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A QUALITATIVE COMPARATIVE ANALYSIS OF BUSINESS MODEL CONFIGURATIONS AND PERFORMANCE IN FORMULA 1

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INTRODUCTION

Technological innovation is critical for firm performance, yet the common assumption that technological innovation is directly connected to superior firm performance overlooks the key role of business models (Amit & Zott, 2001; Baden-Fuller & Haefliger, 2013). Business models are cognitive devices representing a business enterprise's value creation and value capture activities (Baden-Fuller & Morgan, 2010; Chesbrough & Rosenbloom, 2002; Teece, 2010). By adopting different business models managers can, for example, leverage the same technology to target different customer segments, as in the case of satellite technologies used for selling both communication services and navigation devices. Thus, business models connect the technological and economic domains of a business by articulating "a value proposition latent in the new technology" (Chesbrough & Rosenbloom, 2002: 534). Although the role of business models is increasingly recognized (Zott & Amit, 2007, 2008; Zott et al., 2011), we echo some recent works (Baden-Fuller & Haefliger, 2013; Klang et al., 2014) in claiming that our understanding of the relationship between business models and firm performance in technology-based environments (i.e., contexts where firms are pressured to constantly innovate their technology to compete) is still incomplete.

In particular, previous studies of business models have devoted relatively little attention to the fact that firms often run multiple business models simultaneously, thus implementing configurations of business models (for exceptions see Andries et al., 2013; Casadesus-Masanell & Tarzijan, 2012; Markides & Charitou, 2004; Sabatier et al., 2010). Business model configurations are especially important in technology-based environments where firms often "require distinct business models that operate in tandem" (Casadesus-Masanell & Tarzijan, 2012: 132) to develop multiple revenue streams with the same technology. For example, Amazon uses the same online platform to sell both cloud computing services and household goods, targeting different customer segments with different business models. Analyzing Amazon's multiple business models as a configuration (rather than as a set of isolated elements) would reveal the potential synergies among the firm's business models, such as cross-selling opportunities between the different targeted customer groups. More generally, a configurational approach is valuable because it indicates when a firm's business models are complementary—i.e., when the joint adoption of two or more business models is associated with higher firm performance than the separate adoption of each business model (c.f. Kogut et al., 2004; MacDuffie, 1995; Milgrom & Roberts, 1995). Despite its analytical value, extant literature has overlooked the configuration of a firm's business models as a salient unit of analysis to better understand firm performance, mostly focusing on the performance implications of single business models considered in isolation (Zott & Amit, 2007, 2008; Zott et al., 2011). In addition, the exact nature

of the complementarities underpinning high-performing configurations has not been fully unpacked in previous studies (e.g. Ennen & Richter, 2010 for a review), so that we do not have a systematic understanding of why high-performing business model configurations are associated with high performance. Accordingly, in this paper we investigate the following two research questions: Which configurations of business models are associated with high and low levels of firm performance in a technology-based environment? What is the nature of the complementarities underlying high-performing configurations?

We address these questions with a qualitative analysis of the business model configurations adopted by the twenty-eight Formula One (F1) racing firms competing between 2005 and 2013. The F1 industry constitutes a technology-based environment characterized by the continuous development of cutting-edge motorsport technology (e.g. Castellucci & Ertug, 2010; Jenkins, 2010, 2014; Jenkins et al., 2005). Major automobile companies participate in F1 competitions in order to develop and test successful technological solutions, which are often later adopted in standard road cars. Thus, by studying F1, we also elucidate an important source of innovation for the global automotive industry that is connected to tomorrow's mobility.

Our empirical enquiry followed three steps. First, by coding archival data and interviews with F1 experts, we identified the business model configurations adopted by F1 firms. Second, we analysed these configurations and their association with firm performance via Qualitative Comparative Analysis (QCA), a configurational, case-oriented, method (Ragin, 1987, 2000, 2008) well-suited to address our research questions. Third, we inductively explore why the business models bundled in the high-performing configurations (identified via QCA) are complementary—i.e., why some of the configurations are actually high-performing. For this purpose, we conducted a second round of interviews with F1 experts to interpret our QCA results, inquiring into the synergies underpinning high-performing configurations.

