TOWARD A CONTINGENT RESOURCE-BASED THEORY: THE IMPACT OF INFORMATION ASYMMETRY ON THE VALUE OF CAPABILITIES IN VETERINARY MEDICINE

THOMAS H. BRUSH[1]* and KENDALL W. ARTZ[2]
[1]*Krannert School of Management, Purdue University, West Lafayette, Indiana, U.S.A.*
[2]*Hankamer School of Business, Baylor University, Waco, Texas, U.S.A.*

The paper investigates the contingencies which define valuable resources in professional medical services. We identify activities with credence, experience, *and* search *qualities in medical service industries in general, and in veterinary practices more specifically. We propose that different capabilities are needed to deliver different services and test whether the contingent combination of capabilities for particular services is linked to the performance of veterinary practices. For example, we expect that practice capabilities which help to retain clients are necessary for the successful delivery of services with* experience *qualities. We find evidence of performance benefits of client retention in a sample of 193 veterinary practices. We also find that in markets where competition from a new form of entrant is especially intense, an independent veterinarian's* credence *activities combine with its* experience *and* search *activities to jointly improve practice profitability. Since the new entrants' resources are mainly effective in the delivery of services with* search *qualities, the practice capabilities of the independent veterinarians that allow them to offer services with* credence *and* experience *qualities can be seen as a type of isolating mechanism.* Copyright © 1999 John Wiley & Sons, Ltd.

INTRODUCTION

This paper investigates the contingencies between resources, capabilities, and performance in a medical service industry. In considering how to apply the resource-based view (RBV) of the firm to this problem some gaps in the available theories raise new challenges. Barney's (1991) four criteria for resources to confer a competitive advantage—value, rarity, imitability, and substitutability—are limited in their practical usefulness for this problem because they are context insensitive (i.e., noncontigent). While context specificity is incorporated in the theory by requiring that resources be 'valuable,' the theory is not instructive in identifying the contingencies that

might make the same resources valuable in some contexts and not in others. Other theories such as *information asymmetry* can be used to complement the RBV of the firm to better understand the context of resources. This helps to develop the dimension of 'value' in the RBV framework just as research on capabilities in firms has helped to understand dimensions such as 'substitutability' from architectural innovation (Henderson and Clark, 1990) or 'imitability' through absorptive capacity (Cohen and Levinthal, 1990).

The literature on information asymmetry draws on the idea that products have *search, experience*, and *credence* qualities which customers can evaluate in different ways to determine whether to purchase them (Stigler, 1961; Nelson, 1970). Search qualities are attributes that can be known before purchase, experience qualities are attributes determined only during or after purchase, and credence qualities are expensive to judge even after purchase (Darby and Karni, 1973). Services

* Correspondence to: T. H. Brush, Krannert School of Management, Purdue University, West Lafayette, IN 47907-1310, U.S.A.

in particular tend to contain prominent *experience qualities*. Repeat customers have experienced the service and therefore have information that new customers do not have. Some services may also have *credence qualities* which are difficult to assess during and immediately after the service. For example, medical or teaching services have some aspects which can be evaluated at the time of service but long-term health and fundamental learning may not be ascertainable by the recipient of the service at the time of the service. Instead of monitoring the service, it may be best to identify other indicators of credence quality prior to the service.

The resources needed to develop a competitive advantage might differ across products and services which are composed of different degrees of credence, experience, and service qualities. For example, Reichheld and Sasser (1990) show that there are advantages of serving repeat clients in service firms due to the experience qualities present in the service. Similar to the benefits of little rework and reduced scrap from quality manufacturing, they argued that 'zero defections'—or keeping every customer the company can profitably serve—can make an important impact on the bottom line. They discuss examples of how reduced customer turnover and a higher proportion of repeat clients can both increase revenues and reduce costs in a number of different service industries. They conclude that service managers should track the defection rate and manage the service firm to avoid defections. This implies that firms can develop resources and capabilities that are contingent on the experience qualities of the service they are providing. Services with search, experience, or credence qualities may require different types of capabilities and resources within the firm to deliver them.

