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The Strategic Issue of Technological Pioneering: The Impact of Radical Product Introductions and Competitors' Reactive Announcements on Share Price Performance

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Abstract:

This paper seeks to provide a conceptual framework to examine the strategic issue of being the first to introduce and commercialize a radical product innovation arising from the firm's adoption or development of a new technology. This issue is addressed by first, examining how the pioneer's announcement of a radical product innovation impacts its share price performance. Second, it proposes to examine how the impact of the pioneer's announcement on its share price performance is moderated by the first competitor's reactive announcement. Third, this paper suggests how a firm's market position (whether it is a market leader or not) and the extent of the competition in the industry (the degree of concentration) together influence the firm's likelihood to announce in the first place. This paper aims to differentiate and contribute to the investigation of pioneering advantages by examining the short-term performance of pioneering in terms of studying the impact of the pioneer's share price following its first public announcement of a radical product innovation.

Keywords: *Technological pioneer, radical product innovation, competitor's reactive announcement*

1. Introduction

Technological pioneering, the process by which a firm creates and commercializes a new technology to the market well ahead of rivals, is fast becoming a requirement for market success (Chandler, 1990). It is among a firm's most potentially viable strategies as it can allow a firm to target and control premium market segments, build favourable reputation, determine the industry's evolution and achieve high profits (Franco, Sarkar, Agarwal, & Echambadi, 2009; Zahra, Nash, & Bickford, 1995).

This paper seeks to provide a conceptual framework to examine the strategic issue of being the *first* to introduce and commercialize a radical product innovation arising from the firm's adoption or development of a new technology. This issue is addressed by first, examining how the pioneer's announcement of a radical product innovation impacts its subsequent performance, in terms of its share price. Second, it proposes to examine how the impact of the pioneer's announcement on its share price performance is moderated by the first competitor's reactive announcement. Third, this paper suggests how a firm's market position (whether it is a market leader or not) and the extent of the competition in the industry (the degree of concentration) together influence the firm's likelihood to announce in the first place.

This paper presents the factors that a firm needs to take into consideration when deciding whether or not to be the first to publicly announce the introduction of a radical product innovation. Thus this paper draws on the widely researched trade-offs between the advantages and disadvantages of being the pioneer (Hill & Rothaermel, 2003; Kerin, Varadarajan, & Peterson, 1992; Lieberman & Montgomery, 1988; Zahra et al., 1995). It seeks to shed light on the short-term effects of being the pioneer of an innovation, by examining the pioneer's share price performance immediately following its announcement and how its share price is then moderated by the first competitor's reactive announcement. In this paper, the pioneer is defined as the first firm to introduce and commercialize a new product innovation to the market by way of a public announcement. Although providing the optimal strategy of either being a pioneer or a follower is beyond the scope of this paper, the aim is to contribute towards providing conceptual insights to investigate the short-term impact as oppose to long-term impact of pioneering such as profitability (Lambkin, 1988), market share (Aboulnasr, Narasimhan, Blair, & Chandy, 2008; Robinson & Fornell, 1985; Urban, Carter, Gaskin, & Mucha, 1986) and survival rates which have been addressed by researchers to date (Chang & Park, 2013; Moore, Boulding, & Goodstein, 1991).

According to Chandy and Tellis (1998), a review of the literature suggests that there are two dimensions that underlie most definitions on product innovation: technology and markets (Damanpour, 1991; Henderson & Clark, 1990). The first dimension is the extent to which the technology involved in a new product is different from previous technology. The second

dimension is the extent to which the new product fulfills key customer needs better than existing products on a per dollar basis. Considering two levels, low and high for each dimension leads to four types of product innovations: incremental innovation, market breakthroughs, technological breakthroughs and radical innovation (see Table 1).

Consistent with Chandy and Tellis (1998), this paper defines a radical product innovation as a new product that incorporates substantially new technology and provides greater customer benefits relative to existing products.

