Chapter 2
Modularization (MD) and IT in Auto Industry: An Empirical Study in PRC

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ABSTRACT
This chapter is a pioneer study on the application and impact of modularization in the Chinese auto industry. The role of IT as a mediator and moderator is also analyzed in this study. Although Modularization (MD) has become a global trend in the auto industry, few empirical studies have been conducted because it is a difficult task to operationalize the multi-faceted, complex modularization. This research made an analysis through the lenses of international business theories like internationalization theory and Knowledge-Based-View of the firm (KBV). Quantitative methodology like regression and correlation analysis was applied in this study, based on the data collected from 250 automotive firms in China. Academically, this research fills in the gap of empirical study on modularization and its impact in the auto industry of developing economies. In practice, it can help decision makers in the auto industry make a more scientific decision about whether and how they should go into modularization, and have a better understanding of the characteristics of the global auto industry in developing economies.

INTRODUCTION
Modularization (MD) in the auto industry is relatively new when compared to its application in other industrial areas. It is regarded as the third revolution in the history of the auto industry after Henry Ford’s assembly line production system and Toyota’s JIT (just in time) management (Collins, Bechler, & Pires, 1997; Sako, 2003). Modularization brought a major reorganization to the automotive parts supplier industry by realizing a firm’s strategic positional advantage through mass customization (Pine II, 1993; Pine II, Bart, & Andrew, 1993; Ro, Liker, & Fixson, 2007). As Starr (1965) suggested a half-century ago, it can be summarized as “a developing capacity
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to design and manufacture parts which can be combined in the maximum number of ways” (p. 165). While academic interest in this area also experienced significant growth in recent years, few empirical studies have been conducted because it is a difficult task to operationalize the multi-faceted, complex aspects of modularization (Fixson, 2003; Hoetker, 2006; Sako, 2003; Salvador, 2007).

Volkswagen and Mercedes-Benz initiated the strategy of modularization in the mid-1990s in Brazil by separating their products into modules. Eventually it was widely adopted by GM, Ford and other automakers worldwide due to the advantages of low cost, high variety, and speedy delivery (Ro, et al., 2007; Veloso, 2000). In the auto industry, modularization means that automakers are delegating modules with a bundle of more complex functions to parts suppliers.

Although modularization has become a global trend in the auto industry, studies show that different characteristics of modularization are exhibited in various international automobile markets (Doran, 2004; Doran, Hill, Hwang, & Jacob, 2007; Kotabe, et al., 2007; Lin, et al., 2009; Ro, et al., 2007). The People’s Republic of China (hereinafter referred as China) has been recognized as the largest car market and manufacturer in the world in recent times (PTI, 2011; Wyman, 2007), yet the industrial structure is quite different from leading countries such as the U.S. and Japan (J. Chen, 2008; Harwit, 2001; Kim, Rhee, & Oh, 2010; KPMG, 2007, 2009; Lian, 2004; J. Luo, 2005; Sit & Liu, 2000; Sutton, 2005; Q. Zhu, Sarkis, & Lai, 2007). More than sixty percent of the vehicles in China are produced under foreign brands by joint venture factories (Brandt & Biesebroeck, 2007), hence China still does not lead in innovation and design.

Despite the importance and uniqueness of the Chinese auto industry, only a few conceptual scholarly works have been conducted touching on the concept of modularization (Lin, et al., 2009; Liu, Sui, & Gu, 2008; Y. Zhu & Zhang, 2005). This means that there is not a deep understanding of this topic as it exists in the Chinese auto industry. A firm’s strategic positional advantage is the core competence of an auto firm, thus, the relationship between the modularization of automotive firms and a firms strategic positional advantage is important to investigate (Day & Wensley, 1988; Lanctot & Swan, 2000; Parente, 2003). Further, according to the knowledge-based view of the firm theory (KBV), knowledge is

Figure 1. Conceptual structure of supply chain with modularization in the auto industry