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The information science policy for the public open data of the national research institute

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Abstract: In modern society, the importance of information is constantly growing. Human life has been diversely changed due to the volume expansion of information handling and distribution. The rapid growth and informatization of information and communications technology (ICT) could be the driver of the production and distribution of information in the real world. Also, it has greatly influenced the economy, politics, society, culture, etc. As the value of information continues to increase, all governments around the world are becoming more and more interested in the reaction to the provision of information. The people need liberty and equality in the environment for the acquisition or utilization of necessary information. Especially due to the importance of the information sharing system, both the government and people are greatly interested in the information sharing policy of the government. Information sharing policies around the world greatly affect people. They disclose information (from government agencies, local government units, public institutions, etc.) to people. However, in the case of national research institutes, their information sharing policy has been ineffective due to the specialty of their work and data. Also, their data are not at the general information sharing level. In this paper, first, the

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PUBLIC INTEREST STATEMENT

In recent years, public data have provided to people all around the world through the Internet, smartphones, iPads, etc. As information technology (IT) develops, it can be provided anywhere on earth. The rapid growth and informatization of information and communications technology (ICT) could be driving the production and be creating the new distribution structure of information in the real world. This is because public data are more valuable than general data and have great importance, which is why they are used for various policies. The information sharing policy has a great effect on people and very useful because it discloses information from government agencies, local government units, public institutions. Public institutions can look forward to their public open data's utilization promotion and value rise effect. We propose the information science policy direction for public open data of national research institutes through a study of their information sharing system.

information science policy for public open data of national research institutes is presented and discussed. First, we will look for an efficient method of information sharing policy-making for national research institutes. Then we will discuss and present research results data of national research institutes. These will comprise the most useful information from national research institutes. Also, the actual availability of the research results data will be discussed through their utilization trend analysis. In this paper, we propose the information science policy direction for public open data of national research institutes through a study of their information sharing system.

Subjects: Information/Knowledge Management; Operational Research/Management Science; Management of Technology; Innovation Management; Information Technology

Keywords: public open data; national research institutes; government; information science policy; information system

1. Introduction

The use of public data around the world is steadily increasing through the information sharing policy of the government (Henderson, 1999). Information sharing policies have been implemented since the enactment of the Freedom of the Press Act (1766) in Sweden (Hrynaszkiewicz & Shintani, 2014). The Freedom of Information Act (1967) has been implemented for the administrative participation and the public interest of the people of the United States (Alalwan, 2013). It has provided convenient services for the economy, politics, society, culture, etc. The information sharing system has greatly influenced people due to the quantitative expansion and the growing importance of information in daily life (Henman, 2013; Kuhn, 2011; Price, 2014). Recently, public data have started to be provided through the Internet, smartphones, iPads, etc. As information technology (IT) develops, it can be provided anywhere on earth. Also, the information sharing policy has a great effect on people because it discloses information (from government agencies, local government units, public institutions, etc.) to the people (Svatek et al., 2014; van Veenstra & van den Broek, 2013). Because public data are more valuable than general data and have great importance, they have been used in various policies (Chun, Shulman, Sandoval, & Hovy, 2010; Misuraca & Viscusi, 2014; Solar, Meijueiro, & Daniels, 2013).

All governments around the world (the United States, United Kingdom, EU, Japan, etc.) are implementing government lead policies and institutional strategies for the use of public open data (Hallinan & Friedewald, 2012). Public open data are actively used as linked data for the growth of society and the economy (Pabn, Gutirrez, Fernndez, & Martnez-Prieto, 2013). Also, they provide excellent-quality data and diverse applications support through the use of the semantic web and linked data for data connection and various applications support (Balena, Bonifazi, & Mangialardi, 2013; Solar, Concha, & Meijueiro, 2012; Sorrentino, Bergamaschi, Fusari, & Beneventano, 2013).

Public institutions can look forward to their public open data's utilization promotion and value rise effect (Shiramatsu, Tossavainen, Ozono, & Shintani, 2014). Also, their public open data can reduce their budget through the data utilization and diversity (Boulton, Rawlins, Vallance, & Walport, 2011; Tananbaum, 2008).

