ENTERING A MATURE INDUSTRY: A CASE STUDY OF STRATEGIC INNOVATION

by

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ABSTRACT

A mature industry is analyzed to determine if technology can alter the rules of competition and enable the profitable entry of a new competitor. The industry that is analyzed is the electric motor industry in the United States. Issues related to entering and competing in a mature industry are discussed. An assessment is made of the structure of the electric motor industry and the level of innovation in the industry. An entry strategy is developed based on the structure and the issues related to entry and competition. A financial analysis of the entry strategy is used to determine the viability of the entry strategy.

The analysis shows that the appropriate application of information technology, manufacturing technology, and product design enables the new entrant to reconfigure the industry's value chain and redefine the scope of competition. The financial performance, as a result of the strategic innovation, is superior to industry incumbents.

Thesis Supervisor: James M. Utterback
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I dedicate this thesis to my wife, Carol, who gave me unfailing encouragement and support throughout this past year.

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Competing in a Mature Industry

Introduction

It is well recognized that technology can profoundly change an industry or even create new industries. In his book *Competitive Advantage*, Porter states "Of all the things that can change the rules of competition, technological change is among the most prominent." [1] This technological change can take many forms. The new technology may take the form of a product innovation or it may affect some other aspect of the firm's value chain. The fact that technological change can affect any aspect of a firm's value chain means that technology is just as important to competitive advantage in low-technology industries as it is in high-technology industries. The fundamental purpose of this thesis is to determine how technology could alter the rules of competition in a particular mature industry, and enable the entry of a new competitor.

The industry that will be studied is the electric motor industry in the United States. This is a particularly interesting industry to look at because of its generally poor performance in comparison to other manufacturing industries. Some statistics for the industry are shown below in Table 1-1 for 1991. (Other years show similar results.) The table shows that, when compared to the average of all manufacturing industries in the United States, the electric motor industry is less productive in terms of value added per employee and value added per production worker. In addition, the investment per worker is relatively low in comparison to the average of all manufacturing. Even though investment in the electric motor industry lags, the investment trend has been downward over the past two decades as shown in Figure 1-1.

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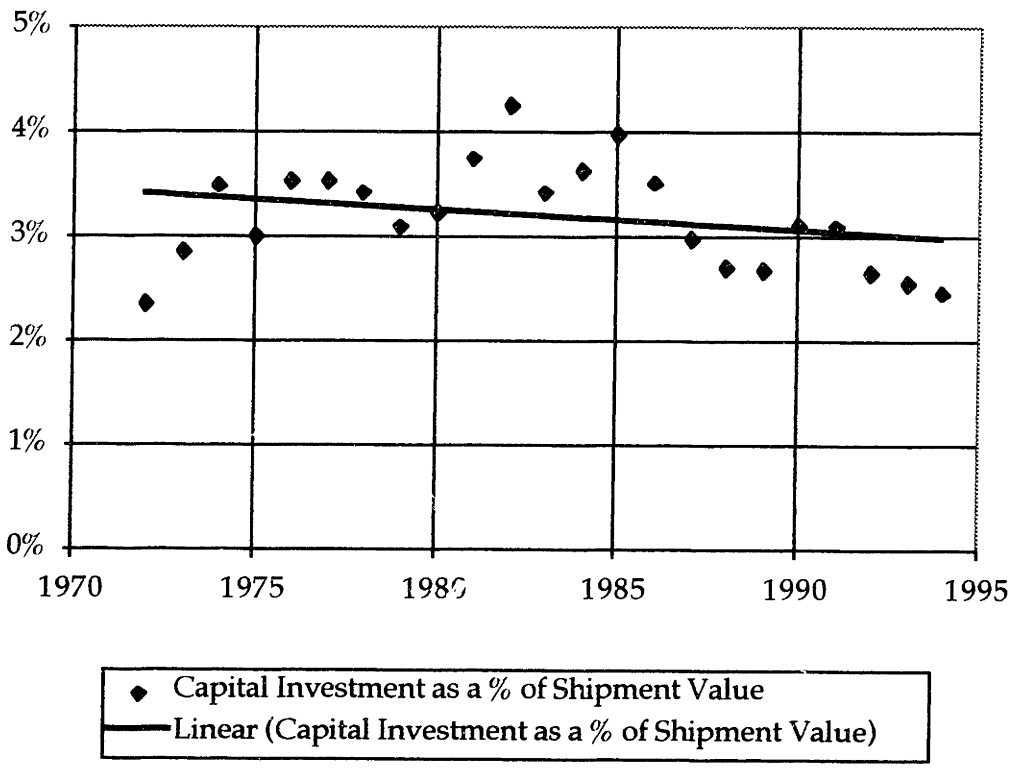
[1] Michael E. Porter, *Competitive Advantage* (New York: The Free Press, 1985), p. 164.

Table 1-1: Productivity and Investment

Performance Indicator	Motors and Generators	All Manufacturing
Value Added/Employee	$60K	$78K
Value Added/ Production Worker	$78K	$114K
Investment/Employee	$3.4K	$5.9K
Investment/Production Worker	$4.6K	$8.6K

Figure 1-1: Capital Investment Trend in the Electric Motor Industry



It will be shown in this thesis how technology can radically redefine an industry and make industry incumbents vulnerable to a new entrant. Furthermore, it will be shown that industry incumbents would find it

difficult to react to such a redefinition. To illustrate, the typical sequence of rejuvenation for the mature business is shown in Figure 1-2. Even though these separate capabilities build upon each other, it takes a great deal of time to develop them. Contrast this to the new entrant who can start off with all these capabilities in place and continuously improve from there, dynamically adding new capabilities to stay out front of the competition. This is made possible by the simultaneous application of information technology, manufacturing technology, and modular product design as shown in Figure 1-3. Throughout the thesis, it will be shown how these three fundamental technologies combine to create higher margins, lower investment, lower product cost, reduced overhead, and sales growth which leads to superior shareholder value.

Figure 1-2: Typical Sequence for Rejuvenating a Mature Business

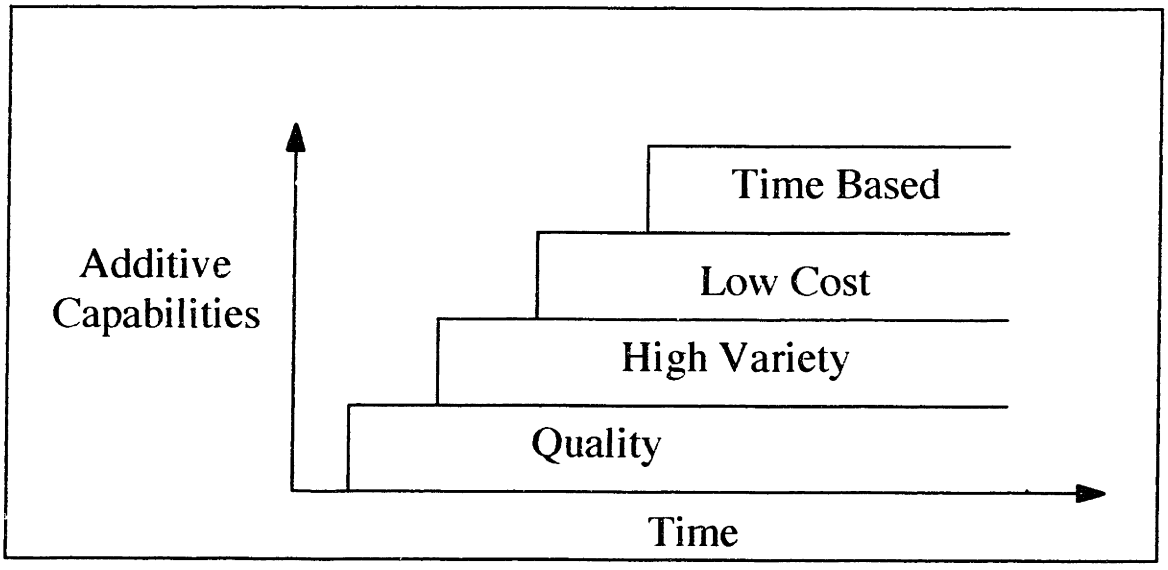
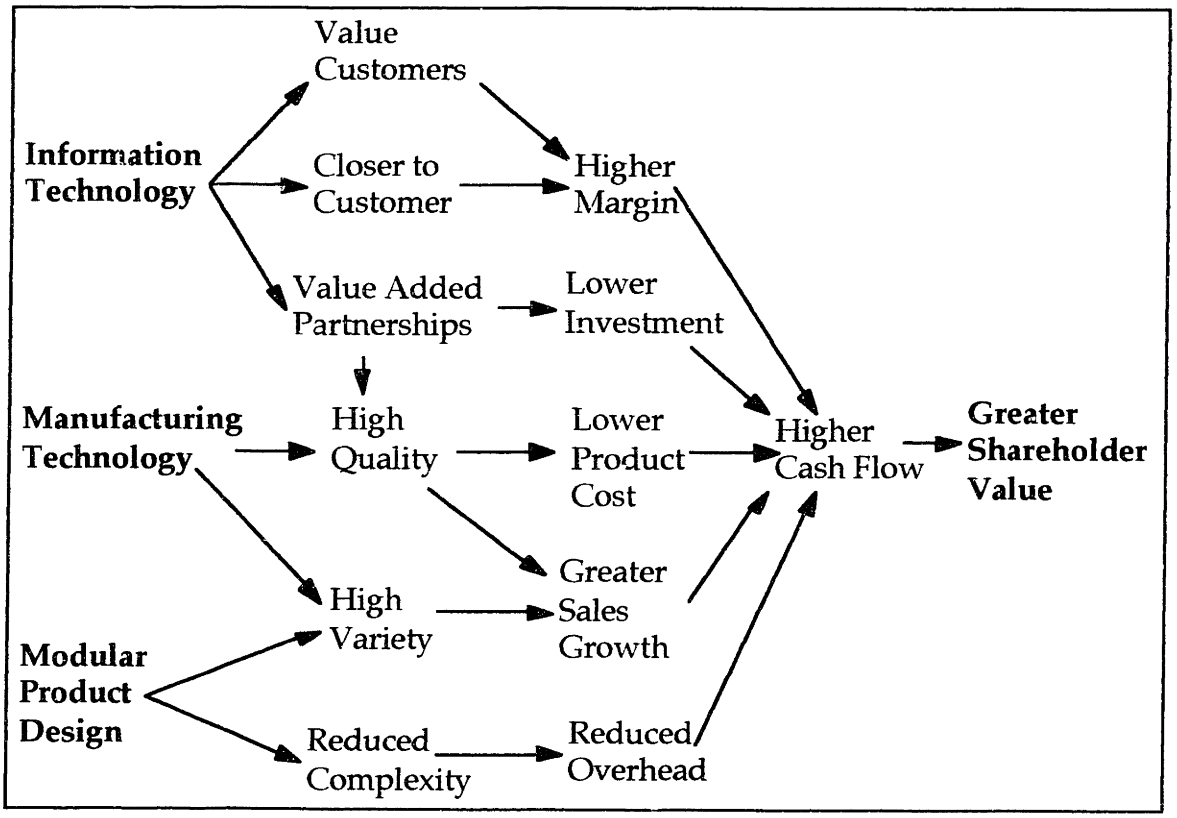
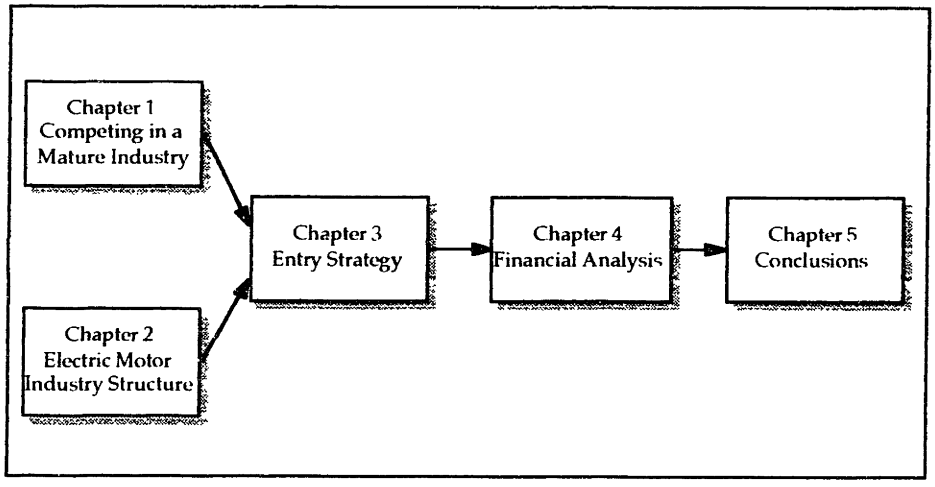


Figure 1-3: The Dynamics of the New Entrant



The process that will be used to analyze a potential entry strategy is shown in Figure 1-4. Initially, generic strategies for entering and competing in a mature industry are reviewed. Next, the structure of the electric motor industry is discussed. A generic strategy for entering this mature industry is developed based on the generic strategies and the structure of the industry. A financial analysis of the entry strategy is used to determine its feasibility. Finally, some conclusion and implications are drawn form the analysis.

Figure 1-4: Flow of Analysis



Phases of Industry Innovation

Industries tend to evolve over time, going through phases of product and process innovation. Utterback[2] has studied the interaction between technological change, organizations, and competition and has developed a model to explain the dynamics of these interactions. The model describes how changes in an industry's product and processes follow a discernible pattern over time. Utterback's model includes three phases of innovation: the fluid phase, the transitional phase, and the specific phase. The significant characteristic of each phase are summarized in Table 1-2.

The fluid phase describes the dynamics of an emerging industry. In this phase, product variety is high, manufacturing processes rely on skilled labor, organizations are entrepreneurial, markets are fragmented, and many small competitors with unique products characterize the competitive environment.

[2] James M. Utterback, *Mastering the Dynamics of Innovation* (Boston: Harvard Business School Press, 1994), pp. 79-101.

Table 1-2: Significant Characteristics in the Three Phases of Industrial Innovation[3]

	Fluid Phase	Transitional Phase	Specific Phase
Innovation	Frequent major product changes	Major process changes required by rising demand	Incremental for product and with cumulative improvements in quality
Source Of Innovation	Industry pioneers; product users	Manufacturers; users	Often suppliers
Products	Diverse design, often customized	At least one product design, stable enough to have significant production volume	Mostly undifferentiated, standard products
Production Processes	Flexible and inefficient, major changes easily accommodated	Becoming more rigid, with changes occurring in major steps	Efficient, capital intensive, and rigid; cost of change high
R&D	Focus unspecified because of high degree of technical uncertainty	Focus on specific product features once dominant design emerges	Focus on incremental product technologies; emphasis on process
Equipment	General purpose, requiring skilled labor	Some subprocesses automated, creating islands of automation	Special-purpose, mostly automatic, with labor focused on tending and monitoring equipment
Plant	Small-scale, located near user or source of innovation	General purpose with specialized sections	Large-scale, highly specific to particular products
Cost of Process Change	Low	Moderate	High
Competitors	Few, but growing in numbers with widely fluctuating market	Many, but declining in numbers after emergence of dominant	Few; classic oligopoly with stable market shares
Basis of Competition	Functional product performance	Product variation; fitness for use	Price
Organizational Control	Informal and entrepreneurial	Through project and task groups	Structure, rules, and goals
Vulnerabilities of Industry Leaders	To imitators, and patent challenges; to successful product breakthroughs	To more efficient and higher-quality producers	To technological innovations that present superior product substitutes

[3] Ibid., pp. 94-95.

As industries begin to mature they enter the next phase of development which is the transitional phase. The transitional phase is distinguished by the market acceptance of a product innovation and the emergence of a dominant design which satisfies the needs of a large number of users. Production processes become more rigid and more tightly coupled to product design. The organization begins to move out of the entrepreneurial mode by adding control systems and procedures. Markets and customer requirements become more clearly defined. The number of firms in the industry begins to drop once a dominant design emerges and an industry shake out occurs.

The final phase of an industry's evolution is the specific phase, which is often referred to as the mature phase. Products are highly defined or standardized, specialized equipment is used to produce the product with lower-skilled labor, controls and procedures are well defined, products are commodity-like and undifferentiated, and a few firms account for most of the industry's production. From an economics standpoint, these industries are called oligopolies. Some examples of mature oligopolistic industries are automobiles, steel, aluminum, petrochemicals, and electrical equipment.

In the specific phase, industry leaders are often vulnerable to technological innovations that present a superior substitute to the market. The technological innovation normally provides superior product performance or a lower cost, or both. In many cases, the innovations come from industry outsiders primarily because industry outsiders have no existing technology or investments in infrastructure to defend. "Industry insiders, on the other hand, have abundant reasons to be slow to mobilize in developing radical innovations. Economically, they have large investments in the current technology; emotionally, they and their fortunes are heavily bound up in the status quo; and from a practical point of view, their managerial attention is encumbered by the system they have--just maintaining and marginally improving their existing system is a full time occupation."[4]

[4] Ibid., pp. 161-162.

The fundamental purpose of this investigation is to use a case study to determine how a new firm could enter an industry that is in the specific phase of industry evolution. It will test the notion that industry leaders are vulnerable to technological innovation. The remainder of this chapter will explore some issues a new entrant might consider before deciding whether or not to enter an industry. The discussion will highlight factors that make entry attractive or unattractive. It will explore some generic strategies for competing in the mature industry.

Factors That Influence Entry

Oster[5] lists three factors that influence whether entry into an industry is attractive or unattractive: the expectation of falling prices, incumbent advantages, and exit costs. These three factors are closely related to what is commonly referred to in traditional literature as barriers to entry, or characteristics of the industry which impede profits. The first factor, expectation of falling prices, can be influenced by what Oster refers to as the technology in the industry--specific assets, economies of scale, and excess capacity--and by the reputation of industry incumbents.

Specific assets are assets the neither create value nor reduce cost if applied in another market. These assets can be tangible, for example, physical properties and production facilities. They may be less tangible as in the case of experienced management, customer relationships, and patents. Usually, the more specific an asset is to a particular business or industry, the more committed the incumbent is to protect that asset. A price reduction by an incumbent is therefore likely when the incumbent feels compelled to protect its specific assets.

