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Strategic Management & Entrepreneurship

Advances in Theory and Practice

a cura di

Francesco Garraffo

Contributi di

Antonietta De Joannon

Marco Galvano

Fabio Sorrentino



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ARACNE editrice S.r.l.

www.aracneeditrice.it
info@aracneeditrice.it

via Raffaele Garofalo, 133/ A–B
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Introduction

The aim of this publication is to share with an audience of Italian scholars and practitioners, theoretical and empirical advances in strategic management and entrepreneurship deriving from a number of studies presented by the authors in international conferences worldwide.

The book is organized in two parts. The first concerns the topic of competition linked with R&D investments or cooperative strategies. The second regards habitual entrepreneurship in the family business context.

In the first part, a theoretical framework is presented illustrating the mechanisms driving competitive dynamics stimulated by pioneers in new technologies. The following two contributions concern the issue of R&D investments and firm performance. The first aims to understand better the relationship between R&D investments and firm performance in a turbulent competitive environment, such as the micro-electronic industry; the second contribution focuses on research partnerships in the biotech industry between small *DBFs* (Dedicated Biotech Firms) and large established corporations.

The last two pieces of research presented in this part discuss cooperation, an emerging issue in strategic management. The first focuses on the competitor's analysis of resource endowment and market position as an antecedent factor affecting the competitors' bent for cooperative agreements. The second research aims to contribute to the literature on cooperation by providing a conceptual framework and presenting a number of pivotal issues that can be used to explain and predict a set

of *distinctive* empirical phenomena, not considered by conceptual frameworks already existing in other streams of business research.

The second part of the volume discusses family business and habitual entrepreneurship, two central themes of research within the entrepreneurial field. Research on habitual entrepreneurship, which has grown progressively over the last few decades, focuses on entrepreneurs who found, own, develop and manage more than one company, creating a portfolio of firms. The main contributions on this topic highlight the relationship between an entrepreneur's prior business experience and his behavior in starting new firms.

Within the context of ownership, the creation of a subsequent or parallel business often involves subjects belonging to the same family, leading to the simultaneous presence of the two fields under study. While social and human capital are the main perspectives employed to explore habitual entrepreneurship, little attention has been paid to the heritage of family and firm resources and their exploitation in a portfolio development. The accumulation of experience and resources assumes an important role for family portfolio creation: family entrepreneurs exploit resources and experiences in different ways, transmitting them through successive generations and new firms.

The studies included in the second part enhance theoretical and empirical understanding and contribute to enrich both family and habitual entrepreneurship literature.

The first contribution highlights the connection between family business and portfolio entrepreneurship development; the other two focus on features and drivers of portfolio entrepreneurship in the family business context. The most important evidence provided is that recognizing the role of resources in family portfolio development: the findings have revealed that, albeit in varying degrees, the wealth of expertise stemming from and consolidated in a prior experience, together with the resources accumulated, may be invested in new businesses, creating a bond between the old and the new initiative. The results also suggest that the portfolio process in a family business evolves with the tendency to remain initially in the same industry, later extending into a different one.

A theoretical framework on competitive dynamics stimulated by pioneers in new technologies

Strategy World Congress Said Business School – Oxford March 18th & 19th 2002

Abstract

This article provides a theoretical framework on mechanisms driving competitive dynamics stimulated by pioneers in new technologies. The issues of competitive dynamics analyzed are the speed and the number of competitors' reactions and the specific counteractions undertaken against pioneer's innovation.

The framework is based on the idea that archetypes of competitive dynamics, in terms of the speed and the number of competitors' reactions, are specified as interaction between a bundle of *stimulus mechanisms* and *response mechanisms*. Besides, trajectories of this competition, in terms of the specific competitors' counteraction undertaken against pioneer's innovation, are explained by the interaction between a bundle of *attracting mechanisms* and *deterring mechanisms*.

The theoretical bases of the analysis come from the literature on pioneer's market advantages and inter-firm rivalry. The joint consideration of these two complementary research streams enables explaining the evolution of competition between the pioneer and its competitors. To illustrate situations that arise from this competition a series of examples are considered.

