



Competitive Strategy Under Uncertainty

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RESEARCH NOTES AND COMMUNICATIONS

COMPETITIVE STRATEGY UNDER UNCERTAINTY

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Competitive strategy under uncertainty involves a trade-off between acting early and acting later after the uncertainty is resolved, and another trade-off between focusing resources on one scenario and spreading resources on several scenarios, thus maintaining flexibility. This paper analyzes both these trade-offs taking into consideration the nature of uncertainty, industry economics, intensity of competition, and the position of a firm relative to its competitors.

INTRODUCTION

Since strategy is concerned with the future, the strategic context of a firm is always uncertain, although the degree and the sources of uncertainty may be different for different firms. Facing an uncertain future, the first decision a firm has to make is when to act. The firm has the choice of acting now or waiting until after the uncertainty is resolved, or at least partly resolved. If the firm does act early while there still is uncertainty, it has to decide whether to focus its resources on several scenarios, thus maintaining flexibility. To properly analyze these decisions it is necessary to take into account the nature of uncertainty and the firm's characteristics. This analysis is further complicated by the presence of competition.

Strategic options under uncertainty

As an illustration, it may be useful to consider the situation in the corn wet milling industry where several potential technologies could develop into alternatives to that licensed by Standard Brands for manufacturing HFCS (high fructose corn

syrup) (Porter and Spence, 1982). It is likely that, some time in the future, one of these process technologies will become the dominant one and displace the 'losing' technologies from the industry. (For the sake of convenience of exposition, let us ignore the possibility that some technology yet to be invented will emerge as the dominant choice for the industry.) A firm in this industry therefore faces a technology investment decision. If it focuses its resources on one technology it will become a strong competitor if that technology eventually turns out to be the right choice. This is clearly a risky strategy. Alternatively, the firm can spread its investment over several technologies; it thus lowers its risk by maintaining flexibility, but may have little chance of becoming a strong competitor. (So there is an opportunity cost of doing this.)

When the future is known with certainty, focusing resources yields advantages such as going down the learning curve faster and exploiting economies of scale. All the advantages of focusing are, of course, preserved in an uncertain environment. Flexibility, on the other hand, while it offers no benefits in an environment known with certainty, is advantageous under

uncertainty. Thus, under uncertainty there is a trade-off between focus and flexibility.

When faced with uncertainty there is a third option, besides focus and flexibility, available to a firm: to wait and act only after the uncertainty is removed. A firm in the corn wet milling industry can choose not to make a significant investment in production technology till it becomes relatively clear which technology is the superior one.

In reality a firm can focus its resources to a greater or lesser extent; in other words, it has an infinite number of options which lie along a continuum. Similarly, it can act right now or any time in the future. It is, however, much easier to discuss the problem and the factors which should influence the decision by considering only the extreme options rather than the entire range of options. This is not, of course, to imply that the firm should in fact choose one of the extreme options.

The problem facing the corn wet milling firm can be stylized by considering a two-time-period setting where the firm can make its investment in either period. By the second period the uncertainty will be fully resolved and it will be known which of the competing technologies has emerged as the superior one. We will denote by 'wait' the strategy of investing only in the second period after the uncertainty is resolved. The 'focus' strategy requires the firm to invest in any one technology in the first period; under the 'flexibility' strategy the firm invests in all competing technologies in the first period. (In the two latter cases the firm may also invest in the second period.) Stylizing the problem this way allows us to follow the '2×2 matrix tradition' in the presentation of our results!

Research objective

The objective of this paper is to offer a first-cut at an explicit analysis of the factors that influence the choice between the strategic options 'wait', 'focus' and 'flexibility' in the context of competitive strategy. This analysis will take into account the nature of uncertainty, characteristics of the firm and of the competitive environment facing the firm. No empirical evidence is presented, and it may be appropriate to look at our propositions as hypotheses awaiting rigorous testing.

Previous Literature

Concentrate your strength against your competitors' relative weakness (Henderson, 1979: 13).

Managers should . . . as the best way of increasing the chances of the survival of their organization (McKelvey and Aldrich, 1983).

