Industrial and Corporate Change, 2015, Vol. 24, No. 3, 655–676
doi: 10.1093/icc/dtv012
Advance Access Publication Date: 12 May 2015
Original Article

OXFORD

Business model configurations and performance: A qualitative comparative analysis in Formula One racing, 2005–2013

Paolo Aversa,[1,*] Santi Furnari[2] and Stefan Haefliger[3]

[1]Cass Business School, City University London, 106 Bunhill Row, London EC1Y 8TZ. e-mail: paolo.aversa.1@city.ac.uk, [2]Cass Business School, City University London, 106 Bunhill Row, London EC1Y 8TZ. e-mail: santi.furnari.1@city.ac.uk and [3]Cass Business School, City University London, 106 Bunhill Row, London EC1Y 8TZ. e-mail: stefan.haefliger.1@city.ac.uk

*Main author for correspondence.

Abstract

We investigate the business model configurations associated with high and low firm performance by conducting a qualitative comparative analysis of firms competing in Formula One racing. We find that configurations of two business models—one focused on selling technology to competitors, the other one on developing and trading human resources with competitors—are associated with high performance. We also investigate why these configurations are high-performing and find that they are underpinned by capability-enhancing complementarities, accelerating firms' learning and supporting the development of focused firms' capabilities.

JEL classification: M10 – Business Administration (General)

1. 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 and Zott, 2001; Baden-Fuller and Haefliger, 2013). Business models are cognitive devices representing a business enterprise's value creation and value capture activities (Chesbrough and Rosenbloom, 2002; Baden-Fuller and Morgan, 2010; 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 and Rosenbloom, 2002: 534). Although the role of business models is increasingly recognized (see Klang *et al.*, 2014 for a review), we echo some recent works (e.g., Baden-Fuller and Haefliger, 2013) 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 Markides and Charitou, 2004; Sabatier *et al.*, 2010; Casadesus-Masanell and Tarzijan, 2012). Business model configurations are especially important in technology-based environments where firms often "require distinct business models that operate in tandem" (Casadesus-Masanell and 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. MacDuffie, 1995; Kogut *et al.*, 2004). 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 (see Klang *et al.*, 2014 for review). In addition, the exact nature of the complementarities underpinning high-performing configurations has not been fully unpacked in previous studies (e.g., Grandori & Furnari, 2008), so that we do not have a systematic understanding of *why* high-performing business model configurations are associated with high performance. Accordingly, in this article 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 comparative analysis of the business model configurations adopted by the 28 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., Jenkins *et al.*, 2005; Castellucci and Ertug, 2010; Jenkins, 2010, 2014). 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.

Given the relative scarcity of systematic scholarly understanding of business model configurations, our study is exploratory in nature. Our broader goal is to sensitize future research on a relatively under-studied topic. We identify and describe business model configurations, analyze their associations with firm performance, and explore the nature of these associations. In other words, our main focus is not on identifying precise causal patterns but rather on qualitatively investigating the mechanisms underlying the associations between business model configurations and firm performance.

Our empirical inquiry 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 analyzed these configurations and their association with firm performance via Qualitative Comparative Analysis (QCA), a configurational, case-oriented, method (Ragin, 1987, 2008) well-suited to address our research questions. Third, we inductively explored *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: (i) a *F1 supply business model* focused on selling technological components (e.g., engines) to other F1 firms (i.e., direct competitors in F1 racing); (ii) 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 10 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.

2. Theoretical background

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 (e.g., Zott and 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 (e.g., Markides and Charitou, 2004; Sabatier *et al.*, 2010). Evaluating how business model choices affect firms' performance can be challenging when business models cannot be considered in isolation and should be understood within the configuration of the other business models that the firm implements (Markides and 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.

2.1 Defining business models

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 television 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 (Chesbrough and Rosenbloom, 2002; Baden-Fuller and Morgan, 2010; Casadesus-Masanell and Ricart, 2010; Teece, 2010; Martins *et al.*, 2015).

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 predesigned (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).

2.2 Business model configurations and performance in technology-based environments

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 (Markides and Charitou, 2004; Sabatier *et al.*, 2010; Casadesus-Masanell and Tarzijan, 2012). 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 and 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 (e.g., see also Sabatier *et al.* 2010; Casadesus-Masanell and Tarzijan, 2012). However, 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.

3. Data and methods

Our study is based on a qualitative comparative 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—see Table 1 for details on the F1 firms). In the following sections, we first describe our research setting, illustrating in particular why we decided to focus on the F1 industry and why this setting provides insights for other industries. Second, we describe the data that we collected and our research design. Third, we present the methods that we used to identify the business models within the F1 industry and to analyze the relationships between business model configurations and performance as well as their underlying complementarities.

3.1 Research setting

F1 is not only the most technologically advanced motorsport in the world but also an empirical setting increasingly used for robust management research (e.g., Jenkins, 2010, 2014; Pinch *et al.*, 2003; Castellucci and Ertug, 2010; Marino *et al.*, 2015). F1 racing comprises an annual calendar of about 12 car races. In each race, each F1 firm (also called "F1 team" 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 innovations have made their way not only into the regular

Table 1. F1 firms participating in Formula 1 races between 2005 and 2013

Nr.	F1 firm	Debut	Years as F1 firm
1	Arrows	1978	1978–2002
2	BAR	1999	2000–2005
3	Benetton	1986	1986–2001
4	BMW	1952	1952–1952, 2006–2010
5	Brawn	2009	2009–2009
6	Caterham	2012	2012–2013
7	Ferrari	1950	1950–2013
8	Force India	2008	2008–2013
9	Honda	1964	1964–1968, 2006–2008
10	HRT	2010	2011–2012
11	Jaguar	2000	2000–2004
12	Jordan	1991	1991–2005
13	Lotus	2012	2012–2013
14	Marussia	2012	2012–2013
15	McLaren	1966	1966–2013
16	Mercedes	1954	1954–1955, 2010–2013
17	Midland	2006	2006–2006
18	Minardi	1985	1985–2005
19	Prost	1997	1997–2001
20	Red Bull Racing	2005	2005–2013
21	Renault	1977	2002–2011
22	Sauber	1993	1993–2013
23	Spiker	2007	2007–2007
24	Super Aguri	2006	2006–2008
25	Scuderia Toro Rosso	2006	2006–2013
26	Toyota	2002	2002–2009
27	Virgin	2010	2010–2011
28	Williams	1977	1977–2013

automotive industry (e.g., ABS brakes, traction control, hybrid powertrains, etc.) but also into the bicycle (e.g., carbon-fiber composite frames) and sailing (e.g., composites for racing boats rudders) industries (Moskvitch, 2011). 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 simulators) and even public transportation systems (e.g., flywheel energy storage mechanisms).

The F1 industry provides at least three advantages for this study. First, F1 offers a clear and reliable measure of performance: as Gino and Pisano note, in motorsport, "performance is unambiguously measurable by lap times and race results" (2011: 70). We align with other studies of this setting by using the final championship classification as a viable measure of performance because winning races represents what all firms declare to be their ultimate goal (Bothner *et al.*, 2007; Castellucci and Ertug, 2010; Jenkins, 2010; Marino *et al.*, 2015). In addition, evidence suggests that F1 racing results are correlated with financial performance (Sylt and Reid, 2011; Black *et al.*, 2013). Second, we echo other scholars (Castellucci and Ertug, 2010; Marino *et al.*, 2015) in claiming that the key similarities among F1 firms, such as their comparable sizes, organizational structures, and focus on producing one specific technological product (i.e., the car), represent an important natural "control," strengthening the internal validity of empirical analyses, especially in qualitative studies such as ours. Third, the media and fans' great interest in F1 has facilitated the accumulation of a large amount of publicly available archival data, which typically offer very detailed accounts of F1 firms and their technologies. We discuss the limitations of this setting in the concluding section of the article.

3.2 Data and sample

We collected secondary data from a broad range of sources—i.e., books, industry reports, specialized and generalist press, etc. (see Table 2 for a list of all our data sources). These sources have been selected because they are established and reliable sources of information about F1.

We used these data to construct a 9-year (2005–2013) longitudinal database containing information on the business model configurations and performance of all the 28 F1 firms participating in F1 racing competitions during the period between 2005 and 2013 (see Table 1). Following previous research on the topic (e.g., Gino and Pisano, 2011), firm performance was measured as the F1 firm's final rank in the Constructor Championship in each of the nine racing seasons from 2005 to 2013 (ranking data were taken from the two official, publicly available, F1 ranking databases: "Forix on Autosport" and "Formula 1").

