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The Intensity of Organizational Change and the Perception of Organizational Innovativeness; with Discussion on Open Innovation

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Abstract: Each individual member of an organization must recognize and lead innovation, which can be affected by human resource development (HRD) investments and organizational changes. In this study, we aimed to verify how HRD investment at the individual level relates to employee perceptions of organizational innovativeness and to examine how the intensity of organizational change, a situational factor at the organizational level, affects the relationship between HRD investment and employee perceptions of organizational innovativeness through multilevel analysis using hierarchical linear models. We performed an analysis based on the responses from 5184 workers and 125 companies where corporate-level and personal-level data were matched in a Human Capital Corporate Panel (HCCP) survey. HRD investment by employees was shown to increase the perception of organizational innovativeness. The results demonstrated that the intensity of organizational change moderated the relationship between HRD investment and the perception of organizational innovativeness. However, the stronger the organizational change intensity, the weaker the positive effect of HRD investment on the perception of organizational innovativeness. Finally, we presented theoretical and practical implications and further research tasks related to the HRD of corporations and open innovation.

Keywords: human resource development (HRD); organizational innovativeness; organizational change; open innovation; hierarchical linear model; multilevel analysis

1. Background

The competitiveness of human resources affects corporate performance and becomes a sustainable competitive advantage. From a resource-based view, knowledge and experience of human resources are scarce and can create a competitive advantage as it is difficult for other companies to emulate [1]. The development of human resources, which are intangible resources, means bringing positive changes to knowledge, skills, and abilities through training and development of the members of the organization [2].

However, although there is a theoretical consensus in the relationship between human resource development (HRD) investment and corporate performance, there is still a lack of empirical analysis. In particular, there is still skepticism regarding whether training and development conducted at corporate sites induce changes in employee behaviors and attitudes or directly affect corporate performance [3]. Innovation, which can be seen as a measure of a corporate performance, is an activity that performs tasks and solves problems with new ideas or methods, and is an important factor for strengthening competitiveness, not only in terms of technological innovation, but also in various forms throughout the corporation, such as process innovation and management innovation. Until now, innovation studies have focused on innovation behavior [4], innovation performance [5], and

technological innovation [6]; however, there is a lack of research on perceived innovativeness by individuals in the organization. In this study, we attempted to verify the role of HRD as an influence on the perception of innovation, considering that organizational change and innovation will only succeed if each member recognizes and leads innovation [7].

Corporate environments are not only evolving faster and becoming more complex but are also pursuing organizational changes in terms of corporate innovation, as it is difficult to maintain corporate competitiveness due to various factors, such as shortening product life due to rapid technological changes, intensifying competition among other companies, and unpredictable market demand [8]. Organizational change can be seen as a series of processes that enhances the effectiveness of the organization by changing its internal behavior patterns and organizational adaptability in a different way to move the organization to an improved state [9,10]. Whereas, contrary to intention, these changes may not show a high success rate due to a lack of understanding from employees regarding change and resistance to anxiety [8,11,12]. As organizational changes can affect corporate performance, it is very meaningful to investigate whether the level of perception of employees' organizational innovativeness through training and development is affected by organizational change as an environmental factor.

Through a multilevel analysis using hierarchical linear models, we investigated, first, how HRD investment at the individual level related to employee perceptions of organizational innovativeness and, second, how the intensity of organizational change, a situational factor at the organizational level, affected the relationship between HRD investment and employee perceptions of organizational innovativeness.

2. Literature Review and Hypothesis Development

2.1. HRD Investment and the Perception of Organizational Innovativeness

The training and development that we address in this study are the knowledge acquisition processes necessary for job requirements, encompassing the concepts of education, training, and development [13]. Corporate investment in the training and development of employees will change the attitude of its members, indirectly affecting organizational performance [14].

Looking at the consequences of employee attitudes based on HRD investment, it appears that education and training in high-performance work systems not only increases job satisfaction directly through capability building for high-performance and high-commitment practices but also has a positive impact on employees' attitudes as employees recognize it as a kind of support and compensation provided by the organization [15]. In addition, education, training, and development for employees were presented as forming a positive attitude and reducing turnover [16,17]. Therefore, because training and development for employees is perceived as support and compensation from corporations, if the investment in HRD is perceived to be high, the overall attitude toward the organization, such as job satisfaction and organizational commitment, should be positive.

