Analysis of Business Prospects

and Pricing Options for

MedACME

June 6, 1997

Strategic Dominion

Kye Gilder
Jason Jordan
Emily Kleeman
John McConnell
Duco Pasmooij

TABLE OF CONTENTS

NOTE: Names, dates, and figures changed due to proprietary information

INTRODUCTION

In the past ten years, the climate for health care service has changed dramatically. The trend toward health management systems reflects the need to divide patient care and medical practice management in order to remain competitive. In addition, the increase in operating costs and desire for more patient information has prompted many physicians to turn toward high technology solutions. Recognizing the need for higher quality automation in the physician's chart as well as the advantages of organization-based clinical guidelines, MedACME Systems was founded in 1996 by a small group of software and healthcare experts in Palo Alto, California. With a clear need for rapid and efficient information processing and a mandate to measure and improve health outcomes, MedACME believes that the potential market for a computerized patient record based around a physician-accepted clinical workstation is considerable.

Shortly after their founding, MedACME received venture capital funding from the Harrison Fund. The alpha site is PhysCorp Inc. in Palo Alto, California, and installation was completed in early 1997. Tentative plans exist for 1 to 2 beta site installations by the end of the year. MedACME's strategy is to provide not just a software product, but an ongoing consulting relationship with the client that begins before the product is installed and continues on a month-to-month basis. In this sense, MedACME is really providing two products, and its task is to prove to its potential customers that MedACME's combination of these products promises them a high quality system that is highly customized to their needs.

MedACME Software

Although there is a wide variety of software products which purport to take advantage of a growing, changing healthcare industry, MedACME has incorporated several novel ideas in its software. For physicians, ease of use in software is of primary importance. Because physicians may see many patients over the course of the day, they require a simple interface and quick data retrieval.

MedACME has designed its software so that almost everything a physician needs to access can be done on one page, resulting in a display that allows the physician to see the most pertinent patient information with a minimum of scrolling and searching. The software currently runs on Windows NT systems, allowing the physician to use either a laptop or desktop PC. Hand-held devices are under consideration. MedACME software incorporates a device referred to as SmartScrollers™, which allow the physician to access levels of data without opening different menus or dialog boxes. In addition, the software has an intelligent back-end which learns to display information according to the preferences of a specific physician. For example, a radiologist may prefer to look at different information than a cardiologist, or two radiologists may prefer to see different data (family history, past prescriptions) upon opening the patient's data chart. The software will learn these preferences. The software improves the physician's interaction with the patient by giving instant access to patient information, and also allows the physician to enter tests and prescriptions which are immediately transferred to the appropriate physician or pharmacy in electronic form.

The software was designed not only for physician/clinician use, but also for the management system administrator. The data entered by physicians is stored in a database and represents a wealth of information of individual and collective physician practices as well as

patient statistics. This is of particular importance to MedACME's marketing strategy because it provides an opportunity for software that can actually increase the quality of provided care. Each client that chooses MedACME for its computerized patient record application receives a highly tailored version of the back-end of the software. Long before installation, MedACME develops a client-specific protocol map. MedACME will engage the physicians and administrators in extensive discussions to develop clinical guidelines and rules. For example, MedACME has developed a Protocol Model with PhysCorp which represents specific treatment guidelines for first-time patients, treatment and tests for various stages of cancer, tests for remission, and other rules which track the physician/patient interaction from the very beginning. Ultimately, these rules are integrated into the software. These rules are used to guide physicians as well as clinicians and RNs. With RNs and clinicians in particular, the rules may be such that patient visits may be completed without necessary referral to a physician if the protocol suggests that it is appropriate. This is a significant step in reducing the amount of relatively costly physician time that is spent on tasks which may not require the full breadth of a physician's expertise.

The software can be used to guide physician, clinician, and RN treatment, but is also of great value to administrators who wish to track physician performance. Since the protocol has been pre-established and integrated into the software, it is very easy for administrators to see which physicians are following protocol, and which, for example, may not be prescribing the correct tests. MedACME believes that the ability to track physician performance on software that is organization-specific will greatly increase the quality of care.

MedACME Consulting

Clearly, development of software that is as organization-specific as that which is described above will require a close relationship with the client. To this end, it is MedACME's

intention to present itself as a company which provides a strong combination of high-tech solutions and consulting expertise. MedACME will hire several full time physicians, nurses, and advisors to serve as consultants who will help develop the client guidelines, oversee the installation, train the users, and help administrators assess the quality of their health care service. MedACME sees its consulting component on equal footing with software development. Its pricing strategy is a per user per month fee, which is currently around $833, or $10,000 per user per year. (Each client represents approximately 100 users, which are composed of physicians, RNs, and clinicians.) Since MedACME charges this price every month, with no initial installation fees, MedACME carries the cost in the early stages of the relationship with the company. However, this pricing scheme reflects their desire to create a long-term relationship with the client, where the client can count on improvements in software and continued technical and consulting support. With MedACME consulting and the software's capacity to track physician performance according to pre-established protocols, each client greatly increases the ability to increase the quality of care that they provide.

Industry Background and Competitor Information

The health information technology field is characterized by a dynamic, rapidly growing competitor base made up of both startups and established firms. On the whole, the industry is volatile, with competitors constantly vying for position within the $8.5 billion market.[1] The attractiveness of developing medical information software stems from the fact that demand is on the rise; almost all HMOs, medical clinics, and physician's groups have a growing need for rapid and efficient information processing and improved healthcare quality at lower costs. Clients are

---

[1] Information obtained from MedACME's web page: www.MedACME.com.

looking to replace paper documents and bulky patient records with computerized forms, charts, and records.

However, the key to success in this industry requires more than simply providing a client with an electronic database or tracking system. A MedACME survey concluded that clients are looking for software that is dependable, flexible, and easy to use and learn. Furthermore, the software must work on portable devices and be compatible with existing electronic systems. The bottom line is that clients do not want to spend long hours training users or doing unnecessary upgrades.

