



# Business type, industry value chain, and R&D performance: Evidence from high-tech firms in an emerging market<sup>☆</sup>

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## ABSTRACT

This study focuses on how the business type and technological learning mode, which a high-tech firm chooses based on its core competence, influence the firm's R&D strategies, which in turn affect firm performance. This study also explores how the interaction between a firm's business type and industry value chain stage affects the relationship between R&D investments and operating performance. We suggest that the linkage of R&D investments and operating performance will increase gradually, when firms move from contract manufacturing to own brand business. R&D investments can contribute more to performance when firms adopt the hybrid business type. Furthermore, R&D investments generate more significant benefits for the own brand companies than the contract manufacturers at the same stage of the industry value chain. R&D investments of the downstream contract manufacturers have a negative impact on firm performance. Regardless of business type, firms in the upstream (midstream) stage of the industry value chain outperform downstream stage firms in deriving benefits from R&D activities. Finally, the lagged effects of R&D investments on operating performance are affected by the interaction between business type and industry value chain.

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## 1. Introduction

In fast-moving business environments open to global competition, and characterized by dispersion in the geographical and organizational sources of innovation and manufacturing, firms begin to focus on functions key to competitive advantage, while outsourcing low-value-added activities to members of their supply chains. On the other hand, firms start to adopt more flexible business models in order to cope with competition and to achieve sustainable operation in the age of meager profits. A given firm will consider its own core competence and competitive advantages when selecting its business type and technological learning mode. Generally speaking, the business types that a firm can perform include own brand manufacturing (OBM), original design and manufacturing (ODM), original equipment manufacturing (OEM) or electronic manufacturing services (EMS). Under OBM, the firm develops and sells products under its brand name. Under ODM, the contract manufacturer carries out some or all of the product design and process tasks that are needed to manufacture a product according to the general product requirement provided by the buyer (contractor). ODM business type provides a mechanism for the contract manufacturer to obtain more of the value-added while still avoiding the risk of launching own-brand products. Under OEM, the contract manufacturer produces a finished good based on the precise specification of the contractor and is able to avoid the huge cost burdens and risks involved in

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R&D activity [1]. The contractor then sells the product under its brand (thereby pursuing the post-manufacturing value-added).<sup>2</sup> From the viewpoint of technological learning, on the other hand, Hobday [2] proposes an OEM–ODM–OBM migration strategy and suggests that the latecomer suppliers should first begin to develop process capabilities, followed by product design capabilities, and finally new product/branding capabilities. From OEM to OBM, the progression can be viewed as a form of training in technological learning [1,3]. By upgrading from OEM and ODM to OBM, contract manufacturers can not only obtain higher profit margins from their own-brand business and brand reputation but also garner more market information regarding product design and development and marketing know-how [4].

In management literature, based on resource-based theory, researchers generally suggest that a firm will take core competence and competitive advantages into consideration when choosing a business type as well as technological learning mode and making resource allocation decisions. A variety of empirical evidence supports the hypothesis that research and development (R&D) investment is a sine-qua-non for enhancing the level of a firm's innovation activities [5,6]. R&D investment by a firm has been viewed as a key factor in strengthening its competitive advantage [7]. This is particularly true for high-tech firms. However, to our knowledge, few previous researchers used high-tech firms as sample and studied whether the choices of technological learning mode (OBM vs. ODM/OEM) of those R&D-intensive firms would affect their R&D investment strategies and the resulting innovation performance. What role does business type, which a firm chooses according to its core competence, play during the process of turning innovation capital accumulated through R&D investments into operating performance? Do OBM firms obtain higher value-added from R&D investments than contract manufacturers (i.e., ODM/OEM firms)?

The term value chain is a concept from business management that was first described by Porter [8]. A value chain is a chain of activities that gives the products more added value than the sum of the added values of all activities. The concept of value chain has been extended beyond individual organizations and can apply to whole supply chains and industries. Firms at different industry value chain stages are characterized by a reciprocal dependence and support in information sharing, manufacturing, logistics, and innovation. Researchers have evidenced that firm performance is influenced by industry value chain [9], market structure [10], and by changes in other structural factors such as industry concentration, growth, and fluctuation of mobility barrier heights [11]. On the other hand, companies at different industry value-chain stages experience different entry barriers in capital and technology and thus, different market competition. Research reports from investment institutions, for example Merrill Lynch, indicate that the information and electronic industry exhibits a phenomenon best described as “feasting upstream, famine downstream”; that is, compared with the downstream sector, the upstream sector enjoys larger profit margins due to the high entry barriers in capital and technology. To our knowledge, however, relatively few studies examined whether a high-tech firm's location in different stages of the industry value chain would affect R&D performance. No study considered the whole industry as a system of value creation and explored how the interaction between business type and value chain stage in industry would affect the linkage of R&D investments and firm performance. In contrast to the U.S. and Europe, most Taiwanese information and electronic firms typically operate in a single business type, and specialize in one of the industry value-added activities. This offers a unique setting to address the issues.

The current study contributes to the literature in several ways. For the R&D and intellectual capital literature, many researches on the field of management have indicated that R&D investments can help to boost firm performance. However, those researches have paid little attention to the lagged effects of R&D investments on firm performance. Our work introduces valuable moderating factors such as business type, technological learning mode, and industry value chain into the linkage of R&D investment and performance and provides meaningful insights for literature and business practice. For example, we find that the R&D capital of ODM/OEM firms in the downstream stage of the industry value chain has a negative impact on firm performance. The lagged effects of R&D investments on operating performance are affected by the business type and the interaction between business type and industry value chain stage. Second, in management literature, based on resource-based theory, researchers generally suggest that a firm will take core competence into consideration when choosing a business type and industry location. However, previous researches have not explored whether the choice of business type or/and industry value chain stage would affect firms' innovation investment strategies and the resulting performance. Our work uses the archival data and provides credible empirical evidences for the advocates of resource-based theory. In addition, based on resource-based theory, R&D investment by a firm has been viewed as an important resource and capability in explaining firm performance. However, our study shows that R&D investment does not necessarily lead to increased performance by itself. In fact, our work highlights the importance of firm-specific (e.g., business type) and industry-specific characteristics during the process of turning innovation capital accumulated through R&D investments into core capability and firm performance. Third, relatively few studies have explored whether the relationship between commercialization orientation, a firm's tendency to devote its efforts and resources to bringing the technology capabilities and R&D results to the market, and performance is affected by firm-specific and industry-specific characteristics. This paper finds that the relationship is strongest for firms in the downstream stage of the industry value chain, followed by those in the midstream stage, and lastly firms in the upstream stage. As a matter of fact, upstream firms with OBM type experience negative impact from the commercialization orientation on their performance.

The remainder of the study is organized as follows. The Taiwanese information and electronic industry is introduced in [Section 2](#). [Section 3](#) presents the literature survey and the research hypotheses. [Section 4](#) elucidates the research design. [Section 5](#) explains the empirical results. [Section 6](#) provides the concluding remarks.

<sup>2</sup> The business model for EMS firms is to specialize in large economies of scale in manufacturing, raw materials procurement, and pooling together resources to create added value services such as warranty and repairs. EMS manufactured goods are always labeled with the buyer's brand and corporate identity.

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