The following literature reviews support that HRD has a positive impact on the perception of organizational innovativeness. Innovation can be defined as the intentional change activity of an organization seeking new things [18], which is largely regarded as a learning performance [19,20]. Learning orientation, which represents the members' hopes and will for learning, is a factor that affects organizational innovation perception [21], and, if learning within an organization is activated, it will have a positive effect on the promotion of organizational innovation as knowledge sharing is promoted [22]. In other words, the characteristics of innovation are inherent in the organization's learning process, and innovation occurs in the process of acquiring knowledge and skills through training and development, which is an organizational learning process [23]. Thus, the more an organization invests in education and training, the more its employees participate in knowledge acquisition activities, which will have a positive impact on the perception of innovativeness in the organization to which it belongs. Based on a prior study, the hypothesis was set that the

HRD investment in an employee would affect the employee's attitude toward the organization and, particularly, their perception of the organization's innovativeness.

Hypothesis 1 (H1). *An employee's HRD investment has a positive effect on their perception of organizational innovativeness.*

2.2. Organizational Change

Organizations must achieve internal fit while responding to their external environments and their elements of structure and process. In recent years, factors that caused organizational change include aging populations, increasing cultural diversity, changing labor forces, developing technology, economic shocks, social change, and world politics [24]. Due to the various changes in the environment, corporations plan to design changes so that they can adapt to organizational improvements and changes in the external environment. Companies must prepare for changes due to external factors, such as changes in government regulations, platforms, the introduction of new technologies, the development of information technology, and changes in products and services. These changes have become essential for survival [25]. In particular, in order to respond to changes resulting from the Fourth Industrial Revolution, organizations should consider adopting and supporting new technologies to enhance technological prowess and implementing HRD strategies to make the organization more creative and resilient [26].

Through a meta-analysis, Damanpour [7] divided the innovation and change of an organization into dimensions and types of innovation (administrative and technical, product and process, and radical and incremental) and stages of adoption (initiation or implementation). Cherrington [26] divided the types of change into development, transitional, and transformational changes according to the degree of complexity and the potential of resistance to change. Development change refers to incremental changes in technology, methods, and processes, and transformative change means incremental change in which the organization moves to a new form, bringing new processes, activities, products, and organizational structure. Transformational change refers to radical changes in organizational duties, culture, products, leadership, etc., and this change occurs mainly in stagnant corporations. Schumacher et al. [27] indicated that organizational change means changes in the various factors that make up the essence of the organization, and presented factors, such as the purpose and goals of the organization, strategy, task, skill, employees, structure, etc., as subjects of change. Weick and Quinn [28] raised the issue of emphasizing only planned and efficient persistence for organizational change, focusing on the changing process rather than the change itself, because the trajectory of organizational change is more often seen as a spiral or open-ended than a linear. Tsoukas and Chia [29] argued that organizations must focus on what they need to do to achieve change, and they explained that change is a unique area of human behavior, and that organization is a place that continuously evolves human behavior.

These organizational changes become an important driver of open innovation. Yun et al. [30] explained that changes in organizational culture make for game-changing innovation and that open innovative culture is formed through interactions between entrepreneurship, intrapreneurship, and organizational intrapreneurship. Chiaroni et al. [31] also demonstrated to Italian firms that changes in organizational structure trigger open innovation. These results support the argument that organizational change can reduce the reluctance of companies to engage in R&D with external organizations and encourage them to contribute positively to new innovation activities.

We would like to suggest relevant theories in detail as these organizational changes that affect open innovation can be performed in various ways and these affect the jobs and attitudes of employees.

2.2.1. Commitment and Resistance to Organizational Change

Studies focused on the attitudes of employees during the study of organizational change have two main trends: commitment and resistance to organizational change. First, the commitment to

organizational change is based on the concept of organizational commitment. The difference between organizational commitment and commitment to organizational change is that the focus is not on a wide range of organizations, but on a specific process of change [32]. Based on the concept of organizational commitment, Herscovitch and Meyer [33] first presented the concept of commitment to organizational change and described commitment as affective, continuing, and normative. Among these three commitments to change, affective commitment to change can be seen as an active attitude due to internal stimulation, such as the attachment of the organization, and continuing and normative commitment to change can be seen as a passive attitude due to external pressures, such as opportunity costs or obligation.

Piderit [34] described the resistance to organizational change as a response of employees to suppress changes in order to maintain the current state of change pursued by the organization. Reasons for resisting change include uncertainty and fear of the situation after the change, concerns over the loss of the rights of vested interests, burdens from acquiring new technologies, basic personal customs, and desires for stability.

