems and the economic problems of developing countries. The scientific technique for ODA cooperation is growing more and more because advanced countries are recognizing the mutual cooperation between advanced countries and developing countries as an attractive investment. The important characteristics of the scientific technique are a major means of achieving sustainable development. The United Nations (UN) has suggested the sustainable development theme for poverty, governance, health, education, the economy, society, and the environment. The scientific technique has eliminated the negative influence of society and the environment on sustainable development and economic growth. In 2008, the South Korean government announced its active participation in and support for ODA. The South Korean government continues to recognize the need for South Korea to increase its development aid to an amount congruous to its status as the world’s thirteenth largest economy. Also, the South Korean government hopes to improve the nation’s image through national aid for developing countries. South Korea was actually an ODA recipient for more than 40 years. In 1987, the South Korean government founded the Economic Development Cooperation Fund (EDCF) for the provision of economic support to developing countries. At the same time, South Korea is an ODA donor country. Thus, the country’s status has risen from that of a recipient of global donations to a donor that proudly offers aid to developing countries. This is a success case and the first in the world. In 2006, the South Korean government supported developing countries with $44.5 billion. The following year, the figure rose to $69.9 billion. The South Korean government has thus joined the DAC of the OECD as an ODA donor country. The distribution of net ODA by countries worldwide in 2013 is described in Figure 1. The United States registered the highest net ODA (2013), followed by Japan, the United Kingdom, etc. Korea’s net ODA in 2013 was $494.96 million. The total net ODA figures for 2013 are shown in Figure 2. Norway had the highest, followed by Sweden, Luxembourg, etc. Korea had a 0.13% total net ODA in 2013.

In this paper, the elements of the effect of the scientific technique for ODA decision of donor countries and recipient countries are the economic cooperation, the relationship, the energy production of the recipient country, etc. The authors look forward to enlarging the scientific technique for ODA scale through the expansion of exports, foreign direct investments (FDIs), and energy production of donor countries and recipient countries. The detailed formula for the economic relationship model is as follows:

\[
ODA_t = \beta_0 + \beta_1(GDP_{it}) + \beta_2(EX_{it}) + \beta_3(FDI_{it}) + \beta_4(ENRG_{it}) + \mu_t
\]

- **ODA**: ODA scale of the donor country for time t of i country
- **GDP**: GDP of the donor country for time t of i country
- **EX**: Export scale of the donor country for time t of i country
- **FDI**: FDI scale of the donor country for time t of i country
- **ENRG**: Energy production for time t of i country (oil, coal, LPG, etc.)
The Clemens, Radelet, and Bhavnani (2004) model has been used to analyze the economic growth of ODA support. The detailed formula of the model is as follows (Clemens et al., 2004, p. 5):

\[ y_{it} = \alpha + \beta x_{it} + \lambda (a_{it})^2 + X_{it} + \theta \ln y_{it} + \epsilon_{it} \]

\[ a_{it} = Z_{it} + \nu_{it} \]

The Development Assistance Committee 5 (DAC5) of the OECD classifies aid variables as social infrastructure & services, economic infrastructure & services, production, multi-sector/cross-cutting, and commodity aid/general pro.ass (Sengupta, 2002; Van, 2009).
In this paper, such aid variables (social infrastructure & services, economic infrastructure & services, production, multi-sector/cross-cutting, and commodity aid/general pro.ass.) were applied to the Clemens et al. (2004) model. The detailed formula of the model is as follows:

\[ y_{it} = \alpha + \beta s_{it} + \beta e_{it} + \beta p_{it} + \beta m_{it} + \beta h_{it} + \beta A_{it} + X_{it} + \theta \ln y_{it} + \varepsilon_{it} \]

\[ a_{it} = Z_{it} + v_{it} \]

The DAC5 of the OECD includes actions related to debt and support for NGO among aid variables. In this paper, these are excluded from aid variables because they do not affect economic growth. Also, the Clemens et al. (2004) model excludes actions related to debt from aid variables.

