

The Influence of Supervisor's Transformational Leadership on Learning Culture and Learning Transfer of Nuclear R&D Personnel

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1. Introduction

The competitiveness of nuclear technology depends on the expertise of the nuclear R&D personnel. To improve their expertise, nuclear R&D personnel have to learn new knowledge and technologies continuously. Therefore, it is important to make a continuous learning environment for nuclear R&D personnel and the supervisor's leadership will be a key factor. From this perspective, this study focuses on transformational leadership. Transformational leadership means that supervisors try to support the members individually, and encourage them to find new methods and approaches. Therefore, it makes them to learn about new knowledge and technology continuously. In this study, we want to empirically identify the influence of transformational leadership on the learning of nuclear R&D personnel. Specifically, we focused on the learning culture and learning transfer of nuclear R&D personnel.

2. Methods and Results

In this section, some of the methods and their results are described. To identify the relationship of influence, a hypothetical model was set up and analyzed based on the structural equation modeling statistics.

2.1 Hypothetical Model

A supervisor's transformational leadership will have a positive effect on the formation of continuous learning culture and learning transfer [1,2]. This is because a supervisor who has transformational leadership will support their member's development and encourage them to try and apply creative thinking and approaches on their job performance. From the perspective of learning transfer, a work environment that encourages continuous learning will make employees apply the learning outcome on the job [3]. Based on these prior studies, a hypothetical model was set through the following figure.

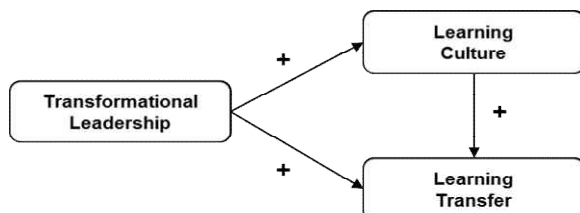


Fig. 1. Hypothetical Model

2.2 Data Analysis

The purpose of this study was to identify the influence of a supervisor's transformational leadership on the learning culture and learning transfer of nuclear R&D personnel. To achieve this purpose, the data from 334 cases from a survey on educational needs produced by KAERI were analyzed using structural equation modeling. These data were the responses from full-time researchers to the survey in 2016. In the overall items, nine items associated with latent variables were selected and used as the measurement variables of each latent variable.

Table 1: Analysis Items Description

Var	Items
TL	1. individual advice (individual consideration) 2. empowerment (individual consideration) 3. responsibility (charisma) 4. new approach (intellectual stimulation)
LC	1. communication(information/technology) 2. searching new solution by using experience 3. sharing of idea
LT	1. level of applying the learning outcome 2. willingness of applying the learning outcome

2.3 Descriptive Statistics

The results of descriptive statistics were described in Table 2. The means of all items were between 3 and 4, and the learning transfer levels were relatively low. Meanwhile, the maximum absolute value of the skewness and kurtosis were 0.975 and 1.070. These results were within the normality criterion range, thus the data were regarded as securing the normality.

Table 2: Descriptive Statistics

Item	Mean	SD	Skewness	Kurtosis
TL1	3.70	.946	-.975	1.070
TL2	3.57	.996	-.881	.596
TL3	3.59	.994	-.731	.329
TL4	3.54	.931	-.816	.662
LC1	3.75	.919	-.617	.342
LC2	3.76	.847	-.506	.356
LC3	3.72	.873	-.375	-.092
LT1	3.04	.852	-.098	-.151
LT2	3.18	.858	-.182	-.211

2.4 Fit Index of Hypothetical Model

To verify the hypothetical model is appropriate, a fit index has been calculated, and these results are described in Table 3. First, χ^2 did not fit the criteria. However χ^2 has a disadvantage in that it will be overestimated by the sample size. To prevent a misjudgment, another fit index has been considered together. For example, GFI, AGFI, RMR, RMSEA and NFI, which are mainly used for the model fitness, meet the criteria. Based on these results, the hypothetical model was considered to be appropriate.

Table 3: Fit Index of Hypothetical Model

Index	Criteria	Value	Result
χ^2	$p > .05$	49.849($p = .001$)	-
GFI	$> .90$	.968	Fit
AGFI	$> .90$	.940	Fit
RMR	$< .05$	.028	Fit
RMSEA	$< .05 \sim .08$	.057	Fit
NFI	$> .90$	.977	Fit

- 1) GFI : Goodness of Fit Index
- 2) AGFI : Adjusted Goodness of Fit Index
- 3) RMR : Root Mean square Residual
- 4) RMSEA : Root Mean Square Error of Approximation
- 5) NFI : Normed Fit Index

2.5 The Influence of Supervisor's Transformational Leadership

To identify the influence of transformational leadership on the learning culture and learning transfer, standard regression coefficients were calculated. The coefficients of transformational leadership on learning culture and learning transfer were statistically significant at 0.668 and 0.189. Also, the coefficient of learning culture on learning transfer was statistically significant at 0.185. It means that the transformational leadership has a positive effect on the formation of the learning culture and learning transfer. In addition, the learning culture has a positive effect on the learning transfer of nuclear R&D personnel.

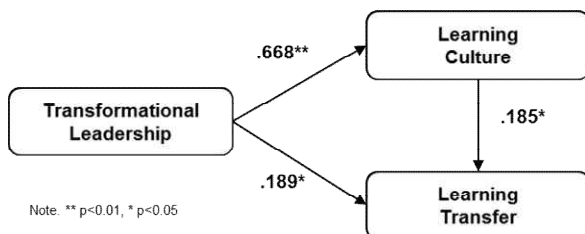


Fig. 2. Standard Regression Coefficient

In addition, the results of effect decomposition are described in Table 4. The supervisor's transformational leadership has an indirect positive effect on the learning transfer through the learning culture. The standard

regression coefficient was statistically significant at 0.124. Therefore, the total effect of the transformational leadership on the learning transfer was 0.312 which means statistically significant. This means that the transformational leadership must be considered as a key factor for facilitating the learning of nuclear R&D personnel.

Table 4: Effect Decomposition

Path	Direct	Indirect	Total
TL→LC	.668**	-	.668**
TL→LT	.189*	.124*	.312**
LC→LT	.185*	-	.185*

Note: standard regression coefficient

3. Conclusions

In this study, it was identified empirically that a supervisor's transformational leadership has a strong influence on the learning culture and learning transfer of nuclear R&D personnel. To develop the competency of R&D personnel, not only formal education programs but also informal learning such as workplace learning have been carried out in the nuclear R&D organization. In this situation, transformational leadership has an effect on willingness and behavior of nuclear R&D personnel on the formal and informal learning. Therefore, transformational leadership is crucial factor in the human resource development system. Meanwhile, supervisors generally refer to project managers in the nuclear R&D organization, and their leadership will be important to improve the expertise of R&D personnel through continuous learning. The leadership required by them is not a one-sided order, but rather individual consideration, charisma, and intellectual stimulation for their nuclear R&D members. As a point of nuclear training and education, it is necessary to consider the operation of leadership programs that strengthen the transformational leadership of the project managers.

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