Oreg [35] divided resistance to organizational change into three components: affective, cognitive, and behavioral change resistance. First, affective change resistance relates to how an individual feels about a change, that is, feeling angry or anxious about a change. Affective change resistance is an affective response to work and is closely related to job satisfaction [12,35]. Second, cognitive change resistance represents what an individual thinks regarding whether change is necessary or beneficial. In other words, cognitive change resistance indicates a subjective evaluation of how beneficial the results of a change will be to an individual or an organization, which has important implications of an individual's attitude to an organization [12,35]. Third, behavioral change resistance includes responding to or intentionally complaining about changes, informing people that the changes are wrong, or responding directly and specifically, such as turnover [12]. Each of these three components has distinct characteristics, but they are not completely independent of each other, and employees' ideas regarding change may be the same in their intentions and actions [35].

2.2.2. Moderating Effect on Perception of Organizational Innovativeness: Job Demands-Resources Model

In this study, we utilized the JD-R (Job Demands-Resources) model as a useful theoretical framework to explain how employees' attitudes are affected by the work characteristics caused by organizational changes [36]. The Job Demands refer to the physical and social aspects of the job that require maintaining physical, social, and organizational effort, and have been mainly studied for workload, role ambiguity, role conflict, and time pressure required to complete the task [37]. Job Resources include the physical, social, and organizational aspects that reduce job demands related to the physiological and psychological costs, assist in achieving job goals, or stimulate individual growth, learning, and development [37]. Research has proposed that excessive job demands cause job stress as they require a great deal of energy and effort to meet job demands, while job resources refer to job-related physical, mental, psychological, social, and organizational support that reduces job demands [38].

The JD-R model explains two different underlying psychological processes that play a role in the development of job strain and motivation [38]. In the first, health impairment processes, poorly designed jobs, or chronic job demands exhaust employees' mental and physical resources and may therefore lead to the depletion of energy and to health problems. The second process proposed by the JD-R model is motivational in nature, whereby it is assumed that job resources have motivational potential and lead to high work engagement, low cynicism, and excellent performance.

The reason why the JD-R model attracts attention is its flexibility. This model does not specify the components of job demands and job resources. The main proposition of the JD-R model is that all job characteristics can fall into two categories, called job demands and job resources [39]. This is because there are differences in what employees require or how they support them, depending on the nature of

the job or the nature of the organization. We argue that the JD-R model is also applicable to variables in this study in a comprehensive range based on prior studies.

Organizational change involves learning new skills, work styles, and cultures, which can increase the job demands of employees [40]. HRD programs serve as job resources in terms of promoting skill diversification, growth, and learning, which can be a factor that can buffer the negative effects of job demands. An HRD program, implemented by an entity for the purpose of accumulating human capital and improving performance, is a systematic and structured program to improve the knowledge, skills, and attitudes required for the job performance [41]. As the environment becomes more dynamic, more complex, and more competitive, there will be many differences in the level or scope of jobs required by individuals. However, the HRD programs offered by organizations are limited in quantity or opportunity, and conceptual and structured knowledge or skills may not be able to respond quickly to essential changes in the business environment, work processes, or jobs [42].

In this situation, the role of the HRD program should be able to provide the capabilities required for individuals to perform their jobs in a timely and effective method. In particular, if organizational changes are affected by changes in the external environment, the HRD programs should be able to fit the content and intensity of organizational changes [43]. Ultimately, only the HRD programs that reflect the intensity of organizational change can serve as job resources, and if the content and level of the HRD programs do not fit the intensity and speed of organizational change, they may have a negative impact on the perception of organizational innovation. Based on the discussion above, we established the following hypothesis:

Hypothesis 2 (H2). *The intensity of organizational change moderates the relationship between employee HRD investments and perceptions of organizational innovativeness.*

We presented a research model that reflects H1 and H2 as shown in Figure 1.

