A Preliminary Study on the Medium-term Plan of Public Universities Transferred from Private Universities

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Abstract

This preliminary study visualizes the characteristics of the medium-term plan of ten universities that were transferred from private to public ones. The analysis tool is KH Coder version 3. Drawing 2-D maps in three ways: Co-occurrence network, Correspondence analysis, Self-organizing map make it to interpret the whole picture.

1 Introduction

This study is a part of a research project of practical study on data-based university evaluation. Currently, university evaluation is mandated by the School Education Law and the National University Corporation Law, and universities are required to continuously conduct self-assessment as an organization. Recently, in order to establish internal quality assurance, many universities have introduced Institutional Research (IR) and are aiming to build a system for evaluation and improvement based on data. Against this background, universities have so far developed self-assessment systems and questionnaire systems for IR. These systems have made it possible to collect data and visualize the results of analysis, and have promoted the spread of an evaluation culture in

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universities. However, the current system mainly analyzes numerical data, and is not capable of conducting evaluation using objective analysis (quantitative analysis) of documents (text data).

In the study, we conduct a preliminary analysis of text data. The focus is the medium-term plan of ten universities that were transferred from private universities to public universities. First, we review the status of previous studies on public universities and medium-term plans. Next, we conduct a quantitative text analysis of the medium-term plan and draw the overall picture using multiple text mining techniques. Our research purpose is two folds. First is visualizing university evaluation documents (text data) into 2-D maps using text mining techniques. Secondly is to get the analytical results such as the discovery of the university's strengths and clarification of factors that cannot see with conventional numerical data. Thus, the research question of this study is using text mining techniques to get the medium-term plan of ten universities to be visualized to guide the discovery of strengths and the clarification of factors.

2   Previous Studies

Regarding previous studies on the public universities and text analysis on the medium-term plans, are as follows.

2.1   Studies on Public Universities

Murata (1994) conducted a comprehensive study of public universities and proposed community orientation and universalism as directions for the development of public universities. In "The Public University in Question," Amano (2006) called public universities "invisible universities. This is because public universities are a small sector in terms of number and size. Their niche lies between local national universities, which form the regional hub, and private universities, which form a large sector in terms of number and size. According to Amano, the question for public universities is whether they can meet the educational demands of the region with their limited resources while competing with national and private universities.

In recent years, research on public universities has made further progress. From the history of the establishment of public universities, Yoshikawa (2010) elucidated the formation process of the public university philosophy regarding universities and regions in modern Japan. In addition, Yada (2019, 2019) summarized the field practices at Kyushu University and the University of Kitakyushu regarding university re-form and public universities. As for universities transferred from private universities to public universities during the last decade, Nakata (2020) conducted interviews with three universities, Kochi University of Technology, Meio University, and Sanyo-Onoda City University, to clarify their policy processes. In addition, Tamura (2021) summarized the effects and challenges of 10 universities that were transferred to public universities. The Ministry of Education, Culture, Sports, Science and Technology (MEXT) has published on its website "Data on the Economic Impact Analysis and Visualization of the Effects of the Transition of Private Universities to Public Universities."

2.2   Text Analysis on Medium-term Plans

Previous research on medium-term plans of universities is as follows. Ninomiya (2009) created coding rules for medium-term goals and medium-term plans of national universities using quantitative analysis software(KH Coder). He clarified the contemporary characteristics of liberal arts education and student support. In addition, Sato (2005, 2019) focused on the keywords of career education, active learning, PBL, and internship in the medium-term goals and medium-term plans of national universities. She then analyzed how the keywords were used in the goals and plans by counting the

number of their occurrences. Furthermore, Takata (2012) analyzed the changes in the field of activities by using the keyword "alumni association" from the medium-term plans of national universities.