Given these conditions, it would appear that MedACME Systems is in a favorable position within the medical information industry. MedACME's product is easy to use and to learn due to the fact that all relevant patient information is displayed on a single screen. Doctors spend more time entering data and less time scrolling and searching through countless windows and displays. Artificial intelligence is utilized in the back end architecture, enabling the system to learn what type of display is most appropriate in any given clinical context; in other words, the system is able to customize its display and input characteristics based on the type of physician entering data. Finally, personalized consulting is provided for each client in order to aid in the implementation of the software and the training of the users. Taken together, all of these factors suggest that MedACME is in a good position to expand.

Thirteen major competitors, both established and startup firms, were identified with MedACME's help in the course of our research. All of these competitors share one fundamental quality: an effort to improve, at a lower cost, some aspect of the health care process. These competitors offer some variation of a Windows platform software package designed to make patient and medical company information more accessible, or eliminate the need for conventional

methods of record keeping, billing, and scheduling. For the most part, these companies offer a system which is concerned with bookkeeping and automation of planning. The most established of these companies is Azron, which has 12 years of experience and offers hand-held capabilities, but appears to lack the back-end database capabilities that MedACME's software possesses. Companies such as ProMedex (formerly Medicus) and HealthPoint offer portable, hand-held products, a focus more concerned on the input of data and patient scheduling and less concerned with tracking physician performance than MedACME. Other companies, such as Araxys and Oceania offer systems that are in closer competition with MedACME, incorporating intelligent back-ends with a physician's chart. At first blush, many of the companies appear similar, underscoring the importance that MedACME differentiate itself to its potential clients by the ease-of-use advantages of its software as well as its client-specific Protocol Model and strong consulting staff.

ANALYSIS

Porter's Five Forces

The Porter Five Forces framework provides a tool for assessing MedACME's position in the health software industry. Looking beyond the unique features of MedACME's software and consulting services, we can readily identify a number of factors driving the evolution of the health information market. These factors can be grouped under five areas: entry barriers, rivalry determinants, determinants of substitution threat, determinants of supplier power, and determinants of buyer power.

The health software market has a number of barriers preventing the entrance of new competitors. The most significant of these barriers are capital requirements, access to distribution, and proprietary product differences. Clearly, all firms in the industry face large capital requirements in the form of design and development costs, implementation costs, hardware costs, and consulting costs. For this reason, significant funding is required for firms without an established client base. Competitors without the necessary capital will be unable to expand and gain any type of market share. MedACME has overcome this barrier with startup capital from the Harrison Fund, a well-established venture capital group. In receiving funding, MedACME has overcome perhaps the largest entry barrier to the market.

A second barrier is access to distribution. This refers to a company's ability to distribute and sell its product. Because MedACME is a startup without a well-known reputation, this is perhaps the most formidable obstacle to MedACME's short-term success. With one alpha site already established and two potential beta sites under consideration, however, it would appear that MedACME is well on its way to overcoming the distribution barrier. Given the favorable attributes of MedACME's software and consulting services, it is likely that MedACME will begin to establish a credible and noteworthy reputation over the next year, opening up still more distribution channels and consulting opportunities.

The third entry barrier deals with proprietary product differences. As discussed earlier, MedACME's product has a number of attributes which set it apart from its competition -- namely the use of its SmartScrollers™ to facilitate the display and presentation of data on a single screen, and the use of artificial intelligence to enable context-specific display capabilities. These unique features give MedACME a distinct advantage over many of its competitors, who

offer less advanced software solutions. As a result, once MedACME is recognized as a credible software vendor, its proprietary product differences will provide it with a competitive advantage over other vendors, enabling it to gain more contracts and expand its distribution channels to a larger client base.

Rivalry Determinants

Competitor strength is determined by two main factors: industry growth and product differences. Not surprisingly, because the health information industry is still relatively young and because of the growing desire of clients to electronically integrate multiple systems through a computerized patient record, demand for reliable health software will likely expand well into the next century. As a result, it is likely that the predicted growth will encourage more entry into the market. It is incumbent upon MedACME to quickly establish a name for itself, before the market is saturated with competitors. As briefly outlined earlier, both MedACME's venture capital funding and its proprietary product differences should enable the firm to establish a preliminary client base and create a reputation among potential clients. This, in turn, should give MedACME an edge over competitors who have yet to enter the market.

Differences among competitor's products play an important role in determining the ability of rivals to encroach upon MedACME's market. As firms take advantage of new technologies, product attributes will continue to evolve and advance. For MedACME to sustain its competitive advantage, it must continue to develop its consulting services as well as its software's artificial intelligence capabilities and ease of use features. As long as MedACME maintains a reputation for high-quality consulting and a product with unique characteristics, clients will have a reason to choose MedACME over other software solutions. MedACME's consulting focus and software product present distinct advantages over other competitor's

services, placing MedACME in a favorable position relative to its rivals. However, many competitors are focusing on hand-held devices and the convenience they offer. MedACME is considering these devices but has not found one which they believe adequately supports their software. If physicians prefer hand-held devices over laptop computers, this may present a disadvantage for MedACME as it seeks to increase its client base.

Determinants of Substitution Threat

Two factors influencing whether a client will switch software products in favor of a substitute are the relative price performance of substitute and overall switching costs. Naturally, the health technology industry is characterized by high switching costs in the sense that once a client purchases a software package, hardware must be bought and configured, personnel must be trained, and overall client operations must be altered to adapt to the new technology. These high costs work in MedACME's favor because once a new client is signed, it will be very costly, time consuming, and inefficient for that client to switch to another software vendor. Thus, once MedACME contracts with a client, that client is a customer who has committed itself for a long time period.