		Customer Need Fulfillment Per Dollar	
		Low	High
Newness of Technology	Low	Incremental innovation	Market breakthrough
	High	Technological breakthrough	Radical innovation

Table 1: Types of Product Innovations
Source: Chandy and Tellis (1998:476)

The elements of competition and innovation focused in this paper draws on the idea of *Schumpeterian Competition*, where Schumpeter (2013) focused on innovation as the central component of competition and the driving force behind industry revolution. His notion of “creative deconstruction” involved market positions of firms committed to old technology being destroyed by innovation. Hence, innovation is an important source of competitive advantage, especially in technology-based industries such as consumer electronics, computers and pharmaceuticals where competition centers on innovation. Technological change influences industry structures, shapes competition and can be the impetus for competitive advantage (Aboulnasr et al., 2008; Porter, 1985).

Research on firms’ decision to introduce and commercialize radical innovations is important for several reasons. First, radical innovation is an engine of growth and a source of better products. Secondly, radical innovation changes the entire shape of industries and makes the difference between the life and death of many firms (Cooper & Smith, 1992; Schumpeter, 2013). It has created entire industries and brought down giants while catapulting small firms to market leadership (Porter, 1985). Indeed, the history of business is littered with the graveyards of entire industries that were destroyed by radical innovation. Tellis and Golder (1996) found that in the long run, failure to embrace a radical product innovation has caused the downfall of many an established firms. The telegraph, gas lighting and typewriter industries are such cases. Therefore, managers need to know how to initiate and manage innovation. They need to be able to make the strategic choice between pioneering a radical innovation and waiting for others to pioneer, the choice of which will partly depend on the firm’s industry environment and their competitors.

There has also been some empirical work on the effect of new product and technology related announcements on firms’ stock prices (Paul K Chaney & Devinney, 1992; Paul K. Chaney, Devinney, & Winer, 1991; Eddy & Saunders, 1980; Sorescu, Shankar, & Kushwaha, 2007). For instance, Chaney and Devinney (1992) found daily excess returns for a 3-day event period centered on the announcement date of a new product. From this evidence, they concluded that the financial market place is efficient at evaluating information about firms’ product and service innovations. However, these previous studies focused on different definitions of new products, include both product and service innovations and have shorter periods of investigation. Further, these studies have not examined the extent to which competitive reactions to the announcement moderate its impact on the pioneer’s stock price. Yet competitive reactions are critical to the impact of announcements on the market reaction as well as the actual eventual performance of the firm.

While extensive literature exists on innovation on economics, strategy and marketing, only recently has research focused on competitive reactions to innovation (Aboulnasr et al., 2008; Gatignon, Anderson, & Helsen, 1989; Ramaswamy, Gatignon, & Reibstein, 1994). The theoretical literature bearing on competitive reaction stems largely from industrial organization and strategy, whereas much of the empirical research comes from marketing (Gatignon et al., 1989). The industrial organization literature emphasizes on the structure (number and size of competitors) from which behaviour (“conduct”) is inferred while the strategy literature is concerned directly with the actions of each competitor (Caves, 1980). This paper seeks to add to this strategy dimension, by examining the impact of competitors’ reaction following the pioneers’ announcements of radical product innovations.

This paper also draws on the notion of announcements as a form of market signaling to competitors and shareholders. Market signaling was first conceptualized by Spence (1974) who focused on educational signals in the employment market. According to Spence, market signals convey information to other individuals in the market. Much of the recent signaling research in economics uses the game-theory paradigm, examining buyer-seller relationships (Engers, 1987). However, no broad investigation has been performed on the announcements of radical product innovation targeted at competitors and shareholders. The objective of this paper is to fill this gap.

The benefits of being the first to announce an innovation are also tied to the advantages of being the pioneer in the market. Although pioneering new markets is expensive and risky, it can also be potentially very rewarding. Theories on pioneering advantages suggest that there are “customer-based” and “producer-based” advantages (Golder & Tellis, 1993).

Pioneers can share customer preferences (Schmalensee, 1982), can become the product category standard (Carpenter & Nakamoto, 1989) and can occupy the most preferred market positions (Lilien & Yoon, 1990; Urban et al., 1986). Producer-based advantages include opportunities to erect barriers to entry (Robinson & Fornell, 1985; Urban et al., 1986), technological leadership, preemption of scarce resources (Lieberman & Montgomery, 1988), and capturing large market share (Carow, Heron, & Saxton, 2004; Urban et al., 1986).

