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論文の内容の要旨

1. Research content

Understanding human resource management (HRM) practices based on the contexts are crucial for an organisation to provide appropriate solutions for technology upgrading and innovation. Arnold et al. (2000) defined four stages of firm technological capabilities, i.e., technology use and operation, technology acquisition and assimilation, technology upgrading and reverse engineering, and research and development (R&D); arranging them in ascending order of difficulties. In their study, they defined states of firms for each stage, but they did not identify coordination of internal and external HRM practices to upgrade firm technological capabilities for one stage to another. This deficiency leads us to adopt qualitative analysis to identify coordination of internal and external HRM practices to upgrade firm technological capabilities in the context of manufacturing firms in Thailand.

The results from the qualitative analysis indicate that to be on the first stage of technology use and operation, firms need to adopt internal training and collaborate with suppliers and related partners for plant setup and operation. Then firms need specific recruitment procedures and precise training and development plans so that they can move to the second stage of technology acquisition and assimilation. Also, firms need to adopt cross-functional teams and project-based teams before they can upgrade to the third stage of technology upgrading and reverse engineering. Lastly, firms need key R&D gurus, e.g., highly qualified personnel with master and Ph.D. degrees, from internal and external sources to upgrade their capabilities to the last stage of R&D. The results from case studies provide us insight knowledge on coordination of internal and external HRM practices to upgrade firm technological capabilities from the fundamental stage of technology use and operation to the complex stage of R&D.

Knowledge from case analysis motivates us to proceed with further empirical study. From the literature

review, researchers mainly study effects of HRM practices on innovation and performance. Although relationships between HRM practices and innovation have been extensively studied, these relationships have not been fully understood. Researchers have not identified precise configurations of HRM practices and main mentors for promoting product innovation across different stages of firm technological capabilities. They mainly generalised conclusions through conventional methods by analysing effects or relationships of a single or group of variables on an outcome. Results from these studies may not fully represent and explain, where different combinations of HRM practices may lead to a presence or an absence of innovation. Also, researchers do not compare configurations of HRM practices for promoting product innovation across different stages of firm technological capabilities, e.g., formal R&D firms – firms that allocated at least some portions of their sale budgets for the purpose of R&D – and non-formal R&D firms. These deficiencies lead us to adopt fuzzy-set qualitative comparative analysis (fs/QCA) to identify configurations of HRM practices and main mentors that lead firms to achieve high levels and cause firms to result in low levels of product innovation across different stages of firm technological capabilities.

The results from the empirical fs/QCA are presented in formal and non-formal R&D firms, where the former indicate four main findings, i.e., (1) R&D personnel development helps formal R&D firms to achieve high levels of product innovation, and if formal R&D firms do not adopt R&D personnel development, they need to collaborate with customers and suppliers; (2) QCCs do not help formal R&D firms to achieve high levels of product innovation, but it is somehow helpful after including supply chain collaboration; (3) QCCs cause formal R&D firms to result in low levels of product innovation. Even with a presence of customer and supplier collaboration in addition to QCCs, formal R&D firms still result in low levels of product innovation if they do not adopt in-house training, engineer rotation, and R&D personnel development; and (4) top management is the main mentors for promoting product innovation, and s/he needs to work with heads of R&D departments.

The latter results on non-formal R&D firms also indicate four main findings, i.e., (1) there is no enough evidence to prove how important R&D personnel development is in helping firms to achieve high levels of product innovation even with a presence or an absence of customer and supplier collaboration; (2) QCCs are somehow helpful for non-formal R&D firms as shown before and after including supply chain collaboration; (3) non-formal R&D firms result in low levels of product innovation if there is an absence of R&D personnel development. Even with a presence or an absence of customer and supplier collaboration, non-formal R&D firms still result in low levels of product innovation if firms do not adopt R&D personnel development; and (4) top management is the main mentors for promoting product innovation, and s/he needs to work with managers of cross-functional teams.

2. Research Purpose

The results from the qualitative analysis and fs/QCA contribute to the literature review by, first,

identifying coordination of HRM practices to upgrade firm technological capabilities in the context of manufacturing firms in Thailand. Second, firms should adopt R&D personnel development such that they can achieve more product innovation. If firms do not adopt R&D personnel development, they should at least collaborate with customers and suppliers to acquire new knowledge for promoting innovation. Even some configurations in non-formal R&D firms do not show precise evidence on the significance of R&D personnel development, firms mainly result in low levels of product innovation if they do not adopt R&D personnel development. Third, adopting only QCCs may cause firms to result in low levels in promoting product innovation, so firms should adopt other related practices, e.g., in-house training, engineer rotation, R&D personnel development, or collaborate with supply chain partners. Fourth, the top-management is recognised as the main mentors for promoting innovation, and this study proves that the top management needs to work with heads of R&D departments for formal R&D firms and managers of cross-functional teams for non-formal R&D firms.

For practical implication, first, the managers need to understand the technological capabilities of their firms so that they can introduce appropriate HRM practices for technology upgrading and innovation. Second, understanding the best HRM practices from the global context is useful, but the managers should not fully adopt those practices. They need to find the best fits of HRM practices in accordance with the current states of their firm. Third, pathways for promoting innovation across different stages of firm technological capabilities can occur through various configurations, so understanding the right combination of HRM practices could help firms for technology upgrading and innovation. Fourth, knowledge sharing from related personnel in various positions within the organisation does not cause firms to result in low levels of innovation, so the managers should motivate their employees to join in innovative activities for knowledge sharing and knowledge co-creation.

