A Study on the Research of Job Characteristics on Organizational Commitment, Resilience and Organizational Citizenship Behavior for Korean Government-funded Research Institutes in the Field of Science and Technology*

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Abstract

Purpose – Government-funded research institutes are important national institutions socially and nationally but academic studies on Korean government-funded research institutes are scarce, especially in areas of human resources and organization. This study investigated the effects of job characteristics on organizational commitment, resilience, and organizational citizenship behavior for organizational members of government-funded research institutes in the field of science and technology.

Research design, data, and methodology – Literature review on the effects of job characteristics on organizational commitment, resilience and organizational citizenship behavior for organizational members of government-funded research institutes in the field of science and technology. Based on the review, exploratory propositions were proposed to conduct future empirical study.

Result – In this study, based on the results of previous studies, it was presumed that job characteristics would affect organizational commitment, and organizational commitment would affect resilience and organizational citizenship behavior. In addition, proposition on the mediating role of resilience on both organizational commitment and organizational citizenship behavior was formulated.

Conclusion – It was propositioned that job characteristics would affect organizational commitment, and organizational commitment would affect resilience and organizational citizenship behavior. Resilience, along with the direct effect of organizational commitment on organizational citizenship behavior, would play a role in mediating organizational commitment and organizational citizenship behavior.

Keywords: Organizational Effectiveness, Job Satisfaction, Organizational Commitment, HRM Practice

JEL Classification Code: H80, H11. Z18.

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1. Introduction

Government-funded science and technology research institutes are institutions founded according to the Act on The Establishment, Operation and Fostering of Government-funded Science and Technology Research Institutes. They are defined as institutions that are funded by the government by law and their primary purpose is to conduct research in science and technology. Currently there are 25 institutes including 4 affiliated institutes. They are operated by the government funds and other earnings. List of Korea's government-funded institutes is presented in <Table 1>.

Table 1: Government-funded Science and Technology Research Institutes

List of Institutions	

1. Korea Institute of Science and Technology
  - (affiliated) Green Technology Center
2. Korea Basic Science Institute
3. Korea Astronomy and Space Science Institute
4. Korea Research Institute of Bioscience and Biotechnology
5. Korea Institute of Science and Technology Information
6. Korea Institute of Oriental Medicine
7. Korea Institute of Industrial Technology
8. Electronics and Telecommunications Research Institute
  - (affiliated) National Security Research Institute
9. Korea Institute of Civil Engineering and Building Technology
10. Korea Railroad Research Institute
	11. Korea Research Institute of Standards and Science
	12. Korea Food Research Institute
	  - (affiliated) World Institute of Kimchi
	13. Korea Institute of Geoscience and Mineral Resources
	14. Korea Institute of Machinery and Materials
	15. Korea Aerospace Research Institute
	16. Korea Institute of Energy Research
	17. Korea Electrotechnology Research Institute
	18. Korea Research Institute of Chemical Technology
	  - (affiliated) Korea Institute of Toxicology
	19. Korea Atomic Energy Research Institute
	20. Korea Institute of Materials Science
	21. Korea Institute of Fusion Energy

Source: Summarized and edited from Act on the Establishment, Operation and Fostering of Government-funded Science and Technology Research Institutes (Act number 17672, partially amended on December 22, 2020).

The budget and manpower of government-funded research institutes comprise a large portion of national R&D. Total budget of 25 institutes doubled from 2.2 trillion Korean won in 2005 to about 5 trillion Korean won in 2021. Although it varies from institution to institution but on average an institution operates with a budget of which 40% comes from government funds and 60% from revenues. The number of permanent employees rose from about 9,200 in 2005 to about 15,000 in 2020. Research personnel comprise 77% of total manpower and support personnel 23% (Roundtable Discussion at the Korean Academy of Science and Technology, April 15, 2021).