In many industries, scale economies play an important role in competitive dynamics. The minimum efficient scale (MES) is the smallest

[5] Sharon M. Oster, *Modern Competitive Analysis* (New York: Oxford University Press, 1994), pp. 49-79.

scale or output for which the cost of each unit of production reaches a minimum. MES is an important consideration for an entering firm because it indicates how much market share must be attained to be cost competitive. It also indicates the size of the capital investment needed to enter an industry. Entry is deterred when a large MES relative to the total market is required because the additional industry capacity is likely to result in a post-entry price decrease. If a firm decides to enter an industry at less than MES, an offsetting factor such as product differentiation or a location-based monopoly must be present so the firm can charge a price premium.

Excess capacity also influences expectations about entry. If an industry already has excess capacity, a new entrant will obviously add even more to that excess particularly if the demand for the product is stable. If economies of scale exist, the expected behavior of the incumbent is to lower prices in order to maintain enough market share so that production is at or near minimum efficient scale. The credibility of an incumbent to lower prices is especially high when capacity utilization is an important competitive factor.

The technology barriers just discussed--specific assets, scale economies, and excess capacity--are not the only clues to potential incumbent retaliation. Incumbent firms may lower prices or retaliate in some other way based upon their own style of competing in an industry. Because firms typically compete in several markets, it may be possible to study the past behavior of incumbents to determine how they might react. The reputation that incumbents have established over time may deter or encourage entry. If the incumbent has a reputation as a fierce competitor, this reputation is in effect a barrier to entry.

Other factors beyond what Oster describes may promote or inhibit retaliation in an industry. Porter points out several additional factors that can limit retaliation by industry incumbents:

- *Mixed motives.* If a leader's strategy would be undermined when responding to a challenger, then the leader faces what Porter calls mixed motives. The leader may choose to lose market share rather than compromise its strategy.

- *Response costs.* A leader may have to invest a large amount of money in order to retaliate. If the amount is high enough, then retaliation is unlikely.

- *Financial priorities.* A leader stressing cash flow may not retaliate if a significant investment is needed for the retaliation. The leader may be interested in short-term profits more than market share.

- *Portfolio constraints.* Resources can be restricted by the corporate parent who has other priorities. Also, firms focused on diversifying may not be monitoring the core businesses, which is under attack by a new entrant.

- *Regulation.* Regulatory pressures such as pollution regulations, safety standards, and anti-trust may inhibit retaliation.

- *Blind spots.* Assumptions that the leader uses to interpret the status of the industry may be faulty.

- *Incorrect pricing.* Prices set on average cost allow a challenger to cherry pick over-priced products.

- *Gentleman's game.* If the competition in the industry has been peaceful, the leader may feel constrained from retaliation.

The second factor that Oster says must be considered when entering an industry is incumbent advantages. Potential entrants must be wary of these incumbent advantages, often referred to as first mover advantages, because they create barriers to entry. There are numerous examples of first move advantages. Long term contracts with suppliers, customers or distributors

could preclude the new entrant from competing in a cost effective manner. Licenses, patents, and certifications create a gap between the new entrant and incumbents. Experience curve effects, which are large and appropriable, provide incumbents who have more cumulative output with lower costs. Sometimes, a pioneering brand can create a first mover advantage especially when consumer uncertainty is high before a purchase, or when the potential cost to the purchaser of making a mistake is high. Pioneering brands also provide industry incumbents with first mover advantage when customers are satisfied with the existing product. Satisfaction with a product makes potential customers reluctant to experiment with a new brand.

The final factor that influences entry is the cost to exit. High exit costs tend to deter entry especially when assets are specific. The specific assets make it difficult to reverse capital investments should an exit become necessary. Table 1-3 summarizes the factors discussed above.

Competing in Mature Markets

Now that some of the considerations for entering an industry have been discussed, its worthwhile to review some of the standard strategies for competing in an industry in the specific phase of evolution.

A well-known concept that describes the historical pattern of successful products is the product life cycle. Similar to Utterback's model of industry evolution, a successful product is seen as passing through distinct cycles: market development, market growth, market maturity, and market decline. During the market development stage, the product is first introduced to the market, demand is uncertain, and sales are relatively low. In the market growth stage, demand begins to accelerate quickly, and the market expands rapidly. As demand levels off and the market becomes saturated, a product

enters the market maturity phase.[6] Finally, in the decline stage, the product begins to lose appeal and the sales begin to drift downward.

Table 1-3: Summarizing the Factors that Influence Entry Into an Industry

1. Expectation of Falling Prices	**2. Incumbent Advantages**
A. Technology of the Industry • specific assets • economies of scale • excess capacity	• long term contracts • licenses, patents and certification • experience curve • pioneering brand
B. Retaliation • reputation of incumbents • mixed motives • financial priorities • portfolio constraints • regulations • blind spots • incorrect pricing • gentleman's game	**3. Exit Costs**

The mature stage has several distinct characteristics. Sales growth is approximately on par with population growth, price competition is intense, and competitors, in an attempt to hold brand preference, make finer differentiations in the product. In the mature stage, buyers are educated so distributors shift from sellers of the product to order-takers. Manufacturers concentrate on holding distributor shelf space and may try for even higher levels of distribution. Generally, the market maturity stage demands active competition on the basis of price and product differences. The length of time an industry remains in the mature stage varies. Market maturity may pass

[6] The market maturity phase is similar to Utterback's specific phase in that market has leveled off. Utterback makes a distinction though that manufacturing at this phase of industry evolution is aimed at producing a specific product at a high level of efficiency. For the purposes of this discussion, the term "specific" and "mature" will be used interchangeably.

quickly, as in the case of women's fashions, or it may persist for decades, as in the case of automobiles.

Some generic strategies for "life extension" or "marketing stretching" have been proposed to manage the mature product. Levitt, in his classic article "Exploit the Product Life Cycle,"[7] suggests several strategies for managing mature products. According to Levitt, the maturity stage will last as long as there are no important substitutes or other major changes--social, fashion, and demand for primary products that use the product being considered--that may lessen demand for the product. Levitt details four strategies to expand sales once a product reaches the mature stage: promote more frequent use among current users, develop more varied usage of the product among current users, create new users by expanding the market, and find new uses for the product.

In the book, *Competitive Advantage*[8], Porter provides some strategies for competing against an industry leader. Although Porter does not specifically say it, much of what he writes about applies to competition in a mature industry. According to Porter, leaders have certain advantages--reputation, economies of scale, access to suppliers and channels, and cumulative learning--as well as commitment and financial resources that enable them to defend against entry. Most successful strategies attack vulnerable leaders while avoiding retaliation.

If a new entrant, or another industry incumbent, wants to successfully attack a leader that new entrant or incumbent must have a sustainable competitive advantage in either cost of differentiation, a way to neutralize the leaders other advantages, and some means for impeding retaliation. Probability of success rises with the challenger's capability for meeting these requirements. Three possible strategies are offered as avenues for attack:

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[7] Theodore Levitt, "Exploit the Product Life Cycle," *Harvard Business Review*, vol. 43, no. 6 (November-December 1965), pp. 81-94.

[8] Porter, *Competitive Advantage*, pp. 513-536.

- *Reconfiguration.* A challenger innovates in the way it performs activities in the value chain or it re-configures the entire chain.

- *Redefinition.* A challenger redefines its competitive scope compared to the leader.

- *Pure spending.* A challenger buys market position through superior resources or greater willingness to invest.

The first strategy, reconfiguration of the industry's value chain, can create a cost or differentiation advantage. As more value activities are reconfigured, the sustainability of the competitor's challenge increases. Many examples of reconfigured value activities exist: superior product performance, lower-cost product designs, more efficient logistical systems, better after sales support, enhanced order processing, higher levels of market spending in an undermarketed industry, re-positioning or new positioning of products, a different type of sales organization, changes in operations, new channels, pre-empting emerging channels, and going direct. Structural changes in an industry (new manufacturing technologies, for example) often enable for the reconfiguration of the value chain.

There are several ways to redefine the scope of an industry for competitive advantage. A challenger may decide to focus on a market segment, product line, or channel. A challenger may decide to use backward or forward integration or de-integration to challenge the leader. The challenger could redefine the geographic boundaries of competition, by going global to reap economies of scale or through de-globalization so that product can be tailored to each country. Finally, the challenger may overwhelm a competitor with a horizontal strategy, a broadening of the scope of competition. Broadening the scope can create advantage against a rival with narrower focus by bundling complementary products or by exploiting interrelationships with other business units or industries.

The third and riskiest way to attack the industry leader is to attempt to buy market share or brand identification through low price or advertising. The challenger in this case is seeking to gain a relative cost or differentiation advantage over the leader through high levels of investment. This approach is costly and often fails because leaders typically have a high level of resources to retaliate with. The spending approach sometimes works, though, when the leader is small and undercapitalized.

Michael Porter describes other generic strategies for competing in a mature industry.[9] Porter suggests that maturity may force companies to choose one of three generic strategies; cost leadership, differentiation, or focus. Cost leadership requires a coordinated set of functional policies aimed at aggressive cost control. Some characteristics that distinguish cost leaders are efficient scale production facilities; cost reductions through experience; control of overhead; avoidance of marginal customer accounts; and cost minimization in support areas like R&D, sales, and advertising. Firms that differentiate, offer a product or service that is seen as being unique in the industry. Dimensions of differentiation include brands, technology, features, customer service, and dealer networks. The last generic strategy, focus, refers to firms that specialize in a particular market or customer segment using either a cost of differentiation strategy. The three generic strategies are summarized in Table 1-4 below. The table shows that each strategy requires a distinct set of resources.

[9] Michael E. Porter, *Competitive Strategy*, (New York: The Free Press, 1980), pp. 237-253.

Table 1-4: Generic Strategies for Competing in a Mature Industry

		Strategic Advantage	
		Differentiation	**Low Cost**
Target	**Industry Wide**	Requires: • Marketing • Creativity • Product Engineering • Corporate Reputation Or Long Tradition In Industry • Cooperation From Channels • Coordination Among Functional Areas • Subjective Assessment • Attraction Of Skilled Labor	Requires: • Sustained Capital Investment • Process Engineering Skills • Design For Manufacture • Low Cost Distribution • Tight Cost Control • Structured Organization • Quantitative Measurement
	Niche Or Segment Only	Requires: A Combination of	the Above Policies

Case Illustration

A case will now be discussed to illustrate how the concepts for entering and competing in an mature industry apply in the real world. The illustration describes how minimills have made dramatic inroads into the steel industry in the United States, an industry previously dominated by integrated steel giants.

The following is a brief description of the steel industry. "Until the 1960's, a handful of vertically integrated giants dominated the industry. Their well-honed system of price leadership and followership was marked by a

consummate insensitivity to changing market conditions. Their virtually unchallenged control over a continent-sized market made them lethargic bureaucracies oblivious to technological change and innovation. Their insulation from competition induced the development of cost-plus mentality, which tolerated a constant escalation of prices and wages and a neglect of production efficiency. Eventually all this made their markets vulnerable to invasion by newcomers--both domestic and foreign. In the 1960s, when these newcomers finally appeared, the industry found itself in disarray and desuetude. It was saddled with a jumble of largely obsolete and poorly located plants; high production costs; and, worst of all, it was without expertise to deal with competitive challenges. The only solution for this malaise the industry thought, was to demand government protection from foreign competition. It is a strategy that the industry has pursued for the last 20 years and that is still the central issue in the public policy debate concerning the steel industry."[10]

The domestic competition mentioned in the previous paragraph came largely from minimills. Minimills are small non-integrated producers that convert scrap steel into finished products. Minimills typically operate using modern equipment to achieve maximum efficiency and concentrate on narrow product lines in specific geographic regions. Overheads are kept low in comparison to the large integrated steel producers to minimize costs. Although there are some limitations to the technology employed by minimills, ongoing developments and improvements have allowed minimills to expand into several product areas.

Using technological innovations, the minimills were able to de-integrate and therefore reduce the specific assets required to enter the industry. This de-integration lowered the costs to exit and therefore the risk to entry. In the steel industry, minimum efficient scale is influenced by the

[10] Walter Adams, *The Structure Of American Industry*, (New York: Macmillan, 1990), p. 72.

location of the plant, the layout, the flexibility of interrelated processes, and the degree of product specialization. Minimills were able to overcome the minimum efficient scale normally associated with the integrated producers using technological innovations and market focus.

Lower labor and capital costs have allowed the minimills to take market share away from industry incumbents. They grew in the 1960s and 1970s despite an overall shrinkage in total industry capacity. The response of the integrated steel makers was a gradual abandonment of the segments where the minimills established the low cost position. Several factors led to this lack of retaliation, but the most prominent was the incumbent producers no longer knew how to compete after years of friendly competition.

The minimills in essence redefined the scope of the industry by de-integrating operations and by focusing on specific products. The generic strategy that best describes minimills is a focused cost leadership. They started out by focusing on producing the lowest cost steel bars, small shapes and wire rods. As technology advances, particularly in the areas of continuous casting, innovations are likely to lead to greatly expanded product lines and a formidable challenge to both the existing integrated mills and to foreign competition.

Breaking Out

Utterback asks a very important question about firms in the specific phase, "Is the specific phase of production the' end of history' for the industry?" He mentions flexible manufacturing and mass customization as two possible ways to "break out" of the specific phase. Flexible manufacturing systems are computer controlled machines linked by handling systems that provide the capability to manufacture small volumes of many different parts. Competitive position may be enhanced because these systems reduce work-in-process inventory, increase capacity due to shorter set-up times, enable predictable scheduling and control of operations, reduce material handling

costs, and are responsive to market requirements. Mass-customization combines flexible manufacturing with standard product platforms to produce low-cost, high-quality customized goods. If these are ways to breaking out of the specific phase, can they also be ways to enter the mature industry?

Summary

Table 1-5 summarizes the strategies for competing in a mature industry. The next chapter will focus on a specific industry case study, electric motors, from the standpoint of industry structure, and innovation. In Chapter 3, the electric motor industry will be compared to the concepts discussed in this chapter to develop an entry strategy. In Chapter 4, the financial ramifications of the entry strategy will be developed. Chapter 5 will discuss lessons learned about entering a mature industry and areas for further study.

Table 1-5: Strategies for Competing in a Mature Industry

Levitt	Promote more frequent use among current users
	Develop more varied usage among current users
	Create new uses
	Find new uses
Porter	Reconfiguration
	Redefinition
	Pure spending
	Cost Leadership
	Differentiation
	Focus
Utterback	Flexible manufacturing
	Mass customization

2

Motor Industry Overview

After a brief description of the electric motor industry, the industry is analyzed using Porter's five forces model, the value chain, and a qualitative assessment of innovation. This analysis will be used in the next chapter develop an entry strategy.

Motor Industry Description

The electric motor industry in the United States consists of nearly 350 companies manufacturing a wide variety of generators and motors. Demand for motors is derived from many sources. In the fractional horsepower range--motors less than one horsepower--demand originates from markets for air conditioning, heating equipment, automobiles, and motor driven consumer products. Many of the industries that use fractional horsepower motors are cyclical and thus affect motor sales accordingly. Integral motors--motors greater than or equal to one horsepower--are used in refrigeration and heating, machine tools, construction machinery, and pumping equipment. Sales of integral motors are directly influenced by producer durables and by commercial and industrial construction.

The physical construction of an electric motor consists of a stator, rotor, enclosure, shaft, and other electrical and mechanical parts. Substantial variations exists among motors in type, enclosure, speed, size, horsepower and power supply. A number of classification are possible, perhaps in the millions, to segment the different product lines. The government tracks electric motors and parts using the major classes shown in Figure 2-1. Although these classification may or may not be related to specific markets, they do provide a useful segmentation by motor technology. The percentage of total industry production in the U.S. is also shown for each classification. Each percentage point of production is roughly equal to $86 million.

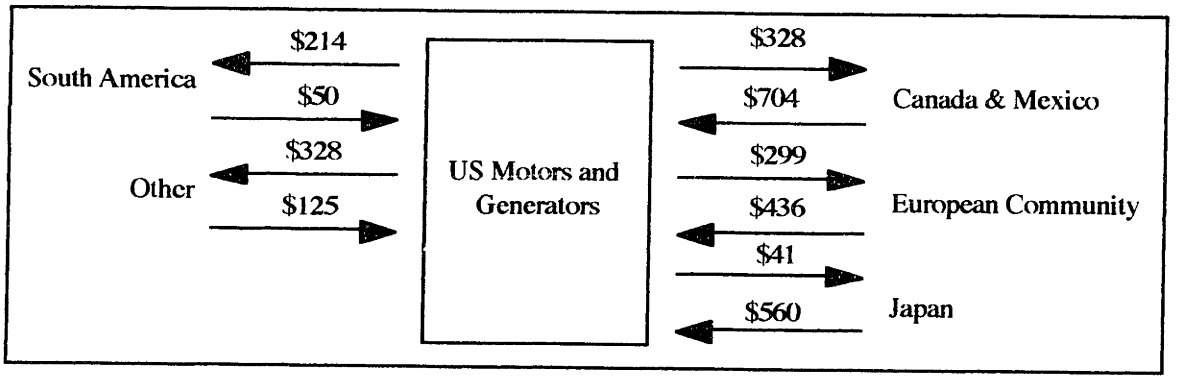
Figure 2-1: Motors and Generators

100 % Motors and Generators					
50% Fractional HP (< 1 HP)	**19% Integral HP (>/= 1HP)**	**13% Prime Mover Generator Sets**	**9% Motor/Gen Sets and Other Rotating Equipment**	**6% Parts**	**3% Land Transportation**
18% Single Phase AC Motors	10% Polyphase AC Motors	10% Diesel Engine Driven Generators			
12% Automotive Applications	3% DC Motors	3% Gasoline Engine Driven Generator			
6% DC or Universal Motors	3% AC Generators				
5% Mechanically Commutated Motors	3 % Other				
4% Permanent Magnet Brushless					
2% Polyphase AC Motors					
3% Other					

1% = $ 86,043,000 in 1993

Exports of electric motors and generators are nearly identical to imports. For example, in 1992, the value of exports was $1.97 billion going primarily to Canada and Mexico. The value of imports was $2.15 billion coming primarily from Canada, Mexico, the European Community and Japan. The European motor manufacturers have concentrated on the larger horsepower motor markets particularly Siemens and ABB. The Japanese have focused more on the fractional horsepower market. Figure 2-2 shows the trade flows in graphical form.