The ideal empirical setting for testing whether the resources generating competitive advantage are contingent upon information asymmetries would be an industry that encompasses services with characteristics of all three types of goods— search goods, experience goods, and credence goods. The small, independent practices who have traditionally dominated the Companion Animal Veterinary Medicine (CAVM) industry offer a full range of veterinary services. Some of these services have mainly search qualities such as retailing, some have predominately experience qualities such as client education about pet needs and immunization programs, and some are domi-

nated by credence qualities such as major surgeries. A complication in examining the contingencies which affect the performance of these activities is that most veterinary firms deliver many, if not all, of these activities. However, there are common firm drivers that affect the delivery of several activities. Thus, we think it is appropriate to consider how combinations of activities and capabilities in firms affect firm performance, rather than the performance of any individual activity separately.

The bottom row of Table 1 represents the central hypotheses in the paper concerning the drivers of competitive advantage for services with different characteristics. We use a sample of independent practices in CAVM to investigate the importance of capabilities which lead to performance from repeat customers as a means of testing the importance of services with experience qualities. Then, we examine whether the experience activities of the independent veterinarians combine with their credence and search activities to jointly impact practice performance. We also control for the effects of scale for performance from services with search qualities. Finally, we examine whether the above relationships are particularly important for independent veterinarians competing in markets that are facing an immediate threat of industry consolidation from new types of entrants.

This paper proceeds as follows. In the next two sections we develop the conceptual distinctions among credence, experience, and search qualities of a service. We link these services to the drivers of competitive advantage that are necessary to deliver them. Then we discuss the likely capabilities within firms that are necessary to support a driver of competitive advantage. These contingency linkages between types of service, drivers of advantage, firm capabilities, and ultimately firm performance are summarized in testable hypotheses. After this, sections describe the methodology and variables and report results. In the final sections we discuss the findings, conclusions, and limitations.

THEORY DEVELOPMENT

Resources and capabilities

While resources can be either given exogenously or created by activities within the firm, *capabili-*

Table 1. Generic medical practice services and their component activities classified by credence, experience, and search characteristics

Generic services	Activities with credence characteristics	Activities with experience characteristics	Activities with search characteristics
Routine care			Blood tests Vaccinations
Retailing			Medical products Prescription drugs Over-the-counter drugs
Client relations		Client education by staff and doctor Quality of customer service Speed of customer service Flexibility responding to clients Promoting quality reputation	
Core medical	Testing patient Diagnosing problems Performing specialized treatment Recommending ongoing treatment		
Preventive care	Knowledge of preventive medicine	Annual physicals Immunization programs Maintaining patient history	
Ancillary service		Behavior training Animal grooming	Efficient boarding facilities
Drivers of competitive advantage	PROFESSIONAL RESOURCES Knowledge of medicine School granting veterinary degree Professional norms, associations	PRACTICE CAPABILITIES Relationship with client Education of clients	MARKET SCALE Low prices Product range

ties emerge from the integration and combination of these resources (Peteraf, 1993; Prahalad and Hamel, 1990; Wernerfelt, 1984). A competitive advantage determined by *capabilities* thereby differs from a competitive advantage determined by *resources* in terms of its imbeddedness within systems and management within the firm (Henderson and Cockburn, 1994). The processes for replication or substitution in competitive firms would also differ in that resources are more likely to be procurable and separable from the firm, while capabilities are more likely to be developed from within the firm.

A wide range of organizational resources and capabilities exist that can provide a company with a competitive advantage. Resources such as employee knowledge or sophisticated computer systems, and capabilities such as high-quality service and fast and flexible response to customer demands can be invaluable for a firm attempting to compete (Barney, 1991; Grant, 1991; Teece, Pisano, and Shuen, 1997). Given the wide range of possibilities, how do we determine which resources and capabilities are most critical for a firm? In particular, which resources and capabilities are most important for the independent veterinary practices that are the focus of this study? Recent research by Reichheld and Sasser (1990)

gives interesting examples of capabilities firms must develop to serve clients purchasing services with experience qualities. Following Reichheld and Sasser's logic, we suggest that to answer these questions we need to more closely examine the characteristics of the activities offered by these service firms. Specifically, a useful framework is to examine activities in terms of their *search, experience*, or *credence* qualities.