Taken together, our analyses revealed two main findings. First, five of the six configurations associated with high performance feature the joint adoption of two specific business models: 1) a F1 supply business model focused on the sale of technology components (e.g., engines) to other F1 firms (i.e., direct competitors in F1 racing); 2) a talent business model focused on the development and trade of F1 drivers with other F1 firms. In addition, these two business models are not featured in any (with the exception of one) of the ten configurations associated with low performance. Second, we discovered that these two business models not only allow accessing valuable resources (i.e., financial, knowledge, human), but are linked by capability-enhancing complementarities, so that the joint implementation of the two business models supports the development of firms' capabilities, fostering faster learning and strengthening the firms' focus on their core activities.

BUSINESS MODEL CONFIGURATIONS AND PERFORMANCE

Through the literature on business models, scholars have aimed to understand the complex systems of activities by which firms generate and capture value. Despite the growing body of research on this topic, several problems remain unsolved—most prominently the relationship between business models and firm performance (Zott & Amit, 2007, 2008). This issue is complex because, especially in technology-based environments, firms run multiple business models simultaneously to leverage the multiple commercial uses of the same technology (Andries et al., 2013; Casadesus-Masanell & Tarzijan, 2012; Markides & Charitou, 2004; Sabatier et al., 2010). Previous studies argue that it is paramount to understand how

business model choices affect firms' ability to profit from their technological innovation (cf. Chesbrough, 2006; Teece, 1986). However, this can be challenging when business models cannot be considered in isolation, but should be understood within the configuration of other business models that the firm implements (Markides & Charitou, 2004; Sabatier et al., 2010). Yet, beyond the notion that new technology can trigger change in business models (Björkdahl, 2009; Chesbrough, 2010), extant literature provides relatively scarce empirical evidence of how the heterogeneity of business models relates to firm performance. To tackle this thorny issue, we first introduce the definition of business model informing our research and then discuss the concept of business model configuration.

Teece (2010: 172) argues that a business model defines “the manner in which the enterprise delivers value to customers, entices customers to pay for value, and converts those payments into profits”. Business models can describe any type of business enterprise: a service firm, a local cafe, a racing company, a sports federation, or a TV station. In this study, we follow the research tradition conceptualizing the business model as a cognitive device to account and articulate a business' value creation and capture activities (Baden-Fuller & Morgan, 2010; Casadesus-Masanell & Ricart, 2010; Chesbrough & Rosenbloom, 2002; Martins et al., 2015; Teece, 2010).

More specifically, we follow the conceptualization of Baden-Fuller and Mangematin (2013) in specifying four constitutive elements of a business model: customer sensing, customer engagement, monetization, and value chain linkages. Customer sensing refers to the identification of customer groups and their demands. Customer engagement consists in defining the value proposition. A common distinction in the literature separates pre-designed (i.e., ‘bus’) products and services from custom-made (i.e., ‘taxi’) solutions. Monetization addresses how firms capture portions of the value that they create, encompassing pricing and the mechanisms (e.g., freemium; work for hire etc.) by which customers can be convinced to pay for the products or services that they consume. Finally, value chain linkages concern the governance architecture of value creation and capture, defining the degrees of integration in a firm's relationships with its suppliers and other stakeholders (vertical integration vs network architecture).

Technology-based environments are arenas in which firms are frequently pressured to innovate their technology to compete. In these contexts, technological innovation often allows firms to implement “several different business models simultaneously to serve different consumers [...and to] help them to develop the market value of their activities and generate revenue streams to balance the uncertainties” (Sabatier et al., 2010: 432). Consider, for example, the case of Netflix, which uses two business models simultaneously—one for its DVD-by-mail services and another for its streaming-video services. In such cases, the unit of analysis that is most useful to understand how business models relate to performance is the configuration of business models that a firm implements—rather than any single business model per se. In fact, adopting a configurational perspective on business models allows us to evaluate whether a firm's different business models are complements (Andries et al., 2013; Casadesus-Masanell & Tarzijan, 2012; Markides & Charitou, 2004; Sabatier et al., 2010). Recent studies suggest that to foster performance without cannibalizing its different activities, a firm implementing two business models simultaneously needs “to balance the benefits of keeping the two business models separate while at the same time integrating them enough so as to allow them to exploit synergies with one another” (Markides & Charitou, 2004: 22). The need for such a balance implies the existence of an optimum point in the trade-off across different business models, which can be achieved by varying the way in which they fit with each other. For example,