Korea's government-funded research institutes differentiated and evolved according to their research specialization from Korea Institute of Science and Technology (KIST) which was founded in 1960s. Government-funded research institutes played a large role in national economic development by introducing advanced technology and developing import-substitution technology. Currently, institutions are transforming from developed country catch-up technology development to leading technology development and are undergoing discussions on vision and role of institutes in the light of transition to the 4th industrial revolution, climate change and increase in technology development needs in solving social and environment problems, and increase in research capacity of private institutes and universities. Evolution of Korea's government-funded research institutes is shown in <Figure. 1>.

R&D in science and technology is a necessary and key condition for national economic development, creation of future industry and science and technology is becoming of greater importance and is inseparable when we mention the world in the future. Importance of government-funded research institutes and the outcomes created by them are becoming more important as well as need for a study on government-funded institutes. Unlike other institutions, government-funded research institutes are unique in a way that have high ratio of personnel with master's and doctoral degrees and where autonomy and creativity in their researches are stressed. In addition to studies that put thesis, patent and royalty of government-funded research institutes as dependent variables, a study that can improve performance of institutes through study on human resources and organizational characteristics is needed.

Government-funded research institutes are important national institutions socially and nationally but academic studies on government-funded research institutes are scarce, especially in areas of human resources and organization. Therefore, in this study literature review was conducted on the effects of job characteristics on organizational commitment, resilience and organizational citizenship behavior for organizational members of government-funded science and technology research institutes. Based on the review, propositions were proposed to conduct future empirical study.

Era	Duty/Role	Major Results
Foundation and growth (1960s~1970s)	▪ Industrial technology foundation ▪ Direct support of industries ▪ Introduction and application of advanced technology	▪ Hosting Korean scientist residing abroad ▪ Localization of color TV receiver (1973) ▪ Localization of polyester film (1973)
Coordinated integration and development (1980s~late 1990s)	▪ Leading role in national R&D projects ▪ Acquisition of high-risk growth technology ▪ leading role in joint industry, academy and research institutes	▪ DRAM(4M~16M) (1986~1993) ▪ Localization of nuclear fuel for heavy water reactor ▪ Commercialization of CDMA (1989~1996)
Introduction of research council [3 councils] (1999~2007)	▪ Leading role in national R&D projects ▪ Future proprietary technology development	▪ Korean high speed train (2003) ▪ Commercialization of LPG engine (2004) ▪ DMB, WiBro (2004)
Research council transitional period [2 councils] (2008~2013)	▪ Securement of leading technology competitiveness (Fast Follower → First Mover) ▪ SMEs and middle market enterprise support	▪ Magnetic levitation train (2008) ▪ Utilization of hyperthermophilic archaea ▪ Biohydrogen production technology (2010)
Research council growth period [1 council] (2014~present)	▪ Securement of leading technology competitiveness ▪ National and social problem solving ▪ Demand responsive R&D	▪ Export of SMART nuclear reactor technology to Saudi Arabia (2015) ▪ Development of millimeter waves 5G mobile communication technology (2016) ▪ Development of perovskite solar cell technology (2019)

Source: Lim (2021)

Figure 1: Duty, role and major results of government-funded science and technology research institutes

2. Literature Review

2.1. Precedent Studies on Job Characteristics

The concept of job characteristics refers to significance and outcome of a job that a worker feels while executing the job (Hackman & Oldham, 1976; Chiu & Chen, 2005; Daly & Dee, 2006). Study on job characteristics first started when Turner and Lawrence (1965) first identified that workers gets satisfaction from job characteristics which are measurable and thus affects performance. They classified job characteristics into 6 dimensions of variety, autonomy, essential interaction, selective interaction, responsibility, and essential knowledge and skills. Hackman and Lawler (1971) later showed that job characteristics affects employees and employee behavior affects job performance thus showing there are correlation between job characteristics and employees.

Hackman and Oldham (1975, 1976, 1980) defined job characteristics into 5 dimensions of skill variety, task identity, task significance, autonomy and feedback. Skill variety refers to the degree to which a job requires a variety of skills and talents of a person. Task identity refers to the degree to which the job requires completion of a whole work. Task significance refers to the degree to which the job has a significant impact on other people, colleague, organization and customers. Autonomy refers to the degree to which the job provides freedom, independence and discretion to the individual in scheduling the work and in determining the procedure. Job feedback refers to the degree to which carrying out the work activities provides the individual with information about the performance.