Cyert and March (1963: 118–120) in their classic book claim that firms try to avoid uncertainty rather than confront it. Whether or not firms in fact do that, the literature on strategic planning, it seems to us, has avoided discussing the trade-offs involved in confronting uncertainty. The previous literature in or related to business policy deals with uncertainty in one of two extreme ways: it assumes either that there is no uncertainty or that it is the dominating concern. One stream of literature, assuming away all uncertainty, uses concepts such as experience curve effects and economies of scale to argue that a firm subject to competition should commit its resources in a focused manner. The empirical evidence linking market share and profitability (for example, Buzzell, Gale and Sultan, 1975) is interpreted as providing support for the 'focus' strategy.

On the other hand there is an equally influential stream of planning literature, derived from systems theory (for example, Ashby, 1952) or population ecology (Hannan and Freeman, 1977), which recognizes uncertainty and argues that a firm subject to uncertainty should try to achieve the ability to survive in the widest possible range of environments. That is, the firm should maximize its flexibility (Utterback and Abernathy, 1975). Thus the analysis that is offered assumes either that there is no uncertainty, and recommends 'focus' as a strategy, or that uncertainty is such a dominating concern that 'flexibility' is the right strategy.

If we venture outside the strategic management field we find two tools which together provide the key to our problem. First there is statistical decision theory (Raiffa, 1968; Hertz, 1964) which tells us how to analyze decisions under risk. Secondly there is game theory which has already been used to give us insights into the competitive aspects of strategy (Rao and Rutenberg, 1979; Spence, 1977). The derived area of stochastic game theory (Basar and Olsder, 1982: Ch. 3.7), is yet in its infancy but is clearly the correct approach to our problem.

Accordingly we will develop our analysis from this perspective.

NATURE OF UNCERTAINTY

Since strategy is concerned with the future, the strategic context of a firm is always uncertain, although different firms face differing degrees of uncertainty. As a first step to analyzing competitive strategy a firm has to understand the sources of the uncertainty it faces and some key characteristics of this uncertainty. Uncertainty can arise from four different types of sources listed here in order of importance: demand structure, supply structure, competitors and externalities.

Demand uncertainty

On the demand side, the size of the market may be uncertain. How big will the demand be and when will it materialize? Not only is this an important question in all emerging industries, but the experts in such an industry tend to have widely different demand projections. For example, in the corn wet milling industry estimates made in 1972 of the demand in 1980 ranged all the way from 2.5 billion pounds to 10 billion pounds. The size of the different market segments may be uncertain; even the dimensions along which to segment the market may not be clear. The desired product (or service) design may be uncertain. Particularly in the early stages of the industry life cycle the 'dominant design' may not yet have emerged (Abernathy, 1978). Finally there may be uncertainty regarding the appropriate distribution channels.

Supply uncertainty—exogenous or endogenous

On the supply side, uncertainty can arise from the internal operations of the firm as well as from the external developments in technology. First, there can be uncertainty about the best process technology. In corn wet milling, the firms could develop HFCS capacity in several different ways. It may be uncertain if a superior technology will be invented, as well as when it will be invented. Supply uncertainty may finally arise from the operations of the firm itself. Key executives can leave, and fraud or accidents can occur.

Uncertainty can be such that the firms in an

industry, individually or collectively, have influence over its resolution. This is particularly true for supply uncertainty (and of course for competitive uncertainty, e.g. in the case of preemption). For example, the ultimate success of a given technology depends critically on the firm's willingness to invest in it. Furthermore, some firms are much more in control than others. Quite often a dominant firm can virtually dictate standards for product specifications while smaller firms have to accommodate to this.

Competitive uncertainty and externalities

This covers unpredictable circumstances inside competitive firms but also the nature of the competitors, their strategies and their response to our strategies. A major issue here is the identity of competitors. Who will enter the corn wet milling industry in the future? Will it be integrated firms or specialists? This in turn leads to questions about the competitive behavior of these firms, about their strategies and their aggressiveness.

There may finally be uncertainty about the effects of external factors such as social pressures and government intervention.

GENERAL PRINCIPLES

Let us now outline how a firm should act under uncertainty, given a particular behavior on the part of its competitors.

When to act

We will here argue for the proposition below:

Proposition 1: The following factors will, ceteris paribus, make it more attractive to act before the uncertainty is resolved: (a) many first mover advantages, (b) low risk-aversion, and (c) ability to influence the way the uncertainty is resolved.