Search, experience, and credence qualities and their drivers of competitive advantage

The activities that medical service firms can provide vary according to the mix of *search, experience*, and *credence* qualities that each activity possesses (Darby and Karni, 1973; Nelson, 1970). *Search qualities* are attributes that potential buyers can determine prior to purchase (Stigler, 1961). *Search qualities* are generally associated with goods and any tangible components of services such as price, smell, and service time. *Experience qualities* are attributes determined only after purchase or during consumption. These include attributes such as purchase satisfaction, reliability, level of comfort, and attention to the needs and feelings of customers. *Credence qualities* are attributes that are costly or difficult to evaluate by the buyer even immediately after purchase and consumption. With credence qualities, the long-term consequences of the service may only be known over the course of time. Yet, even over time, it may not be clear whether a failure associated with the service could have been avoided by the service deliverer. Medical services such as surgery come to mind as examples. General attributes here include degree of professionalism, level of care, sense of fairness and extent of knowledge possessed by the service provider.

Table 1 illustrates how the traditional activities provided by medical service providers might look if classified according to their *search, experience*, and *credence* qualities. Also indicated are the resources and capabilities that are the drivers of competitive advantage for each type of activity. For example, *routine care medical activities* such as blood tests and vaccinations are relatively standardized service offerings. Similarly, retailing activities involve the sale of tangible products that possess relatively easily evaluated qualities. Both of these activities can be judged in terms

of price, convenience and the like prior to purchase. Thus, they are most accurately classified as activities with search qualities or *search activities*. Further, the standardization of these activities suggests their costs are sensitive to the volume purchased. Hence, *market scale* becomes the dominant driver of competitive advantage for these *search activities* (Porter, 1985). *Client relations* are good examples of *experience activities*. Good *client relations* involve educating clients so that they understand the reasons particular procedures are used and providing timely, high-quality service. These activities are difficult for the user to evaluate until the client judges his or her satisfaction with the service. *Practice capabilities* that retain customers are seen as the primary driver of competitive advantage for *experience activities* (Reichheld and Sasser, 1990). Finally, *core medical activities* are a good example of *credence activities*. We consider the medical professional's degree and the degree granting institution to be indicators of *professional resources* (knowledge of medicine) and adherence to *professional norms*. The degree, the granting institution, and participation in professional conferences which keep the medical provider's knowledge base current, could all be seen as drivers of competitive advantage for credence activities.

Medical service activities: Practice capabilities and customer retention

No one disputes the importance of services with credence qualities in medical service—hence the widespread credentials and licenses required to practice. The importance of services with search qualities in medical services is traditionally ignored for the same reason. The existence of medical services with experience qualities is acknowledged but not widely investigated, in part because it may suggest a diminished emphasis on the credence qualities of the service. Consequently, the practice capabilities needed to deliver medical services with experience qualities and the performance implications of these capabilities is not as fully developed as in service firms in general. Therefore, we first review the relationship between firm capabilities and customer retention for performance of service firms in general.