There are some studies on the medium-term goals and medium-term plans of national universities. However, there are few studies on private and public universities. As for private universities, although it is a self-study report, Ota (2020) using KH Coder analyzed the "strengths" in internal quality assurance by creating a simple table of frequent words and a co-occurrence network. As for medium-term plans, Ogashiwa (2021) analyzed the characteristics of medium-term plans of exemplary universities and as-signed metadata to them. Coding rules in Ninomiya (2009) and keywords in Sato (2005, 2019) and Takata (2012) may be a kind of metadata in the paper of Ogashiwa (2021). In addition, the analysis of "strengths" in the self-study report by Ota (2020) would correspond to the analysis of characteristics of the exemplary medium-term plan in Ogashiwa (2021). Furthermore, for the universities which transferred to the public sector, Toriyama (2021) described the community contribution activities of 5 out of ten universities from their medium-term goals and medium-term plans. She relies on the analysis framework of community contribution activities for her reference framework. The results were then organized into the characteristics and keywords of the five universities' community contribution activities.

3   Data and Research Methods

3.1   Data

The data is the medium-term plan of 10 universities that have been transferred from private universities to public universities during this decade, which are published on the website of the Ministry of Education, Culture, Sports, Science and Technology(MEXT) (Table 1). The current medium-term plan is also published on the university website. The chapters of the plans are structured in the same way, although the details differ for each university. First, there is a Preface that explains the concept of the plan, followed by plans for the three basic functions of the university: Education, Research, and Social Contribution. After this is followed by the Corporation's Management, Finance, and Self-study, and so on. In this study, we will analyze the chapter on Preface, Education, Research, and Social Contribution.

3.2   Research Method

In this study, we use KH Coder, which was also used by Ninomiya (2009) and Ota (2020). Higuchi (2016, 2017), the creator of KH Coder, proposes a two-stage approach. It mechanically draws an overall picture of the text in the first stage. Then, it uses coding rules in the second stage to statistically analyze it more deeply. In this study, the first step is to mechanically draw an overall picture of the medium-term plan. First, a list of extracted words is automatically created from the words that frequently appear in the medium-term plan. Then, the overall picture of the medium-term plan is drawn using three methods: co-occurrence network, correspondence analysis, and self-organizing map. The aggregation unit setting is a paragraph.

No	Incorporate	University	Establishing body	Medium-term plan	
				Name	Period
1	2009	Kochi University of Technology	Prefecture	Kochi Prefectural Public University Corporation Medium-term Plan (2nd term)	April 1, 2017～ March 31, 2023
2	2010	Shizuoka University of Art and Culture	Prefecture	Public University Corporation Shizuoka University of Art and Culture 2nd Medium-term Plan	April 1, 2016～ March 31, 2022
3	2010	Meio University	Wide-area municipal zone	Public University Corporation Meio University Second Medium-term Objectives and Medium-term Plan [Revised]	April 1, 2016～ March 31, 2022
4	2012	Tottori University of Environmental Studies	Prefecture · City	Public University Corporation Tottori University of the Environmental Studies 2nd Medium-term Plan	April 1, 2018～ March 31, 2024
5	2014	Nagaoka Institute of Design	City	Public University Corporation Nagaoka Institute of Design 2nd Medium-term Plan	April 1, 2020～ March 31, 2026
6	2016	University of Fukuchiyama	City	Public University Corporation University of Fukuchiyama 1st Medium-term Plan	April 1, 2016～ March 31, 2022
7	2016	Sanyo-Onoda City University	City	Public University Corporation Sanyo-Onoda City University Medium-term Plan	April 1, 2016～ March 31, 2022
8	2017	Nagano University	City	Public University Corporation Nagano University 1st Medium-term Plan	April 1, 2017～ March 31, 2023
9	2018	Suwa University of Science	Wide-area municipal zone	Public University Corporation Suwa University of Science Medium-term Plan	April 1, 2018～ March 31, 2024
10	2019	Chitose Institute of Science and Technology	City	Public University Corporation Chitose Institute of Science and Technology Medium-term Plan	April 1, 2019～ March 31, 2025

Source: Author made with reference to MEXT website, "Data on economic impact analysis and "visualization" of the effect of publicization on private universities"
(https://www.mext.go.jp/a_menu/koutou/kouritsu/1412396.htm) and Karasuyama (2021).