The business models that each F1 firm adopted were coded, year by year, by following the qualitative data analysis and coding methodology described in the next section. The sample of analyzed F1 firms is unbalanced across the years: while certain firms competed in all 9 years, others exited and new firms entered the racing competition. The unbalanced nature of our longitudinal sample does not constrain our configurational analysis, but rather constitutes an opportunity to identify robust configurations across time. Indeed, the fact that the population of F1 firms changes over time allowed us to assess whether there are high- and low-performing business model configurations that remain stable over time despite changes in the population of firms, thus offering an opportunity to identify more robust configurations across the nine seasons we analyzed. We decided to use the year 2005 as a starting year in our data set because this is the first year in which some of the business models that we identified (e.g., external knowledge transfer business model) were first adopted in the F1 industry.

3.3 Data analysis and methods

Our data analysis proceeded in three steps. First, by reading and coding our secondary data and the interviews with our informants (see Table 3), we identified all the business models that were implemented in the F1 industry between 2005 and 2013, coding whether each F1 firm adopted the identified business models in each year. Second, we used QCA (Ragin, 1987) to investigate the association between the business model configurations that F1 firms adopted in a specific year ($time_0$) and the firms' performance in the following year ($time_1$). To further substantiate the results of the QCA with longitudinal qualitative evidence, we integrated this analysis with two case histories of two F1 firms whose performance changed with the adoption of a new business model configuration. Third, to investigate the nature of the complementarities underlying the high-performing business model configurations (identified via QCA), we conducted a second round of interviews with our informants, and we qualitatively analyzed the content of those interviews. Below, we describe the methodology that we followed in our coding and QCA.

To identify the business models adopted by F1 firms, we followed a two-pronged coding methodology. First, we read and interpreted all the 166 documents constituting our database (see Table 2) by using the conceptualization of

Table 2. Data sources

Type of source	Sources	Number of documents
Books	Who Works in Motorsports	2
	Who Works in F1	9
	The Art of War (Parr 2013)	1
	Formula Money (Sylt and Reid, 2010; 2014)	2
	Official Formula 1 Season Review (Cooper and Dodgings 2013)	1
	The Official BBC Sport Guide: Formula One (Jones 2013)	1
	Formula One Technical Analysis (Piola 2013)	9
	Autocourse 2013/14: The World's Leading Grand Prix Annual (Dodging *et al.* 2013)	1
Technical press	Racecar Engineering	1
	Autosport	8
	Motor Sport magazine	5
	F1 Racing	3
	Race Tech International	4
General press	Financial Times (F1 Special Report)	4
	The Economist	6
	The Guardian	8
	Forbes	7
	Gazzetta dello Sport (Italian)	9
Web sites and blogs	BBC.co.uk	8
	Autosport.com	5
	Formula1.com	9
	F1Fanatic.com	4
	JamesAllenonF1.com	7
	JoeSaward.wordpress.com	11
	F1professor.wordpress.com	5
	Others[a]	10
	F1 firms official sites	14
Videos	BBC Sport	3
	Sky Sports	1
	Automotive TV	1
	AutoMoto TV	1
	Nuvolari Channel	2
Audio commentaries	BBC F1 podcast	3
Technical reports	FIA official reports	1
		166

[a]About.com F1 (1); F1technical.com (2); PlanetF1.com (1); GPtoday.com (1); Thepaddockmagazine.com (1); Theguardian.com (2).

business model elements illustrated above (Baden-Fuller and Mangematin, 2013) as an "orienting framework for interpretation" (Kelle, 2007). We then started coding the secondary data into the four categories defined by the framework (i.e., customer identification, customer engagement, value chain linkages, monetization), identifying distinctive business models depending on how they differ with respect to these dimensions. This first phase of coding led us to a preliminary classification of business models, which initially included six business models. We then excluded two business models shared by all the firms, focusing only on those four business models whose adoption varies across F1 firms.[1] In a second step, we validated our initial coding by triangulating the evidence emerging from the secondary

1 Detailed descriptions of all the F1 business models in place are available in the appendix. The exclusion of these business models from the analysis is consistent with the fact that our use of QCA is focused on identifying sufficient, rather than necessary, configurations for an outcome (Ragin, 2008).

Table 3. Interviews with expert informants

Job/role	F1 expert profile	Interview hours Round 1	Interview hours Round 2
F1 academic expert	Professor of management: He has extensively published in top management journals using F1 databases. He is considered one of the premier academic experts on management in F1.	2	2
F1 academic expert	Full professor of mechanical engineering: He has extensive knowledge on motorsport and F1 technology. He serves as external consultant on engineering aspects for Formula 1 firms.	2	–
F1 media expert	F1 journalist: He formerly worked in the media and communication department for some F1 firms. He now serves as editor and correspondent on F1 for one of the most important business and finance media companies. He is also a commentator for F1 races in one of the main national channels.	3	–
F1 media expert	F1 journalist: He is one of the very few long-term reporters worldwide who specializes in covering the business of F1. He now serves as editor for F1 in two major media firms.	4	–
F1 media expert	F1 journalist: Journalist, well-known blogger, and adjunct lecturer on F1, he serves as external advisor in the board of directors of an F1 firm.	2	2
F1 professional	F1 firm A CEO: He worked for more than a decade as the managing director of three F1 firms. In recent years, he won an F1 world championship title with the firm that he managed. He now works as business consultant for a renowned firm in F1.	5	–
F1 professional	F1 firm B top manager: He is a current human resource director in an F1 firm and former human resource manager in another F1 firm. He is involved in the driver development program.	4	3
F1 professional	F1 firm B manager: As a current logistic manager and member of an F1 firm, he has an extensive career in motorsport with former F1 firms.	2	–
F1 professional	Former technical director F1 firm C: As a retired technical director of several F1 firms, he works as senior F1 technical analyst for a major media firm.	3	–
		27	7

data with primary interviews with F1 experts (see Table 3). We discarded inconsistent codes and, as recommended by Woodside (2010: 33–36), we stopped this process when the codes were sufficiently stable across different data sources and informants. Once we had a stable classification of the business models used in the F1 industry, we coded each F1 firm into the four identified business models for each year depending on whether the firm adopted a particular business model in that particular year. Through this coding process, we obtained the configuration of business models that each F1 firm adopted in each year.

To identify which configurations of business models are associated with performance, we analyzed our longitudinal database with QCA. QCA is a case-oriented methodology combining case-based research with Boolean algebra and set theory, to allow systematic and formalized cross-case comparisons (Ragin, 1987, 2008). QCA is well suited to address our research questions because it conceives cases as configurations of conditions, identifying whether some of these configurations are more consistently associated with an outcome of interest. To do so, QCA treats each case as a member of multiple sets and conceives both conditions and outcome as sets. In the crisp-set version of

QCA adopted here, each case is coded as either "in" or "out" a set, being assigned the value of 1 or 0, respectively. For example, a given F1 firm can be coded "in" or "out" the set of "high-performance firms." This process of "calibration" of cases into sets requires the use of theory-based and case-specific knowledge to choose meaningful cutoff values (Ragin, 2008). We used the results of our qualitative coding to calibrate our cases (i.e., F1 firms) into the sets representing the business models that F1 firms adopt. Thus, for each year, we consider a given F1 firm as a member of a given set (e.g., the set of firms adopting the talent business model) when we had coded that particular F1 firm as adopting the given business model on that year. In addition, on the basis of the first author's knowledge of the F1 industry's history and on the basis of three validating interviews with our key informants (see Table 3, Round 2), we coded each F1 firm as a member of the set "high-performing firms" when it was among the top five teams in the final rank of the year's racing season, for each year. We coded each F1 firm as a member of the set "low-performing firms" when it was not among the top five firms in the final rank of the year's racing season, for each year. Starting from the calibrated data, QCA generates a "truth table" (Ragin, 1987), listing all the logically possible configurations of conditions. Given the small-N nature of our sample, we chose to analyze all configurations that had at least one case, setting the frequency threshold of the analysis to 1, as commonly accepted in small-N QCA studies (see Greckhamer *et al.*, 2013). Starting from this truth table, QCA identifies the configurations associated with the outcome of interests through minimization algorithms that eliminate logically redundant configurations (see Ragin, 1987). We conducted a 1-year lagged QCA analysis of our longitudinal database to investigate whether particular business model configurations that were adopted at $time_0$ are associated with high or low performance at $time_1$. The 1-year time lag aims to account for the fact that the adoption of a business model configuration might take some time to become fully operational. Given that this article is not concerned with business model changes as its main focus, the value of using QCA on a longitudinal database is not to detect changes, but rather to identify what are the high-/low-performing configurations that are robust over time despite environmental changes and despite changes in the population of F1 firms competing across the years.