Figure 2-2: 1992 Imports and Exports of Motors and Generators in $Millions[1]



Porter's Industry Structure

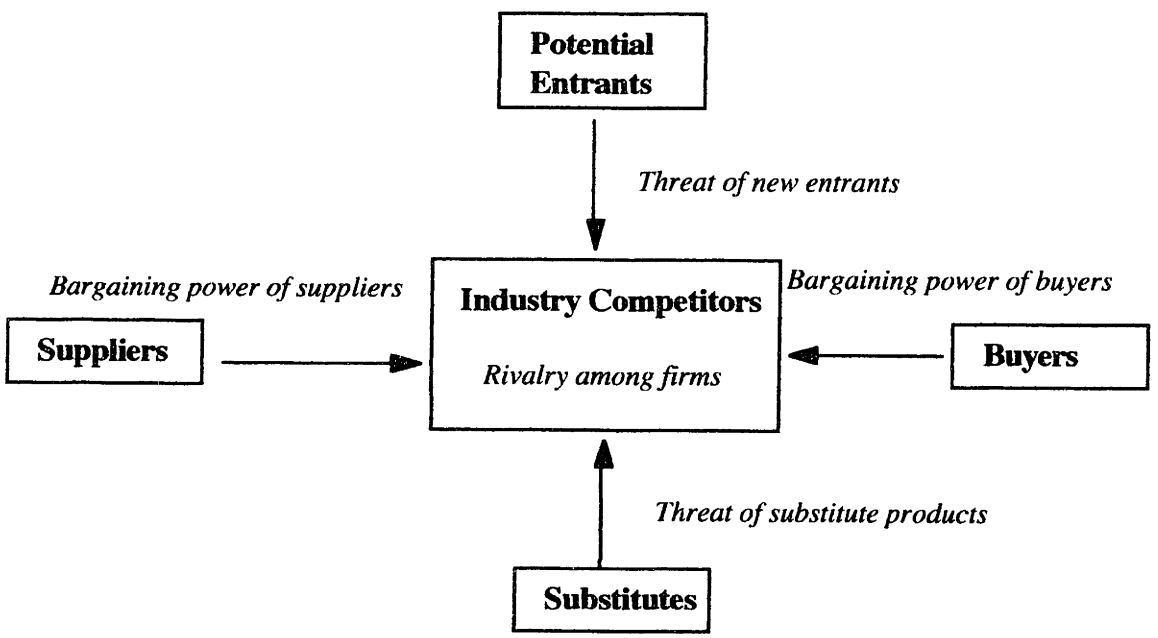
Porter's five forces model shown in Figure 2-3 will be used as a starting point for the industry analysis. Each of the five forces--potential entrants, intensity of rivalry, substitutes, buyers, and suppliers--will be analyzed. The purpose of this section is to gain some insight into the nature of competition and assess the potential for profitable entry.

[1] U.S. Department of Commerce, *U.S. Industrial Outlook*, January 1994, Chapter 20.

Potential Entrants

As was pointed out in the previous chapter, entry barriers determine the threat of entry into an industry. As shown in Table 2-1, most of the entry barriers for the electric motor industry are relatively low. There are some economies of scale, but given the fact that there are over three hundred manufacturers in the U.S. alone, the scale economies are not very significant in most product segments. Product differentiation--defined by Porter as brand identification and customer loyalty--is low in most niches. Capital requirements for entry are moderate because most components like the shafts, laminations, housings, and casting can be outsourced at a number of different suppliers. Some specialized capital assets are needed, however, to wind coils, insulate, assemble and test.

Figure 2-3: Porter's Forces Driving Industry Competition[2]



Few switching costs are incurred by buyers since most motors are considered commodities. Industry standards exists for many types of motors making them easily interchangeable among brands. Access to distributor

[2] Porter, *Competitive Strategy*, p.4.

channels could be problematic for the new entrant because of saturation in the channels. It is possible for the new entrant to gain access to distribution, but it may have to offer some type of incentive in order to do so. These incentives could negate other advantages that the new entrant may have and thus represent a barrier to entry.

Table 2-1: Barriers to Entry

Barrier	Height Of Barrier
Economies Of Scale	Low
Product Differentiation	Low
Capital Requirements	Moderate
Switching Costs	Low
Access To Distribution	High
Product/ Process Technology	Low
Access To Raw Materials	Low
Location	Low
Government Regulations	Low

There are few cost advantages among incumbents because processes used in the industry, although dated, are generally the same. Products can be copied easily but usually aren't because of the tooling costs associated with redesigning product lines. Raw materials, based on well-known processes, are readily available to everyone. Location, which can play an important role in the distribution of the product, is easily copied. There are no government regulations that could create asymmetries among competitors.

Because of these low barriers, several foreign competitors have entered the U.S. market in recent years. In 1973, imports made up 5 percent of apparent consumption. By 1993, that number was at 13.3 percent. In the intervening years, the percentage of imports has fluctuated somewhat, going

as high as 17.6% in 1986. The major foreign competitors are Swiss/Swedish (ABB); French (Leroy Somer); German (Siemens); Italian (ASGEN and Morelli); English (GEC and Hawker Siddeley); Japanese (Toshiba, Hitachi, and Mitsubishi); and South Korean (Hyundai).

Intensity of Rivalry

Rivalry among competitors in the motor industry takes many forms, dependent primarily upon the particular market segment. In small and medium size motors, price is the primary determinant in the purchase decision. In larger motors, other factors become important: performance, efficiency, life-cycle cost, reliability and delivery. Competition in the various market segments reflects these differences in purchasing criteria.

Many characteristics of the electric motor industry would lead one to conclude that the rivalry among competitors is intense. There are numerous competitors in many niches, industry growth is slow, fixed costs are high, there is a lack of differentiation among many products, switching costs are low, competitors are diverse, and the barriers to exit are high for most firms. Despite these characteristics, competition among domestic competitors can be described as benign. Little change in the number of domestic competitors has occurred over the years. The biggest threat has come from foreign competitors who have used low prices or expertise in large motors to penetrate the market. The motor industry, like the steel industry, has generally put the blame on outside influences and has done little to respond to this foreign invasion.

Substitute Products

Generally, there are no substitute for electric motors, but there are two technologies on the horizon that could alter the industry. The first technology is an electric motor that does not even use the principle of electromagnetism. This new motor, used in automatic focus camera lenses, is made of piezoelectric materials that bend when voltage is applied. Disks of

piezoelectric ceramics are arranged so that when the ceramics bend, a ripple is set up causing the rotor to move around in circles. These ultrasonic motors are suited for applications where space, responsiveness and precision are required. One major draw back of this technology is the life is relatively short compared to conventional motors. New ceramic materials coupled with a redesign may promote a longer life in future products though.

Another emerging technology, superconducting materials, could enable motors to become more efficient and smaller. The new superconductors, made of ceramic materials, are used to conduct current in coils which produce the magnetic fields in the motor. The problem with this technology is that the ceramics are structurally weak and brittle so it is questionable if they can ever be fashioned into wires for high volume production. Other problems must also be resolved before this technology is transferred to the shop floor. Currently available materials are not yet able to carry a high enough current density to be practical for electric motors. Also, the operating temperature for these materials is well below what would be acceptable for the majority of applications.

Bargaining Power of Buyers

Buyers of electric motors are able to hold down prices because products are largely undifferentiated, few switching costs are incurred when changing suppliers and most end customers know and care little about the brand of motor. The seller of electric motors, on the other hand, does have some bargaining advantages to offset buyer power. The bargaining advantage of suppliers derives from the fact that most motor purchasers are small, the motors are usually a small portion of end products costs, and there is little threat of backward integration by buyers. The level of buyer bargaining power, therefore, depends primarily on the size of the order and the number of competitors able to offer the same product.

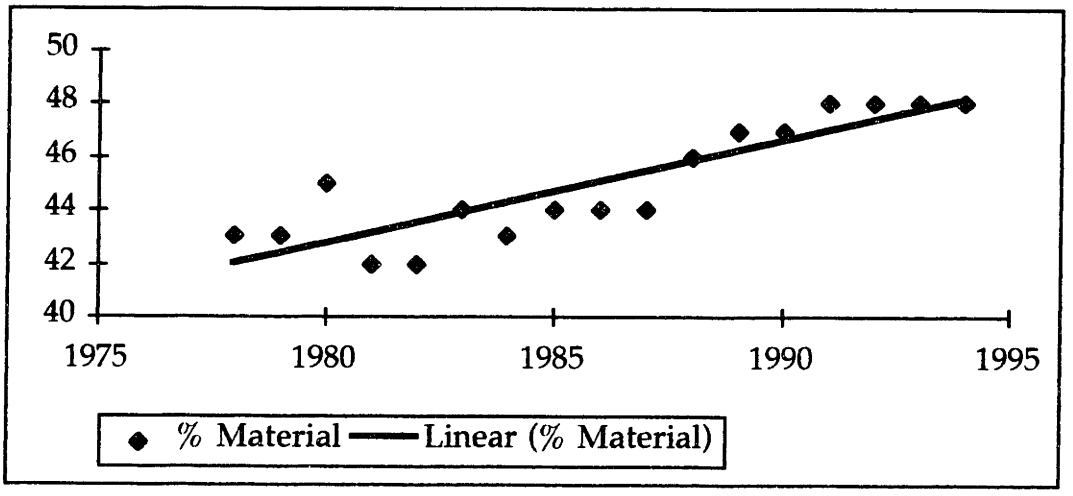
Bargaining Power of Suppliers

Purchased material accounts for approximately thirty to forty percent of the manufacturing cost of electric motors. The major components that make up this cost are carbon steel, copper magnet wire, bearings, castings, forging, metal stampings, and insulating materials. Two factors tend to weaken the bargaining power of suppliers. Most components are readily available from several suppliers so it is relatively easy for the motor manufacturers to switch suppliers. The threat of forward integration into the electric motor industry by the supplier community is also small.

Several factors do work in favor of the suppliers though. Substitutes, while possible for some of the components, either cost too much or degrade the performance to an unacceptable or non-competitive level. For example, aluminum wire could be used in place of copper wire, but the cost of aluminum wire is significantly higher and the efficiency of the motor suffers when it is used.

Suppliers also tend to be concentrated in the most important inputs--steel and wire--thus they are able to influence the prices to some degree. Another factor that provides suppliers with bargaining power is that most of the companies in the motor industry are relatively small are less able to influence suppliers. There is little threat of backward integration by the motor manufacturers into the supplier's industry because of the capital investments that would be required. Finally, as shown in Figure 2-4, the material value of electric motors has increased in the past few years indicating that motor manufacturers are having a difficult time offsetting material price increases with productivity gains or through price increases of their own.

Figure 2-4: Material Content as a Percentage of Sales Vs. Year



Summary of Five Forces

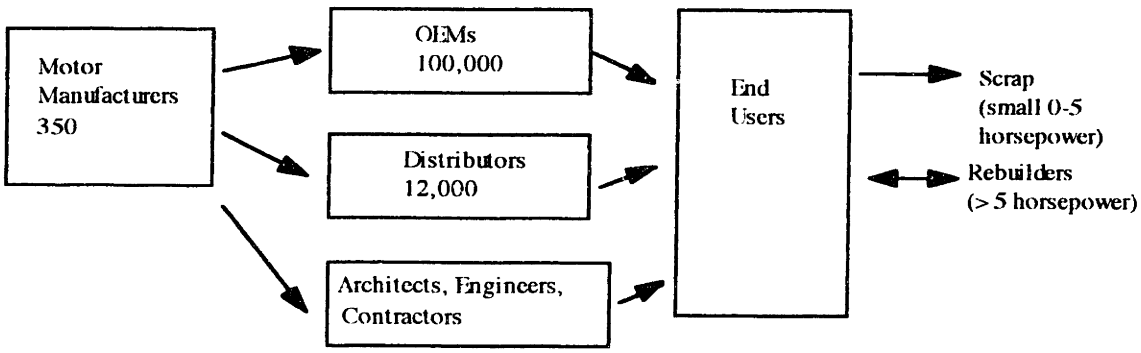
Overall, competition in the motor industry is relatively benign. As expected for an industry in the specific phase, competition is usually based on price. Few, if any substitutes exist or are seen as serious threats on the horizon. Buyers and suppliers generally have little bargaining power. Two factors are seen as possible impediments to entry though; entry could be hampered by the moderate level of capital required and the potential difficulty of accessing some distribution channels.

Industry Value Chain

There are several principle participants in the electric motor industry. The participants include the motor manufacturers, distributors, original equipment manufactures, architects, engineers, contractors, and end users. The motor manufacturer has little direct contact with end users, with the exception of the larger horsepower motors. Figure 2-5 shows an overview of the industry's value chain.

The value chain in Figure 2-5 shows that the industry is very fragmented. There are over 300 motor manufacturers. The top four firms in the industry provide approximately 40 percent of the value of industry shipments. A wide variety of competitors exist; some of the manufacturers sell a broad line of products, while others are concentrated on specific segments of the markets. In addition, to the domestic firms, several foreign competitors also participate in the U.S. market primarily by importing products.

Figure 2-5 Electric Motor Industry Value Chain



Approximately 12,000 establishments distribute electric motors in the U.S. They maintain a local inventory of the most commonly requested motors to provide quick delivery to end users. Distributors also sell to small and medium sized OEMs and construction projects. Often times, when the customer goes to a distributor he or she is looking for a replacement for a failed motor. These customers are concerned about delivery time so that their equipment can be put back into service as quickly as possible.

It is estimated that more than 100,000 OEMs in the U.S. incorporate electric motors into their equipment. Many of these OEMs are involved in the manufacture of pumps, compressors, air conditioners, fans, blowers, machine tools, appliances, construction, or mining equipment. Most OEMs purchase their electric motors requirements directly from the motor manufacturers or through distributors. Few OEMs have integrated backward

to manufacture their own motors. The end users that purchase equipment from the OEMs often care little about the electric motor that is incorporated with the equipment. OEMs generally take the responsibility to service the equipment after it is sold to the end user, often supplying replacement motors and parts.

For large new plant construction, architects, engineers, or contractors usually specify the electric motor requirements and work directly with the motor manufacturer. Customers, though free to choose any brand, usually follow the recommendations of these experts. There are thousands of architects, engineers, and contractors that work for clients to design and build industrial plants and commercial buildings. Most end users believe that motors, although not identical, are quite similar. Brands are easily intermixed, however, in large plant construction a single motor manufacturer usually receives the order for the whole plant.

Cost is a major determinant in making a purchase decision, although users are also concerned with durability, reliability, efficiency, and availability. Life cycle costs, costs related to operating the motor over its life, are more important in large horsepower motor purchases where electricity makes a up a large percentage of operating costs. Most small horsepower motors are scrapped either when they fail or when the equipment to which they are attached is scrapped. Motors above the forty to fifty horsepower range are usually rebuilt a number of times before they are ultimately scrapped. The number of re-built motors produced each year above forty horsepower is higher than the number sold.

Innovation

The level of innovation in the electric motor is at a level one would expect from an industry in the specific phase. Product changes are incremental, productivity is nearly stagnant, and quality has improved only marginally over the years. Most innovations begin with suppliers usually in

the area of materials. Some of the recent innovations that have improved motor performance or have enabled cost reductions include high temperature insulating materials, metal alloys that reduce core losses and increase efficiency, and permanent magnet materials that enable motors to be made smaller for the same level of output power.

Some product lines are undifferentiated meeting industry standards with few mechanical or electrical deviations. Innovation in these products is practically non-existent. Other products are customized to fit particular customer requirements. These product lines normally start with a core electrical and mechanical design to which minor modification are made. Production processes for the most part are old and inflexible. Many of the assets in these inflexible manufacturing processes are specific to the industry, however, areas like machining centers are common in other industries. The cost of changing a manufacturing process is high because of the inflexibility of the processes. Most manufacturers have resisted investing in new equipment preferring to run their businesses with highly depreciated assets. Some, however, have introduced flexible machine lines to reduce manufacturing costs, reduce lead times, and improve quality.

Table 2-2[3] provides a presentation of the evolution of manufacturing in general. Although none of the categories fully describes the present state of the electric motor industry, if one had to pick the most applicable category it would be scientific management moving slowly to process improvement. The shaded boxes indicate where the majority of the electric motor manufacturers are today.

[3] Ramchandran Jaikumar, *IEEE Spectrum*, "Manufacturing A La Carte," September 1993, p. 27.

Table 2-2: Evolution of Manfuacturing

	1800	1850	1900	1950	1970	1985	2000
	The English System Of Manufacture	**The American System Of Manufacture**	**Scientific Management (Taylorism)**	**Process Improvement (SPC)**	**Numerical Control**	**Computer Integrated Manufacturing**	
Number of machines	3	50	150	150	50	30	
Minimum efficient scale (# of people)	40	150	300	300	100	30	
Indirect/direct labor ratio	0:40	20:130	60:240	100:200	50:50	20:10	
Productivity increase over previous epoch	4:1	3:1	3:1	3:2	3:1	3:1	
Rework as fraction of total work	0.8	0.5	0.25	0.08	0.02	0.005	
Number of products	∞	3	10	15	100	∞	
Engineering focus	Mechanical	Manufacturing	Industrial	Quality	Systems	Knowledge	
Process focus	Accuracy	Repeatability	Reproducibility	Stability	Adapt-ability	Versatility	
Control focus	Product functionality	Product conformance	Process conformance	Process capability	Product process/ Integration	Process intelligence	
Organizational change	Breakup of guilds	Staff/line separation	Functional specialization	Problem-solving teams	Cellular control	Functional integration	
Work philosophy	"Perfect"	"Satisfy"	"Reproduce"	"Monitor"	"Control"	"Develop"	
Skills required (machine operator)	Mechanical craft	Repetitive subskill	Repetitive subskill	Diagnostic ability	Experimenta-tion	Learning, generalizing, abstracting	

Summary

This chapter provided a general overview of the electric motor industry form the standpoint of industry structure, the value chain, and the level of innovation. It was shown that competition in the electric motor industry is relatively benign. One interesting feature of the industry that became clear when performing this analysis is that the motor industry is highly fragmented. The fragmentation is driven by the industry structure: low entry barriers, low economies of scale, low buyer and supplier power, diverse market needs, and the need to carry inventory in diverse locations for quick delivery. In the next chapter, a strategy to enter this industry will be developed using the analysis of Chapters 1 and 2.

