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Article

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Cogent Business & Management

Provided in Cooperation with:

Taylor & Francis Group

Suggested Citation: Yoon, Donghun (2020) : The job satisfaction level analysis for the research environment and the research production, Cogent Business & Management, ISSN 2331-1975, Taylor & Francis, Abingdon, Vol. 7, Iss. 1, pp. 1-16,
<https://doi.org/10.1080/23311975.2020.1818364>

This Version is available at:

<https://hdl.handle.net/10419/244946>

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To cite this article: Donghun Yoon | (2020) The job satisfaction level analysis for the research environment and the research production, Cogent Business & Management, 7:1, 1818364, DOI: [10.1080/23311975.2020.1818364](https://doi.org/10.1080/23311975.2020.1818364)

To link to this article: <https://doi.org/10.1080/23311975.2020.1818364>



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Received: 08 May 2020
Accepted: 30 August 2020

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Reviewing editor:
Pantea Foroudi, MBT, Middlesex
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MANAGEMENT | RESEARCH ARTICLE

The job satisfaction level analysis for the research environment and the research production

Donghun Yoon^{1*}

Abstract: The most important factor of the competitiveness of South Korea's national science and technology is the research results. University professors and national research institute researchers perform the important role of generating research results. Therefore, the responsibilities and missions of university professors and national research institute researchers are growing constantly. University professors perform knowledge creation and education. National research institute researchers support national science policy-making and the government R&D program. Satisfactory research support and research environments are very important for university professors and national research institute researchers. Thus, this paper analyzes the job satisfaction level of university professors and national research institute researchers with regard to their research environment and research production. It also proposes an effective policy for achieving a satisfactory research environment based on the results of an analysis of research environments and research production.

Subjects: Employment Relations; Human Resource Development; Management of Technology; Innovation Management



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Donghun Yoon is currently an assistant professor at Kyonggi University, South Korea. His research areas of interest include management information system, logistics, supply chain management, network system, RFID, basic science, research equipment, national large research facilities, science and technology policy, information and communications technologies, R&D strategy, IC-Card and technology diffusion theory. The major field of study is technology diffusion model theory and science and technology policy. He received his PhD from Graduate School of Media and Governance, Keio University of Japan. He worked for Samsung, Keio Research Institute at SFC, Keio University of Japan, and Korea Basic Science Institute before joining Kyonggi University. He is an Editor-in-chief of International Journal of R&D Innovation Strategy and an International Editorial Review Board of international academic journals, International Journal of Asian Business and Information Management and Polish Journal of Management Studies.

PUBLIC INTEREST STATEMENT

The most important factor of the competitiveness of South Korea's national science and technology is the research results. University professors and national research institute researchers perform the important role of generating research results. Therefore, the responsibilities and missions of university professors and national research institute researchers are growing constantly. University professors perform knowledge creation and education. National research institute researchers support national science policy-making and the government R&D program. Satisfactory research support and research environments are very important for university professors and national research institute researchers. Thus, this paper analyzes the job satisfaction level of university professors and national research institute researchers with regard to their research environment and research production. It also proposes an effective policy for achieving a satisfactory research environment based on the results of an analysis of research environments and research production.

Keywords: national science and technology; professor; researcher; job satisfaction; research environment; research production; R&D efficiency