The relative price performance of substitutes is more difficult to gauge. Industry pricing standards have not yet been established and MedACME is still looking into various pricing schemes for its services. Through market analysis, however, MedACME has come up with a range within which it would like to price its product in order to gain market share as quickly as possible. The range reflects current market sentiment and the opinions of various healthcare professionals. We suspect that MedACME's preliminary research will ultimately help it establish a profitable client base and increased market share, but more analysis needs to be conducted in order to determine the optimal, client-maximizing pricing scheme. (A model of different pricing

options is presented later in the paper). Once the industry is more developed, MedACME will have a better idea of where it stands on the price performance spectrum and can adjust its price accordingly.

Determinants of Supplier Power

Supplier power can be characterized by differentiation of the product inputs, which in this case primarily consist of MedACME's consulting skills and programming expertise. The software appears to be well designed and easy to use. In terms of consulting, MedACME itself is not yet a well established name. However, one of MedACME's founders is Don Simborg, who has a well established reputation in data exchange for healthcare, and MedACME should be able to leverage this name recognition in its favor. Whether MedACME holds a significant advantage in this area is difficult to judge.

Determinants of Buyer Power

Finally, an assessment of MedACME's position within the health information market must consider the factor which most influences buyer power: the presence of substitute products. Naturally, the more options a buyer is presented with, the more power a buyer has to choose the product that best suits his or her needs. As a result, with more products it becomes extremely important for the supplier to have a credible reputation and a reliable product. At this point in time, however, most potential health information customers do not have a wide variety of services to choose from -- usually no more than two or three. For this reason, it is important for MedACME to approach and sell itself to as many clients as possible, before the clients are presented with options which may make MedACME look less appealing or affordable. Since

MedACME is a fairly new company, the small size of the market definitely works in its favor due to the limited number of substitutes potential clients have to choose from.

In conclusion, it is clear that MedACME has overcome a number of the obstacles to entry into the health software industry. Entry barriers such as capital requirements and proprietary product differences do not pose any real threat to MedACME's future growth. Likewise, MedACME's services are sophisticated and differentiated enough to give MedACME a competitive advantage over its rivals. MedACME's position is further enhanced by both the high switching costs for would-be clients, and the notion that the market for substitute products has not yet taken off. What remains to be seen, however, is the relative price performance of substitutes and MedACME's access to potential customers. Nevertheless, despite some pricing and distribution uncertainties, MedACME appears to be in a strong position within the market, a position that will likely lead to increased market share and corporate profits.

Economic Analysis

Structure of Revenues and Costs

MedACME was able to provide a large amount of disparate data which the Strategic Dominion group collated and developed into a model that reflects a 4-year time series of client growth, revenues, systems, staffing, and associated costs. This model provides insight into MedACME's expected profits and, in particular, the time series of these profits.

As mentioned above, MedACME charges its clients on a per physician per month basis, with no initial or installation fee. With the added accumulation of development and staffing costs for almost two years before the first client, MedACME will not see real profits for two to three years. MedACME has received funding from the Harrison Fund and it is currently seeking

second round funding to support the business in its early years, due to the particular structure of its revenues and costs.

Although real profits are several years down the road, there are some elements of MedACME's client and pricing structure from which it can benefit. First of all, MedACME must secure at least two to six clients over the next year in order to maintain its cash flow and establish a track record. However, MedACME can benefit from some degree of price discrimination. Since it is actively seeking out clients, sometimes through established contacts, MedACME often has a good idea as to how much the client is willing to pay. Therefore, while it is imperative that MedACME get at least a few clients over the next year, if some clients will be lured by a low price, it is not necessary for MedACME to charge this same low price to all clients, since it has the ability to negotiate individual contracts.

MedACME also benefits from the fact that clients who choose MedACME are choosing MedACME for a long term relationship. In a sense, a client's decision to choose MedACME is similar to a large corporation choosing between Microsoft NT or UNIX. Potential customers will weigh price and performance considerations, but once they choose a particular system, they are locked in for at least ten to twenty years since switching costs are very high. Similarly, a physicians' group choosing MedACME is making a long term commitment and MedACME can count on that client's fees well into the future. Once they have the clients, they can count on a guaranteed revenue stream for years to come.

Since MedACME can count on a client for several years but must still be concerned with attracting clients in the early years, information on costs per client are valuable. These variable costs can provide them with some guidelines as to the minimum price they should charge. Based on the data provided by MedACME, it was determined that variable costs are approximately

$2,400 per user per year. This estimate is averaged over time and based on MedACME's projected client growth to 30 clients by the end of year 2000. While not an exact figure, it can be considered a rough estimate and provides some guidance as to what MedACME can afford to charge its clients. Moreover, when the number of clients is around 30, fixed costs are small relative to variable costs. Currently, MedACME plans on charging $10,000 per physician per year. Some potential customers have indicated that this price may be too high. Our analysis suggests that MedACME can go lower and still be profitable. For example, if one were to assume that doubling the estimated variable price would provide an acceptable margin, a rough guideline for MedACME might be that a price of $5000 per user per year represents the lowest they should charge.

Since MedACME charges its clients on a monthly basis and the bulk of their costs are represented by variable costs, it is possible for MedACME to survive and be profitable without dominating the market. For example, MedACME currently projects 30 clients by the end of year 2000. While only a fraction of the market, this client base will turn MedACME into a successful and profitable business, even if they were to fail to attract any customers thereafter. While MedACME ultimately desires to be wildly successful, it is of some comfort to know that the success of the business is not ultimately dependent on market domination.

Profitability Projections

MedACME requested that our group examine the data in order to determine, based upon their projections, when they would ultimately break even. This task represented the bulk of the work that we performed for MedACME. We provided them with a spreadsheet model that is easy to use and allows them to change key variables, such as price, projections, and staffing

levels, and observe the effect on profits. *Figure 1* shows three price-per-doctor-per-year

scenarios that MedACME has considered: $8,000, $10,000, and $12,000.