Introduction

The study of pioneer's market advantages [1] and of inter-firm rivalry [2] occupies a central position in strategy. The knowledge of elements that affect the pioneer's market advantages and the ensuing competition is of paramount importance for the comprehension of sources of competitive advantage in those industries where a new technology is exploited.

The literature on pioneer's market advantages investigates sources of competitive advantage. Some studies focus on elements (i.e. industry characteristics and resource asymmetries) that influence pioneer's competitive and market advantages, while other studies examine competitors' ability to retaliate and seize pioneer's advantages. Although these studies are well recognized and individually well developed, there have been few systematic attempts to integrate them in a framework focused on archetypes, in terms of the speed and the number of reactions, and trajectories, in terms of the specific competitors' counteraction undertaken, of competitive dynamics stimulated by the pioneer.

According to this need of knowledge, this article focuses on mechanisms that affect the speed and the number of competitors' reaction and, whenever they decide to react, it highlights about elements that affect the competitors' decision for a specific response.

The joint consideration of the speed and the number of competitors' reaction and competitors' decision for a specific response comes from the idea that the discussion on competitive dynamics stimulated by pioneers implies two sequential steps. The first step concerns the process with which competitors become aware and motivated to react. The interaction between characteristics of pioneer's action and mechanisms of competitors' reaction explains the archetypes of competitive dynamics subsequent to pioneer's innovation. Specifically, we can have four different situations: (a) high speed and number of reactions, (b) low speed and low number of reactions, (c) low speed but high number of reactions, and (d) high speed but low number of reactions.

The second step concerns the analysis of elements that, jointly with previous, affect the competitors' decision for a specific response. The competitors' response considered are: (a) imitating the new technolo-

gy, (b) exploiting rival innovations, (c) improving the old technology, and (d) increasing marketing investments.

According to the literature on pioneers' market advantages and inter-firm rivalry, this article provides some initial insights meant to address the following fundamental questions:

- (a) How do characteristics of pioneer's action affect the speed and the number of competitors' reaction?
- (b) How do competitors' decision-making process affects their awareness and motivation to react?
- (c) How do pioneer's isolating barriers, market opportunities, technologies evolution etc., influence competitors' decision for a specific response?

Answering to these questions explain how the competitive dynamics stimulated by pioneers starts and evolves over time.

This research provides some important contributions to managerial practice. The framework provides insights on mechanisms (i.e. characteristics of pioneers' action, competitors' decision-making process, pioneers' isolating barriers, etc.) affecting the competitive dynamics related to technological innovations. This research also yields important implications for competitive mechanisms that affect the competitive advantage over time. For instance, the framework allows understanding which elements affect the market advantage during the competition stimulated by pioneers in new technologies.

The article begins with definitions of concepts considered in the study and it continues with the analysis of the framework on mechanisms driving competitive dynamics stimulated by pioneers in new technologies.

Terminology

The following are the key concepts used in this study:

- *Pioneers* are first movers that exploit market opportunities by using radical innovations.
- *Competitors* are mainly incumbents, and also suppliers and other firms that react to pioneers' innovation.
- *Reaction* concerns any kind of counteraction undertaken against the pioneer: old technology improvements, price cuts, increases in

advertising, product developments, imitations, and rival innovations.

- *Innovations* considered are only radicals (i.e. ATM machines, CAT scanners, electronic calculators, radial technology for tires, 3.5 inch hard disks). Incremental innovations are excluded because competitors can generally easily imitate them. Instead, radical innovations can strongly affect the competitive advantage because these innovations do not share any significant technology or component with previous products and require vastly different manufacturing activities, organizational routines and managerial competencies.

A Theoretical Framework

The framework on interaction between pioneer and competitors starts from the idea that pioneer's action affects the speed and the number of competitors' reaction. According to this idea, the pioneer's action works as a *stimulus mechanism*. The stronger is the stimulus of pioneer's action the faster and larger is the competitors' reaction, vice versa the weaker is this stimulus the slower and smaller is the competitors' reaction.

To understand how strong is the stimulus it is important to study the following characteristics of pioneer's action: (a) *market impact*, that concerns the number of businesses targeted by the pioneer, (b) *competitive pressure*, that concerns the competitors' market share threatened by the pioneer, and (c) *attack intensity*, that concerns the competitors' profits threatened by the pioneer.