1. Introduction

Job satisfaction has been studied in various research fields (sociology, psychology, management, and economics). It is a decision variable of production in organizational psychology and management, and a variable of alienation measurement in sociology. It has also been used as a substitution variable of efficiency, and a forecast variable of the labor market in economics (Goris, 2007; Kosteas, 2011; Lessmann & Bonvin, 2011). This study analyzed the influence of the research environment and research production on the job satisfaction of university professors and national research institute researchers. In this study, job characteristics were designated as important factors of job satisfaction for the job satisfaction analysis. Also, university professors and national research institute researchers were designated as the study objects because they perform the important role of generating research results. University professors are the core human resources of universities and perform the central function in university development. The responsibilities of university professors for research activities and education are growing constantly. Also, the influence of universities on their job satisfaction is greater than that of academic freedom. Therefore, university professors need a research environment for active research and generation of research results. National research institute researchers support national science policy-making and the government's R&D program. Also, national science policy-making and government decision-making are based on their research results. Recently, the research role of national research institute researchers has been expanded to enterprise support, job creation, and research service provision. Thus, national research institute researchers need a research infrastructure for research results generation and national science and technology development. In this study, the job satisfaction is the dependent variable. The research environment and the research production are the independent variables. We used multiple regression analysis to analyze the satisfaction with the research environment and the research production. This paper presents the results of the analysis and comparison of the satisfaction level of university professors and national research institute researchers with their research environment and research production. Then, based on such results, this paper proposes an effective policy for the creation of a satisfactory research environment. This paper consists of introduction, literature review, research environment, research production, research questions, research analysis method, analysis results for research environment and research production, policy discussion, and conclusions. This study formulates a policy for the creation of a satisfactory research environment based on the results of the analysis of the satisfaction of university professors and national research institute researchers with their research environment and research production.

2. Literature review

Job satisfaction is defined as an individual's positive emotional state with regard to his or her job and work environment (Bartlett, 2000; Filiz, 2014). Its characteristics are as follows. First, its level differs from individual to individual. Second, its effect differs from individual to individual. Third, it has a ripple effect. Fourth, it is closely connected to career changes, absences, and productivity. Fifth, it is very important to determine an individual's job satisfaction state and trend (Cole et al., 2004; Kawada & Otsuka, 2011; Ziegler et al., 2012). Job integration (job immersion, job absorption, and job involvement) means the individual is psychologically integrated with his or her job. It is a psychological attachment and devotion to one's job (Lorence & Mortimer, 1985). Recently, organizational commitment has been actively studied. Organizational commitment is defined as the willingness to achieve job integration and organizational participation. It consists of belief in and acceptance of the organizational goals and values, the will and effort to support the organization, and the strong will to be a member of the organization (Lambert & Paoline, 2008; Schlett & Ziegler, 2014). Job satisfaction is the positive evaluation, by a member of an organization, of his or her work environment (Bockerman & Ilmakunnas, 2009; Crede et al., 2007). Advanced researches on job satisfaction are described in Table 1.

Table 1. The advanced research for the job satisfaction

Author	Economic compensation	Correlation
Ronan (1973)	Relation for remuneration level and job attitude	Positive correlation
Lock (1976)		
Hackerman & Oldham (1976)		
Cable & Judge (1994)		
Yang et al. (2008)		
Curral et al. (2005)	Relation for compensation satisfaction and job attitude	Positive correlation
Herzberg et al. (1957)	Related to the remuneration level and job attitude	Positive correlation
Gibson & Klein (1970)		U type correlation
Hunt & Saul (1975)		
Clark et al. (1996)		
Blackburn & Bruce (1989)		Nothing
Converse et al. (1980)	Related to compensation satisfaction and job attitude	Positive correlation
Maher (1966)		Negative correlation
Delay (1988)		Negative correlation
FreemanDelay (1978)		Positive correlation
Poter & Lalwer (1965)	Related to the age and job satisfaction	Positive correlation
Cherniss & Kane (1987)		No correlation
Lincoln & Kalleberg (1990)	Related to education and job satisfaction	Positive correlation

Motive is defined as the internal force that guides the behavior direction. Motivation is the psychological process of the guidance of an individual's behavior direction (Hofmans et al., 2013; Reisel et al., 2010). It influences the individual's work outcome and job satisfaction. Organizations study motivation continuously to determine the willingness of their members to work (Unterrainer et al., 2013). Maslow (1970) proposed the hierarchy of needs model. It structures human needs into five stages (basic needs and need for self-realization). The Maslow theory is as follows. First, deficiencies in needs drive behavior. Second, desire escalates from a lower layer to an upper layer. Third, desire is met from a lower layer to an upper layer (Skalli et al., 2008; Warr & Inceoglu, 2012). The theory of stages of needs by Maslow and Herzberg is described in Table 2.