In recent years, the Ministry of Science, ICT, and Future Planning (MSIP) of South Korea has actively implemented the scientific technique for ODA cooperation. South Korea had properly applied and improved the introduction of technology in technology wastelands through the introduction of foreign capital and aid. Also, South Korea develops new technologies and has the knowledge and experience needed for the introduction of technology. In particular, South Korea has research development know-how and industrial technology. Developing countries need these merits. South Korea has invested 4.39% of its gross domestic product (GDP) in its R&D budget (2014). Also, it has a scientific technique for ODA cooperation potential as a Top 10 technology power in the world for the scientific technique infrastructure. In the National Competitiveness Assessment (2010) of the International Institute for Management Development, South Korea was ranked fourth in scientific competitiveness and eighteenth in technological competitiveness. The scientific technique competitiveness of South Korea has improved due to its foreign-based development strategy and technical aid cooperation with advanced countries. Also, South Korea could develop applied industrial technologies through its foreign-based development strategy and its technical aid cooperation.

The scientific technique for ODA cooperation gives South Korea and developing countries a new chance for scientific technique development. Developing countries need economic development software from South Korea for the scientific technique, technology development, a cure for poverty, etc.

The MSIP has cooperated with the Ministry of Foreign Affairs (MOFA), the Ministry of Strategy and Finance (MSF), etc. for the policy governance and direction. The scientific technique for ODA cooperation budget expansion has been implemented through the Korea International Cooperation Agency (KOICA), the National Research Foundation of Korea (NRF), the United Nations Procurement Division (UNPD), the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), etc. The ODA cooperation has been executed by KOICA, NRF, and EDCF, and implemented by research institutes, universities, and public institutions. The scientific technique for ODA cooperation system of South Korea is described in Figure 3. The three factors of the scientific technique for ODA cooperation are funding, managing, and implementing.

The scientific technique for cooperation paradigm of South Korea for developing countries is described in Figure 4. The scientific technique for cooperation paradigm is classified into the S&T cooperation program and the S&T assistance program. The S&T cooperation program has been implemented as the multilateral S&T program.

This paper focuses on the scientific technique for ODA cooperation for research equipment. Its expected effectiveness is classified into qualitative effectiveness and quantitative effectiveness.

3. Research equipment and operations technology support
In recent years, all governments around the world have shown interest in the foreign market and the resources of developing countries (Ali, Malwanda, & Suliman, 1999; Easterly, 2007). Also, all governments around the world are making efforts to achieve mutual trust and cooperation,
because they recognize such as essential elements of national security and national competitiveness (Mehrotra, 2002; Nelson, 1996; Raworth, 2007). South Korea has been participating in the DAC of the OECD from 2010 for the aid expansion and efficiency improvement of developing countries. The MSIP of South Korea has recognized the importance of research equipment and operations technology support for developing countries because it could be the scientific technique for cooperation enhancement and for the improvement of the national image of advanced countries. The MSIP has implemented the scientific technique for ODA cooperation for research equipment and operations technology due to the bridgehead establishment of research equipment development enterprises and the scientific technique for cooperation enhancement. It manages all
national research equipment and facilities of South Korea. Also, it has the know-how, professionalism, and researcher network for research equipment and facilities.

In 2013, the MSIP of South Korea received formal requests for research equipment and operations technology from the Vietnam Academy of Science and Technology (VAST) of Vietnam and the Ministry of Science & Technology (MoST) of Ethiopia. In this paper, the scientific technique for ODA cooperation model and its expected effectiveness are studied for the formal requests of the Vietnam government and the Ethiopian government. Scientists in South Korea, Vietnam, and Ethiopia have discussed research equipment and operations technology cooperation before the Vietnam government and the Ethiopian government sent their formal requests. The formal request of Vietnam for research equipment and operations technology support emerged from the research discussion of the VAST and the Korea Basic Science Institute (KBSI) in 2010. The Institute of Marine Biochemistry (IMBC) of Vietnam sent the request to the MSIP and the KBSI. Also, researchers and scientists of Vietnam were invited to cooperate for research equipment and operations technology at the KBSI. The formal request for research equipment and operations technology support of Ethiopia emerged from the Triennale Meeting of the Association for the Development of Education in Africa (ADEA) in 2012. The African Union (AU) requested the MSIP of South Korea for assistance with research equipment and operations technology. The ADEA operates in 53 countries for the development of education in the AU. It decides on the Union’s strategy and policy for education development. The MSIP of South Korea looks forward to contributing to the creation of an economic policy that covers the bridgehead establishment of research equipment development enterprises and the scientific technique for cooperation enhancement for the formal requests of Vietnam and Ethiopia.