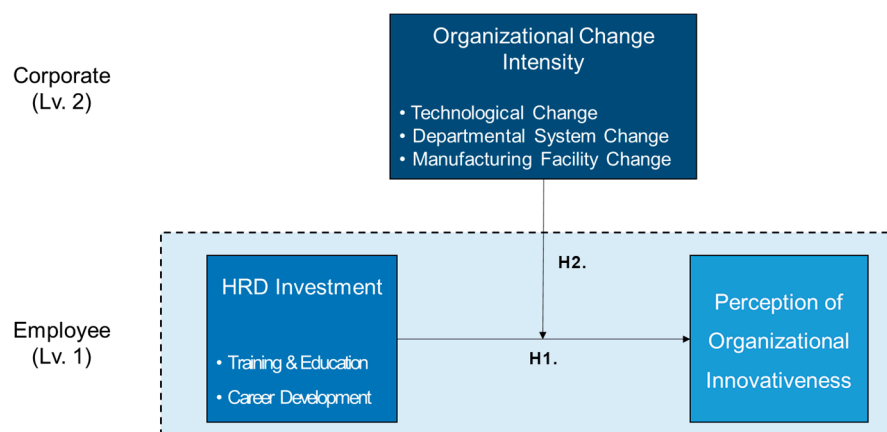


Figure 1. Research model. Human resource development (HRD).

3. Method

3.1. Sample Characteristics

We used the Human Capital Corporate Panel (HCCP) 7th wave data collected by the Korea Research Institute of Vocational Education and Training (KRIVET) in 2017 to conduct an empirical test on the current hypotheses. As HCCP investigated firm- and individual-level data, it is possible to perform a multilevel analysis. This data provides the results of a survey on the general management, human resources (HR) department, human resource management, human resource development, and human resources status. The sample of this study was limited to manufacturing industries, and according to the 30/30 rule of Kreft [44], firms were selected based on criteria where 30 groups were

required to enhance the description of hierarchical linear models and that there should be 30 people per group. Responses from 5184 employees were sampled from 125 firms where firm-level and individual-level data were matched.

3.2. Measures

3.2.1. Employee's HRD Investment

Several authors [42,45,46] define HRD as a concept encompassing personal training, career development, and organizational development. Based on prior research, seven methods of education and training (integrated in-house education training, integrated outside education training, internet learning, postal communication training, domestic training, overseas training, and technical guidance for external companies) and three systems of career development (career development system, mentoring or coaching, and job rotation) were selected. The proportion of programs in which employees participate in the program provided by the entity is set as an HRD investment variable with a value of 0–1.

3.2.2. Perception of Organizational Innovativeness

The perception of organizational innovativeness is defined by the definition in J. Kim's research [47] as the degree of innovativeness employees feel regarding the organization, with an emphasis on creativity, openness, and an innovative atmosphere. For measurement, three questions were used in the HCCP questionnaire for workers. Measurement items included "promoting change and new attempts," "appropriate compensations for innovation," and "preferential treatment of creative people" and were measured on a five-point Likert scale ((1) Strongly disagree, (2) Disagree, (3) Neither agree nor disagree, (4) Agree, (5) Strongly agree). The Cronbach's alpha for checking internal consistency between questions was 0.840.

3.2.3. Organizational Change

Organizational change is defined as a degree of change in the structure, system, and the process of an organization to respond to external environmental changes [27]. The related details were measured in three categories: technological changes, departmental changes, and manufacturing facility changes, using a four-point Likert scale ((1) Nearly none, (2) Mild, (3) Moderate, (4) Severe). The Cronbach's alpha for checking internal consistency between questions was 0.703.

3.2.4. Control Variable

The control variables consisted of three variables at the individual level and two variables at the firm level that can affect the perception of organizational innovativeness. The individual-level control variables were the degree of autonomy in HRD participation, academic background, and service years, and these need to be controlled to separate the pure effects of HRD investment. Among them, academic background was treated as a dummy variable given a value of 1 for a master's degree or higher based on college graduates. The control variables at the firm level included two variables: the size of the corporation and the age of the corporation, which are natural logarithm values for the total number of full-time employees of the corporation, and the age of the corporation (2017 y—establishment y).

Table 1 summarizes the correlation between the variables described above. At the individual level, HRD investment showed a positive relationship to the perception of organizational innovativeness, consistent with the research hypothesis, and among the control variables, the higher the autonomy to participate in HRD, the higher the educational background, and the lower the number of years of service, the higher the correlation with the perception of organizational innovativeness. Among the variables set as control variables at the organizational level, only significant relationships were shown for the size of the corporation.

Table 1. Means, standard deviations (SD), and intercorrelations.