Herzberg et al., (1959) proposed the two-factor theory. It explains the difference between the motive factor and the hygiene factor. The motive factor refers to achievements, acknowledgments, responsibilities, growth, and development in the job. The hygiene factor refers to the policies, administration, management, remuneration, relationships, and work conditions of the organization (Meyer, 2006; Senter et al., 2010; Yeh, 2015). When the hygiene factor is improved, job dissatisfaction can decrease, but satisfaction cannot (Glisson & Durick, 1988; Smerek & Peterson, 2007; Ssesanga & Garrett, 2005). Vroom (1964) explained the needs and choices of humans

Table 2. Theory stage classification of Maslow and Herzberg

Need hierarchy model (Maslow)	Two-factor theory (Herzberg)
Self-realization need	Motive factor (satisfaction factor)
Respect need	
Social need	
Safety need	Hygiene factor (dissatisfaction factor)
Physiological need	

through valence, instrumentality, expectancy, and outcomes. The validity of the expectancy-valence theory has been studied extensively. The action motive can be easily produced when the reward expectancy is high (Dormann & Zapf, 2001; Lambert et al., 2009). The expectancy-valence theory is correlated with performance compensation. Also, it is effective for motivation (Locke & Latham, 2002). Locke (1976) insisted that the free will of an individual is very important for his or her motivation to achieve a goal. The goal is a better future for the free will achievement of the individual. When the goal is difficult enough and when its achievement can be measured exactly, the motivation to achieve it can be much higher. Also, the achievement of the goal can lead to the individual's satisfaction, and failure to achieve the goal can lead to his or her dissatisfaction. The internal reward is the achievement of the individual goal, and the external reward is the organizational outcome (Christen et al., 2006; Hu & Zuo, 2007; Li et al., 2008). It could be stated that job satisfaction determines organizational performance, rather than organizational performance determining job satisfaction (Bakotić, 2016). Organizational talent management should seek to identify employee motivation and job satisfaction interventions that might help to retain talented staff (Sabbagha et al., 2018). Job satisfaction's tenuous relationship to a variety of work behaviors is reviewed from the perspective of a management tool and as a leadership responsibility (Hantula, 2015). The relation between relative wage increases and job satisfaction is relevant for managers with lower absolute wage levels in particular (Grund & Rubin, 2017). Job satisfaction is correlated with labor market behavior such as productivity, quits and absenteeism (Gazioglu & Tansel, 2006).

3. Research environment

The research environment is very important for university professors and national research institute researchers. It also influences their job satisfaction. University professors and national research institute researchers had been guaranteed autonomy to chart their own academic activities in times past. Therefore, their need to achieve research results and grow in responsibility is rising. However, most of them are not satisfied with their organization. The factors that influence their job satisfaction are described in Table 3.

Universities and national research institutes provide services for social evolution. These perform the important role of national science and technology development through knowledge creation. They also secure their competitiveness through their operations system and function change. Effective support is very important for their efficient operations system. Therefore, they consider the administration operation significant. Other factors that they consider significant particularly for research results generation are a laboratory, research equipment, and educational materials. When the research environment is in a good state, the job satisfaction of university professors and national research institute researchers can be improved. This paper is significant t a research environment analysis is performed. Sufficient research cost is essential for academic freedom. Of course, the payment and distribution of the research cost for the achievement evaluation are very effective in the short run. However, they disturb free research activity in the long term. Thus, research cost support is an essential factor. Leadership is an essential factor of the organizational survival of universities and national research institutes. The leader must consider the ability and maturity of his or her organization members, as well as the professionalism and judgment of the organization's professors and researchers. The leader influences the members' job satisfaction.