3. Research Accomplishment

Papers submitted and published in journals

Tieng Kimseng, Amna Javed, Jeenanunta Chawalit, and Youji Kohda. (2020) Applications of Fuzzy Logic to Reconfigure Human Resource Management Practices for Promoting Product Innovation in Formal and Non-Formal R&D Firms, *Journal of Open Innovation: Technology, Market, and Complexity*, 6(2), 38.

Tieng Kimseng, Amna Javed, Jeenanunta Chawalit, and Youji Kohda. (2020) Sustaining Innovation through Joining Global Supply Chain Networks: The Case of Manufacturing Firms in Thailand. *Sustainability*, 12(13), 5259.

Tieng Kimseng, Amna Javed, Jeenanunta Chawalit, and Youji Kohda. (2020) [Accepted], "Mechanisms for Engineers to Promote Product and Process Innovation: Thai Manufacturing Context", *International Journal of Management Practices*.

Tieng Kimseng, Jeenanunta Chawalit, and Youji Kohda. [Under Review], "Reconfiguration of Main Mentors for Promoting Product Innovation: Fuzzy Set Approach", *International Journal of Product Development*.

Tieng Kimseng, Jeenanunta Chawalit, and Youji Kohda. [Under Review], “Applications of Fuzzy Logic to Reconfigure Human Resource Management Practices for Promoting Product Innovation in Formal and Non-formal R&D Firms”, *Engineering Management Journal*.

Oral and poster presentations

Tieng Kimseng., Jeenanunta Chawalit., and Youji Kohda. (2018) “Do engineers’ capabilities and their involvement in different departments create values for firms’ innovation? An empirical study of the Thai manufacturing industry”, the First Global Conference on Creation Value, De Montfort University, Leicester, UK, May 23-24, 2018. [Oral Presentation]

Tieng Kimseng, Jeenanunta Chawalit, and Youji Kohda. (2018), “Human resource management for innovation in production networks: Towards effective uses of internal and external resources based on firm technological capabilities”, the First Global Conference on Creation Value, De Montfort University, Leicester, UK, May 23-24, 2018. [Poster Presentation]

Tieng Kimseng, Jeenanunta Chawalit, and Youji Kohda. (2020), “Revisiting internal mechanisms of HRM practices in creating values for product innovation: An application of fuzzy set QCA”, the 11th International Conference on Applied Human Factors and Ergonomics (AHFE 2020), Hilton San Diego Bayfront, San Diego, California, USA, July 16-20, 2020. [Oral Presentation]

Keywords: Case studies; formal R&D; fuzzy-set qualitative comparative analysis; human resource management practices; main mentors; non-formal R&D; supply chain collaboration; technological capabilities; innovation

論文審査の結果の要旨

本論文は、タイの製造業を対象に、企業が取りうる人材[人的資源]管理の種々の方策が、どのような条件下で有効に働くかについて、QCA(Qualitative Comparative Analysis, 質的比較分析)という手法を用いて分析した。企業が採用した人材管理の方策により、企業の技術活用能力(Technological Capabilities)が高まれば、企業の製品開発力(Product Innovation)が高まり、利益を上げることができるから、どのような人材管理の方策が有効かを知ることは重要である。

QCA は、インタビューデータを対象とするような質的分析(テキストコーディング)と、アンケートデータを対象とするような量的分析(統計分析)と異なる分析ロジックを使う分析法であり、両方の面を合わせ持つ。組み合わせ回路の計算法と同じで、複数の因子の組み合わせ(Configurations)によって、結果を説明しようとする。ある因子は別のある因子と組み合わせられた時に促進因子として働くかも知れないし、別の因子と組み合わせられたときには抑制因子として働くかもしれない。このような現象は線形性を仮定する統計分析では見逃されてしまうが、QCA ではできる。また、現実のデータを因子に解釈するときの閾値の設定や、得られた因子の組み合わせから適切なものを選択したり、現実社会の状況に合わせて再解釈したりするとき、研究者の質的な判断が入り込むことになり、この点も仮説の検定や統計量の推

定を目的とした統計分析とは異なる。人材管理の方策は、「2倍実施したから、効果も2倍になる」という性格のものではなく、「他の因子(方策)との組み合わせで、効果を発揮したりしなかったりする」と考えられるので、QCAによる分析が適している。

本論文では、タイの製造業3社へのインタビューの質的分析と、タイの製造業87社のアンケート結果を使って、プロダクトイノベーション(新しい製品を生み出せる能力)につながる、人材管理の方策について、QCAによる分析を行った。後者のQCAの分析では、人材管理の方策に影響を与えるだろう因子として、①独立したR&D組織を持つ企業と、持たない企業の区別、②外部の企業と(サプライチェーンを通した)協働を活発にしている企業と、していない企業の区別、③技術イノベーションを志向する指導者(メンター)の職種の違いで、分析を行った。

その結果、例えば、タイの製造業においてという制限のもとではあるが、外部の企業と協働を行う企業では、QCC(Quality Control Circle)の方策の重要度は高くはないが、一方で、外部の企業と協働を行わない企業のうち、R&D組織を持たない企業では、QCCの重要度は高い等の、結論が得られた。

以上のように本論文は、知識経営の分野において、QCAという比較的新しい方法を使えば、有用な知見が得られることを示したものであり、博士(知識科学)の学位論文として十分価値あるものと認めた。