In this paper, the public open data of national research institutes are discussed and presented. Management notification information and daily life information greatly affect people. They disclose information (from government agencies, local government units, public institutions, etc.) to people. However, in the case of national research institutes, their information sharing policy has been ineffective due to the specialized nature of their work and data. Also, such data are at their general information sharing level. Also, we propose an efficient information science policy direction for public open data of national research institutes through a study of their information sharing system. In this study, we attempt to find an efficient method of setting the information sharing policy direction of

national research institutes for their public open data. The research results data are the most useful information in national research institutes. Also, the actual availability of the research results data is discussed and presented through their utilization trend analysis.

2. Global information science policy trend

2.1. United States

The United States (US) Government had approved the freedom of the public data utilization section of the Electronic Freedom of Information Act (1996) (Bell, 2012). The Obama administration is actively providing public data to the people. Also, the government and public institutions had established a related strategy and plan from the Memorandum on Transparency and Open Government (Bulgurcu, Cavusoglu, & Benbasat, 2010). The Department of the Interior and the Environment Protection Agency are providing public data to the people through the support of the General Services Administration and the Office of Management and Budget. The United States Government had constructed the Data.gov website (2009.5) for public data provision.

2.2. United Kingdom

The United Kingdom (UK) Government had approved the freedom of the public data utilization section of its Freedom of Information Act (2000) (Baker & Lambert, 2001; Gopinath, 2001). Its public data registry office started releasing the metadata of the government and public institutions in 2001. The UK Government had established the Re-use of Public Sector Information Regulations (2005) and had presented the Power of Information Act (2007). British Prime Minister Gordon Brown had presented the Smarter Government (2009.12). It means public data are provided to public service users and the people for public policy reform. The Cabinet Office and the Office of Public Sector Information had constructed the Data.gov.uk website (2010.1) for public data service (Bonson, Torres, Royo, & Flores, 2012; Nam, 2012).

2.3. Australia

The Australian Government has been managing its public data based on its spatial data access and pricing policy (2001). It means free public data yield profits for the economy and society (Burrows, 2014; Card, Shapiro, Amarillas, McKean, & Kuhn, 2003). The Australian Bureau of Statistics and Geoscience Australia provide public data to the people through a creative commons licence. It incurs the least expense for public data utilization and recycling. The Australian Government had constructed the Data.gov.au website (2009.9) for convenient access of public data and their use by public institutions.

3. Information science policy for public open data

The Korean Government had approved the Electronic Information Sharing System (2004) based on the realization of an electronic government and the Internet diffusion. The Korean Government had also constructed the Open.go.kr website (2006.4) for the use of government agencies, local government units, public institutions, etc. Recently, governments around the world suggested a new paradigm for information sharing enhancement. The Korean Government has implemented Government 3.0 at the same time for the use of public data and for information sharing enhancement. It is also resumed implementing its original open public data system in 2014. The use of public data and the information sharing enhancement are based online. The information sharing system plays an important role in Government 3.0 through smartphone diffusion and ICT. The access convenience and the use of the public data in the information sharing system are success factors of Government 3.0. The Government 3.0 policy of the Korean Government is based on Government 2.0. William Egger suggested that Government 2.0 consists of the 2.0 paradigm combined with public service. It is based on interactive communication for the production, sharing, and use of public data. Therefore, the government constructs the platform for the access convenience and encourages the active involvement of the people. Government 2.0 is the efficient government operation model through the information sharing system. The government paradigm change for the information sharing policy is shown in Table 1.

Table 1. Government paradigm change for its information sharing policy

Classification	Government 1.0	Government 2.0	Government 3.0
Information open sharing	Information request and provision	Information sharing	Information sharing
Service type	One-way service	Interactive service	Individual customized service
		Public–private collaboration	Intelligent service
		One-stop service	Ubiquitous service
		Mobile service	
Web development stage	Web 1.0	Web 2.0	Web 3.0
Government function	Government lead	Citizen participation	Citizen participation
	Monopolistic service provider	Platform provider	Platform provider
Accessibility	Public institution	Public data portal	Individual customized portal
	Cable	Cable and wireless	Smart mobile

Government 3.0 is based on the big data for public data management. It can operate massive volumes of data, from terabytes (TB) to petabytes (PB) and exabytes (EB). The big data need the element technology in Government 3.0. The three big data factors of Government 3.0 are described in Figure 1 and Table 2.