It has been widely argued that, due to the greater uncertainty of buying business services compared to business products, it is very

important to leverage the benefits of building customer loyalty (Reichheld, 1993; Reichheld and Sasser, 1990; Zeithaml, Parasuraman, and Berry, 1990; Zeithaml and Parasuraman, 1985). Heskett, Sasser, and Hart (1990) argue that for a number of reasons related to the uncertainty of the quality of the service repeat customers are lower-cost customers and they generate higher revenues per customer. The factors causing lower costs for repeat customers include: (1) the start-up costs of getting a customer to try the service are no longer present; (2) the costs of educating the customer about how to use the service are no longer necessary; and (3) loyal customers are more vocal about telling others about their 'love affair' with the service, so marketing expenses are lower. Similarly, greater revenues from repeat customers are attributable to: (1) the repeat service customer is accustomed to using the service and will use it more often, thus generating more revenue; and (2) the repeat customer will pay a price premium to use a service, because the benefits are well known and understood (Reichheld and Sasser, 1990). There is evidence to support the benefits of repeat customers for both lower cost and higher revenue per customer transaction in numerous industries including auto service, financial service, industrial distribution, office building management, and software (Reichheld and Sasser, 1990).

While the above evidence suggests that repeat customers can improve firm performance, almost all the industries examined mainly provide services dominated by either *experience* or *search* qualities. Little evidence exists concerning the relationship between customer retention and firm performance where the firm's services are dominated by *credence* qualities. This omission is important for two reasons. First, by not examining services with predominantly *credence* qualities, a large number of industries in which *credence* activities are crucial have been ignored (Bowen and Jones, 1986). Medical services is one of those industries. Second, the findings from services with primarily *experience* and *search* activities may not apply to activities with *credence* qualities. There may be different effects on costs and revenues for medical services than for services in which *credence* qualities are not present. For example, rather than experience making repeat clients *less costly* to serve, it is possible that repeat clients may demand *more complex combi-*

nations of services that require customization. Essentially, *expense per transaction* could increase for repeat clients. From the point of view of the medical practice, one wants to know whether repeat clients pay for this increased customization if it occurs, and whether the *revenue per transaction* exceeds the *expense per transaction* for repeat clients more than for new clients.

While the *credence* activities in medical services may be critical to the success of firms in the industry, that is not to say that the medical services industry does not provide activities that also display *experience* and *search* characteristics. In fact for some activities, *credence* qualities combine with *experience* or *search* qualities to jointly impact customer retention and firm performance. *Preventive care*, which includes services such as annual physicals and immunizations, is one of these activities. Since it is generally difficult to determine whether the doctor's physical examination was proper and adequate, it is impossible for a client to judge the quality of the service even after the examination (e.g., were all those tests really necessary?). Thus, *preventive care* contains credence qualities. Yet, factors such as the speed, friendliness, and ability of the doctor to educate the client also determine the successful delivery of preventive care. Hence, *preventive care* also contains experience qualities.

While some activities contain both credence and experience characteristics, one can also think of some activities with *credence qualities* which would not be augmented by *experience qualities*. For a specialized service such as a surgery, the *credence qualities* might be so strong due to the irreversibility of the procedure as to make *experience qualities* of the service much less important. What exists in medical services, then, is a full range of activities. Some activities exhibit primarily *credence, experience*, or *search* characteristics; while other activities contain some combination of characteristics. We label this latter set of activities intermediate activities. This range of activities in medical services can be represented as a continuum, with activities represented by perfectly symmetric information at one end of the spectrum and activities with perfectly asymmetric information on the other (Figure 1). Also included in Figure 1 is a summary of this paper's hypotheses. Detailed discussion of these hypotheses is presented in the following section.
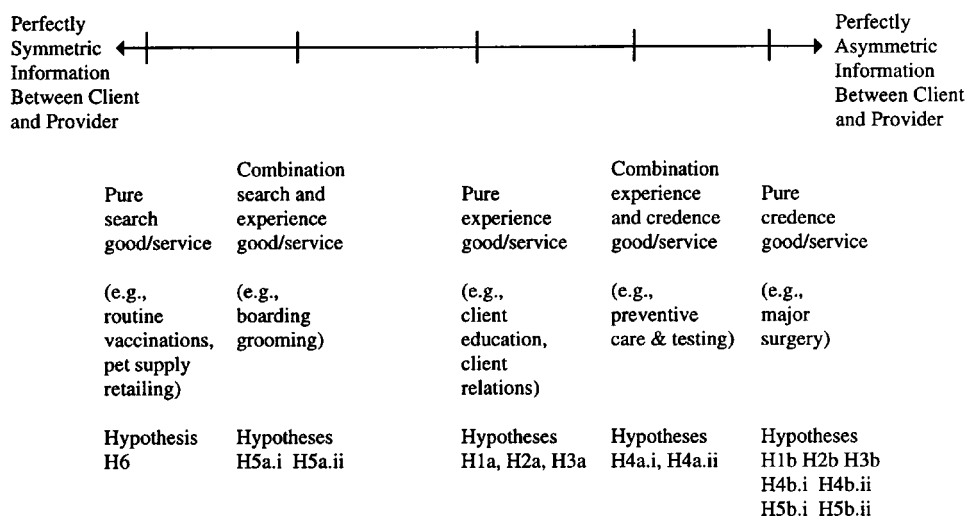
Figure 1.　Diagram of symmetric/asymmetric information continuum and hypotheses