3

Entry Strategy

In this chapter, a strategy will be developed for entering the electric motor industry. The strategic options discussed in Chapter 1 will be considered in the context of the industry analysis to determine the best way to enter. In the next chapter, a financial analysis of the entry strategy will be conducted to determine the viability of the strategy.

Overcoming Barriers to Entry

The factors that could influence entry into the electric motor industry are listed below in Table 3-1. The barriers that could induce incumbents to lower prices include specific assets, scale economies, excess capacity, and reputation effect. The analysis of the last chapter indicates that some assets are specific and excess capacity is cyclical in the electric motor industry. Scale economies appear to be low in many segments given the high number of firms participating in the industry. The reputation effect will depend on the entry strategy and the particular product line that is targeted.

No first mover advantages exist in the electric motor industry, except possibly for some experience curve effects. Most products are viewed by the market as commodities so purchases are predominantly transaction based. Little proprietary technology exists; designs and manufacturing processes have become standardized. Pioneering brands do not exist because industry standards lower uncertainty and risk. In addition, customers are fairly knowledgeable about the products, thus reducing uncertainty even further. Customers can be induced to switch brands with the appropriate pricing strategy.

The first mover advantage that does create a barrier to entry is the experience curve effect. Required experience varies by market segment. In the generic fractional horsepower motors, manufacturing experience curves

Table 3-1: Factors Influencing Entry into the Electric Motor Industry

Barrier to Entry	Description for Electric Motor Industry	Level of Barrier
1. Expectation of Falling Prices		
• Specific assets	• Some manufacturing equipment • Distribution channels	Medium
• Scale economies	• Over 300 firms in industry • MES is low	Low
• Excess capacity	• Real demand is growing at 4% per year • Capacity utilization is cyclical	Medium
• Reputation effect	• Retaliation depends upon strategy	Low in most niches
2. First mover advantages		
• Long term contracts	• Most purchases are transaction based	Low
• Licenses and patents	• Little proprietary technology exists	Low
• Experience curve	• Depends on niche	Medium
• Pioneering brand	• Knowledgeable customers • Industry standards, lower uncertainty and risk	Low
3. Cost to Exit	• Some assets are specific to the industry • Purchases of small companies by large companies to round out product lines is common	Medium

are predominant. In the large horsepower ratings, customer relationships and knowledge of customer applications become critical.

The final barrier, the cost to exit, is important to consider before making a decision to enter. Some assets, winding equipment and insulating equipment for example, are specific to the industry. It would be difficult for a firm to liquidate these manufacturing assets upon exit unless the firm is acquired. The potential for acquisition is high because in the past, a number of small firms have been acquired by larger firms interested in rounding out their product lines.

Any entry strategy must effectively neutralize the barriers to entry. Table 3-2 shows the barriers that were found to be significant, along with potential neutralizing strategies. If an industry incumbent has a high level of specific assets, the expectation of retaliation is high. One potential strategy to neutralize the effect of specific assets is to pick a niche that represents a relatively small piece of the incumbent's business. Otherwise, retaliation by the incumbent would be certain, requiring significant resources on the part of the new entrant.

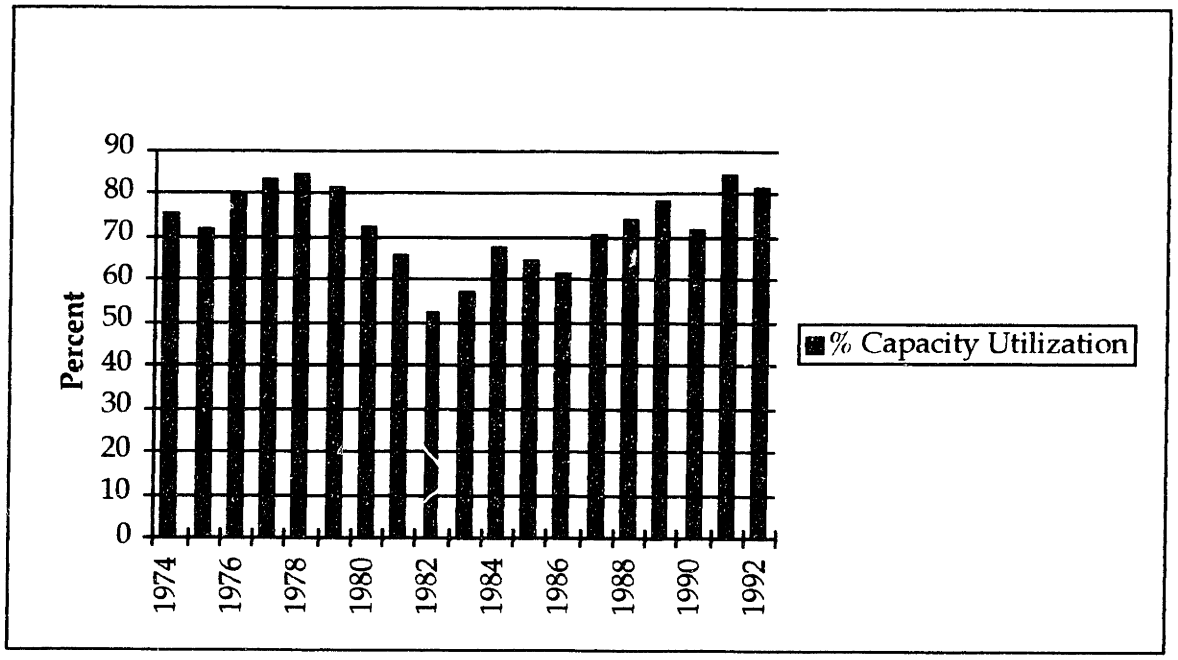
Distribution channels are well established, representing a high level of investment for the industry. Access to the channels could be problematic for the new entrant because of channel saturation. Offering distributors incentives would be prohibitively expensive for a new entrant so an alternative is find some way to bypass the distribution channel. If the distributors are bypassed, they could react in the short term by lowering their price. Longer term, they would have difficulty sustaining this form of competition.

Excess capacity could be neutralized by purchasing an existing company, however, this approach could be too costly for the new entrant. Industry capacity, in this case, would be the same before and after entry, therefore expected price retaliation is low. A different strategy for a new entrant might be to target a growing niche where the added capacity would not be as noticed

Table 3-2: Neutralizing the Entry Barriers

Barrier to Entry		**Potential Neutralizing Strategy**
1. Specific assets	• Manufacturing equipment	• Pick appropriate niches
	• Distribution channels	• Bypass channel
2. Excess capacity		• Purchase a company • Enter growing niche • Enter near the peak of a cycle
3. Experience curve		• Pick niche where experience is easily obtained • Reconfigure industry to make current experience obsolete
4. Cost to exit		• Find a niche that would make an attractive acquisition • Minimize specific assets with process or product innovation • Pick a niche that requires few specific assets

Figure 3-1: Capacity Utilization for Motors & Generators

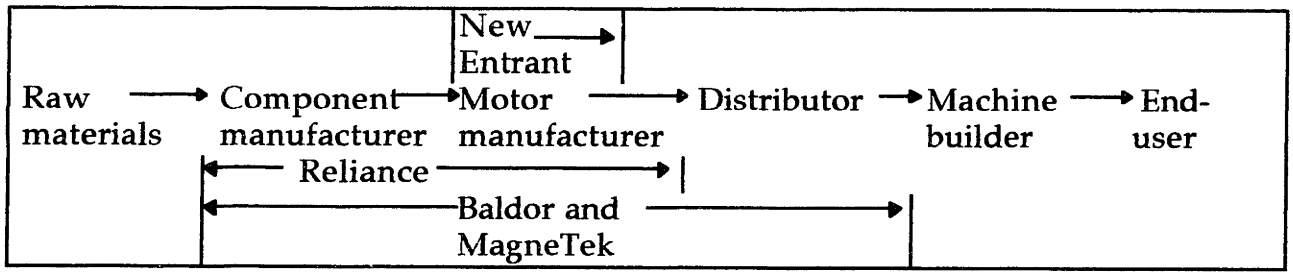


as entering a flat or declining niche. A new entrant may also find it beneficial to wait until a peak occurs in the capacity cycle. Figure 3-1 shows how much capacity utilization has varied in the electric motor industry since 1974.

The experience curve barrier for particular segments of the value chain depends highly on the particular market segment. A neutralizing strategy is to find a niche where it is easy to obtain experience. Another possible strategy is to re-configure the industry's value chain to make current industry experience obsolete, say by using value added partnerships. A value-added partnership (VAP) is essentially a set of independent companies that work closely together to manage the flow of goods along an industry's value chain. A value added chain for the electric motor industry is show in Figure 3-2. The figure shows that the vertical integration of competitors varies significantly. The new entrant could take advantage of low-cost computing and communications technology to focus on only a narrow segment of the industry value chain. "Japanese auto companies also operate as VAPs. Toyota, for example, directly produces 20% or so of the value of its cars, while GM and Ford produce 70% and 50% respectively. Chrysler's comeback was

due in part to the creation of a VAP with its suppliers, distributors, and union. It produces only around 30% of the value of cars it sells. Many industry observers attribute Ford's recent gains on GM to Ford's aggressive moves to form partnerships with suppliers."[1]

Figure 3-2: Value Added Chain



The final barrier to consider is the cost to exit. Entering a niche that would eventually be attractive as an acquisition for a competitor with a gap in their product line could make exit easy. Another strategy would be to configure to product and process so that specific assets are minimized such as with VAPs. Finally, a niche that requires few specific assets might help if exit is eventually required.

Several potential niches in the electric motor industry match the characteristics needed to neutralize the entry barriers. Each potential niche, listed in Table 3-3, has several competitors, but the product line represents only a portion of each company's revenue. Growth in these niches, while slow compared to many high technology corporations, has tended to be on par or slightly greater than motor industry growth. Experience is easy to obtain in that the products tend to be more standardized and purchases are transaction based. The inputs for these products are easy to acquire in the marketplace. The product lines could make an attractive acquisition to other domestic manufacturers or perhaps foreign competition. Finally, the specific

[1] Russell Johnston and Paul R. Lawrence, "Beyond Vertical Integration-The Rise Of The Value-Adding Partnership," *Harvard Business Review*, (July/August 1988), p. 98.

assets can be minimized because most of the components can be purchased at very competitive prices from outside suppliers. Some assembly and test equipment is required, regardless of the niche chosen though.

It has been shown that niches exist in the electric motor industry where it is possible neutralize excess capacity and lower exit costs. But what strategy should the new entrant follow in these potential niches? Using the generic strategies discussed in Chapter 1, it is possible to determine the appropriate direction to take.

The strategies offered by Levitt for extending product life in a mature industry, while interesting, provide little insight into the problem at hand. The only way to promote more frequent use, develop more varied use, create new users, or find new users is to offer superior price/performance. Porter's reconfiguration strategy on the other hand leads one to think about changing the entire value chain so that the distributor can be bypassed. In addition, the redefinition strategy points to de-integration to neutralize experience and to reduce the level of investment. The pure spending approach, in contrast, looks like loser since most incumbents are well capitalized and able to withstand a direct attack.

The nature of the entry barriers automatically leads then new entrant to the focus strategy. Since the niches are price sensitive, the appropriate strategy is to become a cost leader in these niches even though tremendous variety exist in these product lines. To get around the issue of variety, flexible manufacturing and mass customization provide a solution. The strategy then can the be summed up as follows:

- Focus on the appropriate niches.
- Reconfigure the value chain to bypass the distributor.
- Redefine the scope of competition using value added partnerships.
- Employ flexible manufacturing and mass customization.
- Use all of the above to become the cost leader in the niche.

Table 3-3: Representative Niches Meeting Requirements for Neutralizing Factors

Niche	Estimated Number Of Competitors	1993 Market Size	Growth Vs. Industry	Investment Required	Potential To Sell Business	Specific Assets
DC Motors, Permanent Magnet & Wound Field, 1-5 Hp	8	$93M	On Par	Low to Medium	High	Low
Energy Efficient AC Poly Phase Motors 1-200 Hp	7	$138M	Faster	Medium	High	Medium
Permanent Magnet Brushless Servo	13	$115M	Faster	Low	High	Low
Permanent Magnet Brushless Non-Servo	23	$205M	On Par	Low	Medium	Low
Single Phase AC, Capacitor Start < 1 HP	8	$226M	On Par	Low to Medium	Medium	Medium
Single Phase AC, Permanent Split Capacitor < 1 HP	10	$349M	On Par	Low to Medium	Medium	Medium
Single Phase AC, Split Phase	10	$288M	On Par	Low to Medium	Medium	Medium

One of the potential market niches will now be chosen, DC permanent magnet and wound field motors, so that a detailed strategy can be developed. Of particular interest is the marketing plan, design and development plan, and the manufacturing plan. Because the characteristics of the niches listed in Table 3-3 are so similar, much of what is developed here can be applied to these niches as well. The plan developed in this chapter will be used for the financial analysis in the next chapter.

Marketing Plan

The initial customer groups that will be targeted are smaller OEMs that manufacture conveyors, mixers, packaging machinery, metering pumps, feeders, printing, textile equipment, machine tools, and other equipment requiring variable speed and constant torque. Table 3-4 below shows the end applications for the various electrical/mechanical combinations. As the table shows, complexity is quite high.

Because most of the smaller OEMs purchase products from a distributor, these OEMs will be contacted by telephone to introduce them to the new company. After the initial phone contact, follow-up literature will be sent. The literature will highlight the fact that the OEM can get a lower price by buying direct because the middleman has been eliminated. The literature will also stress performance, technical characteristics, and the warranty to put the potential buyer at ease with the concept.

Initially, the focus of this selling will be on manufacturing in the continental US. Later, as experience is gained, the product line can be expanded into other attractive niches. The concept could also be duplicated and transferred to Asia or Europe but in order to do so, certain international standards would have to be considered up front.

Currently, discounts off of list price vary depending on the customer and size of the purchase. OEMs, distributors, and resellers normally receive a larger discount than other users. For example, a 3 horsepower permanent magnet DC motor sells to an OEM for around $425 and to smaller OEMs and small users for about $1150. These end users pay dearly for the small

purchase quantities and the timely delivery. With the modular design and flexible manufacturing, the timely delivery will be available but at a lower price. See Figure 3-3A.

Table 3-4: Applications for DC Motors, 1/4 to 5 Horsepower

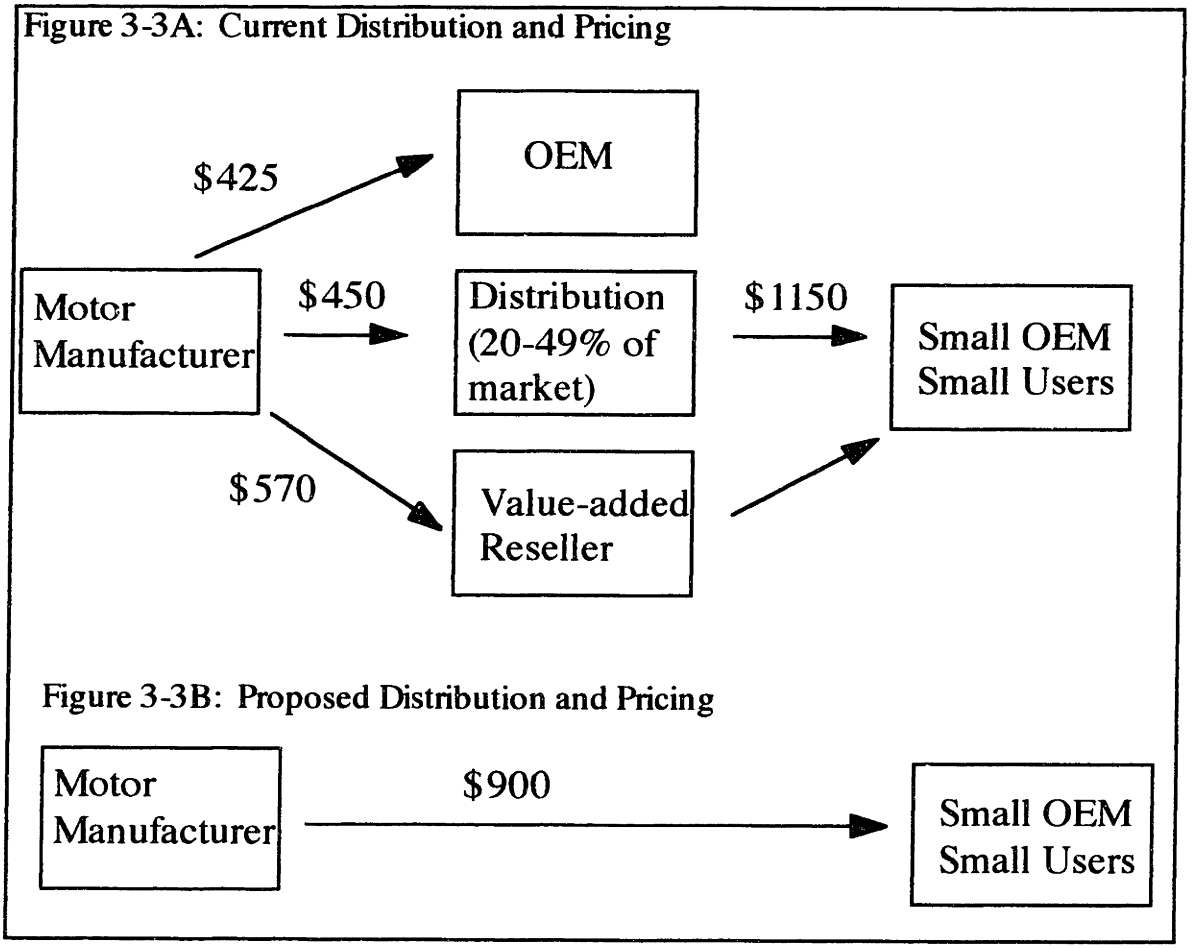
Application	Normal Duty	Speed Regulated	Special Environment
Conveyors	PM TENV, PM TEFC, Compound Wound TEFC, Shunt Wound TEFC	PM TENV W/Tach, PM TEFC W/Tach	PM Explosion Proof, Wash Down Duty, Shunt Wound Explosion Proof
Mixers	PM TENV, PM TEFC		
Packaging Equipment	PM TENV, PM TEFC		
Metering Pumps		PM TENV W/Tach, PM TEFC W/Tach	PM Explosion Proof
Feeders			PM Explosion Proof, Wash Down Duty
Cranes, Hoists, Augers	Compound Wound, TEFC		
Printing, Textile, Machine Tools	Shunt Wound TEFC, Shunt Wound DP		
Metric Applications	PM TENV, PM TEFC		

Key: PM= Permanent Magnet, TENV= Totally Enclosed Non Ventilated, Tach= Tachometer, TEFC= Totally Enclosed Fan Cooled, DP= Drip Proof

In the proposed business, the pricing will be at a level to induce switching, but at no less than gross margin that will cover the order processing costs. It is expected that this gross margin will have to be approximately 40 percent in the long run to make the business viable. So for the example in Figure 3-3B, the selling price to the small OEM or small user

would be $900. This represents a savings of nearly 22 percent for the end user which should be more than sufficient to induce switching.