Table 3. The influence factor for the job satisfaction

Psychological characteristics

Regulation, Control, Leadership, Organizational culture, Administrative and financial support

Physical characteristics

Scale, Budget, History, Mission, Research cost, Research level, Position, Establishment type, Administrative support, Technology support, Information system

When he or she considers professionalism and judgment, the professors and researchers have a positive attitude to their job. Self-determination is an essential factor of the research activities of professors and researchers. The revolutionary leadership can be recognized to the organization member for the goal importance. It can also provide the motive for research activities. Autonomy is very important in universities and national research institutes. It means participation in decision-making for the organization, and academic freedom. It is an essential factor of research activities.

4. Research production

Research production refers to all the research results. It is also defined as the entire outcome of the inputs. It has been receiving attention lately because knowledge creation and the role of intellectuals in it are very important. Research production is also very important in enhancing the competitiveness of national science and technology and worldwide research activities. The factors that influence research production are described in Table 4.

In measuring research production, quantitative measurement and qualitative measurement are essential. The quantitative research measurement objects are the research results, the research paper, the research article, the book, the announcement, the patent, and the exhibit. The qualitative research measurement objects are the research discussion, the academic discussion, the research paper level, and the research effectiveness. Quantitative measurement and qualitative measurement are used at the same time for research production measurement and effectiveness. When the research production level is high, job satisfaction can improve.

5. Research questions

Research questions in this study are as follows.

Does the research environment influence professor's the job satisfaction level?

Does the research production influence professor's the job satisfaction level?

Does the research environment influence researcher's the job satisfaction level?

Does the research production influence researcher's the job satisfaction level?

6. Research analysis method

In this study, job satisfaction is the dependent variable. The research environment and the research production are the independent variables. Also, we assumed that the research environment is the factor that influences job satisfaction most, through advanced research. The research environment is classified into the organizational support, the leadership, the autonomy, and result-centered management. We analyzed the influence of research production on job satisfaction. Research production is classified into the research paper and the SCI (science citation index) paper. The psychological characteristics and the physical characteristics are designated as the control variables, through advanced research. The research model is described in Figure 1. The study hypothesis is as follows. The organizational support, leadership quality, results-centered

Table 4. The influence factor for the research production

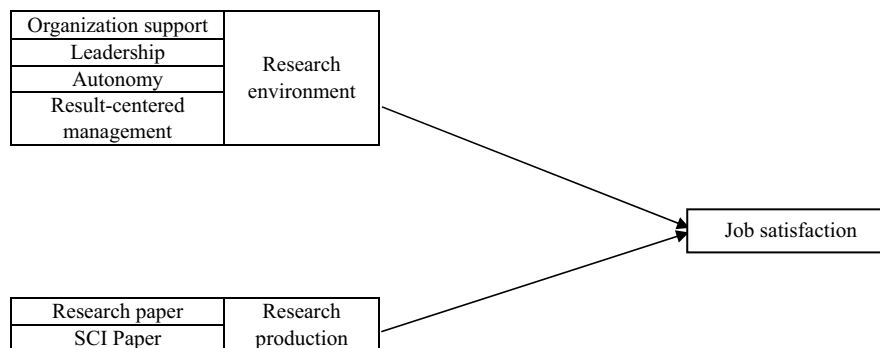
Personal variables

Ability and characteristics, Environmental influence, Employment condition

Institutional variables

Organizational system and leadership, Finance, Research equipment, Research activity support, Culture, Research cost support, Sabbatical year, Research funds

Figure 1. The research model.



management, and research production can be improved or increased to achieve job satisfaction. In this paper, we analyzed the correlation of the factors that influence job satisfaction.

7. Analysis results for research environment and research production

In this study, we utilized the data (50 university professors and 50 national research institute researchers) of National Science & Technology Information Service (NTIS). National Science & Technology Information Service (NTIS) belongs to the Ministry of Science, ICT (Information and Communications Technologies), and Future Planning of South Korea. We also attempted to classify the analysis into university professors and national research institute researchers.