This paper aims to add to the dimension of short-term performance of being the pioneer since most research carried out to date has only attempted to link pioneering advantages to the firm's average long-term performance in terms of economic profitability. Lieberman and Montgomery (1988) highlighted that a serious problem confronting such empirical work is that profit data are seldom obtainable; hence market shares and rates of company survival have typically been used as alternative measures. Although both measures show a correlation with profits, such correlation is not always significant and causality is often ambiguous. Both measures are also inherently biased. For example, early entrants may have natural advantages in market shares that do not necessarily translate into higher profits. Survival rates suffer from similar biases. Pioneers may demonstrate higher survival rates, but it may be difficult to ascertain whether this comes from pioneering or a reflection of other basic characteristics of the firm (Lieberman & Montgomery, 1988).

In light of the above limitations, this paper aims to differentiate and contribute to the investigation of pioneering advantages by examining the short-term performance of pioneering in terms of studying the impact of the pioneer's share price following its first public announcement of a radical product innovation.

2. Theory Development and Conceptual Framework

Figure 1 presents the framework that guides this paper. When a pioneering firm decides to announce a radical product innovation, this action is expected to trigger two events with respect to stock market reaction and competitor's reaction. First, it is conceptualized that the announcement will have an impact on the pioneer's share price. Second, the announcement is expected to trigger competitor's reaction.

It is also conceptualized that the pioneer's announcement has a subsequent direct and indirect effect on its share price. The direct effect, E1, occurs when the pioneer first announces the radical product innovation. The indirect effect on the stock price (computed by $E2 \times E3$) is moderated by the first response of a main competitor in the industry. For instance, the competitor responds with its own announcement of a similar product. It is also conceptualized that the market position of the firm (whether or not it is the market leader) as well as the nature and extent of competition in the industry (whether it is concentrated or not) influence the probability that the firm will announce in the first place (Lumpkin & Dess, 1996).

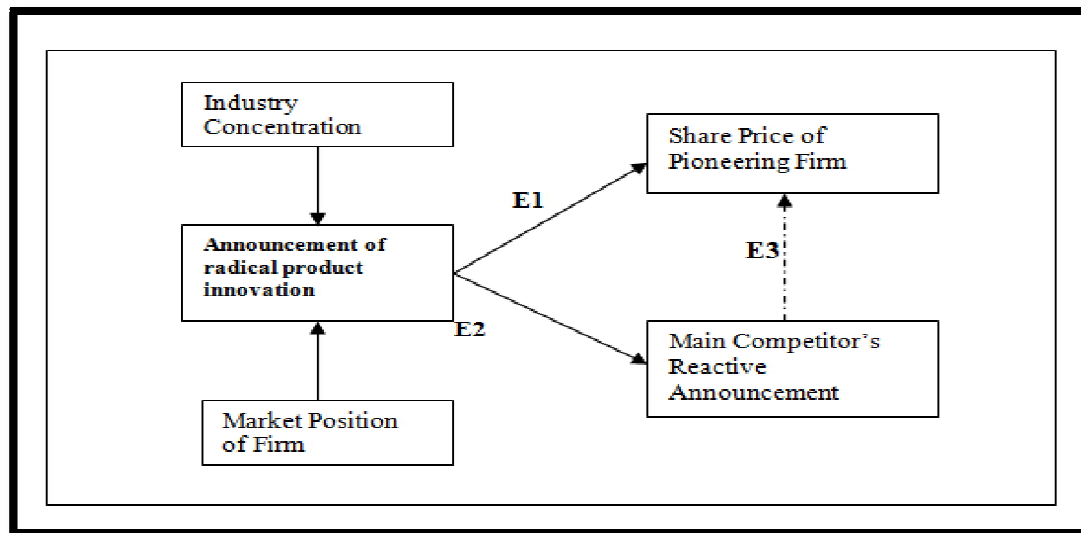


Figure 1: Conceptual Model for the Announcement of Radical Product Innovation by Pioneering Firm

2.1. Link between Innovation and Share Price Value

Innovations undertaken by firms reflect the active commitment of firms to build capabilities to compete in the market. Such initiatives allow them to position themselves advantageously to exploit market opportunities and the potential growth within the industry, thus leading to future benefits. In terms of the *resource-based view*, the firm can be viewed as making investments in creating the resources to capture future emerging opportunities (Peteraf, 1993). Such moves enable firms to accumulate valuable organizational experience and understand their market and customers over time. Therefore, this suggests that firms that innovate are likely to realize significant strategic and competitive advantages in the future. As such, investors should react positively to the announcements of radical product innovations, creating a positive abnormal return in stock

price, around the date of the first announcement by firms. Hence, this leads to the proposition that innovative activity would be associated with enhanced benefits in the future and consequently, positive stock market returns.