These concepts are used by numerous scholars in their studies on job characteristics (Lee & Park, 2018; Kim & Choi, 2016). Fried and Ferries (1986) showed that skill variety, feedback, autonomy and task significance are factors influencing organizational commitment and thus emphasized the importance of job design in order to improve organizational performance.

Other precedent studies showed job characteristics affect organizational performance with worker psychological state as a mediator. According to Fried and Ferris (1986), Lee (1997) and Shin (2004), when a worker utilizes various talents and capabilities when carrying out the work activities, internal motivation and satisfaction increases and commits to the job. When a worker thinks his work affects others, then the worker gets pride in his job and commits to the job with greater significance.

When a worker has the autonomy from job planning to completion process then the worker feels responsibility and pride in his work and such emotion gives positive significance on the organization and commitment. Information feedback on the job performance creates atmosphere of earnest job execution and devotion to the job which lead to higher degree of organizational commitment.

In the 2000s, Hackman and Oldham's job characteristic model was criticized for its limitations in reflecting fast changing complex job environment. In order to overcome its shortcomings, studies reflecting changes in social environment emerged such as the study by Cordery and Parker (2007). Morgeson and Humphrey (2006), in particular, asserted a work design that reflects social relationship of job characteristics. They categorized job characteristics into task characteristics, social characteristics and contextual characteristics. Task characteristics were further classified into autonomy, task variety, task significance, task identity and feedback from job. Knowledge characteristics were job complexity, information processing, skill variety, specialization and problem solving. Social characteristics were social support, interdependence, feedback from others and interaction outside the organization. Contextual characteristics were ergonomics, physical demands, work condition and equipment use.

2.2. Precedent Studies on Organizational Commitment

Organizational commitment refers to the relative level of connection or bond employees have with their organization. It is a notion more than a simple affection or sense of belonging employees have with their organization (Allen & Meyer, 1990).

Along with job satisfaction organizational commitment is a variable that measures organizational performance (organizational effectiveness) and is used by many researchers. Dalton, Todor, Spendolini, Fielding, and Porter (1980) categorized organizational performance into economic performance of profitability, turnover and growth rate, and psychological performance of organizational commitment and job satisfaction. Organizational commitment has positive attributes to an organization that improve organizational performance, lead to lower absenteeism and provide satisfying opportunities to organization members (Natarajan, 2011; Payne & Huffman, 2005).

Organizational commitment has been actively studied by numerous researchers since 1950s. Prior to 1980s it was used as a one-dimensional concept but since the work by Meyer and Allen (1980), it evolved into multidimensional concept. As a one-dimensional study, Becker (1960) explained organizational commitment as calculated approach when organizational members will not leave the organization when supplementary benefits such as retirement pension, vacation and sabbatical is given as a result of certain behaviors by organization members. Porter, Steers, Mowday, and Boulian (1974) approached organizational commitment as psychological affection concept and defined it as the relative level of employees identifying themselves with the organization.

As one of the multidimensional studies since 1980s, O'Reilly and Chatman (1986) studied organizational commitment through 3 factors of compliance, identification and internalization. Meyer and Allen (1987) presented affective commitment, normative commitment and continuance commitment as 3 factors of organizational commitment and are perceived to be the most representative concept in organizational commitment study (Yang & Lee, 2018; Yang, Kim, & Kim, 2013; Wolowska, 2014).

In their study, Allen and Meyer (1990) defined 3 components of organizational commitment. The affective commitment refers to employee's emotional attachment to, identification with, and involvement in the organization. The normative commitment refers to employee's feelings of obligation to remain with the organization and the continuance commitment refers to commitment based on the costs that associate with leaving the organization.

The concept of affective commitment, normative commitment and continuance commitment has been tested for validity and goodness of fit by numerous researchers (Allen & Meyer, 1996; Dunham, Grube, & Castaneda, 1994). In addition, affective commitment, normative commitment and continuance commitment are influenced by various factors such as personal characteristics, job characteristics, job experience and fairness. These 3 components reduce various negative factors that include intent of leave and absenteeism and increase loyalty and satisfaction towards organization (Lee & Park, 2018).