The quality control level of public institutions had been surveyed by the Korea Database Agency (KDB). The quality control level is classified into the introduction, standardization, quantification and optimization. The quality control of the finance data was at the highest level; of the manufacturing data, at the lowest level; and of the public data, at the average level. The quality control of public institutions (2011) is described in Figure 2. The application of public data has greatly increased through the construction of the Open.go.kr website (2006). Such application has also quickened due to the convenient application mechanism in the online system. The application trend of public open data (1999–2012) is shown in Figure 3.

In this study, the public data open application ratio of national research institutes was 0.5% among all public institutions. This is because the public data of national research institutes are very valuable to researchers and scientists. However, it is unusual for ordinary citizens due to the specialized nature of the work and data. The public data open application of national research institutes has become almost their civil appeal handling and management information system. The Ministry of Science and ICT (MSIT), ICT, and Future Planning of South Korea manages and operates the National Research Council for Science & Technology (NST). South Korea's major researches are implemented in 25 national research institutes. The national research institutes also provide services for the people. The research results data are the most useful information in national research institutes. Therefore, we

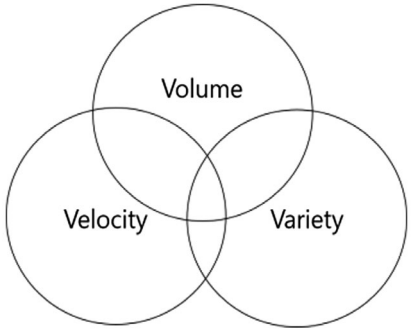

Figure 1. The three big data factors of Government 3.0.

Table 2. Strategy and plan of the government 3.0

Strategy	Plan
Transparent government	Active opening of public data
	Utilization activation of public data
	Public and private collaboration enhancement
Efficient government	Partition removal in government
	Government operation system for collaboration and communication
	Scientific administration for big data utilization
Service government	Individual customized service provision
	One-stop service support enhancement for enterprises
	Access convenience improvement
	New information technology utilization

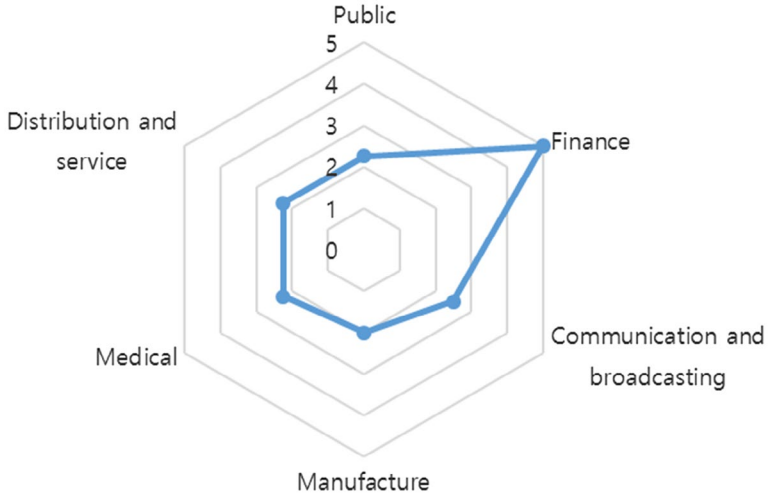

Figure 2. Quality control of public institutions (2011).

