The Analysis for IAEA Policy using Big Data

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1. Introduction

IAEA director general, Yukiya Amano has been reappointed by the IAEA Board of Governors for a further of office for the next four years. According to the articles, there is no candidate application other than Yukiya Amano and no opinion was raised against his reelection. It is said that it will be formally decided at the regular session of the IAEA general conference in September 2017 after approval at the board of governors in March 2017.^[1]

It is expect to be no major change in the IAEA policy if the current director general is re-elected. So, in this paper, the policy basis and policy changes are investigated and analyzed during his tenure.

2. Methods of the Analysis

The policy basis of IAEA is analyzed via extracting keywords that were frequently used in IAEA statements and confirming the association of extracted keywords. In order to analyze the policy change, the keyword extraction and the association analysis is carried out by binding data in a year.

And then, Big Data Analysis was used as the analysis method, and the programming language R was selected as the tool to process the atypical data.

2.1 Analysis Targets

The target of the analysis is the IAEA official statement. In the case of the IAEA official statement, the policy objective is clear. Therefore, the statements of Yukiya Amano from the beginning of his term (Jul. 2009) to the present (Jan. 2017) is collected.

2.2 Big Data & R^[2, 3]

Big Data is collective term for a technique for extracting the values and analyzing the results from a large set of structured or unstructured data sets that is exceeds the ability to collect, store, manage and analyze data with existing database management tools.

The R is a programming language and software environment for statistical calculations and graphics. It is widely used in statistical software development and data analysis. In addition, it is used in statistics software development among statisticians because of easy package development.

3. Results of the Analysis

3.1 Analysis results of policy basis

Figure 1 shows the result of extracting keywords with a high frequency of use for statements. It is higher frequency of use, the larger and centrally located.

The keywords analysis shows that nuclear *safety* and *security* were more emphasized than *safeguards* in the main roles of the IAEA. In addition, keywords such as *iran*, *cancer* and *technology* also show high frequency.



Fig. 1. The result of keywords analysis for 239 IAEA statements. The keyword that is used frequently but is considered to be irrelevant to analysis: *nuclear, iaea, member, states, power, agency and etc.*



Fig. 2. The result of association analysis among top 20 keywords.

Figure 2 shows the result of the association analysis of the top 20 words among the keywords with a high frequency. It is higher the association, the closer the distance and the thicker the connection line.

The results of the association analysis are as follows:

- (Fukushima) *accident*, the importance of the *safety* issue was emphasized. In this regard it, *international conferences* on nuclear *security* is also highly association.
- *Safeguards activities* and *cooperation* on nuclear *materials* have been highly associated with the *iran* nuclear issue.
- A *cancer* treatment *programme* using nuclear, and *technology development* are also related.
- There is associated with the *new* and *help*.

3.2 Analysis results of policy change

In order to confirm policy changes, the statements that bound in a year are analyzed. 2009 and 2017 were included in 2010 and 2016 respectively, due to their small volume. The keywords analysis and association analysis results for each year were not significantly different from the results of *3.1 Analysis results of policy basis*. However, the ranking of the keywords in *Table I* shows significant results.

Table I. The rank for keywords by year

	2010	2011	2012	2013	2014	2015	2016
1	security	safety	security	security	iran	iran	cancer
2	cancer	accident	safety	safety	safeguards	safety	security
3	safety	international	safeguards	conference	security	cancer	safety
4	energy	safeguards	international	safeguards	important	development	development
5	safeguards	fukushima	conference	international	material	important	international
6	developing	programme	iran	important	safety	safeguards	technology
7	help	security	important	new	international	help	help
8	activities	japan	accident	programme	programme	international	important
9	new	daiichi	fukushima	material	technology	technology	new
10	international	material	material	accident	cooperation	programme	use

Since the Fukushima accident in Japan in 2011, nuclear safety and security policy has been given priority. And from 2014, it can be interpreted that the policy of negotiations with Iran and the related safeguards activities has priority. From 2016 onwards, new technology development policy such as cancer treatment using nuclear energy seems to be given priority.

3.3 Verification of results

The analysis results were compared with the IAEA mid-term strategy 2012-2017 to verification, and it is confirmed both are matched mostly. The following are the six strategic objectives of the mid-term strategy 2012-2017.^[4]

- A. Facilitating access to nuclear power
- B. Strengthening promotion of nuclear science, technology and applications
- C. Improving nuclear safety and security

- D. Providing effective technical cooperation
- E. Strengthening the effectiveness and improving the efficiency of the Agency's safeguards and other verification activities
- F. Providing efficient, innovative management and strategic planning

4. Conclusions

During Yukiya Amano tenure, the IAEA policy is largely confirmed in two ways. First, it is the nuclear non-proliferation and security policy represented by Safety, Security and Safeguards. Second is the new technology development policy.

The major policy related to nuclear nonproliferation and security is analyzed as international cooperation in the fields of nuclear safety and security since the Fukushima accident, and safeguards activities related to the Iran nuclear program. The new technology development policy is the cancer treatment programs using nuclear technology and development of technology for solve to global issues such as water, foods, environment and etc.

REFERENCES

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