Variables (Level 1)	Mean	SD	1	2	3	4	5	
HRD investment	0.43	0.31						
HRD Participation	1.81	1.08	0.373 **					
Autonomy								
Academic	0.29	0.45	0.471 **	0.441 **				
Background (dummy)	11.43	8.71	−0.066 **	−0.049 **	−0.278 **			
Service Year								
Perception of	3.24	0.73	0.355 **	0.337 **	0.233 **	0.031 *		
Organizational								
Innovativeness								
Variables (Level 2)	Mean	SD	1	2	3	4	5	6
Organizational	2.34	0.65						
Change Intensity								
(1) Tech. Change	2.40	0.76	0.870 **					
(2) Dept. Change	2.42	0.80	0.771 **	0.516 **				
(3) Mfg. Change	2.36	0.88	0.754 **	0.551 **	0.504 **			
Number of Full-Time								
Employees (ln)	5.97	1.06	0.262 **	0.201 *	0.281 **	0.140		
Corporation Age (ln)	3.63	0.49	0.020	−0.040	−0.019	−0.049	0.105	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. HRD: human resource development.

3.3. Analysis: Hierarchical Linear Model (HLM)

The model of this study is a hierarchical structure in which the subject belongs to the unit organization, a mixture of level 1 variables and level 2 variables, that is, the relationship at level 1 is affected by the strength of the organizational changes at level 2. Therefore, samples at the individual level should consider the impact of organizational change intensity from the organizational level. As individuals in a sample-unit organization are under the influence of organizational change intensity, applying the Ordinary Least Square (OLS) method, a general regression analysis that assumes independence of dataset, can lead to errors in the validity of the study [48]. If we analyze the data only at the individual level, we ignore the fact that an individual is included in an organizational unit, which puts the estimated error at risk of widening the type I error [49]. Analyzing the data using the average value of the individuals' dependent variables at the organizational level does not include the level 1 independent variables, and results in inefficient and distributed results for the organizational effects [50]. Therefore, an analysis using hierarchical linear modelling, a multilevel research model, was conducted in this study.

The HLM analysis consists of two steps. First, the relationship between level 1 variables (in this study, HRD investment and the perception of organizational innovativeness) was estimated (random coefficient model), and in the second step, the effect of the level 2 variable, the high-level situational variable (in this study, organizational change intensity), was verified using the intercept (intercept-as-outcome model) and the slope (slope-as-outcome model) derived from the first step, respectively as the dependent variables. Specifically, the main effect of the high-level situational variable on the lower-level dependent variable was determined by the significance of the t -test for the coefficient value (γ) of the level 2 independent variable regressed to the intercept in the level 1 analysis. In addition, the cross-level moderating effect of level 2 variables for the relationship between level 1 independent variables and dependent variables was determined by the significance of the t -test of the coefficient obtained by regressing the high-level situational variable with the slope derived from the level 1 analysis as the dependent variable [51]. The level 1 and -2 data were analyzed using the statistical programs SPSS 25 and HLM 8.0.

4. Results

This study was a multilevel model that verified the effect of individual-level HRD investments and firm-level organizational change intensity on employee perceptions of organizational innovativeness.

To use HLM to analyze multilevel data, it is important to choose the proper centering method of independent variables. In the centering method, the grand mean centering is a method of subtracting the measurement of the corresponding observation from the total mean value, in which case the value of the constant term represents the expected value of the dependent variable when the measurements of the independent variable have the mean value [51]. The grand mean centering method has the advantage of mitigating potential estimation problems caused by multicollinearity in level 2 analysis [51]. In this study, independent variables and moderating variables, excluding control variables, were used to analyze the values of the grand mean centering. The estimation equation of the HLM model for the hypothesis verification of this study is presented in Table 2, and the empirical analysis results of the estimated equation are presented in Table 3.

Table 2. Hierarchical Linear Model (HLM) estimation equation for the perception of organizational innovativeness.

Model	Level 1	Level 2
Null Model	$INNO_{ij} = \beta_{0j} + r_{ij}$	$\beta_{0j} = \gamma_{00} + U_{0j}$
Random Coefficient Model (H1)	$INNO_{ij} = \beta_{0j} + \beta_{1j} \times HRD_{ij} + \beta_{2j} \times AUTONOMY_{ij} + \beta_{3j} \times ACADEMIC_{ij} + \beta_{4j} \times YEAR_{ij}$	$\beta_{0j} = \gamma_{00} + U_{0j}$ $\beta_{1j} = \gamma_{10} + U_{1j}$ $\beta_{2j} = \gamma_{20} + U_{2j}$ $\beta_{3j} = \gamma_{30} + U_{3j}$ $\beta_{4j} = \gamma_{40} + U_{4j}$
Slope-as-Outcome Model (H2)	$INNO_{ij} = \beta_{0j} + \beta_{1j} \times HRD_{ij} + \beta_{2j} \times AUTONOMY_{ij} + \beta_{3j} \times ACADEMIC_{ij} + \beta_{4j} \times YEAR_{ij}$	$\beta_{0j} = \gamma_{00} + \gamma_{01} \times CHANGE_{ij} + \gamma_{02} \times EMP_{ij} + \gamma_{03} \times AGE_{ij} + U_{0j}$ $\beta_{1j} = \gamma_{10} + \gamma_{11} \times CHANGE_{ij} + \gamma_{12} \times EMP_{ij} + \gamma_{13} \times AGE_{ij} + U_{1j}$ $\beta_{2j} = \gamma_{20} + U_{2j}$ $\beta_{3j} = \gamma_{30} + U_{3j}$ $\beta_{4j} = \gamma_{40} + U_{4j}$