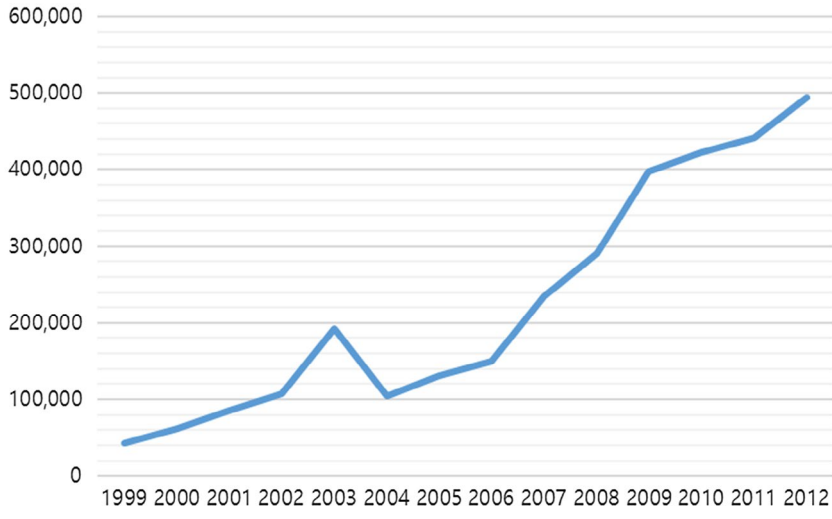

Figure 3. Application trend of public open data (1999–2012).

chose the research results data for researchers, scientists, and ordinary citizens. Then national research institutes have started implementing advance publication. We also propose an information science policy direction for public open data of national research institutes through a utilization trend analysis of the pertinent research results data.

4. Research results data of national research institutes

The study of radioactivity around the world has greatly increased after the tsunami and the Fukushima nuclear accident (11 March 2011) in Japan. Also, ordinary citizens are now very interested in radioactivity. Especially, daily living environment radioactivity has greatly influenced the economy, politics, society, culture, etc. South Korea's 25 national research institutes are implementing studies on living environment radioactivity. We focus on their analysis results because researchers, scientists, and ordinary citizens are very interested in living environment radioactivity. The analysis dwelt on the living environment radioactivity of living necessities such as food and materials.

In this paper, we used the living environment radioactivity analysis results (2011–2014) of the Division of Mass Spectrometry Research of the Korea Basic Science Institute (KBSI). The living environment radioactivity was analysed by asking the client or user for samples. The results presented in this paper do not constitute the entirety of the survey results but are used only as research data. The Korea Basic Science Institute (KBSI) did not participate in the sample collection or selection. The analysis results were disclosed through the information sharing system of the national research institutes. However, the specific analysis results of the samples could not be shared openly due to the information protection duty of the client and the user. In the analysis results, the gamma radionuclide in the sample (400–2,000 g) from the HPGe Gamma-ray Spectroscopy System had been measured. The detection limit was 1.0 Bq/kg, and the data confidence level was 95%. When the client or the user asked for a specific analysis, the specific analysis results were provided by the Korea Basic Science Institute (KBSI)

The living environment radioactivity of 2,377 samples had been analysed in 2011. All the analysis results are described in Table 3. The living environment radioactivity research results data have been provided as public data for researchers, scientists and ordinary citizens. The living environment radioactivity of 1,648 samples had been analysed in 2012. The entire analysis result is described in Table 4. The living environment radioactivity research results data have been provided as public data for researchers, scientists and ordinary citizens. The living environment radioactivity of 2,030 samples had been analysed in 2013. All the analysis results are described in Table 5. The living environment radioactivity research results data have been provided as public data for researchers, scientists and ordinary citizens. The living environment radioactivity of 1,709 samples had been analysed in 2014. The entire analysis result is described in Table 6. The living environment radioactivity research results data have been provided as public data for researchers, scientists and ordinary citizens.