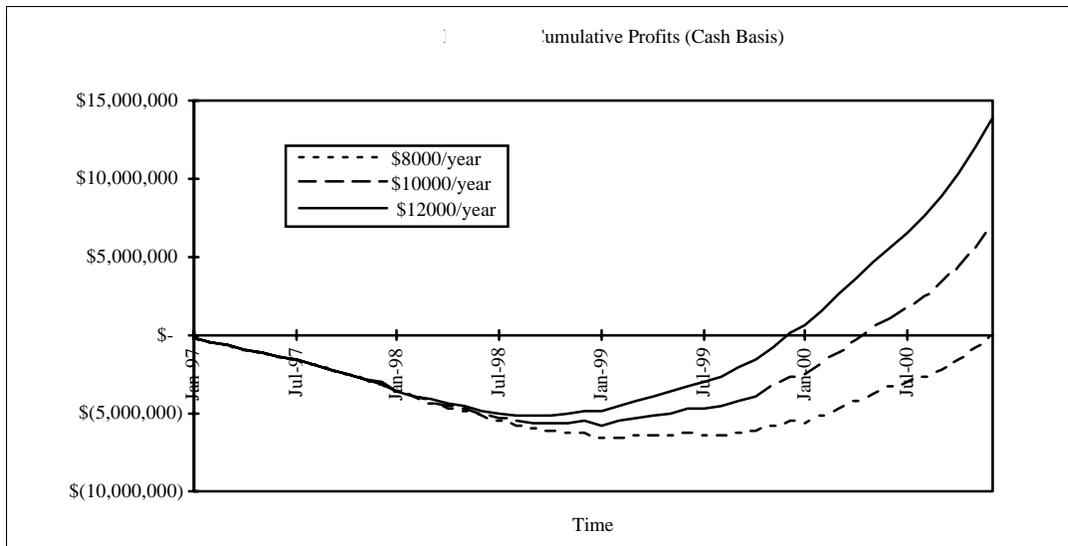Cumulative Profits (Cash Basis)

Figure 1

The above figure shows that, based on their client projections, at a price of $10,000 per

physician per year, MedACME should expect to break even in May, 2000. If they are able to

charge $12,000, they can expect to break even earlier, by December, 1999, while if they are

forced to the lower $8,000 price, they will not break even until December, 2000. (In this model,

the number of clients does not change as price changes). In some cases, data not available to

MedACME (such as the increase in travel costs after the first year) were estimated. In general,

we used estimates that we found to be conservative, preferring to see the results if we erred on

the side of caution. Moreover, these results do not reflect any accrual accounting or

capitalization costs, which would tend to move the break-even date forward. Our results

represent a cautious, conservative outlook. We believe that MedACME's profitability

projections are more favorable than these presented here.

MedACME is currently up for second round funding. This model gave them the ability to

discuss profitability with potential investors as well as allowing them to examine different

scenarios and assumptions. In addition, the above graph gave MedACME an estimate as to how

much funding they need to raise. With the worst case scenarios, cumulative profits hit bottom at

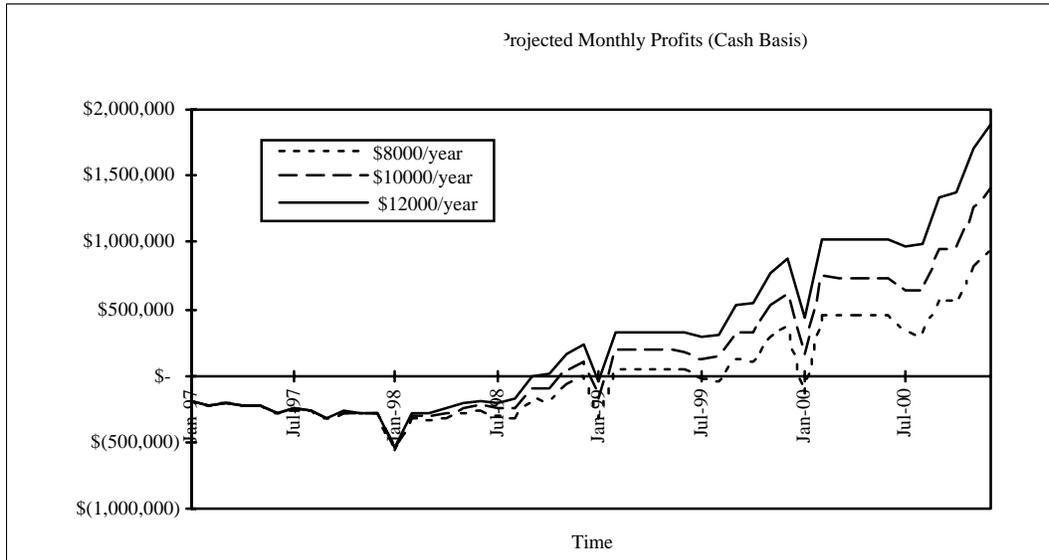around $6.5 million, which represents a rough estimate for required additional funding.

Figure 2

    Figure 2 is similar to *Figure 1* but represents monthly profits. We assumed that all new

clients for a year initiate service at the beginning of the year. The time series shows the nature of

MedACME's costs and revenues; as they take on new clients, initial costs, which include

systems, more consulting, and installation, are high. After a few months of some stability, profits

again begin to climb. This figure also suggests a reasonable number of clients in order for