Table 1: Ten Public Universities Transferred from Private Universities and Medium-term Plans

4　Results

4.1　Extracted words

Table 2 is a list of the top 60 words with the highest frequency of occurrence created from the medium-term plan. The first column is the Japanese extracted word, the second column is the English translation of the extracted word, and the third column is the number of occurrences. The word that appears most often is "Research." It is 411 appearances. Then, "Community" 399 times, "Education" 334 times, "Students" 331 times, and so on. The 60th extracted word is "Plan", and the number of occurrences is 44. When creating an extracted word, the extraction may be adjusted according to the number of times the word appears and the number of documents that appear in the document. In this study, the number of appearances is counted and created mechanically in order of frequency. In the medium-term plan, the extracted words in this list are frequently used.

Extracted words	English Translation	Freq	Extracted words	English Translation	Freq	Extracted words	English Translation	Freq
研究	Research	411	課題	Issues	86	強化	Strengthening	56
地域	Community	399	情報	Information	86	検討	Consideration	55
教育	Education	334	環境	Environment	82	必要	Necessary	55
学生	Students	331	制度	Institution	81	知識	Knowledge	54
行う	Do	203	授業	Class	80	入学	Admission	54
大学	University	196	整備	Maintenance	79	センター	Center	53
支援	Support	194	活用	Utilization	77	学部	Undergraduate	53
活動	Activities	176	学習	Learning	76	就職	Employment	52
連携	Cooperation	171	体制	System	76	目指す	Aim	50
図る	Attempt	149	科目	Subject	75	目標	Goal	49
社会	Society	148	向上	Progress	70	内容	Contents	48
教員	Faculty	132	技術	Technology	69	本学	This University	48
実施	Implementation	129	解決	Solution	66	貢献	Contribution	47
企業	Company	127	組織	Organization	65	実践	Practice	47
充実	Enhancement	119	能力	Ability	64	取り組む	Work on	46
推進	Promotion	111	成果	Outcomes	63	分野	Fields	46
評価	Evaluation	95	促進	Advance	63	開発	Development	45
人材	Human resources	94	積極	Positive	58	総合	Synthesis	45
専門	Specialty	91	交流	Exchange	57	改善	Improvement	44
育成	Training	89	国際	International	57	計画	Plan	44

Tokens, total number of words in the target text file: 35,154 (17,824), Types, number of types of these words: 2,402 (1,956), (　): number of words KH Coder recognizes as analysis targets

Table2: Extracted words list of the 60 most frequent words

4.2   Co-occurrence network

Figure 1 shows the co-occurrence relation with each chapter of the medium-term plan and the extracted words. It visualizes the characteristics of the medium-term plan for each chapter. We use the Jaccard coefficient to measure the co-occurrence relation. The higher the coefficient, the darker the line is drawn. If an extracted word has a large co-occurrence relation with two chapters, two lines are drawn. The more frequent the occurrence of an extracted word, the larger the circle is drawn. If the co-occurrence relation is small, the extracted word is not drawn, even if the frequency of occurrence is large. Figure 1 shows the 25 extracted words with large co-occurrence relations. The rectangles in the figure are the external variables: preface of the mid-term plan, education, research, and social contribution. The co-occurrence network is easy to understand.