We think the living environment radioactivity analysis results are very valuable data and efficient public data. They are also very important to researchers and scientists. Ordinary citizens are likewise very interested in living environment radioactivity research because they see it as capable of solving the uncertainty of their living environment radioactivity. However, a utilization trend analysis of the

Table 3. Living environment radioactivity research results data of 2,377 samples (2011)

Classification	I-131		I-134		I-137	
	Number	Bq/kg	Number	Bq/kg	Number	Bq/kg
Packing material	1	2.8	5	1.6–10.5	15	1.6–16.1
Waste	0	Not detected	2	4.0–6.8	2	6.3–8.5
Bracken	0	Not detected	0	Not detected	1	6.1
Kelp	1	7.0	0	Not detected	0	Not detected
Material	1	1.0	3	1.1–21.7	4	1.6–23.9

Table 4. Living environment radioactivity research results data of 1,648 samples (2012)

Classification	I-131		I-134		I-137	
	Number	Bq/kg	Number	Bq/kg	Number	Bq/kg
Bracken	0	Not detected	0	Not detected	3	0.8–3.0
Processed food	0	Not detected	0	Not detected	18	0.38–16.6
Spinach	0	Not detected	0	Not detected	1	0.9
Milk powder	0	Not detected	0	Not detected	10	0.2–4.9
Shiitake mushroom	0	Not detected	1	0.8	61	0.2–8.8
Hericium erinaceum	0	Not detected	0	Not detected	1	0.9
Pacific saury	0	Not detected	3	0.25–0.9	4	0.38–0.9
Spanish mackerel	0	Not detected	1	0.7	1	0.6
Charcoal	0	Not detected	0	Not detected	2	1.2

Table 5. Living environment radioactivity research results data of 2,030 samples (2013)

Classification	I-131		I-134		I-137	
	Number	Bq/kg	Number	Bq/kg	Number	Bq/kg
Bracken	0	Not detected	0	Not detected	2	0.5–5.0
Pyogo mushroom	0	Not detected	0	Not detected	26	0.4–4.3
Kelp	1	5.0	0	Not detected	0	Not detected
Sea mustard	1	1.4	0	Not detected	0	Not detected
Pacific saury	0	Not detected	1	0.2	1	0.4
Hericium erinaceum	0	Not detected	0	Not detected	1	3.9
Pollack	0	Not detected	0	Not detected	1	0.6
Auricularia auricula-judae	0	Not detected	0	Not detected	1	1.3
Others	0	Not detected	0	Not detected	3	0.7–2.3

Table 6. Living environment radioactivity research results data of 1,709 samples (2014)

Classification	I-131		I-134		I-137	
	Number	Bq/kg	Number	Bq/kg	Number	Bq/kg
Bracken	0	Not detected	0	Not detected	2	1.1–1.2
Pyogo mushroom	0	Not detected	0	Not detected	1	2.0
Kelp	0	Not detected	1	0.8	5	0.7–4.0
Sea mustard	0	Not detected	0	Not detected	16	1.0–6.7

research results data is needed to ensure the effectiveness and reliability of the living environment radioactivity analysis results. Also, it is needed for the information science policy direction of national research institutes for their public open data. In this paper, the effectiveness of the research data, the data quality and the differentiation are discussed and presented for the utilization trend analysis of the research results data.

5. Utilization trend analysis of the research results data

In this study, we analysed the utilization trend of the living environment radioactivity research results data. First, 30 respondents (15 scientists and 15 ordinary persons) were surveyed on the effectiveness of the analysis results. We explained living environment radioactivity to the respondents and then provided them the research results data. At present, the public open data of national

research institutes are only at the management notification information level and are a mere formality. Therefore, the research results data of national research institutes are differentiated from those of other public institutes. However, such data can greatly influence the economy, politics, society, culture, etc.

In this paper, we used the difference investigation method for the scientists group and the ordinary persons group for the utilization trend analysis of the research results data. A null hypothesis and an alternative hypothesis were formulated and verified.

$$H_0 : P_1 = P_2$$

$$H_1 : P_1 > P_2$$

A *t*-test was used to investigate the difference between the two independent populations. It was supposed that the two independent populations had a normal distribution and the same variance ($\sigma_1^2 = \sigma_2^2$). If the sample size is large ($n_1 \geq 30,\ n_2 \geq 30$), the *Z*-test can be used based on the central limit theorem. In this study, the *t*-test was used to verify the mean difference between the two populations.