Sabatier, Mangematin, and Rousselle (2010) show that young biotech firms manage this tension by running a short-term business with immediate returns while simultaneously investing in future-oriented business. In doing so, they balance time lags, risks, and interdependencies, maintaining high returns on investment—see also the case of LAN Airlines by Casadesus-Masanell and Tarzijan (2012). There are also cases in which different business models in a configuration conflict with each other. Consider, for example, the case of Kodak, which ran two business models—one for digital and one for film photography—for a long time without acknowledging that the models were not complements (see Gavetti et al., 2005). These cases of success and failure represent two sides of the same coin: to leverage the potential value that is embedded in their technology, firms need to appreciate the variety of business models that they implement and understand the possible complementarities among them. For this reason, different business model configurations can be expected to be associated with different levels of performance, providing insights into the complementarities underlying high performance.

RESEARCH SETTING AND FINDINGS

Our study is based on a qualitative analysis of the business model configurations adopted by all the F1 firms competing during the period between 2005 and 2013 (a total of 28 firms). F1 is not only the most technologically advanced motorsport in the world but also an empirical setting increasingly used for robust management research (as confirmed by several studies such as Castellucci & Ertug, 2010; Jenkins & Floyd, 2001; Jenkins & Tallman, 2010; Khanna et al., 2003; Pinch et al., 2003; Tallman et al., 2004). F1 racing comprises an annual calendar of about twelve car races taking place around the world. In each race, each F1 firm (also called “F1 teams” due to the sport nature of this industry) competes by having two drivers racing two almost identical cars. Drivers gain a number of points according to their arrival position in each race, and the final tally at the end of the season reflects the total points that they gain over the series of races. Since 1981, all F1 firms are required to develop their own car chassis internally, although the engine and all the other components can be purchased from third parties (external suppliers or other F1 firms).

F1 is an industry that is worthy of research attention per se as it has an estimated yearly turnover of more than US\$3.5 billion, employs approximately 50,000 people in more than 30 countries, and represents the pinnacle of automotive technologies (Jenkins et al., 2005). F1 firms often develop and transfer technological innovations to road car companies. F1 also feeds new technological innovations to many different industries (Moskvitch, 2011). For instance, F1 innovations have made their way not only into the regular automotive industry (e.g., ABS brakes, traction control, hybrid powertrains, active suspensions, finger-controlled gear shift systems, high-performing hybrid engines) but also into the bicycle (e.g., carbon-fiber composite frames) and sailing (e.g., composites for racing boats rudders) industries. Further, F1 innovations have provided technologies that are now used in factories, hospitals, and Olympics’ sports training (e.g., advanced telemetry systems; high-speed swimming suits) and that have contributed to advanced engineering (e.g., virtual design and simulators) and even public transportation systems (e.g., flywheel energy storage mechanisms).

In this study, we explore the association between business model configurations and different levels of performance in a technology-based environment (i.e., F1 racing). We find that configurations comprising business models leveraging technological resources (i.e., F1 supply) and human resources (i.e., talent) are associated with high performance. In addition, we find that

these business models are underpinned by capability-enhancing complementarities, such that their joint adoption critically accelerates a firm's learning and enhances its focus on core activities, thus supporting the development of firm-specific capabilities.

While qualitative comparative analysis (QCA) helps us identify which business model configurations are associated to high and low performance, it does not provide details about the nature of the complementarities underlying different business model configurations. We found that by selling relevant technological components to other F1 firms, F1 teams that operate as part suppliers gain access to a set of critical resources going beyond the financial ones. In particular, they access a large set of data and information about their own technological components derived from their clients' cars—i.e., data on how the supplied engines perform in clients' cars during races. This implies that the more F1 firms engage with F1 competitors as customers, the bigger the data they obtain: for example if a firm sells its engines to other two F1 firms (e.g., Ferrari sold its engines to Scuderia Toro Rosso and Sauber), the F1 firm will access technical data from six cars on the racetrack (each F1 firm deploys simultaneously two cars). This larger and enhanced set of data represents an additional resource, supporting learning processes and enhancing capabilities for technology development. Indeed, this helps the team designing and manufacturing a better car, which is the basic technology used to train drivers and develop the drivers' skills. In addition, because of data-informed training, talented drivers achieve a better understanding of their firm's technology and can provide better feedback to the engineers regarding how to improve technological components, thus further enhancing the firm's technological capability. This is complementary to driver development activities via the talent business model. Overall, the capabilities developed through the supply business model enhance the training experience developed through the talent business model, thus creating better capabilities in developing new drivers—key assets in F1—which in turn can offer more informed advice to the engineering team about the context of use of technology, and in terms of technology development priorities. Better drivers and better technology are the fundamental premise to foster F1 firms' racing results as well as their other outcomes deriving from other activities (prospect technological supply; sponsorships; brand royalties; etc.).