Facing an uncertain situation, the first decision a firm has to make is when to act; the firm has the choice of acting now or waiting until after the uncertainty is resolved, or at least partly resolved. The general principle is that the greater the 'first mover advantages' in the industry, the more important it is for a firm to act early. First mover

advantages could be due to various factors such as learning curve effects, customer loyalty, patent protection and preemption of scarce resources (see Scherer, 1980: 245–247; Schmalensee, 1982; Urban and Hauser, 1980).

It is obviously riskier to act early than to wait. The more risk-averse a firm, the greater is the incentive for the firm to wait. This partly explains why the early entrants in a new industry are often backed by venture capital and hence are less risk-averse than companies with a more conventional capital structure. In situations where what are normally called first mover advantages do not exist (or are not significant), a firm should still act early if both the following conditions are present: the firm has a preference for one particular alternative and the firm can influence the resolution of uncertainty such that that alternative is realized.

Focus or flexibility

If the firm does act early while there still is uncertainty, it has to decide whether to focus its resources and bet on one scenario or to hedge its bets and spread its resources on several scenarios, thus maintaining flexibility. On this issue we shall argue for the proposition below:

Proposition 2: The following factors will, ceteris paribus, make focus more attractive than flexibility: (a) many economies of scale, (b) low risk-aversion, and (c) ability to influence the way the uncertainty is resolved.

The greater the returns to scale characterizing the investment under consideration, the greater is the advantage of the ‘focus’ strategy. Note that returns to scale are different from first mover advantages: the former are static whereas the latter are dynamic in nature. First mover advantages afford greater returns to a firm which acts before another firm, while economies of scale afford greater returns to a firm which invests more. While returns to scale is a source of first mover advantages, it is not a sufficient condition for an industry to exhibit this characteristic. If, for example, technology is progressing very rapidly, it may be best to invest last and get the latest ‘vintage’ instead of going early, even though this could give some preemptive advantages.

Focusing resources is obviously riskier than maintaining flexibility. The more risk-averse the

Table 1. General principles

	Big first mover advantages	Small first mover advantages
Big economies of scale	Focus	Wait
Small economies of scale	Flexibility	Wait

firm, and the greater the degree of uncertainty, the greater is the incentive to maintain flexibility. Finally, if the firm has influence over the resolution of uncertainty, then clearly the firm has an incentive to focus its resources on its preferred scenario.

UNDERLYING FACTORS

While the above discussion analyzes several factors which influence the choice between the three strategies—wait, focus and flexibility—it does not explicitly consider competition. The analysis does implicitly assume that there is competition; for example, first mover advantages are not much use if there is no competition. We next explicitly analyze how competition and some specific characteristics of the competitors influence the choice between the three strategies under uncertainty.

Competition

Proposition 3: Because of the way they influence the payoffs, more competitors do, ceteris paribus, increase the incentives to (a) act early, and (b) focus.

In general, the greater the number of competitors the greater is the incentive to act early rather than wait. For example, in an R&D race, the more a firm invests, and the sooner it invests, the more likely it is to win. If there is only one firm in the race, there is no particular hurry; but if there are several firms in the race then it is important to act early so as to try to achieve a breakthrough before the competitors do. Similarly, the greater the number of competitors, the greater is the incentive to focus rather than hedge. For example, suppose that three firms face two possible scenarios and that two firms

focus on one scenario each, whereas the third firm invests a little in both. In this case it will often be better to have a shot at dominating the industry than to be assured of the number two position.

Relative size

Proposition 4: Because of their ability to come from behind, relatively bigger firms can, ceteris paribus, afford to: (a) wait in the presence of larger first-mover advantages, and (b) stay flexible in the presence of larger economies of scale.

Asymmetries in the resource bases among the firms competing in an industry significantly influence the strategic choice between wait, focus and flexibility. A firm which commands some relevant resources in sufficiently large quantities may be able to wait and yet overcome the first-mover advantages of weaker competitors. In the corn wet milling industry, CPC with its financial resources, strong reputation, and good cost position may be able to enter late and yet snatch the leadership position for early entrants. A strong firm can better afford to wait than a weaker competitor, because it sometimes can ‘leapfrog’ entry and mobility barriers. (Whether this strength comes from multibusiness operations or dominance in a single market is irrelevant).