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - D_0}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \quad (d.f = n_1 + n_2 - 2)$$

where $\bar{X}_1$ = The mean of the sample 1; $\bar{X}_2$ = The mean of the sample 2; D_0 = The mean difference of two populations for the null hypothesis; and s = The estimate of the standard deviation (σ) for the combination of two populations.

$$= \sqrt{\frac{\sum_{i=1}^{n_1}(X_i - \bar{X}_1)^2 + \sum_{i=1}^{n_2}(X_i - \bar{X}_2)^2}{n_1 + n_2 - 2}}$$

where n_1 = The size of the sample 1; and n_2 = The size of the sample 2.

$$\sqrt[s]{\frac{1}{n_1} + \frac{1}{n_2}} = \text{The standard error of } (\bar{X}_1 - \bar{X}_2)$$

Two independent populations were formulated to verify the mean difference between the two populations. The sampled value consisted of the pair. It was not independent and formulated as one population. The *t*-test was used to verify the difference between the sample values.

$$t = \frac{\bar{d} - D_0}{\frac{S_d}{n}} \quad (d.f = n - 1)$$

where $\bar{d}$ = the size of the sample 2; D_0 = the mean difference of two populations for the null hypothesis; S_d = the standard deviation for the difference verification of the sampled value.

$$= \sqrt{\frac{\sum_{i=1}^{n}(d_i - \bar{d})^2}{n - 1}}$$

$$\frac{S_d}{n} = \text{The standard error of } \bar{d}$$

The binominal distribution was used to verify the ratio difference between the two populations. If the sample size is large ($n_1 \geq 30,\ n_2 \geq 30$), the sampling distribution of the ratio difference is close to the normal distribution based on the central limit theorem. Therefore, a *Z*-test was used to verify the ratio difference between the two populations.

$$Z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\frac{\hat{p}\hat{q}}{n_1} + \frac{\hat{p}\hat{q}}{n_2}}}$$

where $\hat{p}_1$ = the estimate for the rate of the sample 1; $\hat{p}_2$ = the estimate for the rate of the sample 2; p_1 = the rate of the sample 1; and p_2 = the rate of the sample 2.

$$\hat{p} = \frac{x_1 + x_2}{n_1 + n_2} \ (x_1 \text{ and } x_2 \text{ are the number of the member in the sample})$$

$$\hat{q} = 1 - \hat{p}$$

$$Z = \sqrt{\frac{\hat{p}\hat{q}}{n_1} + \frac{\hat{p}\hat{q}}{n_2}} = \text{The standard error of } (\hat{p}_1 - \hat{p}_2)$$

Table 7. Survey results on the effectiveness of the research result data

Number	Professionalism	Effectiveness	Data quality	Differentiation	Data open application
1	1	7	5	6	2
2	2	3	4	5	2
3	1	6	3	7	1
4	1	5	4	6	1
5	2	6	6	6	2
6	1	5	5	5	2
7	2	4	5	4	1
8	1	6	3	6	2
9	1	5	3	5	1
10	1	6	4	5	2
11	2	4	4	3	2
12	2	6	3	5	2
13	2	3	5	4	1
14	1	4	4	6	1
15	1	5	5	4	1
16	1	3	6	3	1
17	2	5	4	6	2
18	2	4	6	3	2
19	2	5	5	4	1
20	1	6	7	5	2
21	1	5	4	5	2
22	2	3	5	3	1
23	2	6	3	6	1
24	1	5	3	4	2
25	2	5	4	3	1
26	2	5	5	5	2
27	1	5	5	6	2
28	2	4	3	4	1
29	1	7	5	5	1
30	2	4	4	3	1

In this study, we explained living environment radioactivity to the 30 respondents, then provided them the research results data for the survey. The survey results on the effectiveness of the research results data are shown in Table 7.

(1) Professionalism: Scientists = 1, Ordinary persons = 2.

(2) Effectiveness, data quality, and the differentiation: Very high = 7, Very low = 1.

(3) Open data application: Application = 1, Nothing = 2.