MedACME to have significant monthly profits. Starting in 1999, after the initial dip, monthly

profits begin to climb to significant levels before the addition of customers in year 2000. 1999

represents a 17 client total. This data implies that MedACME can be quite successful with

approximately 17 clients, although it would take longer for them to recoup their startup costs.
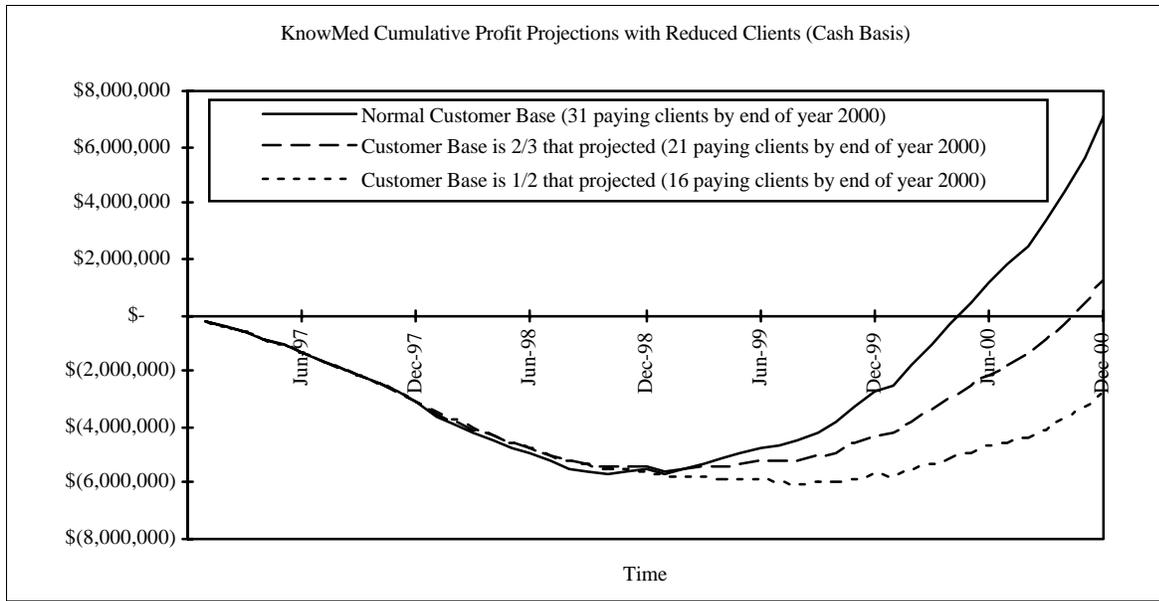
Figure 3

  Figure 3 is analogous to the scenario in *Figure 1* except that it demonstrates the break-even point with a decrease in customer base, holding price constant at $10,000 per physician per year. We note that the maximum cumulative loss is around $6.5 million, as in the worst case scenario in *Figure 1*. *Figure 3* also shows that a large customer base is important if MedACME desires an early break-even point.

Product Diffusion Model

  Thus far, the quantitative analysis we have conducted provides an estimated break-even date for MedACME based on constant demand. Demand forecasts were made after MedACME had conducted some informal market research with decision makers in the position to purchase MedACME's services. We developed a modified Bass Product Diffusion Model[2] to explore the effect of pricing options on MedACME's expected performance. This model estimates the number of customers who first try a given product at period *t.*. It incorporates coefficients of

---

[2] Mahajan, Muller, and Bass, 1993, *New-Product Diffusion Models*, Handbooks in OR & MS, Vol. 5, Elsevier

innovation and imitation, p and q, which represent the pace of adoption of a particular product. The coefficient of innovation represents the number of people who are attracted to the product solely because of its intrinsic characteristics. The coefficient of imitation can be thought of as the "word-of-mouth" effect, or the degree to which people are drawn to the product in a given period based on the number of users of the product from the previous period.

Modifications to the Bass Model

To meet our goal, we modified the Bass model in the following ways:

1. In order to explore pricing options we modified the model and incorporated the price sensitivity of demand.

2. The total number of potential triers was chosen as the long-term number of users that MedACME is trying to achieve, instead of the entire market since it seemed rather unrealistic that a company would get monopoly in this market.

To simplify this modeling problem, we made several basic assumptions. First, we assumed that MedACME's product is a durable good. For some software products this is not a valid assumption, since they can easily be supplanted by a competitor's product offering higher quality or a lower price. However, as discussed above, MedACME's services include much more than software, and choosing MedACME is a long term decision, comparable to a choice of operating system or client-server database. Since a company's decision to purchase MedACME's services is a large scale decision with long term ramifications, this product is closer to a durable good than a non-durable good. Hence, we assumed that a first-time-buyer will automatically adopt the system for long term use. The repeat purchasers in the basic Bass model

are not relevant in our model. The relevant quantities for MedACME's business decisions are therefore the first time buyers, the "triers" and the total sales (i.e., cumulative sales to the triers).

Given MedACME's assessment of demand and a simplifying assumption of demand being a linear function of the price, we made the innovation coefficient a function of the price (see *Appendix B*). The imitation coefficient remains constant. This model allows us to experiment with several pricing options that are available to MedACME. In order to estimate values both for the slope of the demand curve and for q, the word-of-mouth effect, we combined MedACME's assessment with the Bass Model. (Note that MedACME's assessment for 1997 only considers the coefficient of innovation, but that assessments for subsequent years include the effects of word-of-mouth) *Figure 5* compares MedACME's assessments to the assessments generated using the modified Bass model. For this realization, a price of $10,000 per doctor, per year was assumed. Since this assessment most closely mirrors that of MedACME, we concludef that 0.9 and -0.0005 are good approximations for the coefficient of imitation and the slope of the demand curve, respectively.
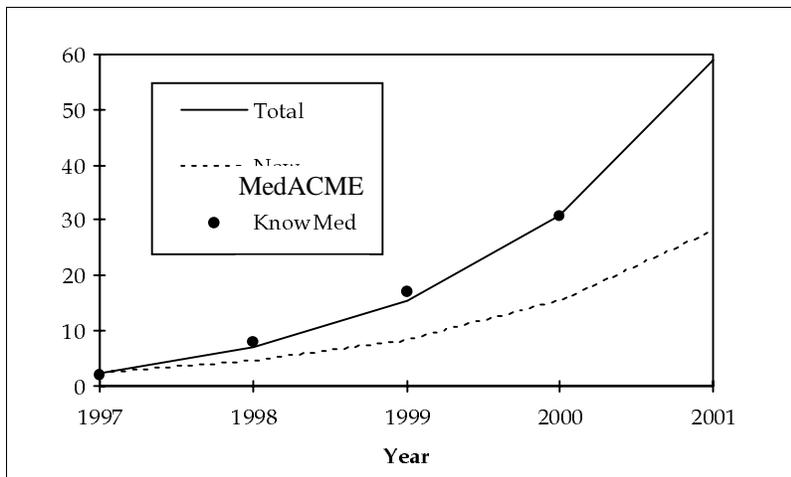

Figure 5: Comparison of MedACME's assessment to that generated by the modified Bass model.