This paper focuses on the research equipment and equipment operations technology support for the scientific technique for ODA cooperation model. It proposes a research equipment operation education program through a dispatched specialist and a human resources education invitation. These have been implemented for the bridgehead establishment of research equipment development enterprises, the enhancement of the scientific technique for cooperation, and job creation. The MSIP and the KBSI host the scientific technique for ODA cooperation. Also, the technique has been used jointly by the MOFA and research equipment development enterprises. The scientific technique for ODA cooperation system for research equipment and equipment operations technology of South Korea is described in Figure 5.

In this paper, Vietnam is presented as a recipient country. Ethiopia will be discussed in future research. The scientific technique for ODA cooperation budget is $15 million (2015–2018). In the 1980s, South Korea received Japanese government loan support through the OECD. Then, the
South Korean government purchased massive research equipment from Shimadzu Corporation in Japan. These were donated to national universities and public institutions. Shimadzu Corporation was founded in Kyoto in 1875. It is a research analysis equipment manufacturing enterprise. In 2002, Koichi Tanaka was awarded the Nobel Prize in Chemistry due to his research on the mass spectrometer. Japan has no scientific technique for ODA cooperation for research equipment and equipment operations technology. However, it is included in Japan’s grant-type aid projects. The scientific technique for ODA cooperation budget is shown in Table 1.

Donor institutions have a research equipment council for the possession of research equipment. Then, they decide on the ownership of research equipment for the recipient institution of the recipient country. Also, the donor institution transfers the possession of the research equipment to the recipient institution through the government inspection of the recipient country. The donor institution chooses an advanced transportation company for the transfer of the research equipment. Then, the advanced transportation company has full responsibility until the research equipment arrives at the recipient institution.

The A/S warranty support has been implemented for recipient countries through the A/S warranty contract of the research equipment manufacturing enterprise. It includes a purchase contract for research equipment. The A/S warranty period of the research equipment manufacturing enterprise is 2 years, and the possession period of the component parts is 10 years.

The outputs of the scientific technique for ODA cooperation are the number of the transferred research equipment and the number of the trained research equipment engineers. The results of the scientific technique for ODA cooperation are image improvement and the export growth of the research equipment, job creation, and the research equipment engineers’ training.

The utilization and output of the research equipment are confirmed once a year. The plan and results are evaluated once a year by the evaluation council.

### 4. The expected effectiveness

In this paper, the qualitative effectiveness and the quantitative effectiveness of the scientific technique for ODA cooperation are analyzed. The qualitative effectiveness is the output of the scientific technique. It could be the equipment operations technology support and the scientific technique for cooperation enhancement through the grant-type aid for research equipment. In the past, overseas technology transfer of intangible property had been actively implemented. Recently, however, cooperation expansion with recipient countries is expected because research equipment

| Classification                      | 2015 (Unit: USD) |
|-------------------------------------|------------------|
| Research equipment cost             |                  |
| Research equipment (mass spectrometer, gas chromatograph, microscope, etc.) | 2,800,000        |
| Transportation and installation, A/S| 200,000          |
| Education cost                      |                  |
| Dispatched specialists for education| 400,000          |
| Human resources education invitation| 200,000          |
| Management cost                     |                  |
| Demand survey and administration    | 100,000          |
| On-site survey                      | 50,000           |
| Sum                                 | 3,750,000        |

Table 1. The scientific technique for ODA cooperation budget
have a visible effect. The competitiveness of the research equipment manufacturing enterprise could be strengthened through the new market development and the export growth of the developing country. Also, it can contribute to the research equipment purchase, job creation, and research equipment engineers’ training.

The quantitative effectiveness is the expected effect of the scientific technique for ODA cooperation on the economy and society. In this paper, Vietnam is a recipient country. The expected effects on the economy and society of Vietnam are analyzed. The return on investment (ROI) had been used to measure the expected effect of research equipment and operations technology support. ROI is the most widely used measure method of management performance and is calculated by dividing the net profit of the company by the investment amount. This method was developed as an internal control technique for the investment return analysis. In this analysis, ROI can be a comprehensive measure of management performance. The purpose of ROI is to classify important factors into profitability and turnover, and to plan and control management performance through management of factors. In recent years, this analysis has been used to plan the management performance, the internal control, the resource allocation determination, the profit forecasting, etc.