All in all, apart from the important but somehow obvious financial and commercial returns that each business model entails, we found that the nature of the complementarity between business models associated with higher performance is capability-enhancing (Kogut & Zander, 1992). This in F1 corresponds to the joint configuration of two business models (i.e., supply and talent) that focus the racing core activities (i.e., developing racing technology and training drivers). Still, less focused business models (e.g., internal and external knowledge transfer) that move the firm's attention away from its core racing activities might overall reduce learning and thus increase the risk of being associated with low performance: a result that in F1 cannot be counterbalanced by mere commercial and economic returns.

IMPLICATIONS

First, our findings contribute to the literature that connects business models to technology and performance (Zott & Amit, 2007, 2008), with particular reference to business model configurations (Andries et al., 2013; Casadesus-Masanell & Tarzijan, 2012; Markides & Charitou, 2004; Sabatier et al., 2010), by elucidating the nature of the complementarities underlying business model configurations. Our study highlights that these complementarities may differ depending on the nature of the linkages connecting the different business models in a

configuration. Whereas previous research has mostly focused on economic complementarities, for example, by exploring cross-subsidies among business models in two- or multi-sided platforms (Casadesus-Masanell & Tarzijan, 2012; Eisenmann et al., 2006), our paper emphasizes capability-enhancing complementarities. We find that certain business models are useful not only because they create and capture value within a line of business (i.e., from a given set of customers), but also because they generate human and knowledge resources that can enrich the value generated across business models. That is, they help enhancing the value of resources and capabilities, which can be used in a different business model adopted by the same firm.

Second, our work contributes to an emerging stream of studies exploring sport environments to investigate management topics (Day et al., 2012; Wolfe et al., 2005) by emphasizing the importance of business model configurations in these environments—a phenomenon that has received relatively less attention in this research stream. In fact, in recent years, academic management studies have increasingly researched sport—and specifically Formula 1—exploring topics such as technological innovation (Jenkins, 2010; Jenkins & Floyd, 2001; Marino et al., 2014), imitation responses (Jenkins, 2013), status interplay between F1 firms and their suppliers (Castellucci & Ertug, 2010), and advantages derived from geographical localization (Jenkins & Tallman, 2010; Pinch et al., 2003; Tallman et al., 2004). Our paper complements these F1-based studies by linking some of the core topics explored in this literature (such as technological innovation and learning) to business model configurations, unpacking how complementarities are related to the development of capabilities. In doing so, we answer the recent call to leverage the rich availability of sport data for better understanding competitive dynamics in the academic and in the practitioners' domains (George et al., 2014; Lewis, 2004).

An interesting implication for future research of the business model lens explored in this study is a refined understanding of competition and competitive groups within an industry (Porac et al., 1989) on the basis of business objectives that go beyond the most salient performance objective in the industry—in our case: winning car races. Indeed, the fact that certain F1 firms might still be able to, literally, “stay in the race” despite underperforming in an industry's core activities sheds light on the fact that some firms might economically survive—even though they consistently underperform relative to their rivals—because their business models target viable niches. The history of F1 offers several good examples of such firms. For instance, the former Italian F1 firm Minardi managed to compete in F1 for twenty years (1985-2005) owing to an effective talent system despite achieving poor racing results: during its lifetime, Minardi obtained only 38 championship points (16 of which were earned by the firm's first driver) and only one front row start (in 1990) and never achieved a podium finish. This seems to suggest that in certain industries different measures of performance co-exist. For example, movies, music, art shows, and many other creative products can encounter the critics' favor and thus being awarded prestigious prizes, but remain commercial failures (Caves, 2000). Sport teams might be proficient at monetizing their value via fans, sponsors, and merchandizing yet perform poorly in matches. Other companies exploring innovative business models (such as the music streaming platform Spotify) might experience growth over the years in terms of their user base, but struggle to make the business profitable. The analytical focus on business model configurations explored in this paper points at the importance, for scholars and practitioners, of being aware of multiple performance criteria when observing industries and the synergies between business models.

REFERENCES AVAILABLE FROM THE AUTHORS