4. Results

To respond to our first research question, we first report in Table 4 below the four key business models constituting the elements of the configurations. Second, we report the QCA results in conjunction with the longitudinal case histories enriching the QCA findings. Table 4 summarizes the four business models that we identified through our qualitative coding, illustrating their different constituent parts based on their definitions discussed above. More detailed descriptions of the business models identified are available in the appendix.

4.1 Configurations of business models and performance

Tables 5 and 6 illustrate the results of our QCA analyses, namely, the business model configurations associated with high and low performance in each of the eight (1-year lagged) temporal windows. Following Ragin and Fiss (2008), in the tables we denote the presence of a condition in a configuration with a black circle and the absence of a condition with a crossed circle.

Through QCA, we identified six distinctive configurations for high performance across the 9 years examined. Some of these configurations occur more frequently across the years. In particular, configurations "c" and "d" occur four times across the analyzed years, whereas configurations "e" and "f" occur twice each. By examining Table 6, we also notice that some elements are common across all the configurations examined over the years. In particular, as emphasized by the gray box in Table 5, we notice that all the configurations (with the exception of configuration "a" in 2005–2006) feature the joint adoption of both the supply and the talent business models. In addition, we note that these two business models are often combined with the adoption of the internal knowledge transfer business model in three of the six high-performing configurations. This pattern across configurations is a noteworthy finding because it characterizes high performance configurations across time. Specifically, this pattern is robust to changes in the samples of cases considered for each temporal windows (some F1 firms die, while others enter the race) and to environmental changes (such as regulatory changes).

Table 6 illustrates the business model configurations that are associated with low performance in each of the analyzed temporal windows. An important insight of QCA is the idea that the conditions that are associated with the

Table 4. Comparison of business models in F1

Constitutive parts of a business model	BM1: Internal knowledge transfer	BM2: External knowledge transfer	BM3: Formula one supply	BM4: Talent
Customer identification	Customer: OEM that owns the F1 firms. The automaker supports the F1 firm, expecting it to develop solutions for road car design and manufacture.	Customer: firms and organizations outside F1 that buy bespoke technology and consulting services from F1 firms.	Customer: other F1 firms. F1 firms sell technology and components (i.e., engines, gearboxes, ECUs) to other F1 firms. They are often bundled with post-sale services and further technological development programs.	Customer: other F1 firms or motorsport firms in other racing categories. F1 firms set up training programs to identify promising future drivers, train them, employ them to develop technology, and later trade or loan them.
Customer engagement	Engagement: "Taxi". Each OEM supports F1 with different levels of commitment, depending on the results that they aim to achieve.	Engagement: "Taxi". The service is tailored to each customer's requirements.	Engagement: "Bus". The F1 firm that works as F1 supplier provides its F1 customers with standard components with minor or no adaptations. Standard prices apply. Taxi services are available for after-sale programs.	Engagement: "Taxi". The training program is tailored to the driver, and participants might be traded via different modes (loan, sell) and prices.
Value chain linkages	The OEM coordinates the internal knowledge transfer between the F1 firm and the R&D/product division of their road car production.	The F1 firm delivers the required service to the client. F1 firms provide consulting in several industries.	Buyer/supplier contracts can include products and services. Costs vary from year to year—about €10 million for a conventional engine and €5 million for kers and engineering support (in 2013).	The F1 firm runs a driver's training through minor categories, and ultimately to F1. This includes connections with other firms in the other racing series, which are either owned or independent.
Monetization	OEMs support F1 activity economically through internal financing.	The external companies pay the F1 firms for the service received.	The customer firms pay the F1 supply firm following installations that vary from contract to contract.	F1 firms set up training programs not only to trade the drivers to other firms but also to save money on the training and future top drivers' employment (drivers are often bound to the training firms via contracts).

Table 5. High-performing configurations of business models identified via QCA

	Configurations		Configurations	Configurations	Configurations		Configurations		Configurations		Configurations		Configurations	
	2005–2006		2006–2007	2007–2008	2008–2009		2009–2010		2010–2011		2011–2012		2012–2013	
	a	b	c	d	e	f	c	d	c	d	e	f	c	d
Internal knowledge (BM1)	●	●		●	⊗	●		●		●	⊗	●		●
External knowledge (BM2)	●	⊗	⊗		⊗	●	⊗		⊗		⊗	●	⊗	
F1 supply (BM3)	⊗	●	●	●	●	●	●	●	●	●	●	●	●	●
Talent (BM4)	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Consistency	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Raw coverage	0.25	0.25	0.40	0.40	0.25	0.25	0.75	0.75	0.80	0.80	0.20	0.20	0.60	0.60
Unique coverage	0.25	0.25	0.40	0.40	0.25	0.25	0.25	0.25	0.20	0.20	0.20	0.20	0.20	0.20
Overall solution consistency	1.00		1.00	1.00	1.00		1.00		1.00		1.00		1.00	
Overall solution coverage	0.50		0.40	0.40	0.50		1.00		1.00		0.40		0.80	
Number of cases per analysis	10		11	11	11		10		12		12		12	

Note: The gray box highlights robust configurational patterns associated with high performance across time (robust to environmental and regulatory changes over time and to changes in the samples of cases examined over time).

Table 6. Low-performing configurations of business models identified via QCA

	Configurations	Configurations	Configurations	Configurations			Configurations			Configurations		Configurations		Configurations		
	2005–2006	2006–2007	2007–2008	2008–2009			2009–2010			2010–2011		2011–2012		2012–2013		
	a	a	b	c	d	e	f	d	g	c	d	h	a	i	j	a
Internal knowledge (BM1)	⊗	⊗	⊗	⊗	⊗	●		⊗	●	⊗	⊗	⊗	⊗	●		⊗
External knowledge (BM2)	⊗	⊗	⊗		⊗	⊗	⊗	⊗	⊗		⊗	●	⊗		●	⊗
F1 supply (BM3)	⊗	⊗		⊗	⊗	●	⊗	⊗	●	⊗	⊗	⊗	⊗	⊗	⊗	⊗
Talent (BM4)	●	●	●	⊗		●	⊗		⊗	⊗		⊗	●	⊗	⊗	●
Consistency	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Raw coverage	0.50	0.33	0.33	0.57	0.57	0.14	0.67	0.67	0.17	0.86	0.86	0.14	0.29	0.29	0.29	0.29
Unique coverage	0.50	0.33	0.33	0.14	0.14	0.14	0.17	0.17	0.17	0.15	0.15	0.14	0.29	0.15	0.28	0.28
Overall solution consistency	1.00	1.00	1.00	1.00			1.00			1.00		1.00		1.00		
Overall solution coverage	0.50	0.33	0.33	0.86			1.00			1.00		0.43		0.72		
Number of cases per analysis	10	11	11	11			10			12		12		12		

Note: The gray box highlights robust configurational patterns associated with high performance across time (robust to environmental and regulatory changes over time and to changes in the samples of cases examined over time).

presence of an outcome (e.g., high performance) may be quite different from those that are associated with its absence (e.g., low performance) (Fiss, 2007).

While several low-performing configurations feature the talent business model similarly to high-performing configurations, this business model is adopted in *isolation* rather than *together* with the F1 supply business model in low-performing configurations. This finding provides indirect evidence of possible complementarities between the talent and F1 supply business models when they are jointly adopted. We provide additional direct qualitative evidence regarding these complementarities in a separate section below. An additional finding is notable. The joint absence of both supply and talent business models constitutes a common configurational pattern associated with low performance, as indicated with the gray box in Table 6. In addition, the adoption of either internal or external knowledge transfer business models in isolation is also associated with low performance in several configurations (i.e., configurations "e, g, h, i, j"). Only one configuration (i.e., "e") of the low-performing configurations shown in Table 6 features the joint presence of the F1 supply and the talent business models observed as a dominant pattern for high performance.

The low-performing configuration "e" (Table 6) and the high-performing configuration "a" (Table 5)—marked in white out of the gray box in the Tables—represent two exceptions to the configurational patterns detected across time (described above). Thus, they deserve further explanation. We build on extant studies of F1 (Jenkins, 2010; Marino *et al.*, 2015) to speculate that environmental shocks in F1—represented by radical shifts in the official regulations (see Marino *et al.*, 2015)—represent a significant source of uncertainty, reshuffling competition and weakening the association between business model configurations and performance. In fact, within our observation period, the years 2005, 2006, and 2009 are the only years in which F1 competition underwent radical shifts in the regulations. It is interesting to note that the only two noteworthy exceptions in our database fall precisely within those years.