Moreover, as is largely considered in theory and practice, a new technology produces high uncertainty about market opportunities and technology evolution. In these circumstances, characteristics of pioneer's action can be a useful source of information for competitors in their attempt to manage the uncertainty and decide to react. But, even if characteristics of pioneer's action can be both a stimulus mechanism and a source of information for competitors, the speed and the number of reactions depend also by the awareness and motivation to react. The competitor's awareness of the threat/opportunity and motivation to re-

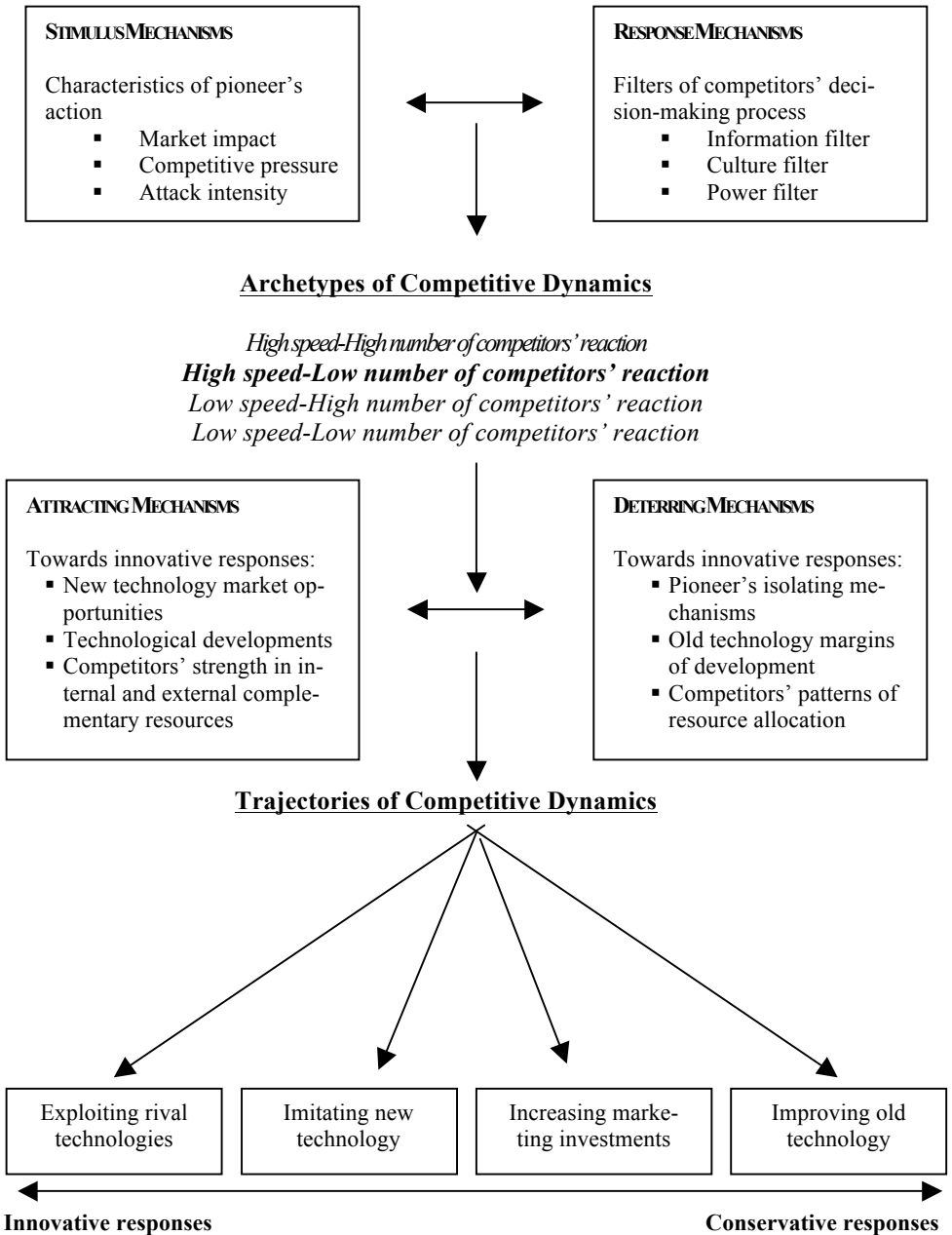
act are affected by: (a) methods and techniques to analyze and control the evolution of competitive conditions, (b) managerial patterns to evaluate opportunities and threats related to the evolution of competitive conditions [3], and (c) managerial skills and power threatened by this evolution [4].

