



Synergy, environmental context, and new product performance: A review based on manufacturing firms



Chi-Tsun Huang^{a,1}, Kuen-Hung Tsai^{b,*}

^a Department of Marketing & Distribution, National Kaohsiung First University of Science and Technology, 2 Jhuoyue Rd., Nanzih, Kaohsiung 811, Taiwan

^b Department of Business Administration, National Taipei University, 151 University Rd., San Shia, Taipei 237, Taiwan

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ABSTRACT

This study adopts a meta-analytic approach to review the effects of technology synergy, marketing synergy and environmental context on new product performance by aggregating the empirical evidence documented in studies published from 1979 to 2011. Based on this aggregation, the results from a structural equation analysis show that (a) increasing technology and marketing synergies improves new product performance and the performance effect of marketing synergy is stronger than that of technology synergy; (b) increasing technology synergy enhances product advantage, which increases new product performance, whereas increasing marketing synergy does not; (c) increasing technology and marketing synergies may hinder product innovativeness; and (d) improving product innovativeness increases new product performance through product advantage. These findings suggest that ignoring the intermediary roles of product advantage and innovativeness may lead to an incomplete understanding of the relationships among technology and marketing synergies, environmental context, and new product performance. The results also demonstrate that technological turbulence affects new product performance through product innovativeness and advantage; in contrast, market intensity has a direct effect on new product performance. Future studies can examine the relationships among synergy, product effectiveness, and new product performance by constructing a mediated moderation or moderated mediation framework based on the environmental context.

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1. Introduction

Developing new products with unique benefits is crucial for firms to increase profits (Langerak, Hultink, & Robben, 2004; Li & Calantone, 1998), although such efforts are often costly and risky. Successful product development typically arises from the appropriate use of technology, marketing capabilities, and assets (Montoya-Weiss & Calantone, 1994; Snoj, Milfelner, & Gabrijan, 2007; Teece, 2000). Studies have identified technology and marketing synergies as two crucial drivers of successful product innovation in industrial markets (Bingham, Gomes, & Knowles, 2005; Gatignon & Xuereb, 1997). Technology and marketing synergies refer to the degree of congruence between existing technological and marketing capabilities and the assets of the firm, and the technological and marketing capabilities and the assets required to execute a new product initiative successfully (Eng & Ozdemir, 2013; Gatignon & Xuereb, 1997; Song & Parry, 1997).² Over the past three

decades, marketing and product-innovation management studies have examined the effects of technology and marketing synergies on new product performance (Song & Montoya-Weiss, 2001; Song & Parry, 1993).

The increasing number of studies on the relationships among technology and marketing synergies, product advantage and product innovativeness, and new product performance has necessitated the development of a greater and more comprehensive understanding of the links revealed in these works. The extant empirical findings do not reach a consensus on the performance effects of these constructs, reinforcing the need to review the performance strengths of the variables. Since meta-analytic findings may reveal much less conflict between various studies than anticipated, and suggest that coherent, useful, and generalizable conclusions can be drawn by reviewing the extant empirical evidence (Hunter & Schmidt, 2004), we thus adopted a meta-analytic approach to aggregate the extant empirical findings to

* Corresponding author. Tel.: +886 2 86746568; fax: +886 2 86715912.

E-mail addresses: howhowone2000@gmail.com (C.-T. Huang), atmas@mail.ntpu.edu.tw (K.-H. Tsai).

¹ Tel.: +886 7 6011000x4210.

² Using the term fit instead of synergy is better for the definitions of marketing synergy and technology synergy. However, we still used the term synergy to keep the consistency with the articles utilized in our research.

review the performance effects of technology and marketing synergies, product advantage, and product innovativeness; and the intermediary roles of product advantage and product innovativeness. When doing so, we also assess the direct and indirect performance effects of other constructs identified in the database.

Previous studies have hypothesized that technology and marketing synergies are directly linked with new product success; however, indirect links may also exist because new product success depends on the effectiveness of the product. Product advantage and innovativeness are two key characteristics of product effectiveness (Brown & Eisenhardt, 1995), and studies have indicated that these two variables substantially affect new product success (Calantone, Chan, & Cui, 2006; Langerak et al., 2004; Li & Calantone, 1998). The extant research has demonstrated a link between technology synergy and product effectiveness (Tsai, Hsieh, & Hultink, 2011). Although product advantage and product innovativeness may serve as crucial intermediaries between technology and marketing synergies and new product performance, existing studies have paid scant attention to these indirect routes.