Figure 3-3: Model For Distribution Pricing



A toll free number will be provided to potential customers so that they can phone in orders. The toll free number will be manned by application engineers who will provide technical and applications assistance to the buyer. The specification for the order will be keyed in by the applications engineer and hard copy will be sent to the customer as a basis for quotation. Once the order is accepted, the file will transfer electronically to the production area where a product is pulled from a small safety stock at the appropriate time and shipped.

Warranty costs will be kept at a minimum by proper design and high quality manufacturing. In the event a failure does occur, a warranty will be

provided that is competitive with industry standards. The company will reserve the right to either repair or replace the motor. Motor repairs will be handled off-line in a separate area away from the main manufacturing line. Service parts will be stocked according to value and frequency of need. In no case is it expected that warranty costs will exceed one percent of sales.

Customers will become aware of the new product line not only through telemarketing and direct mail, but also through advertisements in appropriate magazines and directories. Ads will be placed in the *Thomas Register*, selected phone books, and various trade magazines. In order to introduce the concept, press releases will be sent to the appropriate publications to announce the new product lines and radically different method of manufacturing and distribution. In addition, a marketing database would be used to keep track of customer's needs and to tailor promotion and advertising programs. The database would enable the company to analyze actual behavior of each customer and assess their individual values.

The advantages of this marketing arrangement over incumbents include:

- The new entrant is closer to the customer for improved market feedback.
- The database allows the new entrant to customize promotions to individual customers.
- The database allows the new entrant to value each customer individually.
- The new entrant gets higher margins by selling direct and by focusing on the high value customers.
- The new entrant has lower sales and marketing cost per customer.

Design and Development Plan

"Manufacturing enterprises are evolutionary entities. Over time their product portfolios expand through evolutionary and chronological developments. Products are usually designed and developed one at a time. As a result, it is the exception when the design of manufacturers' products

embrace much compatibility, standardization, or modularization."[2] Al Lehnerd's statement from his article "Revitalizing The Manufacture And Design Of Mature Global Products" applies to the electric motor industry. Most product lines have been developed over time resulting in high level of complexity.

An example of this complexity is the DC motor lines available from General Electric, Baldor, and MagneTek in the 1/4 to 5 horsepower range. Each of these competitors sell a line of motors that has evolved over time resulting in fragmentation and complexity. This complexity could be reduced, along with cost, if each of these lines were completely redesigned to be modular. There is little evidence of this happening because the prevailing thinking in the industry is to use existing manufacturing processes. Most of these manufacturing processes were developed years ago before the advent of flexible manufacturing. In a sense, the investment in outdated facilities has become a barrier to innovation in the industry.

The fundamental design and development strategy then is to take advantage of the complexity and outdated manufacturing facilities of the competition. The fundamental process for designing the redundant product lines is shown in Figure 3-4. After a product niche is identified, competitive products are analyzed. In addition, any additional market needs will be uncovered by surveying potential customers. A product platform can then be developed using this information. For example, in this thesis the product platform is DC motors in the range from 1/4 to 5 horsepower. Consolidating the various options into a modular product line will require a coordinated effort among mechanical design, electromagnetic design, and manufacturing. Suppliers will play a crucial role in providing early input so that the highest quality, lowest cost products result. Suppliers are also key to keeping inventory and raw material costs as low as possible.

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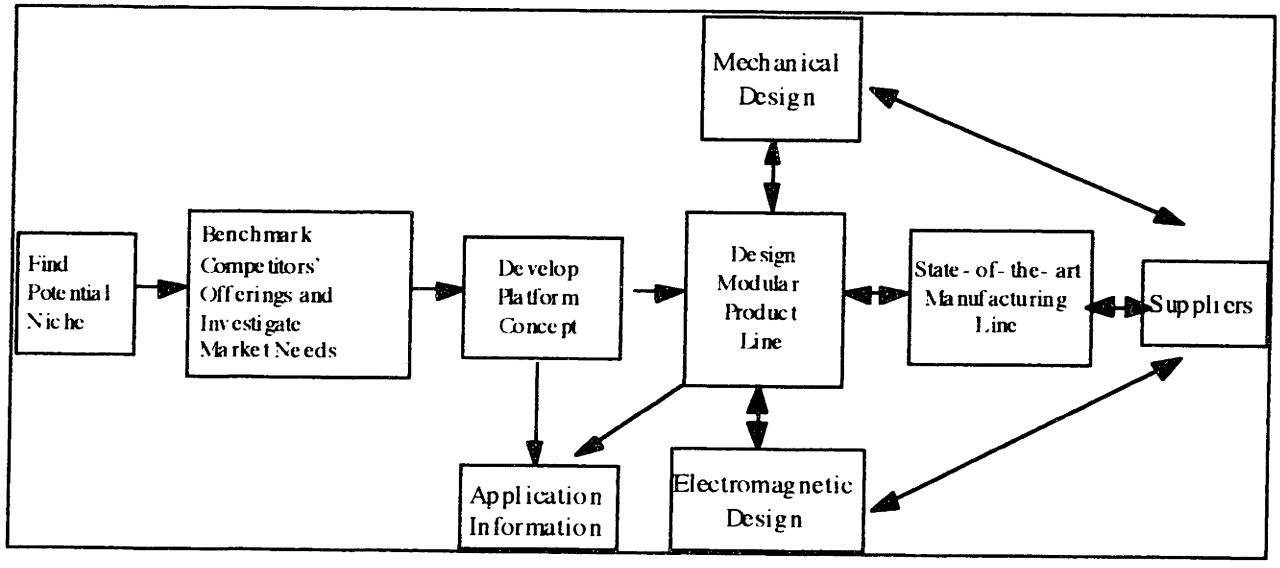
[2] Alvin P. Lehnerd, "Revitalizing The Manufacture And Design Of Mature Global Products,"*Technology and Global Industry: Companies and Nations in the World Economy*, p. 49.

After the first product platform is identified, marketing can begin to investigate the next product platform so that when the design is completed, on the first platform, a new project is already in the pipeline. This process can continue indefinitely until all of the attractive niches have been covered. The process also enables revenues to come in before all of the product lines are designed. As volume grows, selective backward integration may be considered to reduce costs even further. For example, beyond a particular unit volume level, it may be more cost effective to manufacture shafts in-house.

Figure 3-4: Process for Developing Modular Product Line



The advantages of the modular product line include:

- Standardization of parts results in lower cost per part.
- The modular design reduces complexity, lowering overhead costs.
- The modular design provides the customer with the required variety but at a lower cost.

Manufacturing Strategy

The key to the strategy for successful entry is to develop a value chain that allows the new entrant to bypass traditional distribution. This is quite challenging given distributors have the advantage of stocking the most

common items. How can a product line be constructed that supports a strategy where the delivery time is competitive with existing distribution, but inventory levels are much lower? One potential solution is mass customization.

Mass customization refers to a manufacturing process where "processes and people reconfigure perpetually to product exactly what customers want and need."[3] The concept requires autonomous operating units linked together by a dynamic network. Usually, each operating unit is a specific process, like machining a housing, producing a shaft or entering a customer's order. These units can reside within the company or within outside suppliers. The way in which the particular units come together varies in response to a customer's order. To be successful, the units must be effectively linked together.

Today's manufacturing and information technology coupled with a modular product design, would enable the new entrant to become a mass customizer. Each process must first be designed as a module, then a linking mechanism is added to coordinate the processes. For example, the mass customization layout for a DC motor armature is shown in Figure 3-5. After an order is entered by the customer, a custom armature is manufactured to satisfy each order. The potential variations in this armature are shown in Table 3-5.

One of the major causes of complexity in the product is due to the variations in the frame and housings. With the mass customized approach a generic housing is used and becomes mass customized at the machining stage. Frames could be built up in sections and bolted together to create the appropriate length. Today, manufacturers produce different housings depending on the application and a separate frame for every different length.

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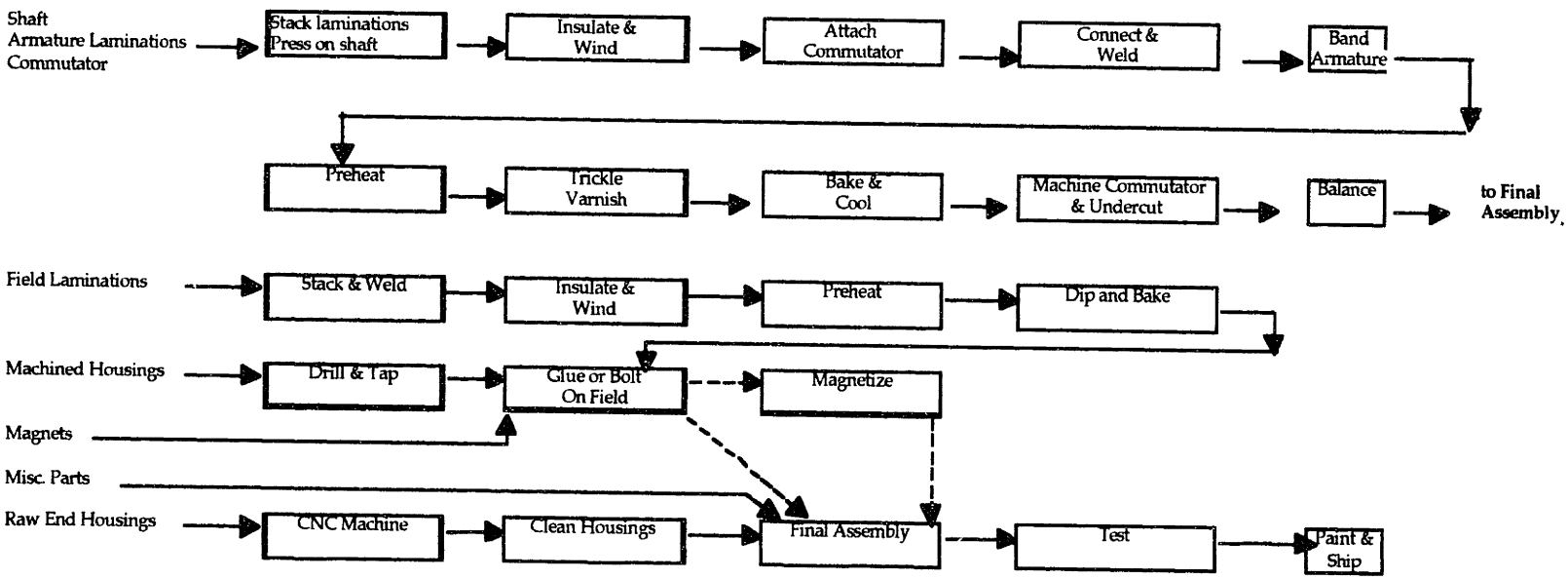
[3] Joseph Pine II, "Making Mass Customization Work," *Harvard Business Review*, (September-October 1993), P. 109.

Figure 3-5: Process Flow for DC Motor



In final assembly, bearings are pressed onto the armature shaft, the brushes and brush holder are attached to an end housing, seals are added, the conduit box is assembled to a housing, and miscellaneous parts are assembled to add the final customization. The parts added in final assembly could be stocked because they are generally low value items. After final assembly, the motor is tested and painted. A nameplate is added and the motor is then packaged and shipped.

Many of the parts could be purchased as indicated in Figure 3-5. Initially, this is a good way to keep capital investment and therefore specific assets to a minimum. Longer term, some of the processes could be integrated with the new company. Several potential suppliers exist for each of the purchased parts shown. The suppliers that are chosen would ideally be close to the new entrant's manufacturing facility, be capable of JIT delivery, and provide certified parts so that there is no need for incoming inspection

Table 3-5: Variables Affecting Armature Designs

Variable	Values
Housing	Enclosed or open
Horsepower	Lamination diameter, stack length
Speed	1150, 1750, Or 2500 RPM
Voltage	90V Or 180V
Duty	Regular shaft, Stainless steel shaft
Balance	Commercial balance, precision balance

The plant would be laid out to support JIT delivery of parts and the short cycle manufacturing concept. Initially, this plant space could be rented. The physical facilities must allow for modular expansion, though, as the product lines are added and the business grows. A pull manufacturing system will be in place to keep inventories to an absolute minimum. The initial inventory turns goal for the business would be as high as 12. It may be possible, once the operation is running, to increase the inventory turns to 24. The competition has inventory turns in the 5 to 8 range. The new entrant

will have a distinct competitive advantage with the manufacturing system described. The advantages of the manufacturing plan include:

- The new entrant has the ability to build to order rather than build to forecast.
- Products can be high quality, high variety but at a reasonable cost.
- Continuous improvement is possible through the VAPs.
- Low investment in plant, equipment, and inventory is required.

Summary

A potential entry strategy was developed in this chapter for entering the electric motor industry. The strategy entails focusing on appropriate niches and reconfiguring the industry value chain to bypass distribution. In the next chapter, the financial ramifications of this strategy are considered.

4

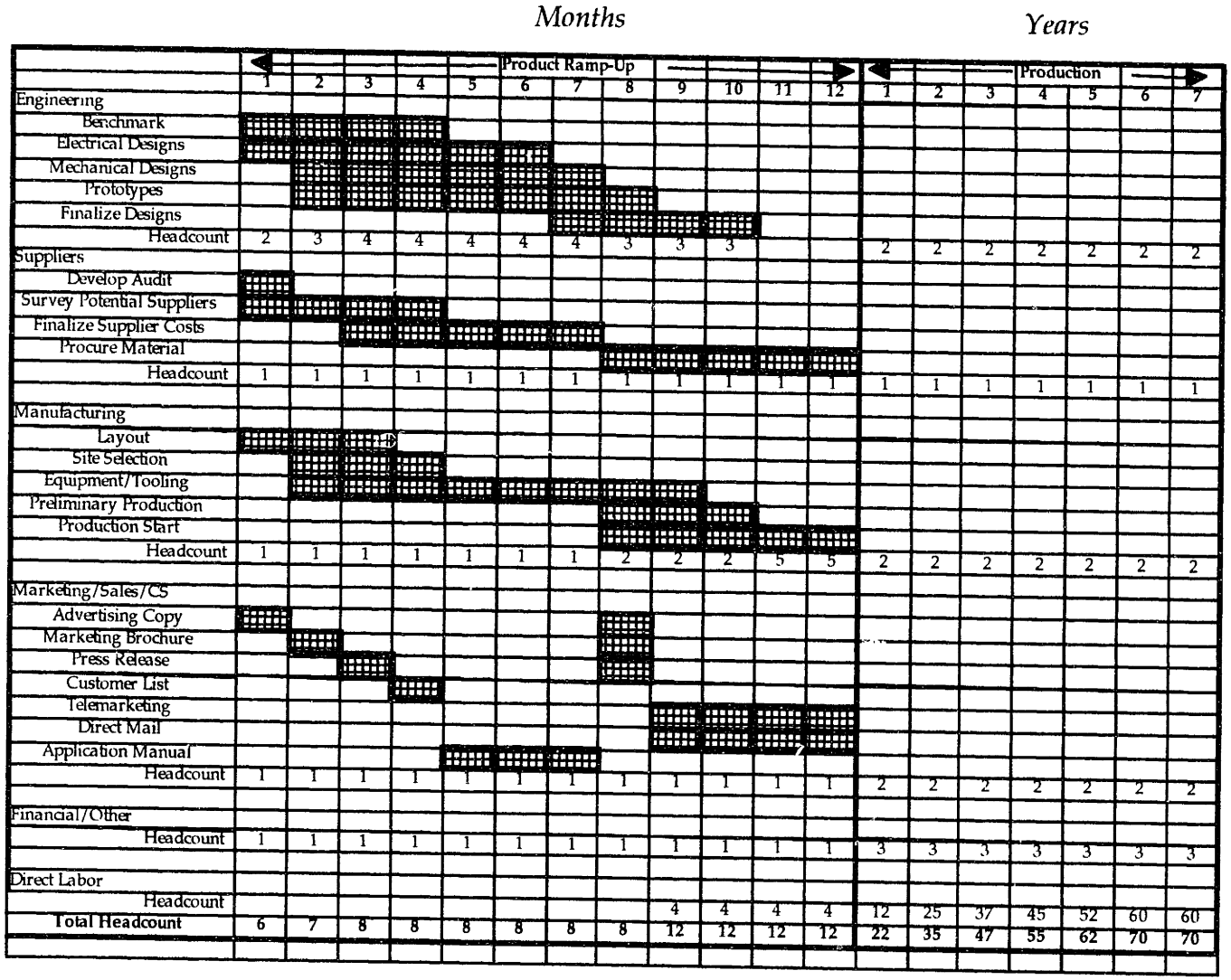
Financial Analysis of Entry Strategy

In order to determine the viability of the proposed entry strategy, it is necessary to perform a financial analysis of the project. A schedule will be developed first to determine the human resources required to start up the business. Required capital resources will be added to the human resources to determine overall investment. A pro-forma profit and loss statement, balance sheet, and cash flow analysis will indicate if the strategy results in an attractive investment. Critical risks and problems will also be factored into the analysis.