In the framework, these elements act as *response mechanisms* that affect the trajectories of competitive dynamics stimulated by pioneers. If *response mechanisms* stimulate a more “conservative” behavior, competitors will retaliate by improving the old technology and/or increasing investments in marketing. Vice versa, if *response mechanisms* arouse a more “innovative” behavior, competitors will retaliate by imitating the pioneer’s new technology and/or exploiting rival technologies.

During the process with which competitors become aware and motivated to react, the interaction between another couple of mechanisms affect the decision for a specific conservative (i.e. old technology improvements and/or increasing in marketing investments) or innovative response (i.e. imitating the new technology or exploiting rival technologies). Specifically, the choice for either a more conservative or innovative response is affected by the interaction between: (a) *attracting mechanisms* (such as market opportunities related to the new technology, new technology developments [5], competitors’ strengths in internal and external complementary resources [6]) that can arouse an innovative counteraction, and (b) *detering mechanisms* (such as pioneer’s isolating barriers [7], old technology margins of development, filters of competitor’s decision-making process) that can provoke a more conservative response.

The framework considers all these mechanisms because they work as a gestalt of competitive factors that affects the archetypes and trajectories of competitive dynamics stimulated by pioneers in new technologies (See Fig.1).

FIGURE 1 - The theoretical framework



Characteristics of pioneer's action

When a pioneer decides to exploit a radical innovation in a market, its competitive strategy is both a means to get certain market goals and a stimulus that affects the competitors' reaction. Specifically, the major decisions of pioneer's competitive strategy that affect the speed and the number of competitors' reaction are: (a) the businesses targeted, and (b) the competitive position seized [8].

These decisions generate: (a) the market impact, (b) the competitive pressure, and (c) the attack intensity of pioneer's action [9].

There are pioneer's initiatives that involve a few numbers of businesses and affect only a handful of competitors (low market impact) while others are more pervasive (high market impact). Moreover, the competitors' market share threatened or seized by the pioneer can be significant in certain cases because competitors are leaders or co-leaders (high competitive pressure) while in other circumstances can be not (low competitive pressure). Finally, the competitors' profits threatened or seized by the pioneer can be substantial (high attack intensity) or not (low attack intensity) [10].

A pervasive and intense pioneer's competitive strategy makes competitors more likely to react. Although competitors may initially be uncertain of the threat and opportunities generated by the new technology, the high pervasiveness and intensity of pioneer's strategy will tend to impel them to react.

Once few competitors respond, others will tend to follow soon, creating a "snowball effect" [11]. This effect enhances the likelihood that other competitors will react because each reaction represents by itself a new threat for other competitors.

According to the perspective that an action stimulates a reaction, the "snowball effect" creates a chain reaction that enhances the speed of each competitor's response.

The chain reaction had been frequent in several industries both for consumer products (electronics, computers, software, video games) and industrial products (medical equipments, office automation, telecommunication, wireless, networking, automotive, industrial equipments).

Market impact. The pioneer's decision about the number of businesses targeted affects the speed and the number of competitors' reaction, in a positive relation.

First of all, this decision affects the number of competitors' reaction because the larger the markets targeted the higher the likelihood that more competitors are threatened. Therefore, if the pioneer uses the new technology in only one market it will have to compete with a lower number of rivals compared with the situation that it operates in two, three, or more markets.

Moreover, a pioneers' initiative on a high number of businesses makes higher the likelihood that competitors involved in more than one of them are threatened. When the pioneer threatens a large number of competitors involved in more than one business, the speed of reaction tends to be higher accordingly to the pervasiveness of the threat.