Importantly, Tables 5 and 6 also report several measures of "consistency" and "coverage" for the identified configurations, following standards of good practice in QCA studies (e.g., Ragin, 2008). "*Consistency*" refers to the extent to which cases featuring a given configuration consistently display the outcome of interest. A common way to measure consistency (followed here) is the number of cases featuring a given configuration and the outcome divided by the number of cases featuring the same configuration but not featuring the outcome (Ragin, 2008). "*Overall Solution Consistency*" refers to the same measure aggregated across all the identified configurations. We set the consistency threshold to 0.80, which is the standard recommended threshold (Ragin, 2008). The high level of consistency of the configurations reported in Tables 5 and 6 has to be interpreted with caution, keeping in mind the limited number of cases included in our samples in each temporal window (reported below the tables). In fact, configurations are likely to be consistent when they include a limited set of cases. At the same time, it is worth reiterating that the sample analyzed in each time window included all the F1 firms competing in that particular racing season.

Following Ragin (2008), we also report three measures of coverage. "*Raw Coverage*" refers here to the number of cases featuring the outcome and a given configuration divided by the number of cases featuring the outcome. "*Overall Solution Coverage*" refers to the same measure aggregated across all the identified configurations. "*Unique Coverage*" indicates the proportion of cases featuring the outcome that are covered *uniquely* by a given configuration (no other configuration cover those cases). The overall solution coverage scores of the high-performing configurations identified (Table 5) vary from 0.40 to 1. This means that, at a minimum, these configurations account for about 40% of the instances of the outcome (high performance) in a time window, accounting for larger proportions of the outcome in several of the time windows analyzed. Similarly, the overall solution coverage scores of the low-performing configurations (Table 6) vary from 0.33 to 1, accounting for a minimum of about 33% of the instances of the outcome (low performance) in two time windows (2006–2007, 2007–2008) and for much larger proportions of the outcome in the other time windows. Although these coverage values are substantive, and aligned with other QCA results published in top academic journals in management (e.g., Bell *et al.*, 2014; Garcia-Castro and Francoeur, 2014), they also indicate considerable elements of randomness or idiosyncrasy in the association between business model configurations and performance. In addition, since the configurations in Tables 5 and 6 identify only the configurations that pass the 0.80 consistency threshold set for the analysis—i.e., being, in other words, the *consistent* configurations associated with the outcome—there are other configurations that can be associated with high or low performance. Further, as per our discussion of the consistency scores, these coverage values need to be interpreted with caution, keeping in mind the small-N nature of our QCA analysis.

Finally, it is important to note that the overall solution coverage scores of the configurations identified in Tables 5 and 6 change through the time windows analyzed. For example, we note that in the windows 2009–2010, 2010–2011, and 2012–2013, the coverage values of the configurations for high performance (Table 5) are higher than in the other time windows. Similar higher coverage scores are detected in the analysis of configurations for low performance (see 2008–2009, 2009–2010, 2010–2011, and 2012–2013). These higher coverage scores are due to the fact that these configurations are partially overlapping in terms of cases covered—i.e., there are several cases that adopt more than one of the configurations identified in each time window—as clarified by the difference between unique coverage and raw coverage in those time windows. In other words, the configurations identified in those time windows are more encompassing, including more cases (higher raw coverage); but they are also less unique (lower unique coverage) because they are shared by several F1 firms in those particular years.

4.2 Two polar cases of business model configurations and performance changes

To further substantiate the QCA results in this section, we report two case histories of firms that underwent considerable performance changes with the adoption of new business model configurations. In particular, we selected Red Bull Racing as an F1 firm that improved its performance from 2006 onward with the adoption of a configuration comprising supply and talent business models. We contrast the case of Red Bull Racing with the polar case of

Williams, a firm whose performance deteriorated over the years with the introduction of a business model configuration comprising the external knowledge transfer business model.

4.2.1 Red Bull Racing

In 2005, Dietrich Mateschitz—owner of the renowned Red Bull energy drink company—decided to acquire a failing F1 firm: the English "Jaguar" (which was refunded as Red Bull Racing). Given the association between energy drinks and performance in extreme sports, Mateschitz aimed at matching the Red Bull brand image with a jaw-dropping racing performance in F1. One of Red Bull Racing's first initiatives was to set up a driver training program—named "Red Bull Junior Team"—for young talented kids, undertaking a progressive training through karting, minor formula series, and gaining F1 entry-level experience in other F1 teams, before landing at Red Bull Racing, as described by this quote:

> From the moment that the Red Bull Junior Team was founded, the objectives were clear, and the search for future Formula One World Champions had begun. Hand-picked international talents would receive professional and continuous training in all relevant areas of motorsport. Only those drivers who have the implicit talent for a sustainable Formula 1 career are supported. (Source: Red Bull Junior Team's Web site).

Beyond training drivers to achieve prime results in F1, Red Bull Racing needed to develop technological excellence, which was lacking given the mediocre performance of the original F1 teams it derived from (i.e., Jaguar), and the consumer-good background of its mother company (i.e., Red Bull energy drink). Between 2006 and 2009 Red Bull Racing supplied a chassis to Scuderia Toro Rosso[2] and, after 2009, supplied the gearbox, in line with what we defined as "supply business model" in F1. By selling parts to another competing F1 firm, Red Bull Racing obtained additional opportunities to test its own technology and thus critical knowledge resources, such as additional telemetry data, which became useful for technological development and increased the technicians' learning curve. At the same time, through the Driver Junior Team, Red Bull Racing started to identify, monitor, train, and promote young sport talents from their very early age, through other racing categories and ultimately at Scuderia Toro Rosso, thus forging their qualities in the years where they can learn more effectively the skills required to excel in professional racing.

Despite large budgets, high ambitions, and a technological support through the data obtained via the supply business model (BM3), Red Bull Racing did not initially achieve high performance. However, when their first driver Sebastian Vettel completed the training program (developed via the talent business model) and arrived at Red Bull Racing, the F1 firm started experiencing durable performance improvements (second in 2009 and first in each the following 4 years). In line with our findings, the transition from low to high performance corresponded to a change from a low-performing to a high-performing business model configuration, as since 2009 Red Bull Racing fully deployed both BM3 (i.e., F1 supply) and BM4 (i.e., talent). The outstanding results with the second driver emerging from a full enrollment with the Red Bull Junior Team training program (Daniel Ricciardo in 2013–2014) are consistent with our finding that the joint adoption of the F1 supply and talent business models for Red Bull Racing continues to be associated with firm high performance. In fact, when only one of these two business models was implemented in isolation, the firm's results were associated with low performance. Furthermore, the adoption of the talent business model also had significant economic benefits for Red Bull Racing. While driving for Red Bull Racing, Vettel accepted to work for a relatively low salary (compared with his market value, especially considering his outstanding records), which led to significant savings for his F1 employer. Despite dominating the F1 driver championships for 4 years in a row (2010–2013), Vettel received "only" $2.5 million in 2010, $11 million in 2011, $12 million in 2012, and $18 million in 2014. By contrast, despite never winning one single championship with Ferrari, Fernando Alonso received $37.5 million in 2010, $42 million in 2011, 37.5 million in 2012, and $29 million in 2013. After a mediocre performance in 2014 (fifth in the driver's championship), Vettel was sold to Ferrari for a 3-year contract; his future salary will be around $80 million per year. Although official figures are not disclosed, some

2 Despite sharing the same ownership, Red Bull Racing and Scuderia Toro Rosso are two completely separate companies with distinct facilities, resources, management, budgets, and competing objectives (Source: Formula1.com). In fact, each technological or human resource trade between the two firms corresponds to a traditional economic transaction just as between two different firms in the F1 arena. In addition, these two firms were competing on the racing track.

F1 informants suggested that Ferrari might also have paid a fee to Red Bull Racing to early release Vettel from his obligations.

4.2.2 Williams

Founded in 1977 by Sir Frank Williams, this British firm is the second most successful F1 firm in history, owing to nine constructor F1 championships. To date, Williams remains one of the few top F1 firms that have never been part of a road car company, despite having engaged in multiple collaborations with automotive firms (e.g., Jaguar, Porsche, and Audi). In the late 1990s and early 2000, Williams obtained mostly high performance results (i.e., third in 2000 and 2001; second in 2002 and 2003). However, in 2004 it began a progressive decline, leading the firm to compete first in the "midfield" (fourth in 2004, fifth in 2005) and to ultimately reach the lower part of the ranking in subsequent years (eighth in 2006 and 2008, seventh in 2009, sixth in 2010, ninth in 2011, eighth in 2012, and ninth in 2013). Despite employing both experienced drivers with a successful track record and young promising drivers, Williams never started an official junior driver program (i.e., BM4) and never established a supply technology business for other F1 firms (i.e., BM3). However, Williams started its own external knowledge transfer business model (i.e., BM2), with two separate divisions called Williams Advanced Engineering (established in 2008) and Williams Hybrid Power (acquired in 2010), which delivered technological solutions to several industries, including the automobile, public transportation, and motorsport industries. Specifically, Williams Hybrid Power based most of its projects on the adaptation of electric flywheels—which were originally developed from an innovative kinetic energy recovery system (also called "kers") for F1 racing (for a detailed explanation on kers in F1 see Marino *et al.*, 2015)—for hybrid powertrains to other vehicles (e.g., Jaguar C-X75, Audi R18 E-Tron Quattro, and Porsche 911 GT3R hybrid).