P₁: Firms that are first to announce radical product innovations will experience positive returns in share prices.

2.2. *Incumbent vs. non-incumbent and share price value*

The second proposition relates the market position of the firm to the excess return of innovation in terms of share price. The market position of the firm is distinguished between an 'incumbent', a market leader with high market share in the existing technology and a 'non-incumbent', a non-market leader with little or no share in the existing technology. It is expected that innovation is likely to be more valuable for non-incumbents. Two reasons support this. First, this view is supported by strategy writers such as Porter (1985) and the empirical results of the PIMS project by Buzzell and Gale (1987) who emphasize that there is a need for firms that are not market leaders to develop 'niche' strategies where they position their existing products and develop new ones to serve specific needs in the market. Therefore, it would seem logical for innovation to be more valuable for such firms. Secondly, innovation should be more highly valued for non-incumbents than incumbents who need innovation only to stay on top of the market rather than to survive on it (Paul K. Chaney et al., 1991). This leads to proposition 2:

P₂: Non-incumbents experience larger returns in share prices than incumbents following the announcement.

2.3. *Industry concentration, market position and the likelihood to announce*

The third proposition relates the extent of competition in the industry and the market position of the firm to the probability that the firm will announce. It is expected that in a highly concentrated industry with only a few market players where the level of competitive activity is low, an incumbent firm (the market leader) is more likely to be the first to announce a radical product innovation (Chandy & Tellis, 1998; Gatignon & Robertson, 1989). Several arguments support this. First, in highly concentrated industries, incumbent firms are more likely to have the discretionary financial resources necessary to innovate than those industries characterized by numerous firms with small share (Chandy & Tellis, 1998). Secondly, when faced with only a few competitors, firms can monitor competition constantly. Ramaswamy, Gatignon and Reibstein (1994) demonstrated that in a concentrated market with less players, there is more cooperative behaviour because industry members are less likely to have diverse and conflicting opinions and are more likely to resolve conflicts than when there are many firms competing against each other.

The third argument relates to the pace and intensity of the competitive behaviour in that industry. Announcements of new innovations will only be of value to a firm if competitive advantage can be gained (Aboulnasr et al., 2008). The logic is that if an announcement is likely to be matched by a competitor, the incentive to announce will be minimal (Eliashberg & Robertson, 1988). However, it would be in the firm's best interests to act aggressively by being the first to announce if it is perceived that competitive retaliation is unlikely or likely to be delayed. Therefore, the firm must have knowledge of its competitors and extrapolate their likely reactions to new product announcements from their past behaviour. This view is supported by the game-theory analogy such as the empirical work conducted by Bensoussan, Bulters and Naert (1978) where they studied the impact of the timing of competitive response on a firm's strategy in a leader-follower situation, examining the followers' reaction to the leader's moves. They conclude that the market leader would be more aggressive in its attacking strategy (e.g. aggressive advertising and promotion) if it expects a less intense and/or more delayed and 'diffused' response from its competitor. This leads to Proposition 3.

P₃: The higher the degree of industry concentration, the more likely an incumbent firm will announce

2.4. *Competitor's Reactive Announcement And Share Price Value*

The fourth hypothesis addresses the issue of how the pioneer's share price performance is moderated by the first competitor's reactive announcement. It is conceptualized that when a competitor reacts to the pioneer's first announcement by, for example, announcing its own similar product, the share price of the pioneer will be moderated. This is supported by the findings of Lee, Smith, Grimm and Schomburg (2000) who study the effects, timing, order and the durability of first mover advantages by analyzing stock market reactions to new product introductions and imitations. They found that early and fast movers achieve greater gains than late and slow movers, but first movers suffer at the time of new product imitations. This leads to Proposition 4.

P₄: The share price of the pioneer will be moderated by its first main competitor's reactive announcement.