When EMI sold the CAT scanner in the U.S. market the market impact of its competitive strategy was really high because EMI entered simultaneously in the three main groups of U.S. customers: small hospitals and specialists, medium hospitals, and big hospitals. The pervasiveness of EMI's competitive strategy stimulated after one year four competitors' reaction, after two years ten reactions, and after three years fifteen. The Bowmar Instrument Corporation of Fort Wayne pioneered the pocket calculators in the entire American market in the 1971. In only one year, twelve new entrants followed the Bowmar's instant success in the most attractive market in the world. Amazon opened its website in the 1995, in the 1996 Barnes&Noble inaugurated its first wide-range website and in the 1997 other competitors followed (Borders, Ingram, Simon&Schuster, and many other publishers).

Competitive pressure. Whereas the market impact concerns the pervasiveness of the pioneer's competitive strategy, the competitive pressure and the attack intensity focus on the effect of pioneer's action on each competitor, which means how strongly this action affects each firm's competitiveness.

The pioneer's threat of competitors' market share can enhance the speed of competitors' reaction and, by this effect, the number of reactions.

When customers' switching costs are low, they can easily switch to pioneer's new technology if competitors don't have it [12]. In these circumstances, the pioneer can seize or seriously threaten the competitors' market share and the likelihood of a speedy counteraction is high due to the risk of their presence in the market.

This phenomenon is faster when the pioneer attacks the leader. If the leader reacts other competitors will follow soon according to a chain reaction triggered by the pioneer and fed by the leader.

The logic of chain reaction affects the number of competitors' reaction too. Whenever the pioneer stimulates a speedy counteraction, by itself this reaction impels other competitors to react.

However, it is important to specify that in several circumstances, competitors' sales and market share don't decline immediately as well as they can continue to grow for a relative long time. In many cases, competitive asymmetries that come from a new technology are not immediate and self-moving. Initially the new technology has typical low performances that make it adapted only for particular markets [13]. The length of time in which it becomes adapted can vary widely. In some cases the new technology is quite immediately suitable for the entire potential market in other cases it needs some improvements before that matches the preferences of the mass market. In these circumstances, the pioneer's competitive pressure is less intense and the archetype of competitive dynamics is nearer to a low speed/low number of competitors' reaction.

ENIAC/UNIVAC pioneered the mainframe computer American market and its computers sought to replace the punch card machines, sorters, mechanical tabulators, and printers, all businesses dominated by IBM. Although ENIAC/UNIVAC had a relative market success, IBM didn't take any significant countermeasure for several years and reacted after seven because the pioneer didn't threaten its market share in the old businesses for a long time [14].

Attack intensity. Finally, the competitors' profits threatened or seized by the pioneer can increase the speed and the number of reactions. The attack intensity reflects the degree to which the current and future profitability of a given competitor is threatened by the pioneer. The degree of threat can vary widely if competitors are either mono or multi-business.

When competitors are mono-business, the level of threat tends to be higher due to the “mono-source” of profits and it stimulates speedy and large counteractions. Moreover, the number of counteractions can be enhanced by the chain reaction effect. In these circumstances, the archetype of competitive dynamics stimulated by the pioneer is: high speed – high number of competitors’ reaction.

If competitors are multi-business, the level of threat is related to the strategic importance of the SBU threatened by the pioneer. When the threatened business is strategically not important for competitors, their reaction tends to be slower. In these circumstances, the chain reaction effect reduces, in a reverse mode, the number of reactions too. In this case, the archetype of competitive dynamics stimulated by the pioneer is a low speed/low number of competitors’ reaction.

Within one/two years that Michelin sold its radial tire in the U.S. market all the U.S. tire makers (i.e. Goodyear, Firestone, Uniroyal, B.F. Goodrich, and General), all mono-business firms, reacted to the French manufacturer’s innovation. In this case, the threat of Michelin’s radial tires impelled the largest mono-business U.S. manufacturers to place a speedy counteraction against this radical innovation. [15]

Competitors' awareness and motivation to react

The fact that a pioneer uses a new technology in a certain business with a certain competitive strategy does not mean that automatically the competitors become aware of the threat/opportunity and motivated to react to it [16]. Even if the stimulus mechanisms should impel for a specific archetype of competitive dynamics, the following response mechanisms affect the competitors’ decision-making process with which they consider the new technology as a threat/opportunity, become motivated to react, and decide how to respond: (a) information filters; (b) mentality filters; and (c) power filters.