From the co-occurrence relations, the characteristics of each chapter are as follows. For the Preface, "Community" "University" "Contribution" "Plan" "Society" "Training" "Human resources" and "Aim" are co-occurrence. For the Education, "Activities" "Students" "Support" "Implementation" "Enhancement" "Education" "Attempt" and "Do" are co-occurrence. For the Research, "Do" "Outcomes" "Research" "Technology" "Development" and "Promotion" are co-occurrence. And for the Social Contribution, "Promotion" "Positive" "Center" "University" "Community" "Cooperation" "Company" and "Activities" are co-occurrence.
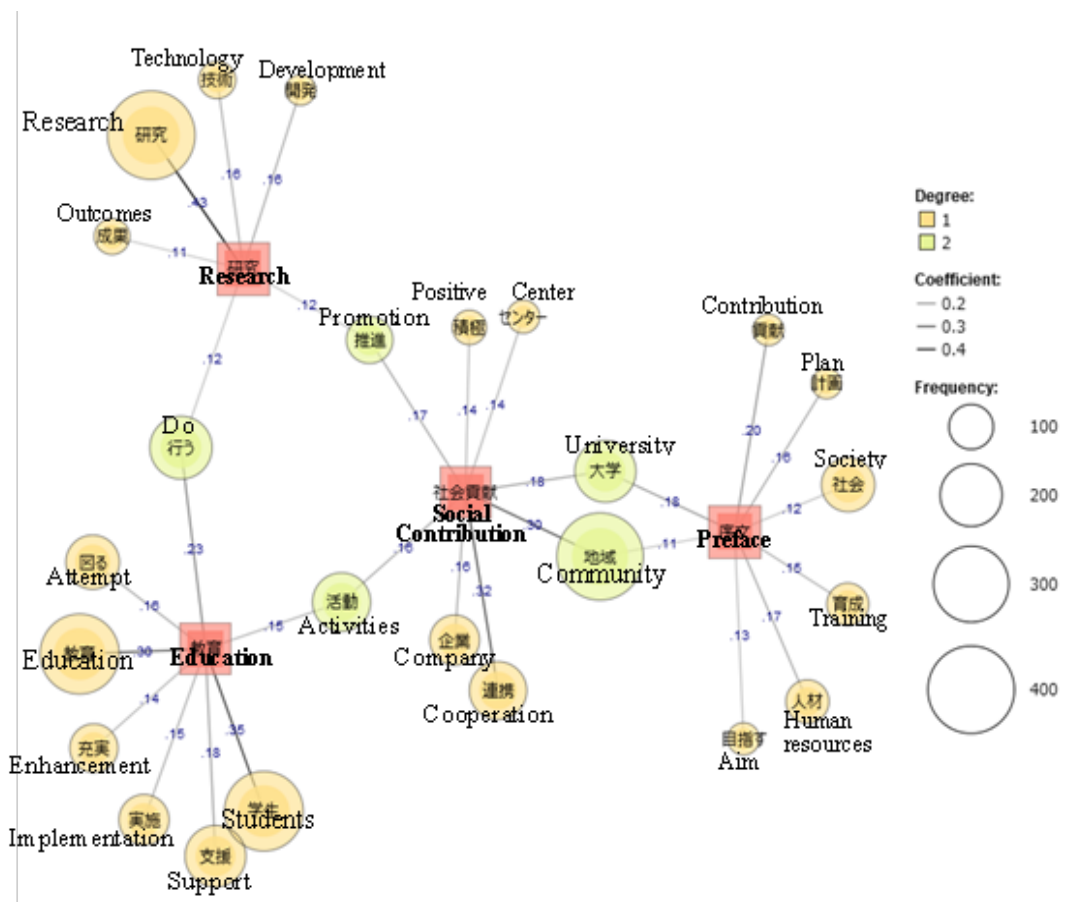

Figure 1: Co-occurrence network of frequently occurring words (External Variables: Chapter)

4.3   Correspondence analysis

Figure 2 is a result of correspondence analysis, showing the characteristics of each chapter. These words are selected by frequency of occurrence, not co-occurrence, and the near origin words have unlabeled. The correspondence analysis shows the locational characteristics of each part. First, Preface and Social Contribution are overlapping. Second, "Human resources" "Training" "Plan" and "Solution" are located between Education. Third, "Outcomes" are located between Education and Research. Fourth, Research is isolated.