2.3. Precedent Studies on Resilience

The concept of resilience is defined in various ways by numerous scholars. Richardson (2002) defined resilience as human ability to recover from hardship. Seville, Brunsdon, Dantas, Le Masurier, Wilkinson, and Vargo (2008) defined it as organizational ability to survive from the crisis and then prosper. Academic study on resilience first started in 1961 by an American psychologist Norman Garmezy (Yang & Lee, 2018). After his work, resilience is defined and studied in various academic fields such as engineering, psychology, ecology and organizational behavior (Go & Ahn, 2016; Bhamra, Dani, & Burnard, 2011).

Over the past 20 years studies on resilience were mainly related to job performance. Many research topics on resilience were job attitude, turnover intent, mental health, subjective well-being and burnouts (Hui, Yang, Lu, Jianbing, Jizhu, & Juzhe, 2019). These studies established researches on resilience that prevent negative job performance and promote positive job performance. Recent studies focus on organizational commitment and burnouts (Youssef & Luthans, 2007), and mental health of organization members (Maslach, Schaufeli, & Leiter, 2001).

Individuals who comprise an organization improve their performance and have higher satisfaction when they are under adequate work and stress (Baek, 2018). However, when an individual is under continuous heavy stress, then physical and mental problems occur that lead to decrease in job satisfaction, increase in turnover intent (Robbins & Judge, 2011). Therefore, it is imperative that stress management is needed to improve organizational performance.

Due to diversity in personalities, needs, stressful situation and the intensity of stress, stress management is not easy but it is important to quickly recover from stress factors (Sonnentag & Zijlstra, 2006). A person with high resilience recovers from stressful situation more quickly through positive mindset (Tugade, Fredrickson, & Feldman, 2004) but a person with low resilience cannot recover quickly because of low stress coping ability (Gillespie, Chaboyer, Wallis, & Grimbeek, 2007). From organizational aspect, an organization comprised of personnel with high resilience will produce good outcome and enable sustainable growth even under adverse internal and external environment (Gulati, 2010).

2.4. Precedent Studies on Organizational Citizenship Behavior

Organizational citizenship behavior is an employee's discretionary and voluntary commitment within an organization that is conducted without any expectation of official compensation (Organ, 1988). Such concept was introduced by Bateman and Organ (1983) and numerous studies were conducted in the field of industrial organization, psychology, human resources management for the past 30 years (Becker & Vance, 1993; Organ, 1994; Podsakoff, Whiting, Podsakoff, & Blume, 2009).

Organizational citizenship behavior is expected to play an important role in improving organizational performance considering rapidly changing technology and business environment in the 4th industrial revolution. Voluntary commitment and dedication to an organization will enable an organization to gain preemptive advantage compared to other organization under same circumstances. In addition, it will play a role in increasing organization activity and forming trust among members by improving inefficient factors, supplementing formal management system (Jeong, Kim, & Sun, 2019).

Organizational citizenship behavior is comprised of various lower level dimensions (Coleman & Borman, 2000; Podsakoff, Mackenzie, Paine, & Bachrach, 2000). Smith, Organ, and Near (1983) categorized organizational citizenship behavior into altruism and generalized compliance. Altruism refers to acts of kind deeds without any expectation of compensation or acknowledgement. Generalized compliance refers to acts of assisting someone within an organization. Organ (1988) proposed 5 dimensions of altruism, courtesy, conscientiousness, civic virtue and sportsmanship.

Organ (1988)'s 5 dimensions are currently used as a major concept in the studies on organizational citizenship behavior. First, altruism refers to acts of helping co-workers without any expectation of compensation. For example, acts of helping new employee or filling in for an absent employee. Courtesy refers to gestures preventing problems for work associates. Prior discussion of work with associates and not interfering in other's work are such examples of courtesy. Conscientiousness refers to doing additional work that is not assigned. Civic virtue refers to voluntarily acting as an example and following rules and regulations. Lastly, sportsmanship refers to acts of refraining from criticizing the organization or the boss and accepting policy and decisions. It is a willingness to forbear inconveniences without appeal or protest.