7.1. Professor

A 5-point Likert scale was used to analyze the job satisfaction, the research environment, and the research production. These are independent variables. The descriptive statistical analysis of the dependent variable and the independent variables is described in Table 5.

The dependent variable of the job satisfaction was 3.81 points. This means the professor was satisfied with his job.

In the organizational support factor of the research environment, the administration support (2.17) and the research cost (2.11) were perceived negatively, and the research equipment (3.13) and the educational materials (3.10) were perceived positively. As for the leadership factor of the research environment, the leadership (2.47) was perceived slightly negatively, and participation in decision-making (2.31) and communication (2.63) were perceived negatively. In the autonomy factor of the research environment, academic freedom (4.01) was guaranteed strongly. However, in the results-centered management factor of the research environment, the pressure for results (3.79), the pressure for research funds (3.61), and the activity regulation (3.96) were requested strongly for the responsibility.

In the research production, there were 2.41 research papers (2012–2014). The SCI/SSCI/AHCI paper (2012–2014) was equivalent to 1.5 papers. The minimum value (0) of the research results of the university professor was difficult to measure. The research production varied from individual to individual because the maximum number of research papers (2012–2014) was 34, and the maximum number of SCI/SSCI/AHCI papers (2012–2014) was 21.

The correlation and the t-test (of the professor) are described in Table 6. In the research environment, the administrative support and the research cost are correlated. In the analysis, the research equipment (0.43) and the educational materials (0.49) are strongly related. This means excellent administrative support leads to a good research environment. Also, the

Table 5. Descriptive statistical analysis of the dependent variables and the independent variables (professor)

Variable		Descriptive statistic			
Factor	Measurement variable	Minimum value	Maximum value	Mean	Standard deviation
Job satisfaction Research environment	Current job satisfaction	1	5	3.81	0.71
	Administration support	1	5	2.17	1.03
	Research cost	1	5	2.11	1.05
	Research equipment	1	5	3.13	1.10
	Educational material	1	5	3.10	1.07
Leadership	Leadership recognition	1	5	2.47	0.91
	Decision-making participation	1	5	2.31	0.97
	Communication	1	5	2.63	0.99
Autonomy Results-centered management	Academic freedom	1	5	4.01	0.71
	Pressure for result	1	5	3.79	1.06
	Pressure for research cost obtain	1	5	3.61	0.96
	Activity regulation	1	5	3.96	0.90
Research production	Research paper number (2012–2014)	0	34	2.41	3.01
	SCI/SSCI/AHCI paper number (2012–2014)	0	21	1.50	2.17

Table 6. The correlation and the t-test (professor)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	0.21**	0.31**	0.23**	0.37**	0.34**	0.20**	0.29**	0.01	0.30**	0.34**	0.31**	0.01	0.01
2		1	0.26**	0.43**	0.49**	0.41**	0.32**	0.33**	0.03	0.12*	0.23**	0.34**	0.03	0.02
3			1	0.34**	0.23**	0.38**	0.33**	0.34**	0.00	0.26**	0.31**	0.01	0.01	0.01
4				1	0.32**	0.37**	0.29**	0.32**	0.03	0.01	0.19*	0.02	0.31**	0.23**
5					1	0.39**	0.26**	0.21**	0.02	0.00	0.21**	0.22**	0.02	0.01
6						1	0.45**	0.43**	0.01	0.38**	0.37**	0.29**	0.17*	0.12*
7							1	0.29**	0.01	0.37**	0.10*	0.16*	0.01	0.03
8								1	0.00	0.23**	0.21**	0.32**	0.14*	0.18*
9									1	0.07	0.12*	0.11*	0.00	0.01
10										1	0.00	0.01	0.03	0.00
11											1	0.23**	0.26**	0.38**
12												1	0.10*	-0.14*
13													1	0.21**
14														1

* $p < 0.05$, ** $p < 0.01$.