3. Proposed Methodological Design

The event study methodology is employed to assess the expectations of investors regarding the financial consequences of announcements of radical product innovations. The technique of event study methodology has been extensively used to study effects of a variety of events, including announcements of earnings (MacKinlay, 1997); customer satisfaction (Sorescu & Sorescu, 2016); brand extensions (Lane & Jacobson, 1995); new product and service introductions (Paul K. Chaney et al., 1991; Sorescu et al., 2007); effect of corporate name changes (Horsky & Swyngedouw, 1987); and effect of strategic investment decisions (Woolridge & Snow, 1990). Pioneered by Fama, Fisher, Jensen and Roll (1969), event study methodology draws on the efficient market hypothesis that capital markets are efficient mechanisms to process information

available on firms. The logic underlying this hypothesis is the belief that investors process publicly available information on firm activities to assess the impact of firm activities, not just on current performance but also the future performance of the firm. When additional information becomes available on firm activities that might affect the firm's present and future earnings (such as the announcement of a new innovation) the stock price changes relatively rapidly to reflect the current assessment of the value of the firm (Fama, 1991). The event study methodology provides management researchers a powerful tool to examine the consensus estimates regarding the future benefit streams attributable to organizational initiatives (McWilliams & Siegel, 1997; Sorescu & Sorescu, 2016).

3.1. Event Window

To be consistent with other similar event study research on stock market reactions to announcements, this paper seeks to use a rather short window (Paul K Chaney & Devinney, 1992; Paul K. Chaney et al., 1991; Lane & Jacobson, 1995). Although this paper examines wider event windows that range from 5 days before through 5 days after an announcement, the analysis will be based on the excess return between the opening share price on the day of the announcement and the closing share price the day after the announcement.

Two event windows will be examined. The first event window is when the pioneer makes the first public announcement of a radical product innovation. The second event window is to examine how the pioneer's share price is affected when the first main competitor reacts by making its own announcement following the pioneer's first public announcement. In both event windows, the effect of the pioneer's share price change is analyzed based on its opening share price on the day the announcement was made and compared it with the closing price the day after the announcement.

3.2. Research Approach to Data Collection

The historical approach should be used for data collection. This paper proposed an examination of radical innovations over a 35-year horizon, from 1980 to 2015 across the globe. The primary advantage of the historical approach is that it focuses on information collected at the time the new technology was emerging. Further, the past records to be used in this study are all publicly available, published sources of information. Moreover, researchers have often called for the historical approach as it is particularly well suited for the chronological dimension in research such as pioneering (Lieberman & Montgomery, 1988; Nevett, 1991).

In order to empirically examine the relationship between radical product announcements and share prices as well as the relationship between the market position of the firm, industry concentration and its likelihood to announce, six types of data is required:

- Sample of radical product innovations.
- Information indicating the announcement date of the radical product.
- Share price information for the pioneering firm during the period of the announcement.
- Information on the level of industry concentration and market share of the firm.
- Information indicating the announcement date of the first competitor's reactive announcement, following the pioneer's announcement.
- Share price information of the pioneering firm during the period of the first reactive announcement made by its competitor.

To determine the first public announcements of radical product innovations and the first main competitors' reactive announcements for the period 1980 to 2015, database such as *BLOOMBERG* and periodicals such as the *Wall Street Journal Index*, *Business Periodicals Index*, and *Financial Times Index* should be utilized. Online search features such as *Lexis/Nexis* would also be useful. For example, search for announcements containing words "launch" or "introduce" within the same sentence as the word "new products". Often, researchers used a single widely circulated medium such as the *Wall Street Journal Index* as the source of announcements (Paul K Chaney & Devinney, 1992; Paul K. Chaney et al., 1991). However, it is usually unlikely that all new innovations are publicized in a single source. The use of *BLOOMBERG* and other periodicals increases the likelihood of obtaining more representative data set than would be possible from a single source because it covers a variety of sources specifically designed to follow new innovations.

The daily stock prices are proposed to be collected for each announcement from the *DATASTREAM* or *BLOOMBERG* database. Information on the market position of firms and industry statistics can be obtained from the Chambers of Commerce, government databases from statistics departments or the company's websites.

Since this is an event study methodology, the appropriate quantitative method to be used to analyze the data is multiple regressions.