> Williams Advanced Engineering continues to focus on delivering energy efficient solutions through incubating and developing new technologies that primarily originate within our Formula 1 operations, to a broad range of industry sectors including automotive, aerospace, and energy (Source: Mike O'Driscoll, Williams Group CEO).

In line with our findings, Williams' implementation of BM2 since 2008 and lack of adoption of BM3 and BM4 corresponded to a clear decline in Williams' racing performance. Similar to the case of McLaren, industry analysts associated this decline with a lack of *focus* on core activities in favor of extra-industry undertakings. In fact, whereas F1 technology is often adapted to fit third-party needs, knowledge from external environments is seldom directly applicable to F1 car technology. Accordingly, despite the positive financial returns coming from these external knowledge transfer activities, in April 2014, Williams decided to sell Williams Hybrid Power to an external company (i.e., GKN), which paid Williams about $13 million to use Williams' technology to improve fuel economy in buses. Williams decided to sell the division because no additional learning opportunities were triggered by these consulting activities and because it desired to refocus on racing activities:

> Williams has always been a racing team and wants to keep the focus on competition, even if there is much potential in using its technology to create revenue (. . .) For Williams, the technology, developed for racing, was not of any further use, and so the subsidiary has been turned into cash instead. The deal includes 'additional consideration' (i.e., further cash) based on future sales and licenses of the flywheel energy storage technology transferred to GKN. This means that it will continue to provide the team with money and reduce the amount of hassle involved: a win-win situation for all concerned. (Source: F1 media expert).

4.3 The complementarities underlying high-performing business model configurations

While 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. To better understand this aspect, we conducted a second round of in-depth interviews with three F1 experts (see Table 3).

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 that go beyond financial returns: 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.

> More teams running the power units would mean more data to support development. (Source: F1 Media expert)

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 firms deploys simultaneously two cars):

> Selling engines allows you to get data . . .; the more technical feedback you get, the more you can advance your engines . . .; little glitches can happen that you learn from . . . (Source: F1 Media expert).

> You collect much more info having six cars on the track as opposed to only two. (Source: F1 media expert)

This larger and enhanced set of data represents an additional resource, supporting learning processes and enhancing capabilities for technology development. Indeed, this helps the engineers designing and manufacturing a better car, which is the basic technology used to train drivers and develop the drivers' skills. As a consequence, because of data-informed training, 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. Better drivers and better technology are the fundamental premise for fostering F1 firms' racing results as well as their other outcomes deriving from other activities (prospect technological supply, sponsorships, brand royalties, etc.). Additionally, drivers who receive successful coaching within a F1 firm's training program provide value in other ways. First, their engagement with the firm means that they are usually willing to accept pays that are lower than their actual market value—see Sebastian Vettel's example above. Second, as F1 firms with a talent business model often hold exclusivity rights regarding their trained drivers, once they decide to trade one of them they might receive a fee from the hiring firm to release the driver from the contract:

> Red Bull now is achieving massive saving by having two 'cheap' drivers. Red Bull invested in them at a youngest age, and it is now going to make savings from that investment. (. . .) And if you save money on a driver, you can spend it somewhere else, maybe on technology (Source: F1 media expert).

> Teams have already sold drivers. Williams sold Jenson Button. They had a 5-year contract on him, and in order to escape from it, he had to pay them. He wanted to go off to Benetton, and he had to buy his way out from Williams' contract, and so part of the team was funded by Button himself. It happens a lot. (Source: F1 media expert).

Finally, as drivers who are trained through the talent business model are used to perform with their F1 firm's technology, the firms combining the talent and supply business models enjoy the possibility of commercializing technology and drivers in bundle. This does not happen only at Red Bull Racing as illustrated above: Ferrari's relationship with Sauber and Marussia further confirms that complementarities are achieved by combining supply and talent business models in bundle. For example, in 2014, Ferrari sold its engine to Marussia and bundled the engine with the loan of Jules Bianchi, one of the drivers trained in the "Ferrari Driving Academy." Before the driver left racing due to a tragic injury during a race in the 2014 season, Ferrari's plan was to move Bianchi, through a series of agreements, from a low-performing firm such as Marussia to a mid-field Ferrari-powered firm such as Sauber, and ultimately to Ferrari.

> Ferrari selling the engine to Marussia does help financially (if Marussia paid!) with the data, and the other advantage that they get from it, of course, is that they are training a driver. Now, the fact that the driver [Jules Bianchi] unfortunately killed himself, means that they now don't have the driver they had planned on, and it will cost them in the long term, because the plan for next year was for Bianchi to go to Sauber, and that was Sauber's business plan (. . .). One can use the loan for driver training, and certainly, there was a plan for Bianchi to drive for Ferrari if he kept delivering. (Source: F1 media expert).

Given that Jules Bianchi could not move to Sauber, another young driver from the Ferrari Driving Academy, Raffaele Marciello, moved to Sauber F1 team as test and reserve driver in 2015. At the same time Esteban Gutiérrez was hired by Ferrari as test driver from the Ferrari-powered Sauber team. This suggests that while exposed to Ferrari's technology (i.e., engine) during his time at Sauber, Gutiérrez acquired the right capabilities to become a strategic asset for Ferrari's technological development—especially regarding the engine—and possibly become one of the two official Ferrari drivers later in his career.

> On the engine side, he [Esteban Gutiérrez] already knows what to expect, because the Saubers he raced were Ferrari-powered. (Source: Motorsport.com).

> I hope that my experience with the Ferrari engine will mean I can contribute to the development of the new power unit. (Source: Esteban Gutiérrez, Ferrari Test Driver).

Overall, the empirical evidence supports the finding that the joint adoption of the supply and talent business models creates resources as well as *capability-enhancing* complementarities between the development of better technologies and the development of better drivers. These benefits improve both the firm's and the drivers' *learning*, to the extent that they reduce the time to achieve high performance.

Our data reveal an additional example of complementarity between the internal knowledge transfer and the F1 supply business models, providing evidence on the high-performing configurations combining these two models identified via QCA (see Table 5): by selling components to other F1 firms, F1 firms learn how to better develop their components and parts for technology transfer to road car manufactures (i.e., internal knowledge transfer). F1 firms that sell engines to other firms have a better opportunity to test and develop their own technology. Accordingly, these firms can enhance their knowledge base that represents the starting point for transferring F1 innovations from small-scale prototype manufacturing to large-scale road cars productions. By contrast, road car companies that highly benefit from receiving F1 technology and from the opportunity to transform such technology into commercially viable innovative automotive solutions are usually willing to increase their financial support to the supplying F1 firm.

Nevertheless, complementarities do not always arise and do not apply to every set of activities. We note a lack of complementarity between the external and the internal knowledge transfer business models. In interviews with our informants, we found that joint implementation of the internal and external knowledge transfer business models can be detrimental to performance because it induces F1 firms to devote less attention to core F1 activities, such as the development of talent and technology. Engaging with internal and external knowledge transfer business models in fact requires time, effort, and cognitive resources. In other words, F1 firms that engage—for example—in internal knowledge transfer, talent development, and external knowledge transfer activities run the risk of losing *focus* and thus failing to be effective in racing competitions. Evidence supports this statement. During the 2014 season, Ron Dennis (CEO at McLaren) identified the "distraction" created by these complex commercial tasks as one of the main reasons behind the recent decline in performance at McLaren. Accordingly, he affirmed that for the following year the firm was required to concentrate its *focus* exclusively on racing (including activities such as those involved in the talent and F1 supply business models).