Comparison of Pricing Strategies

Once approximate values for the unknown parameters in the model were found, we were able to experiment with pricing strategies for MedACME. One of MedACME's goals is to develop a sizable market share. Although we determined previously that it is possible for MedACME to be profitable if it has a relatively small, but dependable, market share, we wanted to explore other scenarios for MedACME's long term growth. In addition, we also determined that once MedACME develops a moderately sized customer base, they should charge no less than $5000 per doctor per year. However, while this information is useful, it gives little insight into the optimal price that MedACME should charge. Therefore, we used this model to determined what price, or series of prices, MedACME should charge in order to achieve its goals of timely profitability and rapid growth in its customer base. The following strategies were considered in our analysis:

- **Stay at 10K:** MedACME's initial strategy of charging a constant $10,000 per doctor per year
- **Do the Wave Up:** MedACME initially charges $7500 and increases its price by $500 each year until reaching $10,000
- **Do the Wave Down:** Analogous to the previous strategy except that the initial price is $12500, but is gradually decreased until reaching $10,000 in year 2002
- **Gates Rules:** A constant price of $8000
- **Dump Truck:** Similar to Do the Wave Up, although the initial price is only 60% of that which MedACME currently plans to charge.

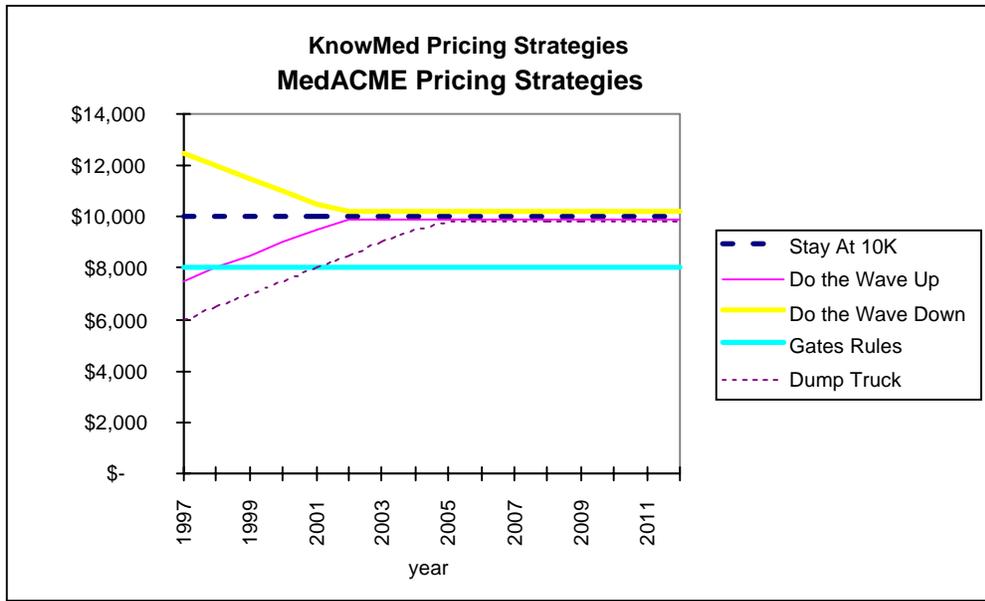All five strategies are shown graphically in *Figure 6*.

KnowMed Pricing Strategies
MedACME Pricing Strategies

Legend:
- Stay At 10K
- Do the Wave Up
- Do the Wave Down
- Gates Rules
- Dump Truck

Figure 6: Graphical chart of the 5 pricing strategies under consideration.

In coordination with data supplied by MedACME, these strategies provide approximate dates that MedACME can expect to break even as well as the expected market share at that time. *Figure 7* shows the long term projected growth of MedACME's client base. This model predicts that MedACME's product will eventually be adopted by 3000 clients. This figure represents the MedACME's expected market share. *Figure 8* compares the evolution of MedACME's market share under different pricing options (*Figure 9*) through the year 2000.
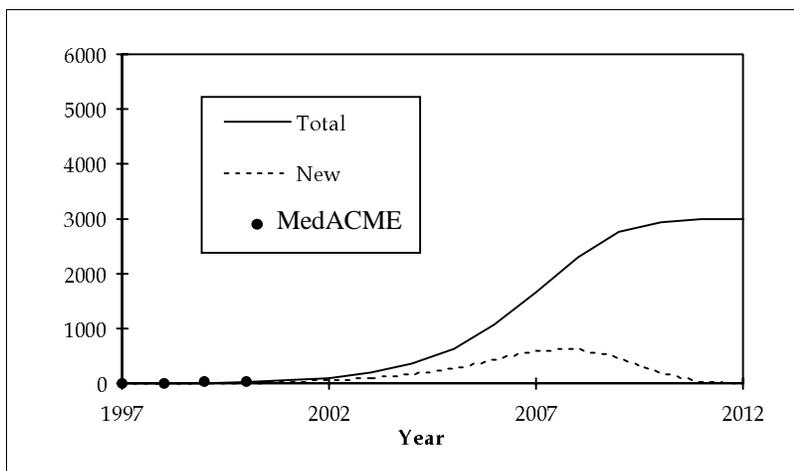