1. Current job satisfaction, 2. Administrative support, 3. Research cost, 4. Research equipment, 5. Educational materials, 6. Leadership recognition, 7. Participation in decision-making, 8. Communication, 9. Academic freedom, 10. Pressure for research results, 11. Pressure for research funds, 12. Activity regulation, 13. Research paper number (2012-2014), 14. SCI/SSCI/AHCI paper number (2012-2014).

Table 7. Influence of the research environment and the research production on the job satisfaction (professor)

Job satisfaction			
Variable	B	β	t
Constant	1.61		7.12
Research environment			
Organization support	0.31**	0.31	7.01
Leadership	0.17**	0.18	3.23
Autonomy	0.08*	0.06	3.12
Results-centered management	-0.14**	-0.11	-2.31
Research production			
Research paper number	0.01	0.03	0.31
SCI/SSCI/AHCI paper number	0.01	0.05	1.01

* $p < 0.05$, ** $p < 0.01$.

administrative support is correlated to the leadership (0.41), participation in decision-making (0.32), and communication (0.33). This means competent leadership can actively support professors. Leadership is strongly correlated to participation in decision-making (0.43) and communication (0.45). This means leadership is important in recognizing a professor's ability. The pressure for research funds and the SCI/SSCI/AHCI paper (2012–2014) are negatively correlated (-0.14).

In this study, we analyzed the administrative support, research cost, research equipment, educational materials, leadership recognition, participation in decision-making, communication, academic freedom, pressure for results, pressure for research funds, and activity regulation through the correlation analysis of the dependent variable and the independent variables. In the research results, these showed a correlation with job satisfaction. We used multiple regression analysis to determine the influence of the research environment and the research production on the job satisfaction of the professor. This is described in Table 7. The organizational support, leadership, and results-centered management showed statistically significant results (P -value < 0.05), as did autonomy (P -value < 0.01). Organizational support (0.31) had the greatest influence on job satisfaction, followed by leadership (0.18) and autonomy (0.06). When results-centered management (-0.11) was strongly requested, the job satisfaction decreased.

7.2. Researcher

The 5-point Likert scale was used to analyze the correlation of job satisfaction with the research environment and the research production. These are independent variables. The descriptive statistical analysis for the dependent variable and the independent variables is described in Table 8.

The correlation of the dependent variables with the job satisfaction was scored 3.13 points. This means the researcher is satisfied with his job.

For the organizational support factor of the research environment, the administrative support (2.61) and academic freedom (2.71) were perceived negatively, and the research equipment (3.90) and the educational materials (3.41) were perceived positively. For the leadership factor of the research environment, the leadership recognition (3.49) was perceived positively, and participation in decision-making (3.16) and communication (3.11) were perceived positively. For the autonomy factor of the research environment, academic freedom (4.01) was guaranteed strongly. However, for the results-

Table 8. Descriptive statistical analysis of the dependent variables and the independent variables (researcher)

Variable		Descriptive statistic			
Factor	Measurement variable	Minimum value	Minimum value	Mean	Standard deviation
Job satisfaction Research environment	Current job satisfaction	1	5	3.13	1.01
	Administration support	1	5	2.61	0.97
	Research cost	1	5	3.87	1.17
	Research equipment	1	5	3.90	1.01
	Educational material	1	5	3.41	0.91
	Leadership recognition	1	5	3.49	0.99
	Decision-making participation	1	5	3.16	0.91
	Communication	1	5	3.11	1.04
	Academic freedom	1	5	2.71	0.91
	Pressure for result	1	5	3.91	1.09
Results-centered management	Pressure for research cost obtain	1	5	3.83	1.10
	Activity regulation	1	5	3.91	0.96
Research production	Research paper number (2012–2014)	0	37	2.53	3.61
	SCI/SSCI/AHCI paper number (2012–2014)	0	19	1.41	2.06