> The Formula One team has no responsibilities for income (. . .); the new model for our Formula One team is that it's completely populated by people who have no other objective but winning in Formula One (Source: Ron Dennis CEO of McLaren)

While F1 cars combine knowledge coming from different domains (e.g., automotive, materials, aerodynamics), their actual development is extremely specific to racing. The likelihood that the knowledge that is developed for third parties outside the F1 industry would be easily redeployable in racing is usually low. Hence, the main purpose of the external knowledge transfer business model is obtaining financial resources from sales rather than gaining *knowledge* and *learning* experiences that could be directly transferred to an F1 firm's racing activity. However, money alone is not a sufficient condition to excel in F1—as a matter of fact several deep-pocketed firms such as Toyota, BMW, and Jaguar (Ford) failed in this goal. Accordingly, focusing on business models related to racing activities emerges as a key aspect for learning and thus performance in F1. This insight is in line with a long-established literature emphasizing the importance of focus for high performance as well as the detrimental effects that strenuous search for synergies can have for the core business (see among others Skinner, 1974; Ketokivi and Jokinen, 2006).

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 and 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. Table 7 summarizes how business models are related to resources, enhancing-capabilities, as well as

Table 7. Resources, capabilities, and complementarities through business models

Business models	Resources for racing accessed via BM	Capabilities for racing developed via BM	Complementarities with other BM
BM1: Internal knowledge transfer	- *Financial:* from sales.	- None	- None
BM2: External knowledge transfer	- *Financial:* from sales.	- None	- None
BM3: Formula One supply	- *Financial:* from sales. - *Knowledge:* additional telemetry data and technological insights.	- Improved routines for technology development.	- By developing a better technology, trained drivers can enjoy a more effective training. - Trained drivers provide better feed-back to develop the technology. - Trained drivers can be "sold" in bundles with technology to other teams.
BM4: Talent	- *Financial:* from trading drivers and/or savings from drivers' salaries. - *Human:* better drivers	- Improved routines for talent scouting and training programs. - Improved driving skills. - Improved processes of technological feedback from the drivers.	- Trained drivers are more familiar with the technology and can provide better feedback to the engineering team. - Better technologies offer better opportunities for drivers' training. - Trained drivers can be "sold" in bundles with technology to other teams.

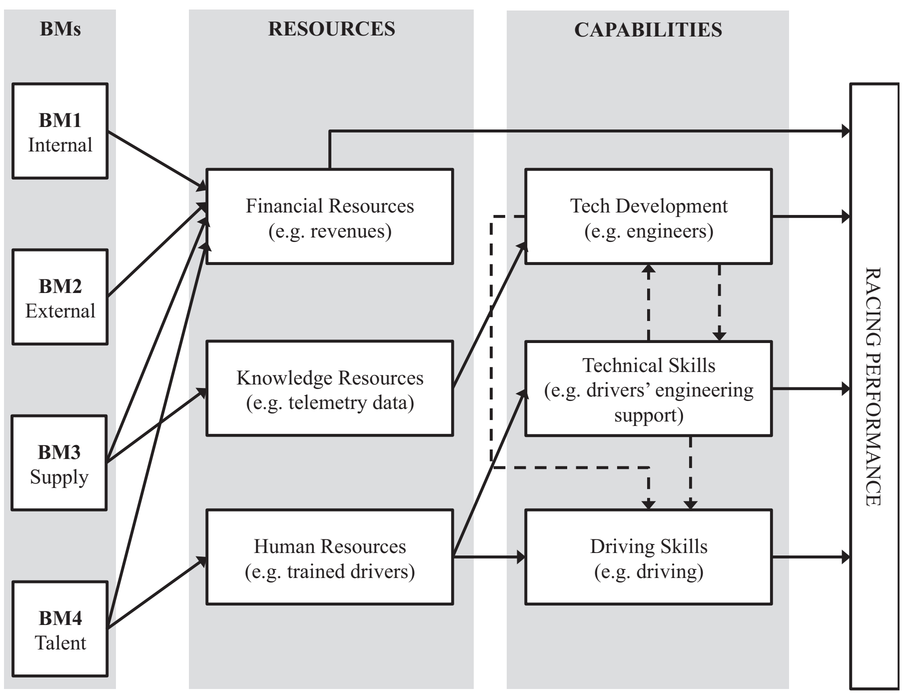

Figure 1. Relationship between business models, resources, capabilities, and performance.

mutual complementarities with other business models. Figure 1 represents the relation between these three types of elements and performance. Solid arrows represent relationships between different kinds of elements (e.g., business models and resources), while dashed ones represent complementarities between elements of the same kind (e.g., different capabilities).

5. Discussion and conclusion

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. These findings provide several contributions to extant research and hold implications for future research.

First, our findings contribute to the literature that connects business models to technology and performance (Zott and Amit, 2007, 2008), with particular reference to business model configurations (Markides and Charitou, 2004; Sabatier *et al.*, 2010; Casadesus-Masanell and Tarzijan, 2012), 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 (e.g., Casadesus-Masanell and Tarzijan, 2012), our article 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 that is 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.

In particular, in the context of F1 we found evidence that firms whose business models focus on developing and marketing both industry-specific technology and human talent enhance firms' capabilities and are associated with superior levels of performance. Similar—but not necessarily identical—configurations are already in place in other companies in other industries. For example, Pixar, the world's leading 3D animation movie company, develops its own 3D-animation software (called "RenderMan"), sells it to third parties (including competitors), and simultaneously runs its own "Animation Academy" in which aspiring 3D animators pay an enrollment fee to learn how to use Pixar's 3D RenderMan software (Catmull, 2008). If students achieve good results, they may be hired by Pixar once they graduate or, eventually, end up working for a competitor. Given their training, they might continue to use Pixar's technology and, thus, become customers of Pixar's software business. Beyond this specific example, we suggest that, in order to understand the complex relation between business model configurations and performance, we need to carefully explore the nature of complementarities underlying this relation, disentangling economic complementarities from *capability-enhancing* complementarities.

Second, our work contributes to an emerging stream of studies exploring sport environments to investigate management topics (Wolfe *et al.*, 2005; Day *et al.*, 2012) by emphasizing the importance of business model configurations—a phenomenon that has received relatively less attention in this research stream. In fact academic management studies have increasingly researched sport—and specifically F1—exploring topics such as technological innovation (Jenkins, 2010; Marino *et al.*, 2015), imitation responses (Jenkins, 2014), status interplay between F1 firms and their suppliers (Castellucci and Ertug, 2010), and advantages derived from geographical localization (Pinch *et al.*, 2003; Jenkins and Tallman, 2015). Our article complements these F1-based studies by linking some of the core topics 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 (George *et al.*, 2014).

An interesting implication is that certain F1 firms might still be able to, literally, "stay in the race" despite underperforming in an industry's core activities. These firms might economically survive—even though they consistently underperform relative to their rivals—because their business models target viable niches. This seems to suggest that in certain industries different measures of performance coexist. For example, movies, music, art shows, and other creative products can encounter the critics' favor and thus be awarded prestigious prizes but remain commercial failures. 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 Spotify) might experience growth over the years in terms of their user base, but struggle to make the business profitable. The analysis of business model configurations (explored in this article) points to the importance of being aware of multiple performance criteria when observing industries and the synergies between business models.

Third, our research design also offers an interesting methodological contribution. Despite the increasing adoption of QCA methodology in management studies, empirical applications of QCA within the management field have generally been cross-sectional in nature. Within this field, our work represents a first attempt to apply QCA to a longitudinal database in order to investigate the robustness of configurations over time. Although our application does not focus on configurational changes across time, we hope our article might represent a starting point for scholars to further develop this methodology toward fully longitudinal empirical applications.

Our research holds practical implications for management by offering industry-specific insights, first of all for industries relying on F1 as a source of innovation (e.g., practitioners in automotive). Scholars affirm that the "diffusion of new pervasive technologies (may) raise productivity and growth, first in the sectors that generate them, then in those sectors that progressively adopt them" (Brusoni and Sgalari, 2007: 189). We complement this insight by identifying which firms in F1 are actually engaging in these tasks. Our evidence suggests that firms that are less successful on one dimension (e.g., on the racing track) might have higher stakes in knowledge transfer activities and might therefore represent more committed partners to feed other domains with innovation and technological solutions. Thus suggest a more circumspect enthusiasm toward simplistic approaches focused only on top performers. By considering all firms and all business models within an industry, researchers and practitioners might discover that low-performing organizations also offer important opportunities.

However, branching out toward other sectors might also endanger firm performance (Skinner, 1974), particularly in fierce environments like F1 which seem to favor more focused strategies. We thus suggest that it is important for managers to be aware of potential pitfalls of such strategies and containing them by leveraging complementarities with other business models.