This study makes two contributions to the marketing and innovation literature. First, we elucidate the synergy–performance relationship by reviewing the direct and indirect performance effects of technology and marketing synergies through product effectiveness. Extant industrial-marketing studies have scarcely investigated the routes in linking the synergy–performance relationship. Second, we extend the environmental context research to the marketing context. Business-to-business (B2B) marketing literature regard environmental context as a moderator (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011; Sanzo & Vazquez, 2011); in contrast, this study reviews the role of the environmental context from a process perspective. Third, we extend the perspectives of rational plan studies by examining the intermediary roles of product innovativeness and advantage in the synergy–performance relationship. Rational-plan research, one of three major streams in new product development, claims product development as a rational plan (Brown & Eisenhardt, 1995) and analyzes product innovativeness and advantage as the antecedents of product innovation performance. In contrast, this study reviews product innovativeness and advantage as the process variables linking synergies, environmental context, and new product performance.

The remainder of this manuscript is organized as follows: Section 2 introduces the development of the data used in this study; Section 3 provides an overview of the extant research and presents the hypotheses; Section 4 presents a review of the bivariate correlations among technology and marketing synergies, product innovativeness, product advantage, and new product performance, and further provides the results of a structural equation analysis; finally, Section 5 presents a summary of findings derived from this study and the subsequent implications, the limitations of this study, and directions for future research.

2. Database development

2.1. Collection of studies

To ensure that a complete and representative database was used in the meta-analysis, and thus meet the stated research goals, we followed the suggestions from earlier meta-analyses conducted in marketing (Eisend, 2010; Kirca, Jayachandran, & Bearden, 2005; Palmatier, Dant, Grewal, & Evans, 2006; Szymanski, Kroff, & Troy, 2007; Verbeke, Dietz, & Verwaal, 2011), and collected studies based on keyword searches and a literature tree. We used the following keywords to search for references from numerous electronic databases, including Business Source Complete, ABI/INFORM Complete (ProQuest), UMI Pro-Quest, Science Direct, Wilson Business Abstract, and JSTOR for studies published before the end of 2011: technology synergy, marketing synergy, product innovativeness (including

product innovativeness, product novelty, product newness, product uniqueness, radical innovation, new-to-firm, and new-to-market), product advantage (including product advantage, product superiority, and product competitive advantage), and new product performance (including product innovation performance and product development performance). We searched through the citations found in identified studies and performed manual searches of journals in which articles on product innovation were most likely to be published. We searched through the citations included in 15 identified studies, published in the *Journal of Marketing* and the *Journal of Product Innovation Management*, and searched 30 journals in which articles on product innovation were most likely to be published.³ Based on the results, we examined the abstracts of relevant articles and retained certain articles for further analysis if the abstracts stated that the outcome variable is new product performance in market or financial measures. We also posted requests on a series of listserves, such as Marketing Listservs, EMERITI Listservs (focusing on radical innovation discussion), and the Innovation and New Product Development Community of Practice, to obtain unpublished research to address the “file-drawer” problem (Rosenthal, 1995). These methods generated a total of 106 articles.

We considered including studies in the meta-analysis based on four criteria. First, the meta-analysis included only studies reporting correlation coefficients or other statistics that could be converted to correlations (e.g., Student's *t* and *F* ratios with one degree of freedom). We did not include studies that reported only the results concerning multivariate models. Second, we included only articles that examined manufacturing firms to reduce the bias that may arise from inconsistent measurements of new product performance. Third, studies have recommended numerous indicators used to measure various dimensions (such as speed, effectiveness, customer satisfaction, and market or finance performance) and new product performance (Griffin & Page, 1996). Aggregating all of these dimensions together may produce an overly complex conceptualization of new product performance. Such aggregation with mixed oranges and apples may lead to unfocused findings (Hunter & Schmidt, 2004). Therefore, we included only those studies that focused on market and financial performance measures. Extant studies concerning technology and marketing synergies only focus on these two performance dimensions. Fourth, because we formulated a structural equation model (SEM) that includes technology and marketing synergies, product advantage and innovativeness, and new product performance, a construct included in this meta-analytic review for multivariate analyses must include multiple study effects relating it to every other construct in the model (Brown & Peterson, 1993). Although several crucial constructs, such as market turbulence, market orientation, and launch proficiency, are associated with new product performance, they are seldom linked with technology and marketing synergies in the studies considered. These steps generated a sample of 75 studies that were

³ These journals include: *Academy of Management Journal*, *Asian Pacific Journal of Management*, *European Business Review*, *European Journal of Innovation Management*, *European Journal of Marketing*, *Industrial Marketing Management*, *Industrial Management & Data Systems*, *International Marketing Review*, *International Journal of Research in Marketing*, *Journal of Academy of Marketing Science*, *Journal of Business Research*, *Journal of Business & Industrial Marketing*, *Journal of Product Innovation Management*, *Journal of Product and Brand Management*, *Journal of International Marketing*, *Journal of Marketing*, *Journal of Marketing Research*, *Journal of Marketing Theory and Practice*, *Journal of Engineering and Technology Management*, *Journal of Personnel Selling and Sales Management*, *Management Decision*, *Management Science*, *Marketing Letters*, *Marketing Science*, *Organization Science*, *R&D Management*, *Research Technology Management*, *Strategic Management Journal*, and *Technovation*.

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