The group of scientists ($\bar{X} = 5.3333$) was larger than the group of ordinary persons ($\bar{X} = 4.4667$) in the group statistics (Table 8). In the significance test results ($P - Value = 0.647$) of the independent samples test (Table 9), the null hypothesis ($H_0 : P_1 = P_2$) cannot be dismissed ($\alpha = 0.5$). Because the equal variance assumption is not a problem, the effectiveness ratings of the scientists and the ordinary persons were the same. In conclusion, both the scientists and the ordinary persons found the research results data very valuable. Therefore, the research hypothesis does not support the effectiveness rating of the scientists and the ordinary persons. The equal variance assumption of the two populations must meet the mean difference verification through the equal variance result of Levene. In this result, the equal variance assumption ($F = 0.214, P - value = 0.647$) had met the mean difference verification.

The case processing summary is described in Table 10. In the chi-square test results ($x^2 = 0.133$ and $p - \text{value} = 0.715$), the null hypothesis ($H_0 : P_1 = P_2$) cannot be dismissed ($\alpha = 0.5$). The professionalism and the open data application cross-tabulation are shown in Table 11, and the chi-square test results are shown in Table 12. Because the application ratios of the scientists and the ordinary persons were the same, they both found the research results data very valuable. The homogeneity test of the two binomial proportions can be analysed through the Z-test and the χ^2 test. The algebra calculation results show the 2 × 2 cross-tabulation ($Z^2 = x^2$). The symmetric measures are described in Table 13, and the paired sample statistics are described in Table 14.

Table 8. The group statistics

	Professionalism	N	Mean	SD	Std. error mean
Effectiveness	1.00	15	5.3333	1.04654	0.27021
	2.00	15	4.4667	1.06010	0.27372

Table 9. The independent samples test

	Levene's test for equality of variances		*t*-test for equality of means						
	F	Sig.	*t*	*df*	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
								Lower	Upper
Equal variances assumed	0.214	0.647	2.253	28	0.032	0.86667	0.38463	0.07880	1.65454
Equal variances not assumed			2.253	27.995	0.032	0.86667	0.38463	0.07879	1.65454

Table 10. The case processing summary

	Cases					
	Valid		Missing		Total	
	N	%	N	%	N	%
Professionalism and open data application	30	100.0	0	0.0	30	100.0

Table 11. Professionalism and open data application cross-tabulation.

			Open data application		Total
			Application	Nothing	
Professionalism	Scientist	Count	7.0	8.0	15.0
		Expected count	7.5	7.5	15.0
	Ordinary person	Count	8.0	7.0	15.0
		Expected count	7.5	7.5	15.0
	Total	Count	15.0	15.0	30.0
		Expected count	15.0	15.0	30.0

Table 12. The chi-square tests

	Value	*df*	Asymp. sig. (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson chi-square	0.133[a]	1	0.715		
Continuity correction[b]	0.000	1	1.000		
Likelihood ratio	0.133	1	0.715		
Fisher's exact test				1.000	0.500
Linear-by-Linear association	0.129	1	0.720		
Number of valid cases	30				

[a]0 cells (0.0%) had an expected count of less than 5. The minimum expected count was 7.50.

[b]Computed only for the 2 × 2 table.

Table 13. The symmetric measures

		Value	Approx. sig.
Nominal by nominal	Phi	−0.067	0.715
	Cramer's V	0.067	0.715
	Contingecy coefficient	0.067	0.715
	Number of valid cases	30	

Table 14. The paired samples statistics

		Mean	*N*	SD	Std. error mean
Pair 1	Data quality	4.4000	30	1.06997	0.19535
	Differentiation	4.7333	30	1.17248	0.21406

The statistical difference was larger than the data quality in the paired samples correlations (Table 15) and the paired samples test (Table 16). In the significance test results ($P - value = 0.310$), the null hypothesis ($H_0 : P_1 = P_2$) cannot be dismissed. In conclusion, the statistical difference between the data quality and the differentiation was zero. In this study, we discussed and presented the effectiveness of the research results data through their utilization trend analysis. The results showed that both the scientists and the ordinary persons found the research results data very valuable. Also, the utilization of the research results data was very high because the open data application ratios of the scientists and the ordinary persons were the same. The statistics on the data quality and the differentiation were very high because the statistical difference between the data quality and the differentiation was zero. Therefore, the effectiveness of the research results data was higher than that of the management