Williams and Anderson (1991) classified organizational citizenship behavior into organizational citizenship behavior-individual (OCBI; OCB individual) and organizational citizenship behavior-organization (OCBO; OCB organization). OCBI refers to acts that are directly helpful to a specific individual while indirectly helpful to the organization. OCBO refers to acts that are beneficial to the organization. LePine, Erez, and Johnson (2002) classified Organ's dimension of altruism and courtesy as concept of OCBI and dimensions of conscientiousness, civic virtue and sportsmanship as concept of OCBO.

3. Generation of Future Research Propositions

In terms of relationship between job characteristics and organizational commitment, Hackman and Oldham (1980) stated that employee's psychological state on 5 job characteristics affects job satisfaction and performance. In addition, Fried and Ferris (1986) stated that skill variety, feedback, autonomy and task significance affect organizational commitment. Recent study by Saud (2020) on Nepalese IT workers showed that autonomy, task identity, task significance and feedback exert positive (+) influence on organizational commitment. Khaldoun and Rick (2019)'s study on university faculty in Arab Emirates showed that autonomy and skill variety exert positive (+) influence and role ambiguity exerts negative (-) influence on organizational commitment. In Kang and Liu (2018)'s study on sports department faculty at universities in China's Jiangsu and Zhejiang Provinces showed that autonomy, skill variety, task identity, task significance and feedback exert positive (+) influence on organizational commitment. In a study by Miedaner, Kuntz, Enke, Roth, and Nitzsche (2018) and Spanuth and Wald (2017) on doctors and nurses in Germany's intensive care center and on project managers in Austria's temporary organization showed that autonomy in decision making and autonomy, respectively, had positive (+) influence on organizational commitment. As for Korean studies on this topic, a study by Lee (1997) showed that autonomy, skill variety and task significance had positive (+) effect on organizational commitment. Ji and Chang (2012)'s study on intellectual worker showed that autonomy and feedback had positive (+) effect of organizational commitment. Lee and Park (2018)'s study on research staff at government-funded research institutes showed that autonomy and feedback had positive (+) effect on organizational commitment. Job characteristics exerted positive (+) influence on organizational commitment in other various studies.

These precedent study results show that Hackman and Oldham (1980)'s 5 job characteristics had positive (+) influence on organizational commitment in conjunction with differences in organization and causal relationship with other variables. Overall, skill variety, task significance, autonomy and feedback showed significant positive (+) relationship in a vast number of cases but the frequency for task identity showed less instances. However, in this study, all 5 characteristics of initial Hackman and Oldham (1980)'s research model was presumed to have influence on organizational commitment. This presumption was made due to lack of studies on government-funded research institutes. It was deemed important to identify and understand what the members of government-funded research institutes had in mind towards their jobs. Job characteristics also play a role in motivation and identifying effect of specific factors of job characteristics on performance variables such as motivation and organization commitment will be important in human resource and organization management at government-funded research institutes.

In particular government-funded research institutes are institutions that conduct R&D and autonomy is an important factor in developing creative technology. If autonomy is high then job satisfaction will be higher which will affect organizational commitment. In today's era of the 4th industrial revolution and convergent technology, skill variety will be an important factor in development of convergent technology. If skill variety is high then receiving project order will be easier which will then lead to job satisfaction and higher commitment to the organization. Sense of duty when working in a national institution for national economic development along with acknowledging importance of their duties and feedback to feel pride in the performance will be a factor in committing to an organization. Flexible task execution by identifying entirety of project task will lead to higher satisfaction and consequently higher level of organizational commitment. Therefore, based on precedent study results and need for further research, following propositions are generated on the relationship between job characteristics and organizational commitment.

Proposition 1: Job characteristics will have positive (+) relationship with organizational commitment.

 Proposition 1-1: Skill variety will have positive (+) relationship with organizational commitment.
 Proposition 1-2: Task identity will have positive (+) relationship with organizational commitment.
 Proposition 1-3: Task significance will have positive (+) relationship with organizational commitment.

