

# **Aging Workforce and Organizational Innovation in Korea**

## **Curvilinearity and the Moderating Influence of Workforce Diversity**

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### **Background/ Objectives and Goals**

Due to demographic trends such as low fertility levels and high life expectancy, organizations are also facing rapidly changing and highly unpredictable business environments; hence, they must pursue continuous innovation for survival and success with their aging workforce. However, is the common prejudice that an aging workforce hinders organizational innovation actually true? Surprisingly, previous studies have presented inconsistent findings about the aging workforce–firm innovation relationship.

To my knowledge, existing empirical studies at the firm level have overlooked the possibility of curvilinearity by focusing only on the linear relationship. However, the assumed linear relationship between workforce age and organizational innovation should be fundamentally reexamined, considering the countervailing forces from the knowledge stock and flow perspectives. Therefore, applying a knowledge-based view (KBV), this study explores the possibility of a curvilinear relationship between an aging workforce and organizational innovation by clarifying the countervailing forces inherent in an aging labor force. Moreover, considering that the age issues are closely related to the composition of the workforce and a diverse workforce has been considered as the effective source of new ideas for sustainable innovation, this paper investigates the moderating role of age diversity in the aging workforce-organizational innovation relationship.

To test two hypotheses, I used HCCP dataset. The data for this study were obtained from the Human Capital Corporate Panel (HCCP) 2007 survey, which the Korean Research Institute for Vocational Education and Training (KRIVET) collected in collaboration with the Korea Ministry of Labor and the Korea Data Network. KRIVET contacted 1,899 companies with more than 100 workers listed in KOSDAQ among 7,246 Korean companies in the Korea Information Service (KIS) corporate database through the stratified sampling method. . The

survey initially obtained 467 firm cases with \$100 million in total assets and 100 or more employees using both face-to-face interviews and paper-and-pencil surveys with all measures in the database referring to the 2006 calendar year. KRIVET used a unique organizational identifier and linked the HCCP data with archival performance data from the Korea Information Services (KIS) and of Korean Intellectual Property Office (KIPO). In particular, the financial and patent data were collected for the 2007 calendar year, a one-year lag from the HCCP data. After eliminating missing data, the final sample for analysis is 212 firms (45.4% of the initial sample). I used *Patent data* as the indicator of exploratory innovation because new inventions are considered to be different from the existing knowledge base and are widely used as an indicator of organizational innovation. It was measured using the annual number of patents registered in the database of the Korean Intellectual Property Office (KIPO). I measured *Aging Workforce* as the average age of employees in the organization. The HCCP survey provides data on the number of employees according to age group (below 29, 30-39, 40-49, and above 50 years) for key respondents (top HR managers). Due to practical difficulties in obtaining the exact age information of all employees in all the companies, this study first multiplied the mean age level by the number of employees belonging to each age group and then divided that value by the total number in all groups. *Age diversity* was computed by categorizing organizational members into four age groups- below 29, 30-39, 40-49, and above 50- and then, computing the diversity index proposed by Blau (1977). The index was computed as  $1 - \sum p_i^2$ , where  $p_i$  is the percentage of employees in the  $i$ th category. The index can vary between 0 and 1, with values close to 1 indicating higher diversity and values 0 indicating lower diversity. I controlled for *Firm age*, *Firm size*, *Unionization*, and *Industry average patents*.

I tested the aging workforce-organizational innovation relationship using negative binomial regression because patent data are widely dispersed counts. In general, widely dispersed data like patent does not use linear regression model because linear regression model can produce biased and unreliable estimates. I entered the control variables in Step 1, the independent variables in Step 2 and 3 (Hypothesis 1), and the interaction terms in Step 4 (Hypothesis 2). To avoid multicollinearity, aging workforce, aging workforce squared, age diversity variables are mean-centering. As shown in Step 2, aging workforce is negatively related to organizational innovation ( $\beta = -.13, p < .01$ ). When the squared term for aging workforce was entered, as shown in Step 3, both aging workforce ( $\beta = 1.03, p < .10$ ) and the squared term for it ( $\beta = -.02, p < .05$ ) are statistically significant with different directions and the change of log-likelihood was also significant. This salience of curvilinear effect supports Hypothesis 1 that there is an inverted U-shaped relationship between aging workforce and organizational innovation, inconsistent with the generally accepted notion about the linear relationship. Furthermore, in Step 4, the interaction term between the squared

term for aging workforce and age diversity shows that the moderating effect of age diversity is marginally significant positive ( $\beta = .10, p < .10$ ).

Currently, organizations have to pursue firm innovation through an aging workforce. However, in contrast to social conventions, older employees are a double-edged sword for organizational innovation. The empirical results showed that organizational innovation had an inverted U-shaped relationship with the degree of workforce age. This necessitates determining the differential impacts of an aging workforce on organizational innovation rather than the simple linear relationship because older employees are both beneficial and harmful to creating, sharing, and integrating knowledge for innovation. This study provides an alternative way to address seemingly contradictory findings by exploring the possibility of curvilinearity for a cross-industry sample of Korean firms. In addition, this paper explores the moderating role of age diversity in the aging workforce–organizational innovation relationship. The findings, as expected, suggest that a diverse labor structure contributes to a firm’s ongoing innovation activities by stimulating new ideas or bringing fresh perspectives into the organization. However, the explanatory power of this variable is statistically marginal. Therefore, the effect of workforce diversity on the aging workforce–organizational innovation relationship in future research can be examined from the benefits (i.e., diverse information) and costs (i.e., conflicts among employees) viewpoints of diversity.

The study will contribute to the literature on age, innovation, and diversity in several ways. First, from a theoretical standpoint, by applying a KBV, this study will provide an alternative means to address seemingly contradictory findings by exploring the possibility of curvilinearity. Moreover, it will contribute to the existing discussions on the aging workforce–organizational innovation relationship. From a practical standpoint, this study shows how organizational managers must focus on managing the workforce composition to ensure consistent innovation through effective utilization of existing human resources and appropriate workforce diversification.

**Keywords:** Innovation, aging workforce, diversity, nonlinearity