INNO: Perception of Organizational Innovativeness, HRD: HRD investment, AUTONOMY: HRD Participation Autonomy, ACADEMIC: Academic Background, YEAR: Service Year, CHANGE: Organizational Change Intensity, EMP: Number of Full-Time Employees, AGE: Corporate Age.

4.1. Null Model

Prior to the specific hypothesis verification, the null model was validated to check the interorganizational variance and its significance. Analysis showed that the mean value (γ) of the perception of organizational innovativeness was 3.24 ($t = 125.134$, $p < 0.001$), and the Interclass Correlation Coefficients (ICC) (1) was 0.13. There was a significant interorganizational variance of 13% of the perception of organizational innovativeness variances ($\chi^2 = 990.52$, $p < 0.001$). These results indicate that the perception of organizational innovativeness may vary depending on the organization. Based on this, the next step of analysis was conducted.

4.2. Level 1 Model

The next step was to analyze the random coefficient model of the HLM to verify the effectiveness of the HRD investment measured for the perception of organizational innovativeness at the individual level. The degree of autonomy in the HRD participation, academic background, and service year of individuals were controlled for. Validation showed that HRD investment has a strong positive relationship with the perception of organizational innovativeness ($\gamma = 0.330$, $p < 0.001$). Therefore, we accepted hypothesis 1, which validated the influence of HRD investment on employee perceptions of organizational innovativeness.

Table 3. Multilevel Regression Estimates and Model Comparisons across Three Models of Perception of Organizational Innovativeness.

Model Parameter	Random Coefficient Model		Intercept-As-Outcome Model		Slope-As-Outcome Model	
Fixed Effect	Estimate	SE	Estimate	SE	Estimate	SE
Level 1						
For INTRCPT1, β_0	3.232	0.026 ***	3.231	0.024 ***	3.232	0.024 ***
INTRCPT2, γ_{00}						
HRD investment	0.330	0.042 ***	0.332	0.042 ***	0.335	0.040 ***
HRD Participation						
Autonomy	0.062	0.010 ***	0.061	0.010 ***	0.061	0.010 ***
Academic						
Background	−0.009	0.009	−0.008	0.009	−0.009	0.009
Service Year	0.006	0.001 ***	0.006	0.001 ***	0.006	0.001 ***
Level 2						
Organizational Change Intensity			0.140	0.039 ***	0.147	0.039 ***
Number of Full-Time Employees			−0.000	0.000	−0.000	0.000
Corporation Age			−0.003	0.001 ***	−0.003	0.001 ***
Interaction Effect						
HRD investment × Organizational Change Intensity					−0.111	0.067 *
HRD investment × Tech. Change Intensity					−0.065	0.051 *
HRD investment × Dept. Change Intensity					−0.118	0.049 *
HRD investment × Mfg. Change Intensity					−0.004	0.040
Random Effect	σ	χ^2	σ	χ^2	σ	χ^2
INTRCPT1	0.071	639.617 ***	0.061	539.448 ***	0.061	539.371 ***
HRD slope	0.068	174.720 **	0.068	174.695 **	0.060	164.300 **
HRD Participation						
Autonomy slope	0.003	143.046	0.003	143.018	0.002	139.371
Academic						
Background slope	0.004	199.956 ***	0.004	200.088 ***	0.004	198.858 ***
Service Year slope	0.006	142.467	0.006	142.173	0.006	135.079
Level 1, r	0.424		0.424		0.424	
Model Deviance	10,714		10,734		10,885	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.3. Level 2 Model

Next, we analyzed the intercept-as-outcome model as a reference to the HLM, although not set as a hypothesis. For this purpose, the level 2 variables, such as the organizational change intensity and the size and age of the corporation, were included in the model. The variances of random effect coefficients from previous models, which examined the effectiveness of HRD investments at level 1 for model verification at this stage, were verified for significant variances at 0.071 ($p < 0.001$) for the perception of organizational innovativeness. This result means that even after the employees' perception of organizational innovativeness was explained through level 1 HRD investments, level 2 variance existed in the intercept. In addition, the organizational change intensity at level 2 was $\gamma = 0.332$ ($t = 7.940$, $p < 0.001$), confirming that organizational change intensity had a positively significant effect on the perception of organizational innovativeness at level 1.