Legend:
- Total
- New
- MedACME

Figure 7: Long-term results for P(t)=$10,000 for all t
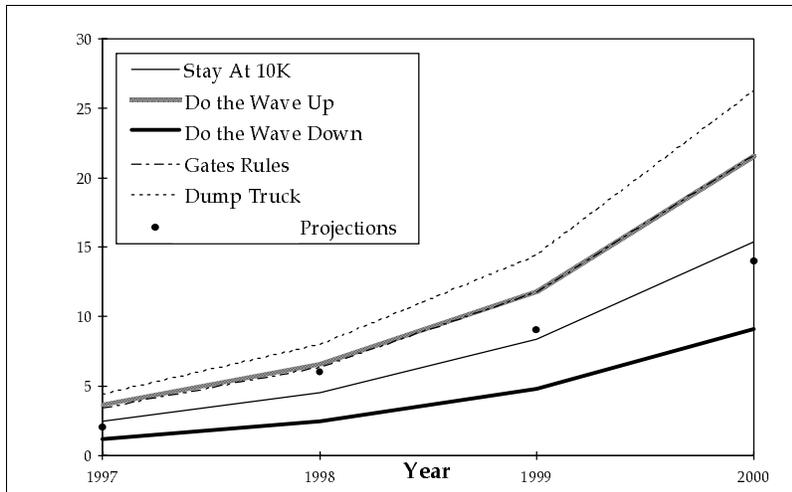
Figure 8: Evolution of MedACME's market share under several pricing strategies

Pricing Options	P_{1997}	P_{1998}	P_{1999}	P_{2000}	Total Clients	Sensitivity to ε	Break-Even Point
Stay At 10K	2	5	8	15	30	0.0%	May-00
Do the Wave Up	4	7	12	22	45	2.2%	Feb-00
Do the Wave Down	1	2	5	9	17	8.8%	2000+
Gates Rules	3	6	12	22	43	4.7%	May-00
Dump Truck	4	8	14	26	52	3.8%	Jan-00
MedACME's Projections	**2**	**6**	**9**	**14**	**31**	**-**	**May-00**

Figure 9

These results show that the most desirable pattern is to price low initially and then gradually increase the price once MedACME has gained a significant market share. The strategies that employ this scheme are denoted *Do the Wave Up* and *Dump Truck*. The strategy denoted *Gates Rules* has an almost identical outcome to *Do the Wave Up*. These results suggest that MedACME's initial plan to charge a constant $10,000 per doctor per year may be so high that the additional revenue gained up front is not enough to outweigh the increased market share that is projected under the other strategies.

The model also reveals information about the time at which MedACME can expect to break even. The three strategies discussed above are again the most attractive if they are

considered on the basis of the break-even date. In this category, the top three strategies are at least as good as MedACME's original strategy (denoted *Stay at 10K*). Note that the original strategy and *Gates Rules* project the same break-even point. This result may seem contradictory at first because the two strategies incorporate constant, but distinct, pricing plans. However, closer examination reveals that more clients are attracted at the $8000 price than at the $10,000 price. Thus, the increase in demand under *Gates Rules* exactly counterbalances the increased revenue under the original plan, resulting in an approximate break-even date of May 2000. The clear losing strategy is that whose initial price is high but which gradually drops to $10,000.

Because all of the approximations made thus far have been generated from a relatively small amount of market data, we continued our analysis by exploring the sensitivity of the model to the slope of the demand curve, which as a first approximation represents sensitivity to the price elasticity ε of demand. This sensitivity analysis was conducted by increasing and decreasing the slope of the demand curve by 10%. The percentage (average) change in the total number of clients was used as a measure of the sensitivity. This value, which we refer to as sensitivity to elasticity, is also recorded in *Figure 9*. Note that the widest variation occurs under the least attractive pricing strategies. Furthermore, the three most attractive strategies are still the clear winners, even if variation of elasticity within this 10% range is allowed.

CONCLUSIONS AND RECOMMENDATIONS

Our results suggest that MedACME's plan is a viable one, and the company should become profitable by late 1999 or early 2000. Our economic analysis shows that once MedACME's client base grows to around 30, fixed costs become low, relative to variable costs.

However, for the preceding periods, fixed costs represent a sizable percentage of overall costs. We suggest that MedACME try to limit costs in its first few years so that it might break-even sooner than expected. At the very least costs could be cut by consolidating their staffing structure and also by sharing resources among clients. Currently, MedACME plans to have a two consulting teams assigned to each client, an implementation and an ongoing support team. While these teams will each be assigned several clients, we believe that MedACME could limit its staffing costs by consolidating the functions of the implementation and ongoing support teams. In addition, based on the model that provided, MedACME is considering shifting the cost of servers onto the client. This will have the effect of reducing the cost associated with taking on a new client for MedACME while not raising the actual monthly price they charge.

Our strongest suggestion to MedACME is to develop a client base in its early years, even if this means pricing lower than the current plan of $10,000 per user, per year. Both our qualitative and quantitative analyses suggest that MedACME would benefit by aggressively building its client base in its early years. This strategy is attractive because of the high switching costs that will encourage clients to continue service with MedACME. Furthermore, MedACME can help promote this early growth by offering a price per doctor per year that is considerably lower than the $10,000 they are currently considering. With the minimal amount of market data available, it is difficult to predict the demand for MedACME's product with a high degree of accuracy. However, we feel confident that an initial price of $6000 - $8000 will encourage rapid early growth and a healthy market share for MedACME. This will also allow them a solid client base which will provide a guaranteed revenue stream into the future. In the worst case, this will at least allow MedACME to become a viable operation; if client growth continues, we expect MedACME to be profitable and successful on a large scale.

WHAT DID WE LEARN?

During the lectures we learned about several different tools for strategy modeling. But we felt that a very important aspect of the learning process in EES & OR 483 is the immediate opportunity to apply it in practice. Initially we planned to apply every single tool we had available after attending the lectures, but after understanding the models you realize that it might not be appropriate to use a certain model and instead you decide to focus on the more useful issues. Going through the process of mastering the fundamentals, formulating the key problems and applying the appropriate tools has been a very interesting process.

In addition, the findings had to be communicated to MedACME management. We spent a significant amount of time discussing what level of detail to present and on which conclusions to focus in the short time that MedACME's management had available. Despite the fact that we were very eager to show the very exciting modeling techniques we used, we decided to focus on the recommendations that would directly assist MedACME's management in taking strategic decisions. The experience we gained in efficiently presenting results of a project will be important for any project we will do in the future.