A number of questions are left unanswered, then, concerning customer retention and firm performance. For example, researchers have generally not investigated whether there are benefits of repeat customers in service industries that are selected to contain both credence and experience qualities (Reichheld and Sasser, 1990). If firms can develop capabilities to retain customers in services with experience qualities can they also do so when the service includes credence qualities? In addition, while Reichheld and Sasser (1990) showed that repeat and new customers have different revenues and costs *within* an organization for services with experience qualities, are there differences in performance *between* firms in the same industry based on their ability to retain clients? We also do not know whether experience activities interact with other credence and search activities to improve performance.

Hypothesis development for the CAVM industry

While the classification of activities in Table 1 provides useful information for firms attempting to develop a competitive advantage in the delivery of these different services, it does not answer the question of contingency. Which services are offered and which drivers of competitive advantage are important for their delivery? To answer this we must state two conditions for service to contribute to performance in medical practices: first the service must be offered, and second the

practices must develop the required drivers of competitive advantage for these services. We will discuss each type of generic service with respect to these two conditions. For each service we try to incorporate the means of operationalizing these conditions in different ways.

Experience activities: Doctor/client (patient) relations

Activities here include efforts directed towards developing a strong doctor/client or practice/client bond. This includes recognizing the importance of communicating to the client the best way to take care of a sick pet, and of educating clients about maintaining a healthy pet. In addition, organizational routines encouraging activities such as referral thank-you cards, new client welcome letters and the like are key to building trust and depend on the knowledge, cooperation and efforts of the entire staff (Lofflin, 1992). As in the previous category, the intangible nature of these services precludes the owner of the pet from evaluating the services beforehand. Rather, the client evaluates these activities as they are being received by the pet, and after the service is completed. In this regard, these activities have experience qualities, because signals conveyed during the service are indications of the quality of the service. These activities require a somewhat personalized approach by the provider, thus negating the opportunity to achieve significant scale economies and the possibility

that these activities could have significant search qualities.

To investigate whether activities with *experience qualities* are important in CAVM, we want to examine whether client loyalty, and activities which may contribute to client loyalty, are associated with the profitability of practices. This largely derives from whether the practice has developed capabilities such as the staff's ability to respond to diverse client needs. These capabilities may be important for translating the often difficult-to-observe quality of medical service into a tangible and valued service by the client which then increases customer retention. We are unable to measure capabilities such as this directly. Therefore, we will examine whether the outcome of these activities, i.e., client retention, differentiates between the performance of different CAVM practices (Reichheld and Sasser, 1990; Tumblin and Wutchiett, 1996). We infer, then, that these performance differences, if they exist, are due to capabilities within the veterinary practice that might affect client retention despite the importance of services with credence qualities (Meyers, 1997). In the first hypothesis, we expect the experience quality of the doctor/client relationship to increase the money that each repeat client spends per transaction. This occurs because the client understands the service and the value of the service. New clients, on the other hand, are uncertain as to the value of the service and avoid risk by spending less.