The frequent words in the Preface and Social Contribution are "Community" "University" "Cooperation" and "Center" "Contribution" "Positive" and "Promotion." The frequent words in Education are "Students" "Class" "Improvement" "Subject" "Undergraduate" "Admission" "Necessary" "Contents" "Ability" "Specialty" and "Knowledge." Some distance away are "Faculty" "Institution" "Evaluation" and "Maintenance." The frequent words in Research are "Research" "Development" and "Technology."
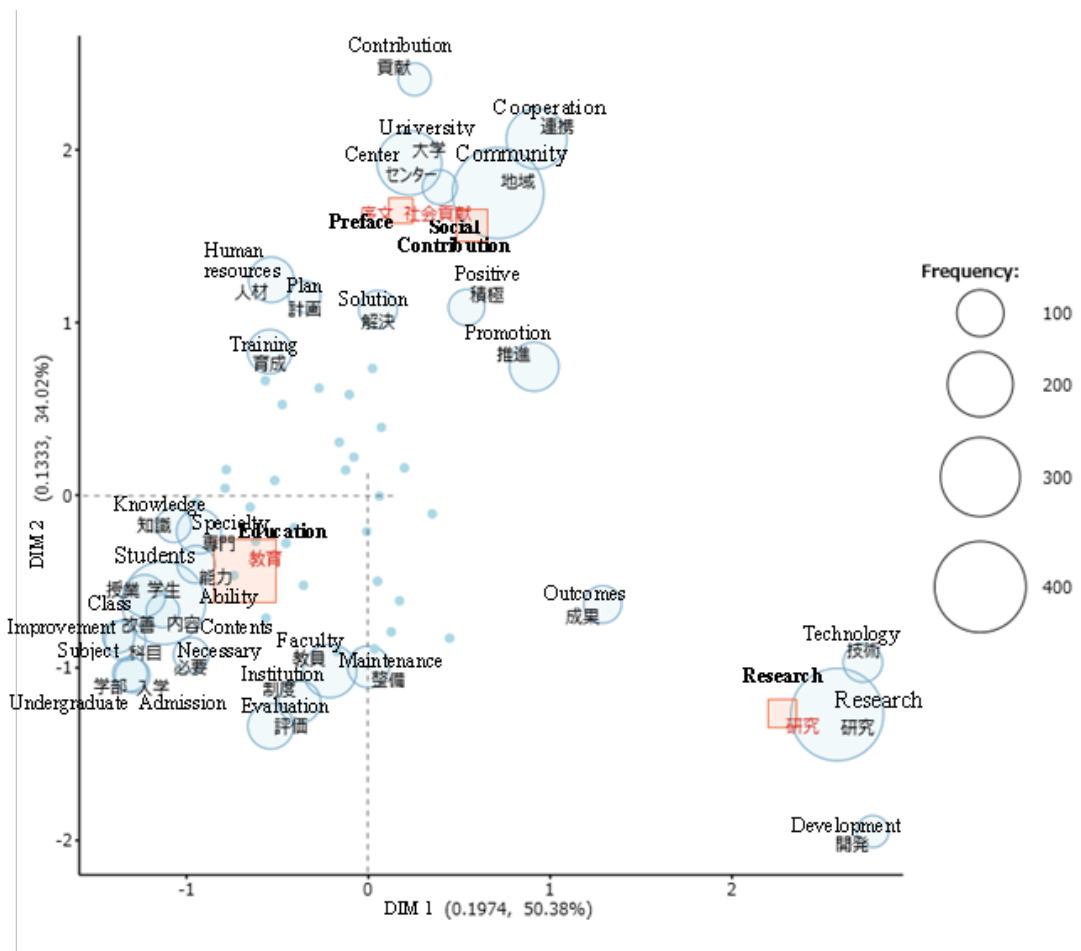