Information filters. An effective strategic response requires a clear perception of the prospects in the firm's environment. This perception comes from the methods for evaluating the environment. Each competitor can adopt different methods: (a) business, economic, or

technological forecasting (i.e. extrapolation, multiple regression, curve fitting, scenarios, competitive analysis, Delphi, asymptotic analysis, threats and opportunities analysis), models of the environment (i.e. input-output, econometric, cybernetic, and stochastic), estimation of impact (impact analysis, cross impact analysis, deductive analysis, and force field analysis). Each of these methods is more effective only for particular kinds of forecast. Thus when the environment change for any reason these methods can misrepresent the environmental conditions. As Ansoff says: "the environmental surveillance and analysis techniques can be viewed as a filter through which the environmental information must pass on its way into the firm." [17].

The effect of information filters can be summarized in this example that Cooper and Schendel remind: "In 1934, when General motors introduced the first mainline diesel-electric locomotive, the producers of steam locomotives could look back upon two earlier threats which they had survived: the electric locomotive, and, in the 1920s, passenger cars with individual gasoline-powered engines. Both of these prior threats captured only small segments of the American locomotive market. According to the methods used by the producers of steam locomotives in the control of competitive conditions, there was no indication that the next threat, the diesel-electric, would destroy the industry within fifteen years." [18]. Managers of steam locomotives firms were not aware of the threat because the environment changed and increased the effect of information filter.

Mentality filter. Even if the methods for evaluating the environment give meaningful information on a technological threat/opportunity, managers of threatened firms can reject this information or evaluate it as irrelevant. Sociological and psychological literature explains this behavior with the concept of "mindset". Managers that experience successes and failures cumulate convictions about "things that do work" and "things that do not". These convictions represent a mentality filter that becomes critical whenever from the competitive environment comes a threat that changes the "things that do work".

In several articles Bower and Christensen tell how Seagate lost its market after a disruptive technology came into the disk drive industry. They say how senior managers quite rationally decided that the 3.5-

inch drive would not provide the sales volume and profit margins that Seagate needed from a new product. As a former Seagate marketing executive recalled: "we needed a new model that could become the next ST412. At the time, the entire market for 3.5-inch drivers was less than \$50 million. The 3.5-inch drive just didn't fit the bill - for sale or profits." [19]. The "things that do work" for Seagate's managers were markets that fit the bill - for sale or profits. Even though Seagate's revenues of 5.25-inch drives had grown to more than \$700 million by 1986, by 1987 sales of 8 and 5.25-inch products had largely evaporated.

Power filter. Finally, technological discontinuities have major implications for managerial skills and the power of each manager. As Ansoff reminds "it's natural for managers and departments, whose power base is threatened by a discontinuity, to minimize or even refuse to recognize the impact of the discontinuity on the firm." [20]. Moreover, even if a technological innovation is not a threat for the power structure the management can refuse to recognize it because it is a threat for employees and host communities. These phenomena work as a power or political filter.

As Cooper & Schendel remind in their study of seven threatened industries by new technologies, it was common for the traditional firms' spokesmen to emphasize the shortcomings of the new technology with comments such as "It is no wonder if the public feels that the steam locomotive is about to lay down and play dead," and "It is certain that substantially all airplanes which operate at speeds of 550 mph or less will use propeller propulsion." [21]. The managers of these industries were conditioned not only by their involvement with the old technology, but also by their skills and positions of influence inside the threatened firms. For these reasons they minimized the threat and initially acted "as if nothing had happened".

The joint effect of the stimulus mechanisms and the response mechanisms explain the timing and the number of early movers, followers, and late movers. While the characteristics of pioneer's action affect the likelihood that a certain archetype of competitive dynamics will happen, the filters of competitors' decision-making process influence both the timing of each competitor's response and the specific counterattack undertaken.