3.3. Sampling Frame

To avoid sampling biases, a relative formal sampling frame is needed to choose the types of radical product innovations for this study (Chandy & Tellis, 1998). First, the sample would be restricted to three product classes within consumer durables: consumer electronics, office products (e.g. computers, laptops and the like) and pharmaceuticals. Previous research, especially in the literature on innovation diffusion and market pioneering, have studied product classes from these

industries(Chandy & Tellis, 1998; Golder & Tellis, 1993;Tellis & Golder, 1996). Further, they are attractive because they are within the technology intensive industries, hence are more likely to introduce truly radical unique innovations.

Second, product categories from the three classes must have high unit sales. The sample should be restricted to product categories with more than one million units in sales. This cutoff value is necessary to ensure that the product categories in the sample would include innovations that had a large impact on consumers so as to form huge markets.

Third, the technology used in one product category must represent a substantial shift from the technology used in the previous product generation. Therefore, each product innovation in the sample should be rated by a team of experts to determine the degree of radicalness relative to previous product generation.

Fourth, since this study is investigating the impact of the share price of a firm that first announces the radical product, the sample of new innovations would only be limited to those that were announced by publicly traded firms. For example, Toshiba was the first to announce the launch of the DVD Player in Japan on 1 November 1996 followed by Matsushita.

4. Conclusion, Discussion and Implications of Expected Results

This paper expects to find that the pioneering firm will experience a positive impact on its share price immediately following the announcement of a radical product innovation. Further, non-incumbents (firms with little or no market share) are expected to gain larger returns on share prices compared to incumbents (market leading firms with large market share). However, the pioneer's share price is expected to be moderated if its main competitor responds with its own announcement of a similar product. Finally, the higher the degree of industry concentration, the greater is the likelihood that an incumbent firm will announce.

There are several factors that a firm should consider when making the strategic decision of whether or not to be the first to announce a radical product innovation. First, the choice of whether to be a pioneer or a follower in a radical new innovation is likened to the ability of the firm to sustain its lead over competitors in that new technology as well as the advantages and disadvantages that the firm can reap from being the first to introduce and commercialize the new innovation (i.e. first-mover advantages versus first-mover disadvantages)(Porter, 1985). All these factors interact to determine the best choice for a particular firm when it is deciding whether or not to be the pioneer. For example, the firm should determine whether it has the organizational skills and resources to enhance its ability to innovate faster than competitors or if the rate of diffusion of technology is low enough to discourage imitation(Zahra et al., 1995). This will give the company lead time advantages to capture the first-mover advantages such as establishing reputation(Suarez & Lanzolla, 2007), preempting a favourable market position and allowing the firm to enjoy temporary favourable access to facilities and scarce resources. On the other hand, a firm should also assess the first-mover disadvantages such as having to bear pioneering costs and irreversible research and development investments and face the uncertainty of demand for the new technology(Gatignon & Robertson, 1989). Thus the strategic choice between pioneering and following a new innovation is a problem of balancing the advantages and disadvantages of the pioneer and the follower(Lilien & Yoon, 1990).

There is also a need to make a strategic choice in relation to the timing of market entry of the new innovation, that is, deciding when is the best time to announce. Kalish and Lilien's (1986) study indicates that an entry too early runs the risk of pushing an underdeveloped product into the marketplace, with possible negative results, while a new product may sacrifice sales if entry is delayed too long. The goal is to be able to balance the risks of premature entry and missed opportunity of late entry resulting in a timing entry that will capture first-mover advantages.

Another implication from the expected results of this paper relates to the level of competition in the industry and competitor's reactive behaviour. One of the difficulties in the market place is that often when a move is made to obtain an advantageous position in the market, such as being the pioneer in announcing a new innovation, a competitor quickly makes a counter move of some sort(Ramaswamy et al., 1994).The counter move negates the impact of the initial move except for possibly stimulating primary demand. In this paper, the share price of the pioneering firm is expected to be moderated by a competitor's reaction. Hence it is necessary to understand competitor's behaviour in order to anticipate the nature and likelihood of competitive response to one's actions. A firm considering making an announcement should also evaluate how fast competitors will react so as to adapt its strategy accordingly. A general issue inherent to measuring a move and reaction involves the understanding of who initiates a move and who is the reacting entity, i.e. the characteristics of the firm and its competitor. A firm can use the game theory analogy to shape strategy when faced with the task of predicting a competitor's likely reactions. To do this, it is essential to be able to identify competitor's key strength and weaknesses, its current strategy and assumption that it holds about the industry and itself.

5. References

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