The scientific technique for ODA cooperation budget is $15 million (2015–2018). The trained research equipment engineers can work for more than 30 years. The analysis results showed that the ROI rate is 300%. The ROI has been used as an economic analysis method for the measurement of the management effect of the scientific technique for ODA cooperation. In the ROI of the Vietnam government, the output is the Korean government loan support for research equipment and operations technology support, and the costs are the labor cost, overhead cost, and opportunity cost of the Vietnam government through the research equipment engineers’ training. The monthly average labor cost of Vietnam was $190 (2013) in the survey results of the Ministry of Labor, Invalids, and Social Affairs (MOLISA) of Vietnam. The cost of the training of the 50 research equipment engineers was reflected in the calculation. The output is the Korean government loan support for research equipment and operations technology support.

\[
\text{ROI} = \frac{\text{Output}}{\text{Cost}} \times 100
\]

In the research equipment engineers’ training, the output and the cost were applied to the training program and the labor cost of the research equipment operations engineer for the measurement of the ROI. We calculated B/C Ratio and ROI through the research equipment and operation technology support and the labor cost of equipment operation. The detailed formula is as follows:

\[
\text{B/C Ratio} = \frac{\text{Research equipment and operation technology support}}{\text{Labor cost of research equipment operation}} \times 100
\]

\[
\text{ROI} = \frac{\text{Research equipment and operation technology support} \quad \text{– Labor cost of research equipment operation}}{\text{Labor cost of research equipment operation}} \times 100
\]

\[
= \frac{\text{Research equipment and operation technology support}}{\text{Labor cost of research equipment operation}} \times 100
\]

The detailed formula for the ROI of the research equipment and the operation technology support is as follows:

\[
\text{ROI}_{\text{Grant-Type aid}} = \frac{\text{Benefit}_{\text{Grant-Type aid}} \quad \text{– Cost}_{\text{Grant-Type aid}}}{\text{Cost}_{\text{Grant-Type aid}}} \times 100
\]
The benefit-cost (B/C) is $15 million. The annual investment cost is $3.75 million (2015–2018). The additional value looks forward to creating in ROI because the value of the benefit-cost has been increased through the skills and knowledge of the trained research equipment engineers.

$$\text{ROI}_{\text{Grant - Type aid}} = \frac{15,000,000 - 3,750,000}{3,750,000} \times 100 = 300\%$$

In the economic analysis of the net present value (NPV), the fixed discount rate is applied. The average discount rate of 5% of the public investment was calculated for the fixed discount rate. The NPV method deducts the cash outflow of the present value in the cash inflow of the present value from the investment. The NPV curve is described in Figure 6.

$$\text{NPV} = \sum_{t=0}^{n} \frac{C_t}{(1+i)^t} - C_0 = \sum_{t=0}^{n} \frac{C_t}{(1+i)^t}$$

- $t$: time $t$,
- $C_t$: cost of time $t$,
- $C_0$: cost of investment,
- $R$: rate of the discount,
- $n$: total business period.

The detailed formula for the investment cost of the research equipment and the operations technology support is as follows:

$$\frac{C_5}{(1+i)^5} + \frac{C_6}{(1+i)^6} + \cdots + \frac{C_{29}}{(1+i)^{29}} + \frac{C_{30}}{(1+i)^{30}} = \sum_{t=5}^{30} \frac{C_t}{(1+i)^t}$$

The detailed formula for the grant-type aid investment of the research equipment and the operation technology is as follows:

$$\frac{B_1}{(1+i)^1} + \frac{B_2}{(1+i)^2} + \frac{B_3}{(1+i)^3} + \frac{B_4}{(1+i)^4} = \sum_{t=1}^{4} \frac{B_t}{(1+i)^t}$$

Figure 6. Net present value (NPV) curve.
When the investment cost and the ROI are equal (NPV = 0), revenue is created.