Table 15. The paired samples correlations

	N	Correlation	Sig.
Data quality and differentiation	30	−0.242	0.198

Table 16. The paired samples test

		Paired differences					*t*	*df*	Sig. (2-sided)
		Mean	SD	Std. error mean	95% Confidence interval of the difference				
					Lower	Upper			
Pair 1	Data quality differentiation	−0.33333	1.76817	0.32282	−0.99358	0.32691	−1.033	29	0.310

notification information of the national research institutes. In this survey, the satisfaction of the scientists and the ordinary persons with the research results data was very high.

6. Conclusions and information science policy direction

In this paper, the importance of information and public open data are discussed and presented. The value of information has steadily increased. Also, multiple needs for information have arisen due to the quantitative expansion and growing importance of information. The rapid growth and informatization of ICT could be driving the production and distribution of information in the real world. Also, information has greatly influenced the economy, politics, society, culture, etc. As the value of information continues to increase, all governments around the world are becoming more and more interested in the reaction to the provision of information. Especially, both governments and people are greatly interested in the information sharing policy of the government due to the importance of the information sharing system (Hicks & Katz, 1996; Kash, 1990; Schafer, 2000). The information sharing policy around the world has a great effect on people because it discloses information (from government agencies, local government units, public institutions, etc.) to the people. However, in the case of national research institutes, their information sharing policy has been ineffective due to the specialized nature of their work and data. Also, such data have been at the general information sharing level. In this study, we attempted to find an efficient method of setting the information sharing policy direction of the public open data of national research institutes. The research results data are the most useful information in national research institutes. Also, the information science policy direction for the public open data of national research institutes is discussed and presented through a study of the information sharing system of national research institutes.

In this study, we focused on the living envwironment radioactivity analysis results because researchers, scientists and ordinary citizens are very interested in living environment radioactivity. The living environment radioactivity of the necessities of life, such as food and materials, was analysed. We used the living environment radioactivity analysis results (2011–2014) of the Division of Mass Spectrometry Research of the Korea Basic Science Institute (KBSI). The living environment radioactivity was analysed as provided by the client or requested from the user for the sample. We analysed the utilization trend of the living environment radioactivity analysis results data. In this study, the satisfaction of the scientists and the ordinary persons with the research results data was very high. Also, the utilization of the research results data had increased.

We suggest the following information science policy direction for the public open data of national research institutes. First, a survey on the demand of scientists and ordinary persons for public data

is very important. It can provide necessary information to scientists and ordinary persons at the appropriate time and increase the effectiveness of the information and the satisfaction of the user. The effectiveness of the information and the satisfaction with the formal data opening and the management notification information were not high, though. In the case of national research institutes, information sharing has been ineffective due to the specialized nature of their work and data. Also, it was at the general information sharing level (papers, patents, operation conditions, etc.). Therefore, a public data demand survey is very important.

Second, the opening of the research results data of national research institutes is needed by people. The opening of all the data from the research results is necessary for users because such data are simple information or at the newspaper article level. Also, it is desirable within the allowable scope of the law, personal information and security information. National research institutes provide services for people. The research results data are the most useful information in national research institutes.

Third, the data quality and the reliability of the public data are needed because information sharing (by government agencies, local government units, public institutions, etc.) has a great effect on people. This is because public data are more valuable than general data and have great importance, which is why they are used for various policies. The data quality and reliability are very important because all the criteria for government policies are set from public data. Big data system construction is needed for the management of the growing volume of public data. The quantitative expansion and management of public data are also very important.

In this paper, we attempted to find an efficient method of opening the public data of national research institutes and suggested an information science policy direction for such public open data. In the future, we will discuss the process of the operation and management, the search function improvement, the visual design improvement, the system interface, etc. of such system.

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