

論文の内容の要旨

論文題目 THE INFLUENCE OF TECHNOLOGY/KNOWLEDGE DIVERSITY ON
COLLABORATION FOR R&D: THEORY, METHODOLOGY, AND
EMPIRICAL EVIDENCES
(共同研究開発における技術・知識多様性の影響：理論、
手法及び実証的証拠)

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This dissertation aims to integrate relevant theories, derive new measurement constructs, and provide evidences to discover implications and influences of technology and knowledge diversity in collaboration for R&D, both in organizational and individual level.

There are three basic components that contribute to this research. First, in order to measure technology diversity more accurately, the category-based technology diversity indices (Herfindahl-based index and cosine-based index) have been improved by using technology relatedness matrix to solve the problem of non-independent categories. A mathematical constructive proof is given and its development process provides a general solution framework where other proposed analogue measures in literature can be incorporated. This dissertation also provided a thorough examination of validity. Specifically, examinations of content validity, convergent validity, discriminant validity, internal consistency, and criterion-related validity. The results reveal that the proposed indices perform well based on the empirical analyses. Finally, the generality of the proposed indices is discussed.

Second, using the improved category-based technology diversity indices, this research investigates relationship between collaborative performance (primarily for invention quality) and technology diversity in inter-firm R&D alliances. The technology diversity is differentiated into two types: inter-firm technology diversity and within-alliance technology diversity. By empirically analyzing 21,169 granted U.S. patents applied by 10,821 alliances from year 1993 to 2002, inter-firm technology diversity is found to hinder quality of invention consistently, even though the effect of technology sector is taken into consideration. Meanwhile, within-alliance technology diversity is generally susceptible to this moderation effect, that a higher value promotes quality of invention in traditional technology sectors. This, however,

impedes quality in emerging technology sectors. Moreover, moderation effect of explorative degree is also testified. Results show that within-alliance technology diversity would facilitate quality of invention if collaborating firms attempt to invent in an unfamiliar technology class where they have weak technological strength.

Third, this research integrates theories relevant to collaborative knowledge creation and provides evidence to discover effects of knowledge diversity on collaborative knowledge creation. A sample including 38,500 granted U.S. patents which involve two inventors in collaboration is used in analysis, from application year 1991 to 2005. Inter-individual knowledge diversity is argued to affect collaborative knowledge creation in three dimensions: increases probability of excellent ideas, increases probability of disagreements, and lowers knowledge assimilation. The factors of technology scope and affiliation scope are additionally argued to moderate the effect in these dimensions. Empirical evidence supports that these two factors both lower the influence of knowledge diversity on quality of the newly created knowledge despite their ability to facilitate knowledge quality.