\[
\sum_{t=5}^{30} \frac{C_t}{(1+i)^t} = \sum_{t=1}^{4} \frac{B_t}{(1+i)^t} \quad \text{or} \quad \sum_{t=5}^{30} \frac{C_t}{(1+i)^t} - \sum_{t=1}^{4} \frac{B_t}{(1+i)^t} = 0
\]

The results of the analysis of the value of research equipment and operations technology showed that the investment returns are very high because the value of the benefit-cost has been increased through the skills and knowledge of the trained research equipment engineers.

\[
\sum_{t=5}^{30} \frac{C_t}{(1+i)^t} < \sum_{t=1}^{4} \frac{B_t}{(1+i)^t} \quad (\text{Investment cost} < \text{Investment returns}, \ 0 < \text{NPV})
\]

In this study, the 10-year durability life of the research equipment was assumed to have been extended for 5 years through the effective management of the trained research equipment engineers. This means the research equipment was used for 15 years. Straight-line depreciation was applied to the value of the research equipment. The durable period is 15 years, and the rate of depreciation is 6.6%. As of 2019, it is a result for the present value. The average cost of the 12 research equipment is $124,257.

\[
\text{Profit} = \frac{\text{Average cost of research equipment} \times \text{Research equipment number}}{\times \text{Depreciation rate} \times \text{Extension of period (Year)}}
\]

The benefit-cost (B/C) is $492,058. The annual investment cost is $3.75 million (2015-2018).

\[
\text{Profit} = \frac{\$124,257 \times 12 \times 0.066 \times 5}{5} = \$492,058
\]

In the economic analysis of the job creation effect, the labor cost of the research equipment engineers is calculated as the job creation effect. The monthly average labor cost of Vietnam was $190 (2013) in the survey results of the MOLISA of Vietnam.

\[
\text{Pay} = \frac{\text{Labor cost of research equipment engineer (Year)}}{\times \text{Year}} \times \text{Number of research equipment engineer}
\]

The benefit-cost (B/C) is $3,420,000. The annual investment cost is $3.75 million (2015-2018).

\[
\text{Pay} = \frac{\$2,280 \times 30 \times 50}{5} = \$3,420,000
\]

The ROI had been used for the expected effect of the research equipment and the operations technology support. The scientific technique for ODA cooperation budget is $15 million (2015-2018). The trained research equipment engineers can work for more than 30 years. The analysis results showed that the ROI rate is 300%. The benefit-cost of the effective management of the trained research equipment engineer is $492,058, and the benefit-cost of the job creation effect is $3,420,000.

5. Scope and limitations of the study
The quantitative effectiveness of the scientific technique for ODA cooperation is difficult to calculate. The labor cost is also difficult to monetize. The benefit-cost (B/C) analysis is always done with ceteris paribus presuppositions, which imply that margins of error are inevitable. In this paper, we applied the quantified variables to the benefit-cost (B/C) analysis for the quantitative effectiveness calculation of the scientific technique for ODA cooperation. We also attempted to calculate the labor cost. Much research and effort is needed for accurate research results of the scientific technique for ODA cooperation model. In future research, we will further improve the scientific technique for ODA cooperation model.

6. Conclusions
This paper presented and discussed the scientific technique for ODA cooperation. It focused on the scientific technique for ODA cooperation for research equipment. The importance of research equipment management and operations around the world is growing steadily. Actually, research institutes
have been continually supported with the scientific technique for ODA cooperation for research equipment. However, government-led ODA for research equipment is rare. In this paper, the scientific technique for ODA cooperation model and its expected effectiveness were examined for the first time. The expected effectiveness of the scientific technique for ODA is difficult to calculate. The scientific technique for ODA is not for profit. Its expected effectiveness and economic analysis are very difficult and convoluted, because it is not a capital investment or an assessment of a payback. This study is deemed very useful for scientific technique for ODA policymaking and for scientific technique for ODA cooperation among all research institutes around the world. Future studies should further improve the scientific technique for ODA cooperation model and its expected effectiveness. This study focuses on quantitative research but requires qualitative research. In future research, we will focus on qualitative research. Also, a new scientific technique for ODA cooperation model and its expected effectiveness will be proposed for the vitalization of the scientific technique for ODA cooperation.

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