One of the dangers of trying to maintain flexibility is that the firm may spread its resources so thinly that it will lose regardless of which scenario is realized. Clearly a larger firm with more resources can better afford to hedge than a smaller firm. A smaller firm may have no choice but to focus if it is to have any chance of winning. Casual observation suggests that the failure rate among small firms in an emerging industry is high. A partial explanation for this might be that the small firms tend to bet exclusively on one scenario and hope that they win, rather than try to maintain flexibility. The contents of propositions 3(a) and 4(b) are combined in Table 2.

Upside potential

Proposition 5: Because of their greater upside potential, big firms with sunk investments in an

Table 2. Typical situations

	More competition	Less competition
Small firm	Focus	Wait
Big firm	Flexibility	Wait

industry can, ceteris paribus, afford to invest more and stay flexible in the presence of larger economies of scale.¹

Another type of asymmetry among firms arises from how much they will gain if they bet on the right scenario in the focus strategy; that is the firms face differing degrees of upside potential. What creates this difference is that success requires a set of investments which can be made sequentially and some firms have already made some of these investments. If a firm guesses right it can use the investments it has already made; the more it has already invested, the greater is its upside potential. This potential clearly influences the trade-off between the focus and flexibility strategies; the greater the upside potential, the greater is the incentive to maintain flexibility.

WHERE TO FOCUS

Proposition 6: Firms who focus should, ceteris paribus, base their choice of where to focus on: (a) relative strength and expected profitability if they are strong, and (b) what others will do if they are weak.

If a firm does decide to focus, it still has to choose where to focus its resources. Assuming that the scenarios are equally likely, a firm should focus its resources on the scenario under which it has the strongest position relative to its competitors. For example, consider two competitors in the corn wet milling industry: firm A which is strong in production skills, and firm B which is strong in distribution skills. Further suppose that the industry could evolve along one

¹ A referee has pointed out to us that this synergy between past and future investments generally can apply to synergy between any other part of the firm’s business and the new investment in question.

of two equally likely scenarios; under scenario 1 the demand will be very low and success will depend on production skills, whereas under scenario 2 the demand will be high and distribution will be the key skill required. Having decided to focus, there are strong reasons why firm A should focus its resources on scenario 1 and firm B should bet on scenario 2. In other words, bet on your strength and hope that the scenario favorable to you will be realized. To emphasize that it is strengths relative to competitors that matter, and not absolute strengths, consider the above example with one change: firm B instead of being strong in distribution has its strength in production, but is weaker than firm A in production. Firm A should still focus its resources on scenario 1; firm B should bet on scenario 2 even though its strength is in production and not distribution. Under scenario 1 firm B would be at a competitive disadvantage relative to firm A, whereas under scenario 2 it is at least on an equal footing. In the absence of scenario-specific skills it is better, in general, to bet on the most likely scenario.

This generalization has to be modified if the firms in the industry are not equally strong. The strongest firm, if it does focus, clearly should bet on the most likely scenario. A weaker firm, on the other hand, is probably better off betting on a less likely scenario on the ground that if the most likely scenario is realized, the firm will lose out to the stronger competitor anyway. In effect, the weaker competitor is going for a small chance of a big profit rather than for a big chance of a very small profit. The reasoning used here is similar to that used to support the recommendation that a small firm should try to find a niche rather than competing head-on against a big firm in the major market segment.

CONCLUSIONS

Summary

Competitive strategy under uncertainty involves, among other things, a trade-off between acting early and waiting, and another trade-off between focus and flexibility. This paper has analyzed these trade-offs taking into consideration the nature of uncertainty, economics of the industry, number of competitors and the position of a firm relative to its competitors. The previous literature

has implied that in the presence of uncertainty focus is not a viable strategy. This paper has argued to the contrary by indicating that there are trade-offs involved here and thus, under certain circumstances, focus may be the best competitive strategy under uncertainty.