4.4. Full Model

As a reference to the HLM, the slope-as-outcome model confirmed that the organizational change intensity at level 2 showed a moderating effect in the relationship between HRD investment and perception of organizational innovation at level 1. As a prerequisite for verification at this stage, the random coefficient of HRD investment was investigated for the intercept-as-outcome model, indicating significant variances of 0.061 ($p < 0.001$) for the perception of organizational innovativeness. The analysis of the interaction effects between two levels of variables showed a negative relationship between the HRD investment measured at level 1 and the organizational change intensity at level 2 ($\gamma = -0.111, p < 0.05$). Therefore, hypothesis 2 was accepted. These results showed that the organizational change intensity at level 2, as well as the HRD investment, had a certain effect on the perception of organizational innovativeness.

Additional analysis was conducted on each of the three measurement items to verify if there were differences in the interaction effects depending on the subject of organizational change. As a result, the coefficients of the interaction effect of technological changes ($\gamma = -0.065, p < 0.05$), departmental changes ($\gamma = -0.118, p < 0.05$), and manufacturing facility changes ($\gamma = -0.004, p > 0.05$) differed, and the intensity of departmental changes related to organizational structures was found to be relatively more influential. The interaction effects between the two levels are shown graphically in Figures 2 and 3 in accordance with Aiken and West [52].

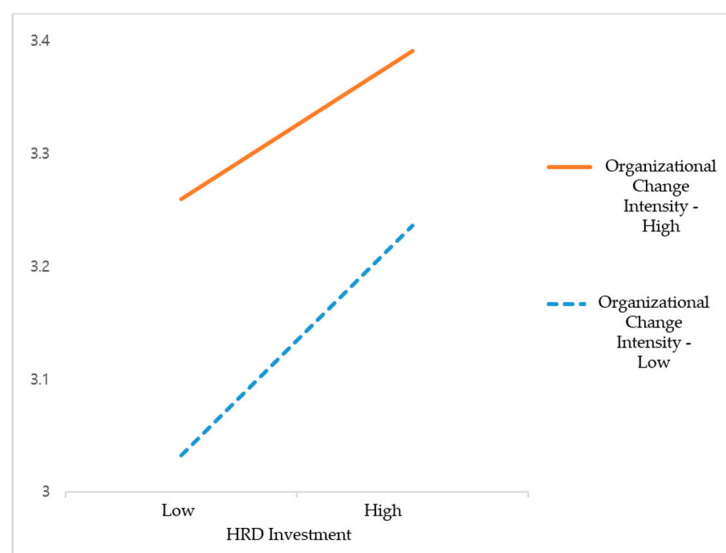


Figure 2. Moderate Effects of the Intensity of Organizational Change in Employee HRD Investment: Perceptions of Organizational Innovativeness Relations.

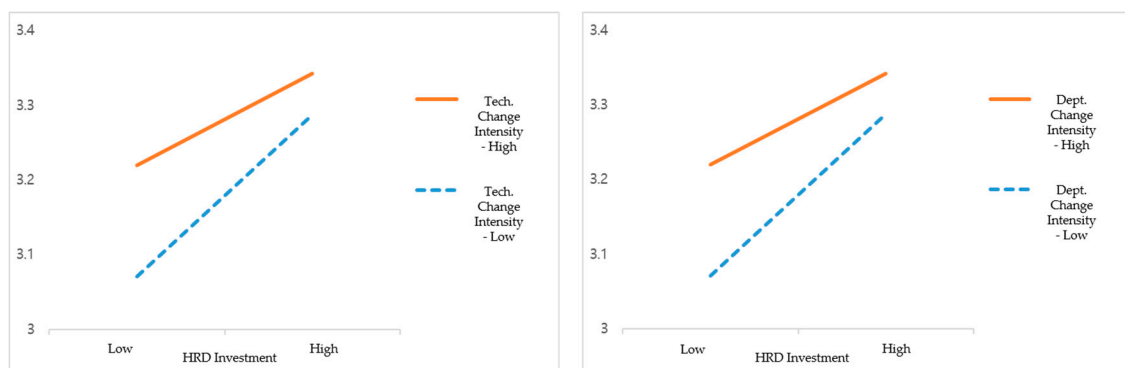


Figure 3. Moderate Effects of the Intensity of Technological (L)/Departmental (R) Changes in Employee HRD Investment: Perceptions of Organizational Innovativeness Relations.