Figure2: Correspondence analysis of words and variables

4.4   Self-organizing map of the extracted words

The self-organizing map visualizes the characteristics of the medium-term plan from the pattern of occurrence of the extracted words. Figure 3 shows the 61 extracted words arranged into eight clusters. The word "In the Prefecture" was not listed in Table 2 because it was the 61st extracted word, although its frequency of occurrence was 44. The chapter on medium-term plan can be interpreted using the previous two analyses as a guide. (1) Preface has "This University" "Aim" and "Synthesis." (2) Education(1) has words such as "Education" "Implementation" and (3) Education(2) has words such as "Students" "Support." (4)Research has words "Technology" "Development" and so on. Dual domain of (5) Research and Education has words such as "Outcomes" "International" and "Exchange." (6) Social Contribution has words such as "Cooperation" "Promotion" "Contribution." Dual domain of (7) Preface and Social Contribution has words such as "Issues" "Solution." Finally triple domain of (8) Preface, Social Contribution, Education has words such as "Human resources" and "Training."
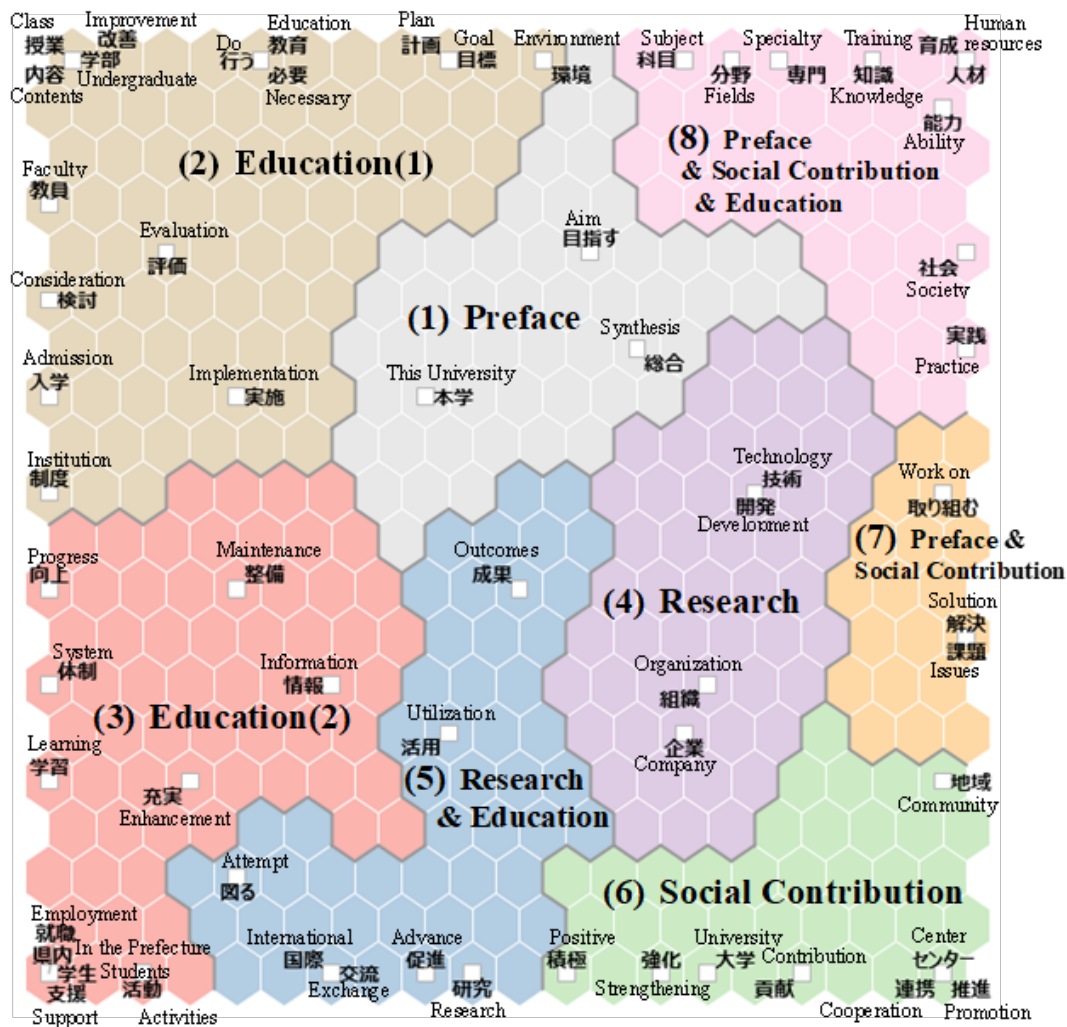

Figure 3: Self-organizing map of the extracted words

5　Conclusion and Further Study

In this study, we conducted a preliminary study on the medium-term plans of public universities. First, a review of previous studies showed that there were fewer studies on the medium-term plan of private and public universities compared to national universities. And studies from the approach of quantitative text analysis were even more limited. Using KH Coder, a software for quantitative text analysis, we then drew the characteristics of the medium-term plans of ten universities that were transferred from private to public universities. Three ways to draw them were (1) Co-occurrence network, (2) Correspondence analysis, and (3) Self-organizing map. Each of these three methods focused on co-occurrence relations, frequencies of occurrence, and patterns of occurrence to create a whole picture of the medium-term plan. The first two maps helped interpret the Self-organizing map.

The second step of our research is to create coding rules based on the keywords or metadata that characterize the medium-term plan and to conduct a deeper analysis. Further studies lead to a deeper analysis. Following studies are further required. These are as follows.

- ・KH Coder: analysis used coding rule.

- ・External data: analysis linked with financial data, etc.

- ・Other documents: for example, studies of the self-study reports.