Table 9. The correlation and the t-test (researcher)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	0.31**	0.33**	0.32**	0.31**	0.26**	0.30**	0.21**	0.00	0.34**	0.23**	0.30**	0.04	0.03
2		1	0.21**	0.31**	0.33**	0.39**	0.34**	0.38**	0.04	0.21**	0.22**	0.20**	0.01	0.01
3			1	0.23**	0.30**	0.34**	0.33**	0.26**	0.01	0.10**	0.30**	0.03	0.03	0.02
4				1	0.21**	0.23**	0.29**	0.20**	0.02	0.11**	0.14*	0.01	0.33**	0.11*
5					1	0.31**	0.26**	0.31**	0.03	0.01	0.10*	0.32**	0.01	0.03
6						1	0.32**	0.41**	0.04	0.18*	0.31**	0.33**	0.10*	0.10*
7							1	0.30**	0.02	0.32**	0.11*	0.18*	0.02	0.01
8								1	0.01	0.30**	0.38**	0.31**	0.16*	0.17*
9									1	0.06	0.11*	0.10*	0.01	0.00
10										1	0.03	0.00	0.02	0.03
11											1	0.21**	0.22**	0.21**
12												1	0.17*	-0.18*
13													1	0.33**
14														1

* $p < 0.05$, ** $p < 0.01$.

1. Current job satisfaction, 2. Administrative support, 3. Research cost, 4. Research equipment, 5. Educational materials, 6. Leadership recognition, 7. Participation in decision-making, 8. Communication, 9. Academic freedom, 10. Pressure for research funds, 11. Pressure for research results, 12. Activity regulation, 13. Research paper number (2012-2014), 14. SCI/SSCI/AHCI paper number (2012-2014).

centered management factor of the research environment, the pressure for results (3.91), pressure for research funds (3.83), and activity regulation (3.91) were requested strongly for the responsibility.

For the research production, there were 2.53 research papers (2012–2014) and 1.41 SCI/SSCI/AHCI papers (2012–2014). The minimum value (0) of the research results of the researcher was difficult to measure. The research production varied from individual to individual because the maximum number of research papers (2012–2014) was 37, and the maximum number of SCI/SSCI/AHCI papers (2012–2014) was 19.

The correlation and the t-test (researcher) are described in Table 9. In the research environment, the administrative support and the research costs were found to be correlated. The analysis showed that the research equipment (0.31) and the educational materials (0.33) are related. This means excellent administrative support leads to a good research environment. Also, administrative support is correlated to leadership (0.39), participation in decision-making (0.34), and communication (0.38). This means competent leadership can actively support a researcher. Leadership was also shown to be correlated to participation in decision-making (0.32) and communication (0.41). This means leadership is important for the recognition of researcher ability. The pressure for research funds and the SCI/SSCI/AHCI paper (2012–2014) were negatively correlated (–0.18).

In this study, we analyzed the administrative support, research cost, research equipment, educational material, leadership recognition, participation in decision-making, communication, academic freedom, pressure for results, pressure for research funds, and activity regulation through a correlation analysis of the dependent variable and the independent variables. In the research results, these showed a correlation with job satisfaction. We used multiple regression analysis to determine the influence of the research environment and the research production on the job satisfaction of the researcher. The results are described in Table 10. In the results analysis, the organizational support, leadership, and results-centered management showed a statistically significant correlation with job satisfaction (P -value < 0.05), as did autonomy (P -value < 0.01). The organizational support (0.32) most significantly influenced the job satisfaction. Leadership (0.11) also influenced the job satisfaction. When the results-centered management (–0.11) was strongly requested and the autonomy (–0.04) was restricted, the job satisfaction decreased.

