

Effects of Enhanced and New Corporate Technological Knowledge in Responding to Technological Change

P.N. SubbaNarasimha
Department of Management
G.R. Herberger College of Business
St. Cloud State University
St. Cloud, MN 56301
U.S.A
(320) 255-3823
psubba@stcloudstate.edu

Track: Academic

Abstract

While the importance of technological knowledge in assuring superior performance is well accepted, few studies have investigated the nature of relationship between them. The few econometric studies that confirm the existence of a positive relationship between technological knowledge and firm performance looked only at the total stock of technological knowledge. However, organizational learning knowledge literature informs us it is not the total stock of knowledge but specific characteristics of that stock that is important for superior performance. A logical next step is to unbundle technological knowledge into components, and study their performance effects. My paper reports on the effects of a firm's enhanced and new technological knowledge on performance under varying regimes of technological change.

Theory

In technology there exist a large number of specialties in which expertise can be acquired. Limited resources force firms to decide on how they will allocate R&D funds across specialties. Theories of expertise emphasize enhancement of knowledge for long-term survival. In contrast, theories of technological change emphasize development of new knowledge. In the paper, I use those theories to develop three hypotheses:

H1: The strength of the relationship between enhanced technological knowledge and firm performance increases with increasing rate of technological change. Specifically, the greater the rate of technological change, the stronger is the positive relationship of

enhanced technological knowledge to performance.

H2: New technological knowledge positively affects performance as technological change increases. However, the strength of the relationship increases at a decreasing rate as the proportion of new technological knowledge increases.

H3: The efficacy of technological knowledge to face increasing technological change is a function of combinations of enhanced and new technological knowledge.

Analysis

Using Tobin's q for performance I test the hypotheses with the following multiple regression models:

$$Tq = a_1 TKe + a_2 TCNG + a_3 TKe * TCNG \quad (1)$$

$$Tq = a_1 TKn + a_2 TCNG + a_3 (TKn)^2 + a_4 (TKn)^2 * TCNG \quad (2)$$

$$Tq = a_1 TCe + a_2 TCn + a_3 TCNG + a_4 TKe * TKn + a_5 TKe * TCNG \\ + a_6 TKn * TCNG + a_7 TKe * TKn * TCNG \quad (3)$$

where TKe is enhanced technological knowledge, $TCNG$ is rate of technological change and TKn is new technological knowledge. The hypotheses are supported if coefficients a_3 (Eq. 1), a_4 (Eq. 2) and a_7 (Eq. 3) are positive and statistically significant. The analysis yields two conclusions. One, the performance effects of enhanced technological knowledge increase with increasing rate of technological change. The relationship is negative for low rates and positive for moderate to high levels of technological change. Two, new technological knowledge does not have any direct effects on performance. It has indirect effects. Specifically, it acts jointly with enhanced knowledge in improving performance under moderate to high rates of technological change.