- ・Other universities: for example, studies of other Public, National, and Private universities.

- ・Other fields: a review of studies in related fields, such as public organization.

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References

Amano, I. (2006). *The Public University in Question* (Towareru Kouritsu Daigaku), Sociology of University Reform(Daigaku Kaikaku no Shyakaigaku), Tamagawa University Press, pp.250-259.

Higuchi, K. (2016). *A Two-Step Approach to Quantitative Content Analysis: KH Coder Tutorial Using Anne of Green Gables (Part I)*, Ritsumeikan Social Science Review, vol. 52, no. 3, pp.77-91.

Higuchi, K. (2017). *A Two-Step Approach to Quantitative Content Analysis: KH Coder Tutorial Using Anne of Green Gables (Part II),*" Ritsumeikan Social Science Review, vol. 53, no. 1, pp.137-147.

Murata, S. (1994). *Research on Public Universities: Community Orientation and Universalism*（Kouritsu Daigaku ni Kansuru Kenkyu: Chiikisikou to Universalism）, Taga Syuppan, p.301.

Nakata, A.(2020). *Possibility of Public University Policy: Why did the Number of Public Universities Increase Rapidly in the Heisei Period?* (Kanosei Toshiteno Kouristu Daigakuseisaku: Naze Heiseiki ni Kouritsu Daigaku ha Kyuzo Shitanoka), Gakkokeiri kenkyukai, p.320.

Ninomiya, Y. (2009). *Contemporary Issues in Liberal Arts Education and Student Support: The Medium-term Goals and Plans of the National University Corporation*, Research and Development Center for Higher Education Hitotsubashi University 2008 edit., pp.87-98.

Ministry of Education, Culture, Sports, Science and Technology (MEXT) , *Data on economic impact analysis and "visualization" of the effect of publicization on private universities;* https://www.mext.go.jp/a_menu/koutou/kouritsu/1412396.htm

Ogashiwa, K. (2021). *Feature Analysis of Exemplary Medium-term Plans for University and Metadata Assignment for their Documents*, Record Management, no. 81, pp. 35-53.

OTA, K. (2020). *Analysis of Self-check and Assessment Report（Chapter II Internal Quality Assurance）: Practice of Text Mining using KHcoder*, Ritsumeikan Higher Educational Studies, No. 20, pp.153-162.

Sato, R. (2005). *Career Education in the Medium-term Goals and Plans of the National University Corporation : Necessity of Career Education and Its Realization*, Shizuoka University Educational Research, Shizuoka University vol.1, pp.31-41.

Sato, R. (2019). *Examining Higher Education Policy from the Perspective of Educational Methods in the Second and Third Medium-term Goals and Plans of the National University Corporations: Focusing on Active Learning, PBL, Career, and Internship*, Shizuoka University Educational Research, Shizuoka University, vol.15, pp.97-104.

Takata, E. (2012). *Current Status of Alumni Associations in National Universities Management: Focus on Mid-term Plans of National Universities*, The Journal of University Studies, University of the Ryukyus, vol. 4, pp.1-9.

Tamura, S. (2021). *Public Universities Past, Present and Future: Prospects for a Sustainable Future* (Kouritsu Daigaku no Kako・Genzai Soshite Mirai: Zizoku Kanou na Syourai heno Tenbo), Tamagawa Daigaku Syuppanbu, p.188.

Toriyama, A. (2021). *A Study of Contribution from the Public University to the Local Community in Japan*, Koukyo Seisaku Shirin : Public Policy and Social Governance, vol. 9, pp.106-121.

Yada, T. (2019). *Public University (1) Heisei University Reform and Public Universities* （Kouritsu Daigakuron (jyo) Heisei no Daigakukaikaku to Kouritsu Daigaku） , Hara Shobou, p.470.

Yada, T. (2019). *Public University (2) Heisei University Reform Field Practice Record* （Kouritsu Daigakuron (ge) Heisei no Daigakukaikaku no Genbajissenroku） , Hara Shobou, p.448.

Yoshikawa, T. (2010). *Birth of Public Universities: Universities and Regions in Modern Japan* (Kouritsu Daigaku no Tanjo: Kindainihon no Daigaku to Chiiki), The University of Nagoya Press, p.392.