We argued for the general principle that commitment can be postponed in situations without major first mover advantages, whereas first mover advantage and economies of scale make focusing of resources a logical choice. Without economies of scale but with first mover advantages the firm should act early and hedge its bets. The choice between the three strategies—wait, focus and flexibility—is also influenced by the number of competitors in the industry and the relative competitive position and past investments of the firm. In the typical situation we have argued that more competition makes earlier commitment more desirable, and that smaller firms have to take more chances and make focused bets, whereas bigger firms, especially if they have sunk investments in the industry, can afford to hedge. Finally, firms should focus on scenarios where their relative strength, given what others are expected to do, will be greatest. The logic of our entire argument is summarized in Figure 1.

Managerial implications

While the managerial implications of the present analysis seem quite direct, we prefer to see this as a first-cut at a very complex problem. Several issues need further research before more specific recommendations can be made. For example all of the above analysis is contingent on the firm's inability to escape the trade-offs in any way. One possibility is for the firm to concentrate its investments in flexible assets which can be used under several scenarios or in salvageable assets which can be sold to other firms. The drawback of this approach is that such investments rarely offer the potential of a big competitive advantage. Another option, which is frequently used in emerging industries, is for competitors to cooperate with each other in dealing with uncertainty (of course, subject to anti-trust approval). An example of this is cooperative agreements or joint ventures for doing research. If a firm can supply resources enough for betting on only one scenario, then a cooperative arrangement can

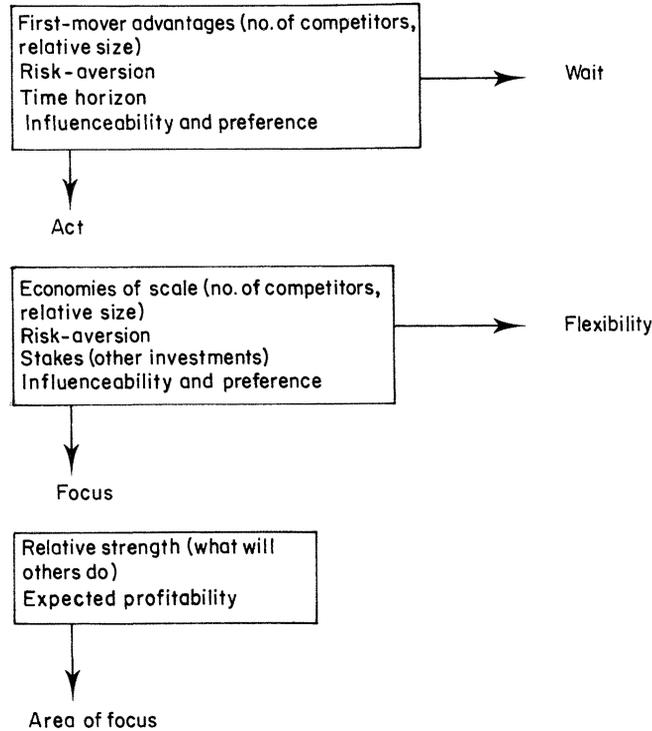


Figure 1. Logic tree for main argument

give it and its partners a reasonable presence in several scenarios. Thus the firm has the advantages of both focus and flexibility. There is, however, a price to be paid for this. The firm gets a guaranteed lease on its own life in exchange for guaranteed survival of competitors. It may be tempting to try to use uncertainty to shake out some of the competition. It is very risky, however, for a small firm not to join a cooperative arrangement if its competitors are cooperating. Cooperation is thus an attractive option for small firms facing uncertainty; if the degree of uncertainty is very high and the resources required to bet on each scenario are also large, it may be attractive for even the big firms to join such cooperative arrangements. It is thus not surprising there are so many cooperative arrangements (such as joint ventures, minority equity positions, and cooperative agreements for research or production) in emerging, high-technology industries.

Further research

While it is not the topic of this paper, we feel that the cooperation option is very timely and of

increasing importance. It seems a major area for future research is to further understand how cooperation can yield gains in risk-sharing and exploiting economies of scale. More direct extensions of the present paper could either take the form of applications to specific industries or types of industries (emerging, regulated, concentrated, etc.) or could consist of search for more detailed and perhaps contingency-based recommendations. The latter endeavor will very quickly require much more formalized arguments than those used on the broad-brush level here. While stochastic game theory is difficult to work with, we feel that the importance of the topic may justify going that extra mile.

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