Table 10. Influence of the research environment and the research production on the job satisfaction (researcher)

Job satisfaction

Variable	B	θ	t
Constant	1.43		6.51
Research environment			
Organization support	0.30**	0.32	6.17
Leadership	0.18**	0.11	2.91
Autonomy	–0.04*	–0.04	–3.01
Results-centered management	–0.11**	–0.09	–1.40
Research production			
Research paper number	0.03	0.01	0.47
SCI/SSCI/AHCI paper number	0.02	0.04	1.31

* $p < 0.05$, ** $p < 0.01$.

8. Policy discussion

8.1. Research environment: organizational support

In the analysis results, the organizational support showed a statistically significant influence on the job satisfaction of the professor and the researcher. The job satisfaction of the researcher was higher than that of the professor in relation to the administrative support, research cost, research equipment, and educational materials. The professor did not show a high job satisfaction level related to the research cost because he or she already had his or her own research funds. However, the researcher was very satisfied with his or her job in relation to the research cost due to the national R&D support. As for the research equipment and the educational materials, the professor acquired these through his or her own research funds, and the researcher, by using large research equipment and facilities. Therefore, the organizational support influences the job satisfaction of professors and researchers.

8.2. Research environment: leadership

Leaders must professionally respect professors and researchers. In the analysis results, the researcher was more satisfied than the professor with the leadership. The researcher highly valued participation in decision-making and communication because a national research institute is a public institution. An autonomy guarantee and an atmosphere of freedom are needed to increase the job satisfaction of the professor, and professional respect and horizontal relations are needed to increase the job satisfaction of the researcher.

8.3. Research environment: autonomy and results-centered management

In the analysis results, the satisfaction of the professor was higher than that of the researcher due to autonomy. Both the professor and the researcher have a heavy work load. The professor scored higher than the researcher for work freedom. The satisfaction of the researcher was higher than that of the professor for the pressure for results and the pressure for research funds. This is because the national research institute researcher performs main R&D projects through national R&D support, whereas the professor conducts his or her own research project. The satisfaction of the professor was higher than that of the researcher with respect to activity regulation. This means the professor was more satisfied than the researcher in his or her job due to his or her work freedom.

8.4. Research production

The research production of universities and national research institutes is the most important factor of our national science and technology and economic development. In the analysis results, the research production volumes of the professor and the researcher were significantly correlated to their job satisfaction. This is because the main work of the professor and the researcher is research results creation. This analysis showed that the research production effort and organizational management influence job satisfaction through their interaction.

9. Conclusions

This study analyzed the influence of the research environment and the research production on the job satisfaction of a university professor and a national research institute researcher. The most important factor of the competitiveness of Korea's national science and technology is the research results. Therefore, the responsibilities and missions of university professors and national research institute researchers are growing constantly. Satisfactory research activity support and a satisfactory research environment are very important for university professors and national research institute researchers. We analyzed the job satisfaction level of a university professor and a national research institute researcher in relation to their research environment and research production. In the results, the organization and the leadership influenced the job satisfaction level of the university professor and the researcher. Results-centered management had a lower correlation with the job satisfaction level of the university professor and the researcher. Also, the autonomy guarantee was related to the higher job satisfaction level of the university professor and the researcher. The relation of the research production was not statistically significant for the university professor and the researcher. The research limit of this paper focuses only on research environment and research production for the

job satisfaction level analysis. The limitation of this study is that it is not discussed the global infrastructure and it will be discussed in future research.

It is necessary to study for the research environment and the research production in more detail. In future research, we will consider various factors for the job satisfaction level analysis. This paper proposed an effective policy for the achievement of a satisfactory research environment based on the results of the analysis of the research environment and the research production. This study is significant that policy-making through analysis of the job satisfaction of a university professor and a national research institute researcher was performed.

Funding

The author received no direct funding for this research.

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Citation information

Cite this article as: The job satisfaction level analysis for the research environment and the research production, Donghun Yoon, *Cogent Business & Management* (2020), 7: 1818364.

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