Start-up Schedule

The human resources required to start up the business are shown in Figure 4-1. The business will require six people initially, but this will ramp up to twelve over the first twelve month period. According to the schedule, the product line can be designed and verified, the production line set up and de-bugged, all within the first twelve month period. In total, ninety-three man months of indirect labor are required along with sixteen man months of direct labor. Assuming that indirect labor costs $8,333 per month ($100,000 per year) and direct labor costs is $4,167 per month ($50,000 per year) the total start up cost is $842,000. The schedule also shows the headcount ramp-up in subsequent years. During the first year of production, a headcount of nineteen is required to support the business for a sales to headcount ratio of $136,164. This ratio grows to $228,571 over the seven year time period. A check of competitors in the electric motor industry indicates that most are in the $100,000 to $110,000 range for sales revenue per headcount. The high sales to headcount ratio for the new entrant's strategy points to a fundamental difference in the way the new entrant's business is structured. Value added

Figure 4-1: Headcount Requirements for New Entrant



per employee is higher and it is less vertically integrated than industry incumbents.

The estimated production capital and tooling costs are shown in Figure 4-2. In order to minimize specific assets, the only operations performed in-house are those required to customize the product. All other processes are performed by suppliers. This manufacturing set-up is consistent with the process flow shown in Figure 3-5. Total capital and tooling amounts to $2,017,000 to start the business. This will enable the new entrant to ramp up to approximately 10,000 units per year in volume. After that incremental capital and tooling is required and is shown in Figure 4-2 for each year of production. Year 0 refers to the first year of operation before volume production begins.

The initial investment required to get the modular product line up and running is the total of human resource cost plus capital. In order to gauge the return of this investment, a cash flow analysis must be performed. The approach that will be taken here will be to construct a pro-forma balance sheet and profit and loss statement. A cash flow statement can then be developed to determine when and what the internal rate of return of such a program would be. Some of the key financial ratios from the new entrant will be compared to several incumbents to highlight the advantages of the entry strategy from a financial standpoint.

Figure 4-2: Tooling and Capital Estimates-Part One

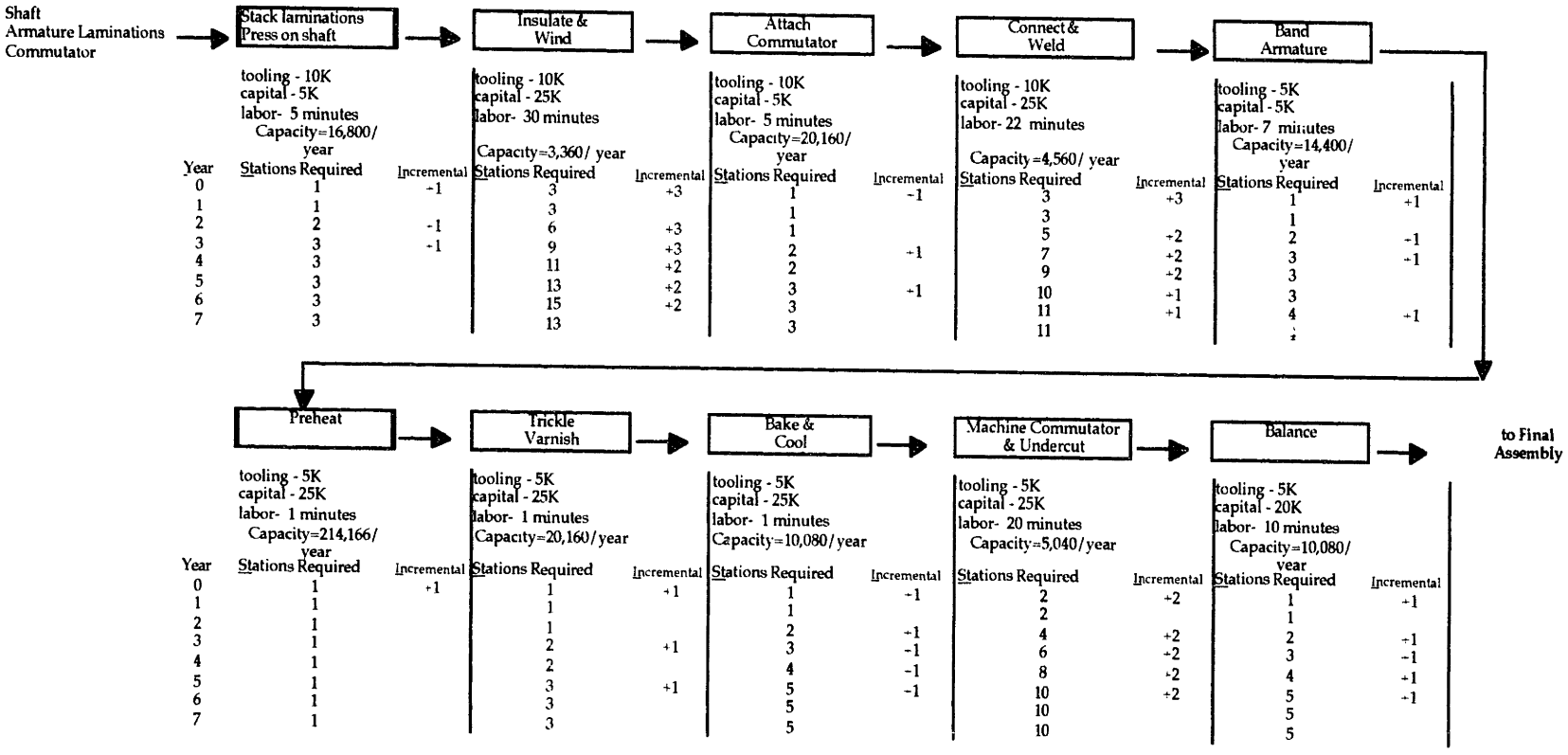
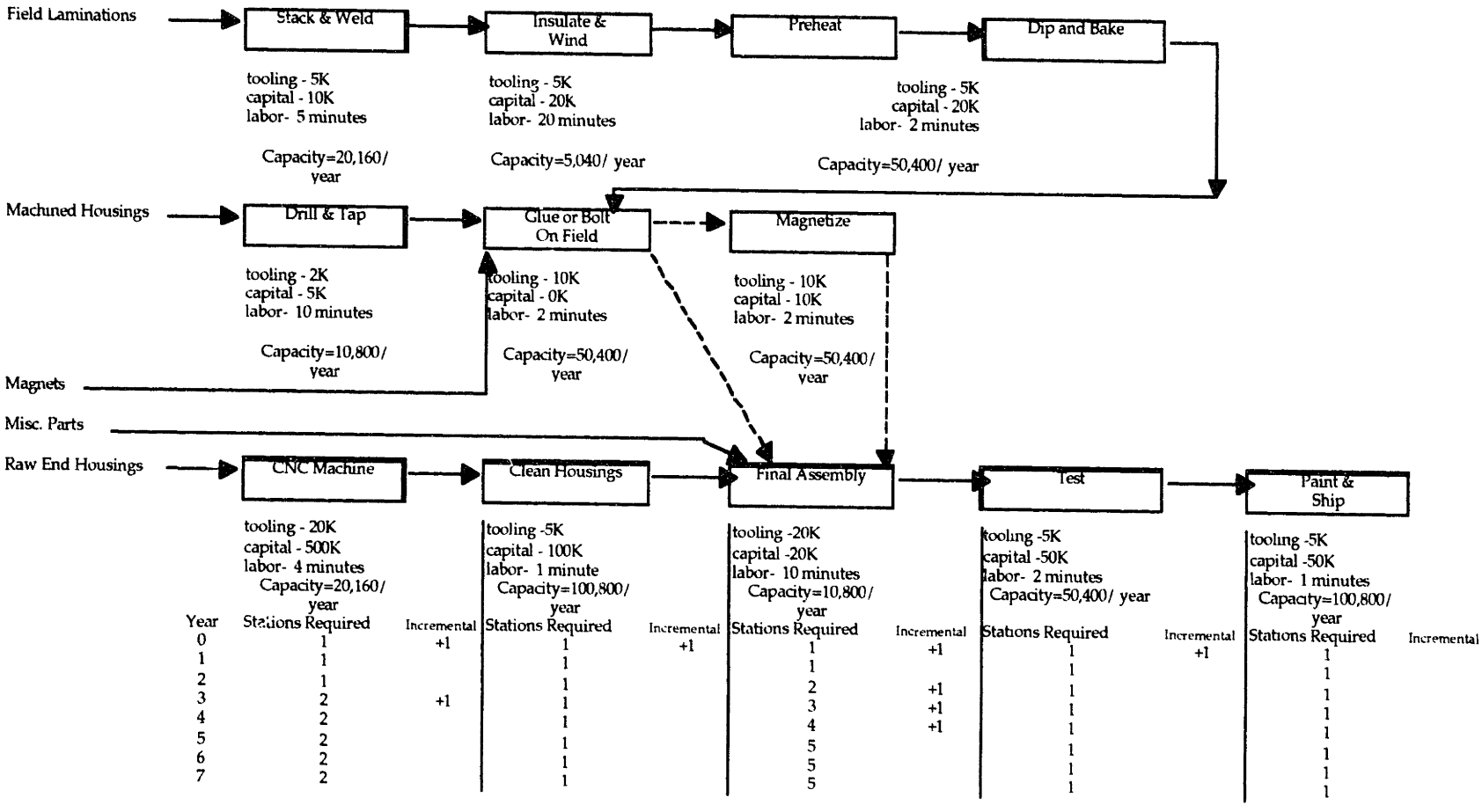


Figure 4-2: Tooling and Capital Estimates-Part Two



Year	Stations Required	Incremental	Stations Required	Incremental	Stations Required	Incremental	Stations Required	Incremental	Stations Required	Incremental
0	1	+1	1	+1	1	+1	1	+1	1	
1	1		1		1		1		1	
2	1		1		2	+1	1		1	
3	2	+1	1		3	+1	1		1	
4	2		1		4	+1	1		1	
5	2		1		5		1		1	
6	2		1		5		1		1	
7	2		1		5		1		1	

Market Share

The particular product segment that was chosen is currently a $100 million segment. Assuming a conservative growth estimate of 5% per year, the market segment will grow to $141 million over the eight year time frame. The eight year figure is important because it is the expected life cycle of the particular product line plus the first year required for start-up. After this time, the product and manufacturing lines would be redesigned and updated. Figure 4-3 shows the market segment growth, the expected market share of the new entrant, the production units and sales dollars. It is expected that the new entrant could easily obtain an 11% market share after seven years. In reality, this number could be significantly higher, but for the purpose of this analysis, only 11% penetration conservative number will be used.

Figure 4-3: Market Growth

Year	Market Size $M	Market Share %	Units (000)	Sales $M
0	100	0	0	0
1	105	3	10,000	3
2	111	5	20,000	6
3	116	8	30,000	9
4	122	9	37,000	11
5	128	10	43,000	13
6	134	11	50,000	15
7	141	11	50,000	16

Profit and Loss Statement

The profit and loss statement is shown in Figure 4-4 for the entry strategy over the seven year production period plus first year start-up period. The following assumptions were made when developing this statement:

Cost of Goods Sold: The gross margin will rise over time from the high twenty percent range to over forty percent over the seven year production

time frame. Initially, gross margins are lower because the factory overhead is allocated over fewer units and the depreciation and amortization expense is relatively high. Figure 4-5 shows a sample calculation for the cost of goods sold for a one horsepower DC permanent magnet motor. Higher horsepower motors will have higher margins than those shown in Figure 4-5. Motors below one horsepower will have lower gross margins. It is expected that well over half of the sales volume will be in the 3/4 to 1 horsepower range.

Figure 4-4: Profit and Loss Statement $(000)

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Sales	0	3,000	6,000	9,000	11,000	13,000	15,000	16,000
COGS	0	(2,130)	(3,720)	(5,310)	(6,380)	(7,410)	(8,400)	(8,800)
SG&A	(842)	(1,100)	(1,150)	(1,420)	(1,600)	(1,760)	(1,880)	(1,970)
Depreciation	0	(60)	(100)	(140)	(180)	(220)	(200)	(200)
Interest Income	0	0	50	50	50	50	50	50
EBT	(842)	(290)	1,080	2,180	2,890	3,660	4,570	5,080
Tax	0	0	0	979	1,329	1,684	2,102	2,337
Net Earnings	(842)	(290)	1,080	1,201	1,561	1,976	2,468	2,743

Operating Expenses: The costs for operating the proposed company was determined using the headcount schedule in Figure 1-1 and other costs associated with running the business.

Depreciation: Depreciation associated with production tooling, plant and equipment is included in the cost of goods sold. Depreciation for office equipment and non-production related equipment is shown as a separate item on the profit and loss statement. A five year straight line basis was used for all capital equipment. A two year straight line basis was used for production tooling.

Interest: No interest expense expected is included in the profit calculations because debt financing is highly unlikely for a start up of this type. There will be some interest income because some of the retained earnings are kept as

marketable securities as a cash flow cushion. The assumed rate of return for these marketable securities is 10%.

Figure 4-5: Product Cost Calculation: 1 HP, 1750 RPM, TEFC, 180 volt

Part	Year 1	Year 7
Laminations	$ 27.67	$ 27.67
Housing	30.19	30.19
Magnets	21.38	21.38
Magnet Wire	15.56	15.56
Commutator	12.97	12.97
Shaft	9.83	9.83
Bearings	5.19	5.19
End Housings	29.40	29.40
Brush Rig	6.92	6.92
Brushes	3.46	3.46
Feet	3.93	3.93
Conduit Box	2.36	2.36
Fan	4.32	4.32
Shroud	3.93	3.93
Misc. Parts	7.16	7.16
Total Material	184.27	184.27
Direct Labor	16.48	16.48
Overhead	83.74	20.14
Total COGS	284.42	220.87
Average Selling Price*	$ 400.00	$ 400.00
Gross Margin	29%	45%

*Current selling prices from distributors range from $480-$580. Prices from the motor manufacturer to OEMs or distributors are significantly lower. The pricing shown here is conservative, reflecting a mix of sales both to large OEMs and to small OEMs or end users.

Taxes: Taxes were calculated at forty six percent of pre-tax earnings less the operating loss carry forward. No investment tax credit is used for capital investment.

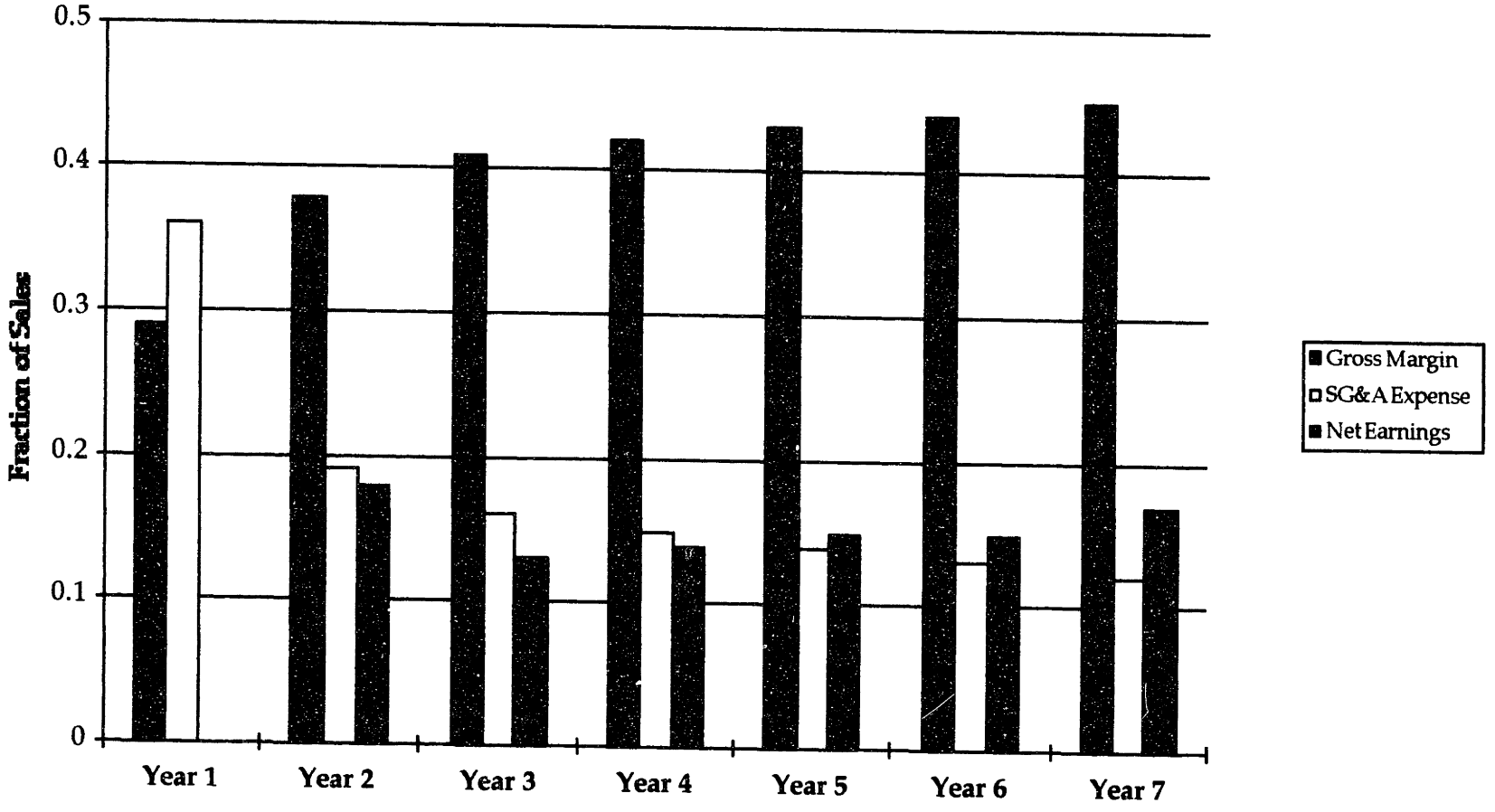
It is instructive to compare the profit and loss statement with several incumbents' to gain some insight how the strategy results in a different financial structure. The first significant difference between the profit and loss

statement shown in Figure 4-5 and the typical incumbent's profit and loss is that in the later years, the gross margin of the new entrant is significantly higher. Of five competitors--Emerson, Baldor, Reliance, MagneTek, and Kollmorgen--Emerson has the best financial performance by far. But even their gross margin is at 35% versus 45% for the new entrant in later years. The simple explanation for the higher margin is that by bypassing the distributor, higher prices can be charged.