Proposition 1-4: Autonomy will have positive (+) relationship with organizational commitment.
Proposition 1-5: Feedback will have positive (+) relationship with organizational commitment.

Following are results of precedent study results on the relationship between organizational commitment and organizational citizenship behavior and resilience. In order to actively counter rapidly changing business environment and to overcome periodic shocks and stress, studies on organizational citizenship behavior and resilience and their relationship with organizational commitment are conducted internationally and domestically.

Studies by Youssef and Luthans (2007), Hui, Yang, Lu, Jianbing, Jizhu, and Juzhe (2019) and Paul, Budhwar, and Bamel (2019) showed that there is a positive (+) relationship between organizational commitment and resilience. Deniz and Murat (2018) in their study on teachers showed that there is a strong positive (+) relationship between organizational commitment and resilience. Results of these studies are in line with other precedent studies (Larson & Luthans, 2006). As for Korean studies, Park and Kang (2019)'s study on dental hygienist showed that there is a positive (+) relationship and influence between organizational commitment and resilience. On the other hand, Baek (2015), Park and Byun (2015), Oh and Suh (2015) claimed that resilience had positive (+) effect on organizational commitment.

Overall, precedent study results show that organizational commitment has influence or positive (+) relationship with resilience. In numerous studies, it was shown that resilience has positive (+) effect on organizational commitment. It this study, it was presumed that organizational commitment has positive (+) effect on resilience. Level of will to recover among members of government-funded research institutes will vary from person to person but organizational commitment will strengthen ability and will to recover for the organization under stress and hardship. Members of government-funded research institutes are specialist group with strong affection and pride to the organization. They are highly educated group with at least master's degree and have already had experience in being under external stress and overcoming them when earning their degrees, project contract and work execution. They were deemed to have higher level of organizational commitment and resilience. Unlike other studies, this study sought to identify effect of organizational commitment on organizational citizenship behavior and also the mediating effect of resilience to show the effect of organizational commitment on resilience. Based on such research purpose and logic following proposition on employees of government-funded research institutes is generated.

Proposition 2: Organizational commitment will have positive (+) relationship with resilience.

In regards to the relationship between organizational commitment and organizational citizenship behavior, most precedent studies focus on antecedent factors of organizational citizenship behavior (Moon & Kim, 2006). Most study results showed that positive variables such as organizational commitment has positive (+) effect on organizational citizenship behavior and negative variables such as cynicism has negative (-) effect. As for organizational commitment, it had direct effect on organizational citizenship behavior and was frequently used as a mediating effect.

Review of numerous study results on the relationship between organizational commitment and organizational citizenship behavior showed that organizational commitment exerts very positive (+) effect on organizational citizenship behavior (Yoon & Bae, 2017) and the results correspond with many foreign and domestic studies (Wiener, 1982; O'Reilly & Chatman, 1986; Tansky, 1993; Meyer, Stanley, Herscovitch, & Topolnytsky, 2002; Lee, 2011; Kim & Kim, 2013; Lee & You, 2015). Han, Hwang, and Lee (2019)'s study on sports center managers showed that organization commitment has positive (+) effect on organizational citizenship behavior. A recent foreign study by Khaldoun and Rick (2019) on university faculty in Arab Emirates showed that organizational commitment has positive (+) influence on organizational citizenship behavior (altruism and citizenship). Wombacher and Felfe (2017)'s study on German military showed that commitment to whole organization and low-level team organization all have positive (+) effect on OCBI and OCBO. Tharikh, Ying, Mohamed Saad, and Sukumaran (2016)'s study on Malaysian secondary school teachers showed that organizational commitment and job satisfaction have positive (+) effect on organizational citizenship behavior. Devece, Palacios-Marques, and Alguacil (2016)'s study on Spanish middle management during economic downturn showed that 3 dimensions of organizational commitment, affective commitment, normative commitment and continuance commitment (high sacrifice, low alternative) have positive (+) effect on organizational citizenship behavior.