The main limitations of our work reside in the idiosyncrasies of our empirical setting as well as the limitations of our research design that warrant caution for generalizing our results to other industries. Prior research on motorsport has extensively addressed the issue of the generalizability (see, e.g., Bothner *et al.*, 2007; Castellucci and Ertug, 2010; Jenkins, 2010; Gino and Pisano, 2011; Marino *et al.*, 2015). Generally, scholars agree that motorsport-based findings are usually more valuable for high-tech industries, such as the aerospace, defense, nanotechnology, biotech. Competitive dynamics in F1 are characterized by at least three salient features: highly specialized talent; multiple performance criteria; a fixed number of roles, which limits the employability of human resources. For example, similarly to many other sports, F1 firms compete via a limited number of talented human resources (i.e., only two official drivers per season are allowed). This limit to the utilization of resources thus makes it viable for an F1 firm to loan talented drivers to other competitors rather than keeping them inactive. This also happens in professional soccer, where loaning a young player to a competitor's team is a common practice fostering revenues and increasing the player's value. However, the same logic might not apply in contexts that do not feature similar employability's constraints, so that loaning a firm's employee to a competitor might be unusual. Furthermore, traditional measures of financial performance are of limited value in F1 not only because detailed and reliable financial data are not available—F1 firms are mostly private companies with a tendency not to disclose actual costs and profits—but also because F1 firms are often not expected to generate revenues as their main goal in the first place, such as R&D centers. Rather, they develop technology and generate visibility for their owners. Given all the above, future studies could further explore business models' complementarity in different settings not limited by these boundary conditions.

Other limitations relate to our research design. Our results show that the association of some business model configurations with different levels of performance is consistent through time despite environmental and population changes. Still, our research design does not lead to the precise identification of reverse causality and thus we cannot fully rule out the possibility that high performance in F1 entitles winning teams to sell technology to other F1 competitors, rather than the opposite (i.e., selling technologies provides additional information helping to better perform in F1). Although the evidence from our cases supports this latter pattern, we acknowledge that both these two opposite causal explanations are possible and leave to future studies to test the direction of this complex relationship more comprehensively. Finally, we identify two exceptions in our configurations that seem to point at a moderating effect of environmental contingencies. We speculate that radical discontinuities might break the patterns of association identified by our study. Future studies should consider exploring the contingent value of exogenous changes vis-à-vis the relation between business model configurations and performance. To conclude, we believe that motorsport is much more than an inspiring metaphor for firm competition; rather, it represents a viable environment and research laboratory in which to explore the trajectories of business model research as well as the fascinating evolution of the automobile industry. With this work, we document part of the processes shaping competition in one of the most innovative industries connected to automotive technology—an arena that is likely to feed technological innovations for the future of human mobility.

Acknowledgments

We are grateful to the Special Issue editors, as well as the three anonymous reviewers for their guidance and comments during the review process. We thank Charles Baden-Fuller and Mary Morgan for insightful and formative conversations on business models. We also thank Stefano Brusoni, Gregoire Croidieu, Peer Fiss, Hans Frankort, Alessandro Giudici, Mark Jenkins, Vincent Mangematin, Paul Nightingale, Davide Ravasi, Alessandro Rossi, Clemens Ruling, Valerie Sabatier, Simone Santoni, and all the colleagues who contribute to the "Business Models" research group at Cass Business School. We also would like to thank the scholars at the QCA Workshop at ETH Zurich 2014, and particularly Gregory Jackson, Johannes Meuer, Charles Ragin, and Claude Rubinson. We gratefully acknowledge our expert informants, and particularly Joe Saward, Christian Sylt, Otello Valenti, and Nick Fry. Finally, we also express our deep gratitude to Davide Campari and Deliveroo for their constant support while writing this paper. All authors contributed equally. Errors are our own.

Funding

This work was supported by the European Commission's Marie-Curie Actions (Project nr. 301688 - Project Acronym AJ86RH5GYM - FP7-PEOPLE-2011-IEF) and the EPSRC UK Research Council (EP/K039695/1 Building Better Business Models).

References

Amit, R. and C. Zott (2001), 'Value creation in e-business', *Strategic Management Journal*, **22**, 493–520.

Baden-Fuller, C. and M. S. Morgan (2010), 'Business models as models', *Long Range Planning*, **43**, 156–171.

Baden-Fuller, C. and S. Haefliger (2013), 'Business models and technological innovation', *Long Range Planning*, **46**, 419–426.

Baden-Fuller, C. and V. Mangematin (2013), 'Business models: A challenging agenda', *Strategic Organization*, **11**, 418–427.

Bell, G., I. Filatotchev and R. Aguilera (2014), 'Corporate governance and investors' perceptions of foreign IPO value: An institutional perspective', *Academy of Management Journal*, **57**, 301–320.

Björkdahl, J. (2009), 'Technology cross-fertilization and the business model: The case of integrating ICTs in mechanical engineering products', *Research Policy*, **38**, 1468–1477.

Black, E., J. Guo, O. Sample and X. Xing (2013), 'Life in the fast lane: An examination of sponsor returns in formula one grand prix', *Working Paper*, Presented at the 2013 Eastern Finance Association Conference.

Bothner, M. S., J. H. Kang and T. E. Stuart (2007), 'Competitive crowding and risk taking in a tournament: Evidence from NASCAR racing', *Administrative Science Quarterly*, **52**, 208–247.

Brusoni, S. and G. Sgalari (2007), 'New combinations in old industries: The introduction of radical innovations in tire manufacturing', in U. Cantner and F. Malerba (eds), *Innovation, Industrial Dynamics and Structural Transformation*, Springer: Berlin Heidelberg, pp. 189–207.

Casadesus-Masanell, R. and J. E. Ricart (2010), 'From strategy to business models and onto tactics', *Long Range Planning*, **43**, 195–215.

Casadesus-Masanell, R. and J. Tarzijan (2012), 'When one business model isn't enough', *Harvard Business Review*, **90**, 132–137.

Castellucci, F. and G. Ertug (2010), 'What's in it for them? Advantages of higher-status partners in exchange relationships', *Academy of Management Journal*, **53**, 149–166.

Catmull, E. (2008), *How Pixar fosters Collective Creativity*. Harvard Business School Publishing: Boston, MA.

Chesbrough, H. (2010), 'Business model innovation: Opportunities and barriers', *Long Range Planning*, **43**, 354–363.

Chesbrough, H. and R. S. Rosenbloom (2002), 'The role of the business model in capturing value from innovation: Evidence from Xerox corporation's technology spin-off companies', *Industrial and Corporate Change*, **11**, 529–555.

Day, D. V., S. Gordon and C. Fink (2012), 'The sporting life: Exploring organizations through the lens of sport', *The Academy of Management Annals*, **6**, 397–433.

Fiss, P. C. (2007), 'A set-theoretic approach to organizational configurations', *Academy of Management Review*, **32**, 1180–1198.

Garcia-Castro, R. and C. Francoeur (2014), 'When more is not better: Complementarities, costs and contingencies in stakeholder management', *Strategic Management Journal*, Forthcoming.

Gavetti, G., R. Henderson and S. Giorgi (2005), *Kodak and the Digital Revolution*. Harvard Business School Publishing: Boston, MA.

George, G., M. R. Haas and A. Pentland (2014), 'Big data and management', *Academy of Management Journal*, **57**, 321–326.

Gino, F. and G. P. Pisano (2011), 'Why leaders don't learn from success', *Harvard business review*, **89**, 68–74.

Grandori, A. and S. Furnari (2008), 'A chemistry of organization: Combinatory analysis and design', *Organization Studies*, **29**, 459–485.

Greckhamer, T., V. F. Misangyi and P. C. Fiss (2013), 'The two QCAs: From a small-N to a large-N set theoretic approach', *Configurational Theory and Methods in Organizational Research*, **38**, 49–75.

Jenkins, M. (2010), 'Technological discontinuities and competitive advantage: A historical perspective on Formula 1 motor racing 1950–2006', *Journal of Management Studies*, **47**, 884–910.

Jenkins, M. (2014), 'Innovate or imitate?: The role of collective beliefs in competences in competing firms', *Long Range Planning*, **47**, 173–185.

Jenkins, M. and S. Tallman (2015), 'The geography of learning: Ferrari gestione sportiva 1929–2008', *Journal of Economic Geography*.

Jenkins, M., K. Pasternak and R. West (2005), *Performance at the Limit: Business Lessons from Formula 1 Motor Racing*. Cambridge University Press: New York, NY.

Kelle, U. (2007), '"Emergence" vs."Forcing" of empirical data? A crucial problem of "Grounded theory" reconsidered'. *Historical Social Research, Historische Sozialforschung. Supplement*, **19**, 133–156.