Hypothesis 1a: An increase in the proportion of Repeat Clients *will increase* Revenue per transaction.

New Clients are more expensive to attract—through advertising, coupons, or promotions. In contrast, repeat clients are more likely to spread the good news about the practice through word of mouth and thereby attract clients at low cost. Once new clients come to the veterinary service provider, they are more expensive to administer. New client accounts must be opened, records and files must be transferred and updated. In addition, new clients must be educated about the process both in the practice and for making reservations, as well as for particular questions concerning their pet. There is likely to be a greater number of unanswered questions at first visits, and this results in a longer visit and more time required of both the veterinarian and staff.

Hypothesis 2a: An increase in the proportion of Repeat Clients *will decrease* Expense per transaction.

If Hypotheses 1a and 2a were both supported, with the client retention rate found to increase revenues and decrease costs, then practice capabilities aimed at retaining clients would be considered valuable in the sense of Barney (1991). On the other hand, if the client retention rate were found to have the opposite effects, i.e., decrease revenues and increase costs, then client-retaining capabilities would be harmful, not valuable. But what if client retention rate had mixed effects on revenues and costs, e.g., helping revenues but hurting costs, or vice versa? In that case, would client-retaining capabilities be valuable in the sense of Barney (1991)? It depends on the net effect of the client retention rate on profit margins. Therefore, we investigate the effect of client retention on performance as indicated by the Revenue/Expense ratio in the following hypothesis.

Hypothesis 3a: An increase in the proportion of Repeat Clients *will increase the* Revenue/ Expense *ratio.*

Credence activities: Core veterinary activities

Core veterinary activities include services such as testing to gather information on the patient, diagnosing the problem and performing treatment in specialized areas such as oncology, ophthalmology, or soft tissue surgery. For these services, the specialized knowledge needed to perform the activity makes it difficult for the client to fully evaluate the service quality, since he or she is unfamiliar with the intricacies of the activity performed. Furthermore, since the procedure is performed on the animal, direct evaluation of the service by the pet owner is even more difficult than for typical credence goods.

For these activities, credence qualities are the dominant method in which consumers evaluate service quality. The veterinarian's Doctor of Veterinary Medicine (DVM) degree is key in signaling information to purchasers concerning the service provider's knowledge, reputation, and service quality (Nayyar, 1990). In addition, the specialized nature of these activities suggests a relative insensitivity to scale economies. Thus, for core veterinary activities, it appears that pro-

fessional resources provide the dominant source of competitive advantage. Since every practice has a veterinarian with a licensed degree we are unable to differentiate between practices with subtle differences in this difficult-to-observe characteristic. However, in our Competitive Dynamics section that is discussed later in the paper, we are able to investigate what happens when independent veterinarians compete with practices staffed by DVMs whose 'credentials' in veterinary medicine may be perceived by clients to be of a lower quality.

Credence activities with experience qualities: Preventive care

In addition to activities that can be classified as having primarily experience, search, or credence characteristics, some intermediate activities display a combination of qualities. Preventive care is one of these activities. Practices which participate in a preventive care approach to veterinary medicine are concerned with diseases in the population of pets as well as with routines known as Programmatic Early Detection of Diseases. These routines might involve more testing and lab work, either in terms of inside lab supplies or outside lab work for these practices than for other practices (Metzger, 1996, 1997). For all animals this would involve early disease detection tests for intestinal parasites or heartworm and annual exams which would help to identify diseases before they are serious. This early detection may allow the veterinarians to treat diseases before they become serious as well as improve the prospects for curing a disease. A follow-up after annual exams might include additional diagnostic tests such as urinalysis or chest X-rays. Programs for early detection are particularly important for older animals. Some practices will routinely generate a Geriatric Profile of older animals which might include at least 15 tests (Metzger, 1997). Among other things these tests check liver and kidney function, the level of blood glucose (an indicator of diabetes), the level of calcium (an indicator of cancer) or the level of electrolytes (an indicator of adrenal disease).[1] Additional test-

ing for some practices engaging in preventive medicine might also include Pre-Surgical Profiles to determine whether animals may have liver or kidney diseases which might make them vulnerable to surgery or anesthetics (Metzger, 1996). Finally, some practices have management information systems which will cross-reference the age of the pet with the likely tests which are necessary for possible tests which might provide early detection of diseases.