To summarize above precedent studies, organizational commitment had positive (+) effect on organizational citizenship behavior even in roles other than roles associated with official compensation. Commitment to an organization leads a member to conduct unofficial voluntary behavior such as to be considerate to others, prevent work associates to be in trouble, act more than the organization asked for, follow rules and regulations and refrain from criticizing the organization. In this study, as was in precedent study results, it was presumed that organizational

commitment by members of government-funded research institutes will have an effect on organizational citizenship behavior. As mentioned in the discussion on generation of proposition 2, members of government-funded research institutes are specialist group with strong affection and pride to the organization. Their projects are often conducted on a team level. In order to successfully conduct team projects and team assignments, behaviors associated with official compensation is not enough and coordination via unofficial behaviors is needed to solve various problems. It is presumed that the reason government-funded research institutes produced diverse output was due to unofficial voluntary behavior. Therefore, following proposition can be presented based on precedent study results and logic.

Proposition 3: Organizational commitment will have positive (+) relationship with organizational citizenship behavior

In regards to the relationship between resilience and organizational citizenship behavior, there are active studies conducted on these two variables internationally. Advent of the 4th industrial revolution, worldwide social and cultural change calls for ability to recover from hardship and stress and also voluntary behavior are deemed as an important organizational factor in terms of an organization.

Paul, Bamel, and Garg (2016), Paul, Bamel, Ashta, and Stokes (2019)'s study on Indian manufacturing workers showed that there is a positive (+) relationship between resilience and organizational citizenship behavior and also organizational commitment having mediating role between resilience and organizational citizenship behavior. As for Korean studies, Kim and Byun (2019)'s study on 5-star hotel workers showed that resilience exerts positive (+) influence on organizational citizenship behavior. Ha, Lee, Gong, Lee, and Lee (2017)'s study on central ministry civil servants showed that resilience has positive (+) effect on organizational citizenship behavior.

In this study, causal relationship in proposition 2 and precedent study results were taken into account and along with the effect of organizational commitment on organizational citizenship behavior as prescribed in proposition 3, it was presumed that resilience will have mediating role between organizational commitment and organizational citizenship behavior. Affective commitment will act as an engine to quickly recover from negative situation or changes in circumstances. Based on such presumption following proposition 4 is presented. Precedent studies on effect of organizational commitment on resilience are lacking except for the study by Park and Kang (2019). Studies testing resilience's mediating role on organizational commitment and organizational citizenship behavior are scarce thus study on mediating role of resilience will be academically meaningful.

Proposition 4: Resilience will mediate the relationship between organizational commitment and organizational citizenship behavior.

4. Conclusion

Government-funded research institutes are very important national institutions socially and nationally but academic studies on human resources and organization of these institutes, in particular, are scarce. In this study literature study on the effects of job characteristics on organizational commitment, resilience and organizational citizenship behavior of members of government-funded science and technology research institutes was conducted. Based on prior study results, it was presumed that job characteristics will affect organizational commitment, and organizational commitment will affect resilience and organizational citizenship behavior. In addition, proposition on the mediating role of resilience on both organizational commitment and organizational citizenship behavior was formulated. After taking these into account, this study presents various propositions and derives implications for future study.

This study can present following implications. First, studies on members of government-funded research institutes, at human resources and organization level in particular, were lacking and thus this study underlines the need to conduct such research. Second, this study applies job characteristics, organizational commitment and organizational citizenship behavior variables that were continuously studied in other disciplines, on members of government-funded research institutes and presents integrated research propositions.

Limitations and future research directions are as follows. First, this study was conducted at human resources and organization level to improve performance of government-funded research institutes but integrated model on causal relationship between related variables is needed. In particular, organizational commitment, resilience and

organizational citizenship behavior variables are important factors on organizational performance. Therefore, additional study on each variable is needed since in-depth study on variables on government-funded research institutes are lacking. Follow-up study on effect of quantitative factors such as size of research funds and manpower inputs on organizational performance is also desired. It would be interesting to test mediating effect of not just resilience but also organizational commitment. Second, variables for organizational citizenship behavior were integrated as one variable in this study but further studies on lower dimensions of organizational commitment and organizational citizenship behavior in government-funded research institutes are called for.

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