Ketokivi, M. and M. Jokinen (2006), 'Strategy, uncertainty and the focused factory in international process manufacturing', *Journal of Operations Management*, **24**, 250–270.

Khanna, T., Kartik Varma and D. Lane (2003), 'Formula one motor racing', *Harvard Business School Case*, 703–412.

Klang, D., M. Wallnöfer and F. Hacklin (2014), 'The business model paradox: A systematic review and exploration of antecedents', *International Journal of Management Reviews*, **16**, 454–478.

Kogut, B., J. P. MacDuffie and C. Ragin (2004), 'Prototypes and strategy: Assigning causal credit using fuzzy sets', *European Management Review*, **1**, 114–131.

Kogut, B. and U. Zander (1992), 'Knowledge of the firm, combinative capabilities, and the replication of technology', *Organization Science*, **3**, 383–397.

MacDuffie, J. P. (1995), 'Human resource bundles and manufacturing performance: Organizational logic and flexible production systems in the world auto industry', *Industrial and Labor Relations Review*, **48**, 197–221.

Marino, A., P. Aversa, L. Mesquita and J. Anand (2015), 'Driving performance via exploration in changing environments: Evidence from the formula one racing industry', *Organization Science*, Forthcoming.

Markides, C. and C. D. Charitou (2004), 'Competing with dual business models: A contingency approach', *The Academy of Management Executive*, **18**, 22–36.

Martins, L. L., V. P. Rindova and B. E. Greenbaum (2015), 'Unlocking the hidden value of concepts: A cognitive approach to business model innovation', *Strategic Entrepreneurship Journal*, **9**, 99–117.

Moskvitch (2011), 'Formula 1 technology goes beyond the track', *BBC News - Business*.

Pinch, S., N. Henry, M. Jenkins and S. Tallman (2003), 'From industrial districts to knowledge clusters: A model of knowledge dissemination and competitive advantage in industrial agglomerations', *Journal of Economic Geography*, **3**, 373.

Ragin, C. C. (1987), *The comparative method: Moving beyond qualitative and quantitative strategies*. University of California Press.

Ragin, C. C. (2008), *Redesigning Social Inquiry: Fuzzy Sets and Beyond*. Wiley Online Library.

Ragin, C. C. and P. C. Fiss (2008), 'Net effects versus configurations: An empirical demonstration', in *Redesigning Social Inquiry: Fuzzy Sets and Beyond*, University of Chicago Press, Chicago, MA: 190–212.

Sabatier, V., V. Mangematin and T. Rousselle (2010), 'From recipe to dinner: Business model portfolios in the European biopharmaceutical industry', *Long Range Planning*, **43**, 431–447.

Skinner, W. (1974), *The Focused Factory*. Harvard Business Review: Boston, MA.

Sylt, C. and C. Reid (2011), *Formula Money*. Money Sport Media Limited.

Teece, D. J. (2010), 'Business models, business strategy and innovation', *Long Range Planning*, **43**, 172–194.

Wolfe, R. A., K. E. Weick, J. M. Usher, J. R. Terborg, L. Poppo, A. J. Murrell, J. M. Dukerich, D. C. Core, K. E. Dickson and J. S. Jourdan (2005), 'Sport and organizational studies exploring synergy', *Journal of Management Inquiry*, **14**, 182–210.

Woodside, A. G. (2010), *Case Study Research: Theory, Methods and Practice*. Emerald Group Publishing Limited.

Zott, C. and R. Amit (2007), 'Business model design and the performance of entrepreneurial firms', *Organization Science*, **18**, 181–199.

Zott, C. and R. Amit (2008), 'The fit between product market strategy and business model: Implications for firm performance', *Strategic Management Journal*, **29**, 1–26.

Appendix

Business Models in the Analysis

BM1: Internal Knowledge Transfer. Several F1 firms collaborate with automotive manufacturers to transfer and adapt technological solutions from the racing field to road car production. In some cases, F1 firms emerged as specialized racing spin-offs from existing road car companies (e.g., Caterham, Renault, Mercedes, Toyota, Honda). In other cases, road car production was established to commercialize the technological solutions of existing F1 firms (e.g., Ferrari, McLaren, Lotus). In both cases, F1 firms' abilities to develop solutions, which are redeployable in the automobile industry, are financially repaid—in different ways—by OEMs. This is the essence of this business model. For example, some firms in our sample (e.g., Ferrari, Mercedes, McLaren, Marussia, Renault, and Caterham) were part of an industrial group that included road car manufacturers. Other F1 firms instead (e.g., Williams) transferred solutions to external OEM customers (e.g., Audi, Porsche, Jaguar). This is one of the reasons why F1 is considered the cutting edge of automotive technology, and it is one of the largest feeders of technological innovation to major road car OEMs.

BM2: External Knowledge Transfer. In this business model, the customers are firms and organizations outside F1, to which F1 firms sell bespoke technology research and consulting projects. As with most high-tech industries, F1 combines cutting-edge technologies that are derived from multiple fields (e.g., aerospace, mechanics, materials engineering, simulation and information technologies, and telecommunications, among others). This, in turn, allows F1 firms to sell diverse technological applications beyond the F1 domain. Some F1 firms (e.g., McLaren, Caterham, Williams, Sauber) have seized these business opportunities and established technology consulting divisions aimed at providing tailored solutions to other companies and industries.

BM3: Formula 1 Supply. Some F1 firms produce additional components to supply other F1 firms (mostly engines). For example, in 2013, Ferrari supplied engines to Scuderia Toro Rosso and Sauber, gearboxes to Sauber, and gearbox shells to Scuderia Toro Rosso; Mercedes supplied engines to McLaren and Force India; Red Bull supplied its gearbox internals to Scuderia Toro Rosso and, until 2009, supplied also the chassis; McLaren supplied its electronic control units (ECUs) to FIA (the governing body of F1), which then sold them on to all F1 firms as mandatory equipment. These supply contracts vary from case to case and often include some engineering fitting and after-sale services.

BM4: Talent. In F1, drivers' 'talent' represents a precious source of competitive advantage, and several firms have implemented structured business models to scout, train their own drivers, and eventually trade or loan them to other racing firms. F1 firms scout promising drivers when they are still very young (and thus are available comparatively cheaply), enroll them into customized training programs to become professional drivers, and partially or fully finance their participation in minor championships (from go-karting, to Formula 2000, Formula Renault, GP3, GP2, DTM, and Indycar) until they are ready to be promoted to Formula 1—a privilege that is reserved only for the most successful sportsmen. Drivers that underwent a driving academy within a particular F1 firm require on average lower salaries from their "mother team". In addition to saving (significant) costs from their salary F1 firms often ask the driver to contribute to part of the training and driving costs via their personal sponsors. Eventually (but not necessarily), the drivers can be loaned or sold to other competing F1 firms or other racing firms in other categories—this usually corresponds to an additional source of revenues. Some of the training programs for young talent include, among others, the McLaren Young Driver Development Program (est. 1989), the Red Bull Junior Team (est. 2008—joined with Scuderia Toro Rosso), and the Ferrari Driving Academy (est. 2009).

Business Models Common to All F1 Firms (Not Considered in the Analysis)

BM5: Concorde Agreement. Through the Concorde Agreement, all the F1 firms that participate in F1 races receive an annual revenue payment from the FIA, which is mainly derived from broadcasting royalties, on-track sponsorships, and track owners via a series of agreements that are managed centrally by Bernie Ecclestone, the F1 supremo. Specifically, under the terms of the Concorde Agreement, F1 firms receive 50% of the revenues of the sport, which is about $800 million today. The amount that each firm receives is calculated on a standard scale based on their individual performance in the previous race series—which makes it a 'bus' model.

BM6: Visibility and Sponsorships. All F1 firms enjoy a basic level of visibility, through media, broadcasting, and spectators at the races, which, in turn, creates opportunities for them to advertise space (e.g., logos on cars and clothing, technical partnerships) to other companies and thus to establish a set of business sponsorship activities. All F1 firms receive various measures of financial and technical support from their different suppliers, partners, supporters, and organizations, as well as merchandizing branded clothes and gadgets for fans and supporters. Additionally, F1 firms receive royalty fees from their sponsors, who in turn increase their own sales results because of the visibility of their association with F1 firms and the sport in general. Sponsorship and co-branding royalties are based on the firm's status and the level of the visibility that the sponsors want to achieve and thus are tailored to the particular sponsoring customer—making such partnerships 'taxi' engagements. Another way to collect money from visibility and sponsorship relates to driver pay. Most professional drivers are supported throughout their career by one or more organizations or institutions—e.g., firms, governments, investor groups, and families—which sponsor them by covering part or all the costs during their racing careers.