A second difference between the new entrants profit and loss statement and the incumbent's is the percentage of sales, general, and administrative (SG&A) expense. In the first year the SG&A as a percentage of sales is nearly 37 percent. By the last year the of the financial horizon this percentage will decrease to approximately 12%. Most other companies in the business operate at anywhere between 15 percent and 20 percent. The strategy, to take most orders by phone, allows the new entrant to minimize costs associated with a field sales organization and manufacturer's representatives. Non-marketing SG&A costs can also be held to minimum because the new entrant can design an order entry and financial system with a clean slate and therefore more efficiently than incumbents.

The two factors contributing to financial success of the new entrant are the higher gross margin plus the minimization of SG&A costs. These factors are shown graphically in Figure 4-6 over the seven years of production. They are not shown for the first year of operation because without sales, the percentages are meaningless. Net earnings as a percentage of sales are also shown. Although the earnings percentage is a bit erratic, it is substantially higher than even the best incumbent--Emerson. Emerson, a highly respected performer in electric motors, seldom surpasses a nine percent net revenue level.

Figure 4-6: Gross Margin, SG&A, and Net Earnings as a Fraction of Sales



Balance Sheet

The next financial statement, the balance sheet, also uncovers some fundamental differences with incumbents. But first, the assumptions for the balance sheet are:

Cash: Cash is set to maintain a reasonable a sales/cash ratio consistent with the competition.

Accounts Receivable: One of the keys to success of the new entrant is a high inventory turnover. Initially, it is expected that sales/inventory ratio = 12. Over time, as the customer order entry and manufacturing systems become optimized, this turnover will increase to 24.

Marketable Securities: Some excess cash is invested in securities as a cash flow buffer.

Property Plant, & Equipment: Includes tooling, production capital, and non-production capital. Plant and equipment is depreciated on a five year straight-line basis, tooling on a two year straight-line basis.

Accounts Payable: The days payable is assumed to be 60 days which is on par with the industry.

Debt: It is assumed that this is an all equity financed operation. This is a realistic situation given that banks would be reluctant to finance a startup operation of this type.

Deferred Taxes: Deferred taxes are based on the accelerated cost recovery schedule (ACRS) allowed by the IRS. For simplicity, accelerated depreciation was calculated only for the capital investments.

Paid in Capital: An initial investment of $3 million is required to start the business.

Retained Earnings: A problem arose when constructing the balance sheet. The company begins to generate a large amount of cash in the third year of production. In a normal situation, this cash would be reinvested in another opportunity within the company, the next target niche, for example. In order to keep the analysis focused on only this opportunity, the excess cash is paid out to shareholders in the form of dividends. By paying out the excess cash to shareholders, the balance sheet appears as it would under conventional circumstances. This excess cash does point out that work can begin on attacking a second product niche in the third year of the enterprise or in the second year of production.

Besides the assumptions just listed here, the balance sheet differs from incumbents in significant ways. One significant difference is the level of inventory for a given level of sales. The sales/inventory ratio measures how often inventory is turned. In a conventional motor company, the inventory turns typically fall in the range of 5 to 9. Because the new entrant's manufacturing system is designed for just-in-time delivery, and short cycle manufacturing, the inventory to support a given level of sales is much lower. The new entrant starts out with inventory turns on the order of twelve. The turns progressively increase as the manufacturing system is refined and experience with suppliers is achieved. Ultimately a level of twenty four turns is achieved.

Figure 4-7: Balance Sheet $(000)

Year	0	1	2	3	4	5	6	7
Current Assets								
Cash	141	100	479	645	917	1,126	1,312	1,556
Accounts Receivable	0	369	738	1,476	1,804	2,132	2,460	2,624
Inventories	100	249	428	563	612	650	683	667
Non-current Assets								
PPE	2,017	2,217	2,777	3,892	4,387	4,857	5,172	5,172
Less Accum. Depr.	0	(575)	(1,190)	(1,664)	(2,402)	(3,207)	(3,771)	(4,329)
Net PPE	2,017	1,642	1,587	2,228	1,986	1,650	1,401	844
Marketable Securities	0	0	500	500	500	500	500	500
Total Assets	**2,258**	**2,360**	**3,732**	**5,411**	**5,818**	**6,058**	**6,356**	**6,191**
Current Liabilities								
Accounts Payable	100	492	984	1,476	1,804	2,132	2,460	2,624
Long Term Liabilities								
Debt	0	0	0	0	0	0	0	0
Deferred Taxes	0	0	0	186	204	140	142	170
Owners Equity								
Paid in Capital	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Retained Earnings	(842)	(1,132)	(252)	749	810	786	754	397
Less Dividends	0	0	(200)	(200)	(1,500)	(2,000)	(2,500)	(3,100)
Total Owner Equity	2,158	1,868	2,748	3,749	3,810	3,786	3,754	3,397
Total Liabilities + OE	**2,258**	**2,360**	**3,732**	**5,411**	**5,818**	**6,058**	**6,356**	**6,191**

Another important aspect of the new entrant's balance sheet is the efficiency with which assets are utilized. Four common measures of asset utilization are asset turnover, return on assets, net sales/plant and equipment and net sales/working capital. The first measure asset turnover, is simply the ratio of net sales to assets. It indicates the level of sales generated for each asset dollar employed. The second measure, return on assets, measures the profit as a percentage of total assets. The third measure, net sales/plant and equipment, indicates the level of sales generated for each dollar invested in plant and equipment. Finally, net sales/working capital indicates the level of sales generated for each dollar invested in working capital. A summary of

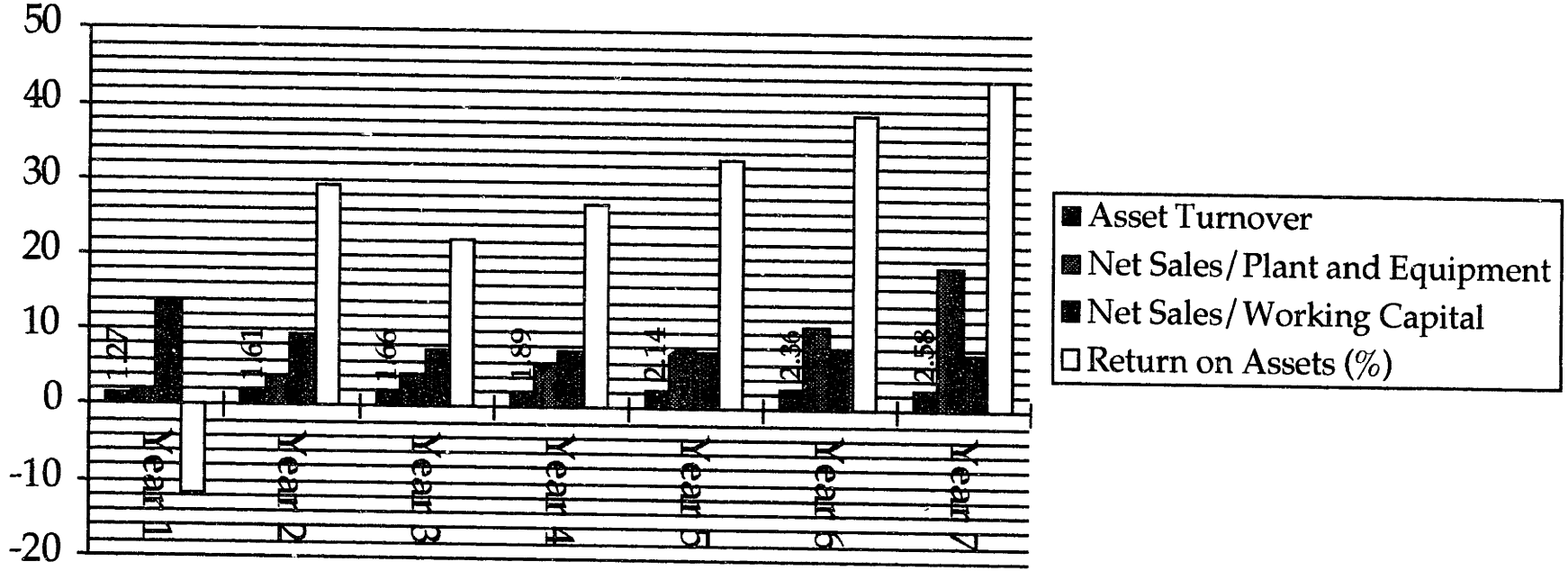
these ratios is shown in Figure 4-8 for the seven years of production along with an indication of what is currently typical in the industry.

Asset utilization for the new entrant is significantly higher than current industry incumbents. There are two reasons for the superior financial performance of the new entrant. First, because the inventory is kept to a minimum, the asset base is less. Second, and more importantly, the new entrant is much less vertically integrated than the incumbent. It is possible, given the nature of the supply base that exists, to purchase materials from the outside at prices that are nearly identical to what it costs the less efficient producer to make internally. Vertical integration only makes sense when the component can be produced internally at a lower cost.

The return on assets is superior to industry performance for the same reason that assets turnover is better plus the fact the profit margins are higher. The superior profit margin goes back to the strategy of focusing on a particular type of high margin customer, the customer who normally buys through a distributor. Profit margins are also boosted by the low level of SG&A required to run this type of business.

The third ratio, net sales/plant and equipment, is a bit deceiving. An assumption made for the P&L and balance sheet is that the plant is rented and not owned. The rent expense has been put into overhead as part of the cost of goods sold. Most of the incumbents own their own manufacturing facilities so the plant shows up as a significant part of the assets on the balance sheet. Over the long term, it may make better sense to purchase the plant, but one of the goals of the entry strategy was to minimize specific assets. Another contributing factor to the high ratio is the new entrant is less vertically integrated. As a result, the assets are low and the sales/plant and equipment ratio is much higher than the rest of the industry.

Figure 4-8: Asset Utilization



Typical Values:Asset Turnover: 1-1.5 , Return on Assets: 2-10% , Net Sales/Plant and Equipment 4-6 , Net Sales/Working Capital: 3-7

The final asset utilization ratio, net sales/working capital is also superior to industry incumbents. Working capital is equal to current assets minus current liabilities. The ratio shown for the new entrant, while good by industry standards, could be improved. The potential sources of improvement are to manage the cash more closely, reducing the average balance. The second possibility is to improve the collection on the accounts receivable. For the balance sheet shown, the days receivable are at 60 days. Some companies in the industry are below 50 days.

Cash Flow Statement

The last financial statement to be considered here is the statement of cash flow. This statement is particularly important for new startups because it provides investors with a schedule as to when financing is required. It also allows one to calculate the net present value and internal rate of return for the new venture. Figure 4-9 indicates that the cash flow from operations turn marginally positive in the second year. By the third year, this cash flow is substantial.

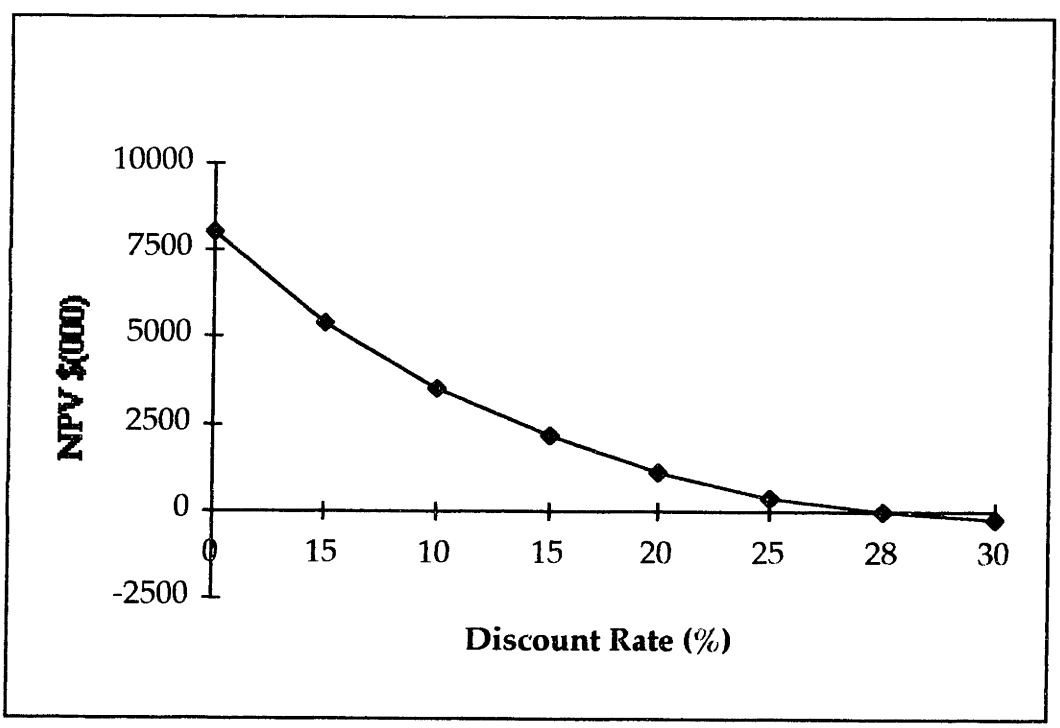
Figure 4-9: Cash Flow Statement $(000)

Year	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Net Income	(842)	(290)	1,080	1,201	1,561	1,976	2,468	2,743
Depreciation Expense	0	575	615	474	738	806	564	558
Deferred Taxes	0	0	0	186	18	(64)	2	28
Accounts Receivable	0	(369)	(369)	(738)	(328)	(328)	(328)	(164)
Inventories	(100)	(149)	(179)	(134)	(49)	(38)	(33)	15
Accounts Payable	100	392	492	492	328	328	328	164
Cash Flow Operations	(842)	159	1,639	1,481	2,267	2,680	3,001	3,344
Purchase of Securities	0	0	(500)	0	0	0	0	0
Acquisition of P&E	(2,017)	(200)	(560)	(1,115)	(495)	(470)	(315)	0
Cash Flow Investing	(2,017)	(200)	(1,060)	(1,115)	(495)	(470)	(315)	0
Dividends Paid	0	0	(200)	(200)	(1,500)	(2,000)	(2,500)	(3,100)
Stock Issuance	3,000	0	0	0	0	0	0	0
Cash Flow Financing	3,000	0	(200)	(200)	(1,500)	(2,000)	(2,500)	(3,100)
Total Cash Flow	**141**	**(41)**	**379**	**166**	**272**	**210**	**186**	**244**

The cash is used up primarily to fund investments in plant and equipment, purchase long term securities, and to pay out dividends. As mentioned previously, the cash used to pay these dividends could in fact be used to expand the product line. Initially, $3 million of financing is required to start up the business. After that, the cash flow from operations provides sufficient funding to cover any additional investments.

The internal rate of return (IRR) for the business is nearly 28%. The IRR represent the discount rate at which the net present value of the investment is equal to zero. This value of IRR is extremely attractive given the fact that an assumption has been made to make the residual value of the business at the end of eight years equal to zero. In reality, the value could be significantly higher; assets could be sold or the business could maintain some level of competitiveness and thus cash flow after the eight year time frame. Figure 4-10 shows net present value of the business plotted against the discount rate.

Figure 4-10: NPV Vs. Discount Rate

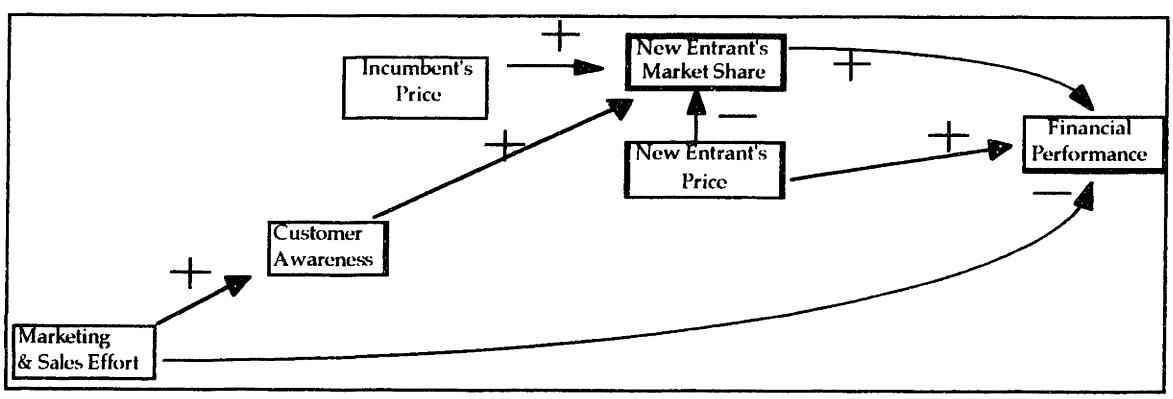


Critical Risks

The financial analysis completed above considers only one possible scenario. Although the scenario chosen was in the author's view the most likely to occur, it is important to look at other possible scenarios in order to understand the upside and downside potentials. Because the realm of possible outcomes is infinite, it is important to focus only on the variable that could have a material effect on the financial health of the new entry strategy.

Picking the right variables to use in a sensitivity analysis requires some knowledge of the key success factors of the business. The dynamics of the key success factors for the electric motor industry are show in Figure 4-11. What the diagram indicates is that financial performance depends upon the new entrant's market share as well as the price the new entrant is able to charge in relation to the incumbents. The diagram shows that as marketing and sales effort increases, customer awareness increases, and the new entrants market share increases. (The sign positive denotes positive correlation between variables.) The financial performance is positively affected by the increase in market share but negatively impacted by the increased budget needed to sustain the higher marketing and sales effort.