APPENDIX A: COMPETITOR INFORMATION

Company	Location	Phone	Web Address	Core Business	Clinical Application Modules	Technical Platform	Documentation / Charting Protocal	Coded, Structured Text Entry
Abaton	Minneapolis, MN	612-858-7844	www.abaton.com	EMR	Patient documentation and records	Windows, Client-Server	Established protocol	
Araxsys	Redwood City, CA	415-562-0455	www.araxsys.com	EMR	Patient enrollment, Scheduling, Cost accounting, Contract management, Tailored treatment regiments	Windows, Client-Server	Established protocol	Yes
Azron	San Diego, CA	619-450-0200	www.azron.com	EMR	Form builder, Query/Report writer	Windows, Client-Server	Established protocol	Yes
Clinitec	Horsham, PA	215-957-5490	www.clinitec.com	EMR, Accounting, Billing	Accounting and billing, Patient database	Windows, Client-Server	Established protocol	Yes
Electronic Healthware Systems	Birmingham, AL	205-871-1031	www.chsmed.com	EMR, Consulting	Practice management information systems, Managed care info systems, Decision support tools for managed care, Referring physician module	Windows, Client-Server		Yes
Healthpoint	Durham, NC	800-452-9653	www.healthpoint.com	EMR	Patient documentation and records, Clinical decision making	Windows, Client-Server	Established protocol	Yes
Medicalogic	Beaverton, OR	503-531-7000	www.medicalogic.com	EMR	Schedulogic, Linklogic, Accesslogic, Successlogic	Windows, Client-Server	Established protocol	Yes
Oceania	Palo Alto, CA	415-812-3000	www.oceania.com	EMR	Patient documentation and records	Windows, Client-Server	Established protocol	Yes
Promedex		800-446-3393	www.promedex.com	EMR, Consulting	Staff and patient scheduling, Inventory and material control, Payroll accounting, Clinical and administrative decision making tools	Windows, Client-Server	Established protocol	Yes
Datamedics	Boston, MA	617-788-4838						
Praxis	Los Angeles, CA							
Purkinje	Montreal, Can	514-355-0888						

Company	Hand-Held / Wireless Technology	Rules Based Protocol Management for Decision Support	Alert Capability	Voice Technology	Web Access	Application on Internet	Number of Clients	Distinguishing Characteristics
Abaton		Yes	Yes		Yes	Yes		Parallel computing, Web access, Electronic data interchange
Araxsys	No	Yes	No	No	Yes	Yes		User-customized library of clinical and business rules, Remote processing over the Internet, Customized reports
Azron	Yes	Yes	Yes	No	No	No		Customizable database, Point of care access, Security by program and PIN, Enterprise-wide system
Clinitec	Yes	Yes	Yes	Yes	No	No		Alliance with QSI
Electronic Healthware Systems	No	Yes	Yes	Yes	No	No		Speak-easy dictation, Touch screen, Medical teleconferencing, Security levels
Healthpoint	Yes	Yes	Yes	Yes	No	No		Pen and voice dictation, Workflow management, Practice analysis, Joint venture between Glaxo Wellcome and PCN (201-490-3000)
Medicalogic	No	Yes	Yes	No	No	No	2000 users (100 sites)	Intelligent backend, Online help
Oceania	No	Yes	No	No	Yes	Yes		Automated charting, Database containing coded-structured terms that describe over 1 million expressions, Patient info on the web
Promedex	Yes	Yes		No	No	No		Bar code technology, Medical and software consulting
Datamedics								
Praxis								
Purkinje								

APPENDIX B: NEW PRODUCT DIFFUSION MODEL

The equations that we used for the product diffusion model are:

$$T(t) = p*m + (q-p)*Y(t) - Y^2(t)*q/m$$

where
$T(t)$ = the number of new triers in period t
m = the number of potential triers
p = coefficient of innovation
q = coefficient of immitation

$Y(t)$ = cumulative number of triers from period 0 through period t = $\sum_{i=0}^{t-1} T(i)$

We modeled MedACME's demand curve as a linear function:

$$y(P) = a*P + b$$

where
P = price
a = slope of demand curve (less than 0)
b = parameter

This demand curve is independent of time and is only a function of the price P, and we therefore named it the *innovative demand* curve; it does not incorporate any word-of-mouth effect -- i.e. imitation effects -- and the purchase decisions are solely based on the price. We used MedACME's growth assessment to find values for the parameters of this curve. MedACME expected to attract 2 new clients per year at a price level of $10,000 per user per year; the point (10,000, 2) lies on the curve. We assumed that the slope of the curve would be approximately -0.0005 and we derived that b=7 by matching MedACME's demand assessment and our models (as described in the section *Modifications to the Bass* Model). This led to the following equation:

$$y(P) = -0.0005 * P + 7$$

The innovative demand curve was used to make the coefficient of innovation p a function of the price P. Since the coefficient of innovation indicates the fraction of the market that with try a product in every time period, we assumed that y(P)/m would be a good approximation for p. The equation for the number of new triers therefore becomes:

$$T(t) = y(P) + (q - y(P)/m) * Y(t) - Y^2(t) * q/m$$

where
$T(t)$ = the number of new triers in period t
m = the number of potential triers = 3000
$y(P)$ = innovative demand = -0.0005P + 7
q = coefficient of immitation = 0.9
$Y(t)$ = cumulative number of triers from period 0 through period t $= \displaystyle\sum_{i=0}^{t-1} T(i)$

The number of potential triers m was chosen as MedACME's market share objective and is represented by m=3000. We verified the values of y(P)/m and they were always smaller than p_{max} = 0.06.

The second quantity that was important for MedACME was the total number of MedACME clients. In our case of a highly durable good this is simply the cumulated number of triers from period 0 until period t (including the new triers in period t!):

$$X_{total} = \sum_{i=0}^{t} T(i)$$