5. Discussion

This study used HCCP data to identify the relationship between employee HRD investment and the perception of organizational innovativeness and to analyze the impact of organizational change intensity within that relationship in a multilevel analysis using HLM. The results showed that employee HRD investments increased the perception of organizational innovativeness as predicted in the hypothesis. We also demonstrated that, as a situational factor, the organizational change intensity moderated the relationship between these HRD investments and the perception of organizational innovativeness.

These findings provide some important theoretical and practical implications for creating a desirable organizational culture and managing human resources. The result that employee HRD investments improve the perception of organizational innovativeness is consistent with the results of prior studies [20,22] in that changes in learning orientation, knowledge, skills, and attitudes through HRD programs had a positive effect on promoting organizational innovation. Considering that HRD investment is a planned learning experience that brings about changes in the knowledge, skills, attitudes, etc., of individuals and provides knowledge or skills for job performance and complements the deficiencies, investments in human resources are important in promoting organizational innovation, and continuous and effective training is required to ensure proficiency and competence in human resources. While individual HRD programs are important, it is more appropriate to understand the overall level of a corporation's HRD utilization.

Next, we identified a variable of organizational change intensity as one of the factors at the organizational level that could be a constraint or facilitator in the relationship between HRD investment and the perception of organizational innovativeness. While until recently, research in the field of organization management mainly focused on the factors affecting individual-level competence, attitudes, and performance, the research on factors affecting the organizational level was insufficient. The strength of our study was in analyzing the effect on the relationship between employee HRD investment and organizational innovation perception by establishing a situational factor at the organizational level (the organizational change intensity). The organizational change intensity reduced the impact of HRD investment on the perception of organizational innovativeness, and it supported the results of a prior study [41] that the effectiveness of HRD investment may be affected by the organizational change intensity from a strategic HRD perspective.

This explains the buffer effect between the job demands, which increase with the organizational change and the job resources of participating in the HRD program within the theoretical framework of the JD-R model, but shows that this effect weakened as the intensity of the organizational change increased. If the intensity of the organizational change was strong, it was likely that the HRD program did not fit the job demands and level of change, and that the effectiveness of the HRD program may be weak due to the employees' lack of understanding, stress, and resistance to anxiety about the organizational changes [8,11,12]. This may result in a lack of quality or quantity in the HRD program and lead to particular employee perceptions of organizational innovativeness in the organizational change situation.

From a practical point of view, we concluded that HRD programs implemented by corporations affect the perception of organizational innovativeness but do not fully reflect the level, intensity, and content of organizational change [42]. While most corporations recognize the importance of human capital and provide employees with various HRD programs to gain competitive advantages, these efforts can be said to fall short of the level of change the organization wants, and their effectiveness is reduced by organizational strategic and structural changes. Consequently, efforts to improve the quality as well as quantitative use of HRD programs are more important for companies.

Further extending the discussion above, organizational change can be expected to take a role as a driver of open innovation. The intensity of organizational change will motivate efforts to respond to new markets, such as HRD investment, as the role of moderator for the perception of organizational innovativeness has been identified. Our findings show the limitations of the HRD program as the intensity of organizational change is stronger, and we suggest open innovation activities as an

alternative. As the intensity of organizational change becomes stronger, the firm must make internal adjustments through stronger open innovation.

The limitations of this study and suggestions for future studies are as follows. First, the use of secondary data requires careful attention to the interpretation of the research results based on conceptual and operational definitions of variables. In measuring the HRD investment, we did not reflect the latest program types in this study. For example, Moodle (Modular Object-Oriented Dynamic Learning Environment)-based online learning systems affect creative collaboration [53]. Even in the case of organizational change, we only measured at the level of change without reflecting the cause and external fit of change. Second, although we measured the HRD investment to participation in accordance with the type of program, future studies will require an analysis that includes the features as the performance of an HRD is also related to the purpose, format, and content. Finally, the effect of organizational culture-level innovativeness perception is important; however, verifying these relationships with various effectiveness variables that are of interest to management, including financial performance, is necessary.

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