Figure 4-11: Dynamics of the Electric Motor Industry



Financial performance is also determined by price. If the incumbent decides to raise his price, the new entrant's market share will increase and the financial performance will improve. If, on the other hand, the new entrant

has a higher relative price, the new entrant's market share will decline. This will have negative impact on financial performance which could be offset by the higher price. Price is by far the highest leverage variable.

The easiest and therefore most likely reaction of an incumbent would be to lower prices. The sensitivity analysis will therefore focus on this important aspect of competition. It is assumed that market share and therefore unit volume will remain unchanged as well as the marketing and sales effort. Some adjustments are made to accounts receivable, accounts payable, and inventory to keep them at a constant percentage of sales. The chart in Figure 4-12, shows the effect on the NPV for three different pricing reactions. The IRR drops from 28 percent to 20.4 percent with a 5 percent decrease in price and the IRR drops to 12.4 percent with a ten percent decrease in price.

A decision tree showing the results of the financial analysis is shown in Figure 4-13. Probabilities for the different pricing scenarios are shown. A discount rate of 15% is used for the decision tree analysis as an estimate for the cost of capital. The payoff from entering the industry and staying regardless of outcome is:

Payoff= [.50 (2162)] + [.25(873)] + [.24 (-416)]= 1,195

The payoff for entry, then exiting only if the price is dropped to 10% is:

Payoff= [.50 (2162)] + [.25(873)] + [.24 (-416)]= 1,195

The payoff is the same in either case. The happens because it is actually more expensive to exit than to stay in at the reduced price. This is true even though the assumption was made that the assets could be sold at one half book value at the end of the second year. Despite attempts to minimize the specific assets, they play an important role in the entry decision.

Figure 4-12: Sensitivity Analysis

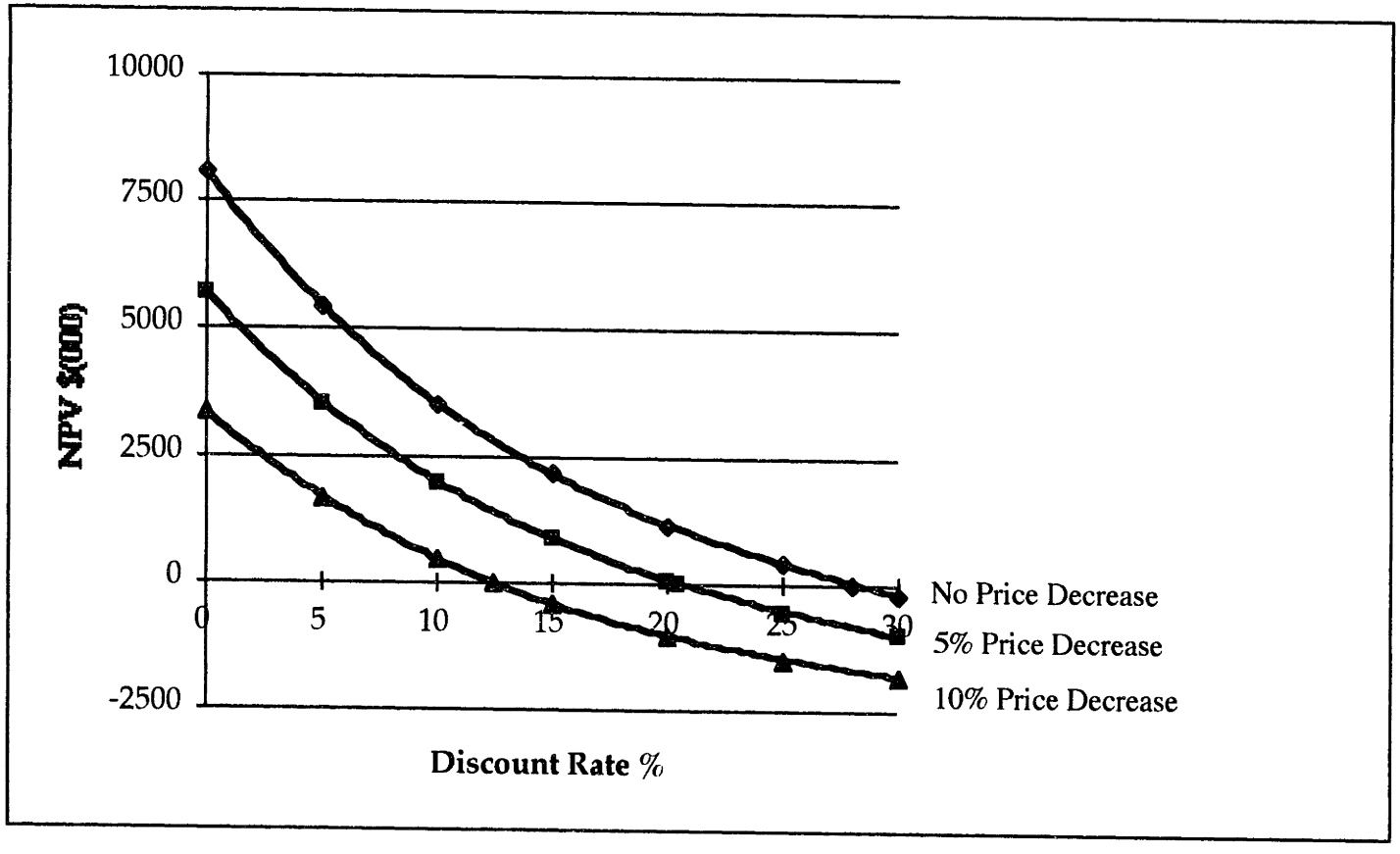
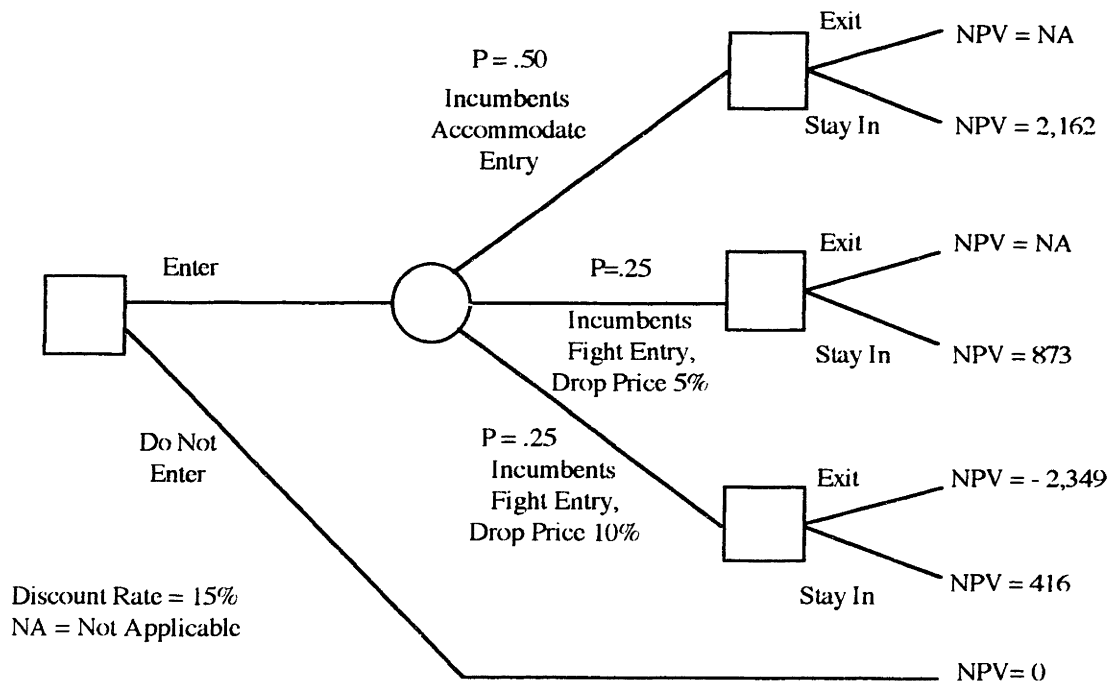


Figure 4-13: Decision Tree for Entry Decision



Summary

The financial analysis of the entry strategy created in Chapter 3 indicates that a new entrant could be viable financially. There are some risks, however, in that significant competitor retaliation could create a negative net present value for the business. The interesting aspect of the analysis is that it is beneficial to stay in the business and grow market share no matter what the incumbents do with price. Realistically though, if all of the incumbents dropped prices 10%, the financial backers of the new entrant would probably pull the plug on the business.

5
Conclusions

The case analysis investigated in the preceding chapters has shown that while challenging, it is possible to re-write the rules of competition in a mature industry. This was accomplished by the application of new information and manufacturing technology coupled with an appropriate platform design. Two questions are worth discussing now. The first question is how can a new entrant sustain its competitive advantage in the long term? The second question is, if the strategy is really viable, why hasn't an incumbent firm pursued it? After all, it would seem that an incumbent would be in a much better position to exploit such a strategy. These two questions will be discussed in this last chapter.

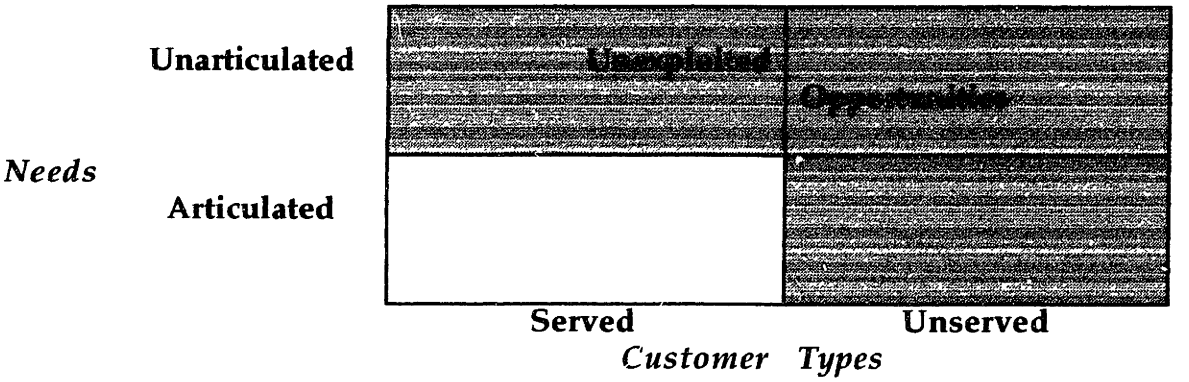
Sustainable Competitive Advantage

One of the goals of any company should be the pursuit of ambitious, profitable growth. How would the new entrant in the electric motor industry go about this? One way would be to work down the list of attractive niches identified earlier. This would certainly work, providing a much larger growth opportunity than just looking at one niche. The issue, though, is whether this is enough to sustain the firm over the longer term horizon, of say five to ten years.

Gary Hamel and C.K. Prahalad wrote an interesting book related to sustaining competitive advantage. *Competing For The Future* provides some insights that can be applied to the motor industry example. In that book, the authors state "There are three kinds of companies. Companies that try to lead customers where they don't want to go (these are companies that find the idea of being customer led an insight); companies that listen to customers then respond to their articulated needs (needs that are probably satisfied by more foresighted competitors); and companies that lead customers where

they want to go, but don't know it yet."[1] They go on to describe the two-by-two matrix shown in Figure 5-1 to illustrate what the third type of company does.

Figure 5-1: Leading Customers[2]



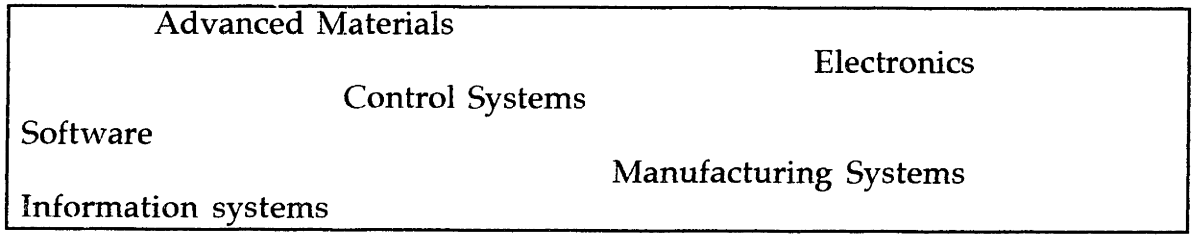
On the horizontal axis are two classes of customers, those the company currently serves and those it does not. Customer needs--both articulated and unarticulated--are found on the vertical axis. According to Hamel and Prahalad, just responding to the articulated needs of a served customer will cause a company to become a laggard. In other words, focusing on the lower left quadrant will lead to stagnation. Growth opportunities can be found in the other three quadrants or the shaded region of "Unexploited Opportunities." This is where one has to look to maintain a long term competitive advantage.

Serving the articulated needs/unserved quadrant has already been discussed as a growth strategy. This can be accomplished by focusing on different niches and expanding globally. The top two quadrants are a bit more difficult to visualize. Although it is challenging to specify what might create the next phase of competitive advantage in the top two quadrants, it will

[1] Gary Hamel, C.K. Prahalad, *Competing for the Future*,(Boston: Harvard Business School Press, 1994), page 100.
[2] Ibid., page 103.

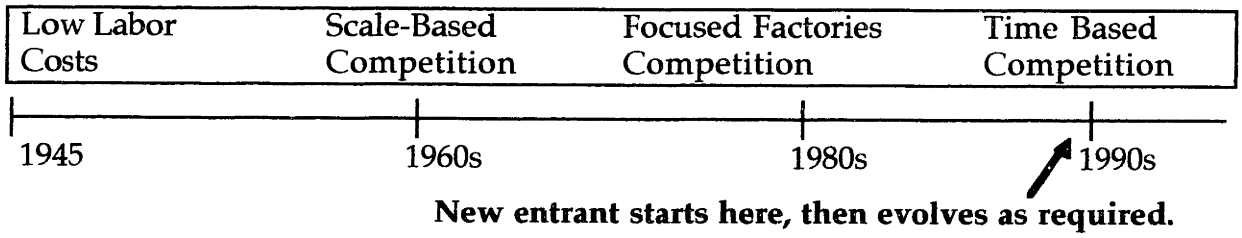
likely come from a combination of advances occurring in different fields. The most likely fields contributing to this change are show in Figure 5-2. Advanced materials hold the promise of smaller more efficient motors. Control techniques and electronics are advancing, opening up new applications for certain types of motors. Software, and the reduced cost of electronics, could make motors programmable in the future, customized to each particular application from a performance standpoint. Manufacturing and information systems will continue to evolve, making it less and less expensive to mass customize motors.

Figure 5-2: Determinants of Future Competitive Space



Companies that are successful over the long run know how to continuously adjust operations to stay on the leading edge. The Japanese have gone through four distinct cycles of focus for examle. The timeline in Figure 5-3 shows that their competitive focus moved from low labor to scale to focused factories to time based competition. The new entrant could start out as a time based competitor and then continuously evolve, adding capabilities as needed to remain on the leading edge of competition.

Figure 5-3: Japanese: A Change In Focus



Industry Incumbents

Given the apparent attractiveness of redefining the industry's product delivery system, why hasn't an incumbent firm already done so? After all, the tools, flexible manufacturing and modular design, have been available for some time. The answer probably lies in what can best be described as the industry's state of mind. The state of mind refers to what managers carry around in their minds--biases, assumptions, preconceptions--about the way the industry makes money, what technologies are useful, and who the customer are.

The reason the industry's state of mind is so important is that it tends to dictate the range of managerial responses in particular situations. According to Prahalad and Hamel "Managerial frames, the corporate equivalent of genetic coding, limit management's perception to a particular slice of reality."[3] They go on to list several characteristics that indicate whether the lack of genetic variety in an industry can be exploited. These characteristics are listed in Table 5-1 along with the relevant description of the electric motor industry. A "yes" answer indicates a lack of genetic variety. The table shows that the electric motor industry fits many of the characteristics that one would attribute to an industry with a lack of genetic variety.

Table 5-1: Assessment of Genetic Variety in the Electric Motor Industry[4]

Genetic Industry Characteristic	*Electric Motor Industry*
Concentrated, stable market share positions among firms.	No
Fragmented industry?	Yes
Same profit recipe among firms?	Yes
Top management with entire careers in industry?	Yes
Take up rate of new technology slower than most?	Yes
High barriers to entry?	No
Basic concept of product remained unchanged?	Yes
Do regulatory issues preoccupy managers?	No

[3] Ibid., page 50.
[4] Ibid., page 54.

Authors Charles Bader-Fuller and John M. Stepford build on the concept of managerial frames in their book *Rejuvenating the Mature Business.* Their studies provide additional evidence that managers in mature industries tend to blame failure on outside sources. In the book, they make a comparison between managerial views in a mature business and a dynamic or entrepreneurial business. In the mature business, "Managers perceive the industry as stable with slow demand growth and incremental changes in technology. Managers believe that profitability is achieved by giving less value to customers or staff or other shareholders. Similarly, giving better service can lower profits."[5] Contrast this to the dynamic or entrepreneurial business. "Managers believe there is potential for change, new ways of operating, and new strategies, many of which have been ignored by mature businesses. Managers believe that to create better profits a firm must give better service to customers and better value to its staff. Value can be delivered to all shareholders without tradeoffs."[6]

The behavior of the electric motor industry in the U.S. has been to under-invest in plant and facilities, but over-invest in inventory. It has been shown that a new entrant could create a profitable business by doing just the opposite. The industry's reaction to foreign competition has been to move plants to border towns in Mexico to take advantage of the unskilled low-cost labor. The new entrant would keep domestic facilities, with a highly trained and skilled labor force. The manufacturing processes and product lines of traditional competitors requires long set-up times and therefore long production runs. Distributors are needed in the industry because the manufacturing lead times are too long to provide the timely delivery that customers require. The new entrant could overcome the limitations of the production process by modularizing the product line and by adopting the concepts of advanced manufacturing.

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[5] Charles Baden-Fuller and John M. Stopford, Rejuvenating the Mature Business, (Boston: Harvard Business School Press, 1994), p. 4
[6] Ibid., p. 4

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