As a result of these tests associated with early detection, practices which engage in a high degree of this testing might be considered as engaged in a preventive medicine approach (Metzger, 1996). We measure this tendency as practices with a high level of outside lab expenditures and inside lab supplies per transaction (*Lab Services/Transaction*).[2] Lab expenditures are necessary to diagnose and anticipate the problems that might adversely affect the long-term well-being of pets. This testing is indicative of a practice which seeks to manage the ongoing health of the animals in its care rather than react to problems once they occur at a more advanced and critical stage. There may be a direct effect between the degree that a practice pursues preventive medicine and its revenues, expenses, and revenue/expense ratio. However, we have no direct measure of the driver of competitive advantage for offering this service with credence qualities, i.e., knowledge of preventive medicine procedures. Hypotheses 4a.i suggests that practices which pursue preventive medicine approaches (*Lab Services/Transaction*), and apparently have the resources necessary to provide a service with these credence qualities, are more profitable. We would consider this a test of the direct effect of the credence qualities of the preventive care on performance. It is also necessary to include this direct effect to investigate interaction effects with preventive care (Pindyck and Rubinfeld, 1981).

Hypothesis 4a.i: An increase in Lab Services/Transaction *(an indicator of a preventive medicine approach) will increase the* Revenue/Expense *ratio.*

---

[1] We would like to thank Dr. Richard Goebel, Director of the Purdue University Veterinary Teaching Hospital for this abbreviated list of tests associated with Early Disease detection.

[2] Dr. Robert Froehlich, Director of Hospitals and Management Group for the American Animal Hospital Association suggests that expenditures on lab work per transaction is a good indicator of the degree to which veterinary practices pursue a preventive medicine or early disease detection approach to their patients.

While the specialized knowledge of the veterinarian may play an important role in the delivery of this service, the effective delivery of this activity also depends on the service orientation of the entire staff. Information systems that provide the practice with detailed patient histories enhance the communication ability between client and provider and facilitate the perception of effectiveness and competence. In addition, they may prompt the staff to suggest tests for preventable diseases and complement the routine programs for detection. The existence of these capabilities reinforces the ability of the practice to use a preventive approach which should have greater impact on increasing loyalty and revenues from *Repeat Clients*. Loyal customers' costs are decreased because the education they have received over time allows them to more knowledgeably administer their own treatment when possible (Meyers, 1997). Therefore, they see the value to themselves from the preventive approach of the practice and are willing to pay more or buy more services when they do go to the veterinarian. In addition, because of the knowledge of these *Repeat Clients*, it costs less for the practice to service them. Thus there are effects of preventive medicine which interact with the presence of *Repeat Clients* for both the *Revenue/Transaction* ratio and *Expense/Transaction* ratio.

We hypothesize in Hypothesis 4a.ii that there will be an interaction between a service with credence qualities (knowledge of preventive medicine) and the services with experience qualities (delivery of preventive medicine) and that these effects will jointly increase the *Revenue/Expense* ratio of practices.

> *Hypothesis 4a.ii: An increase in* Lab Services/Transaction *(an indicator of a preventive medicine approach) will positively moderate the relationship between the proportion of* Repeat Clients *and the* Revenue/Expense *ratio.*

Complex search activities with experience qualities: Ancillary services

Included in this intermediate category are activities such as behavior training, animal boarding, and dog grooming. Although these ancillary activities provide an opportunity for standardization (e.g., animal boarding), the idiosyncratic nature of the pet for which the service is being performed requires that each singular activity be specialized to some extent. This need to provide a specialized service precludes scale effects as the sole competitive driver of these *complex search activities*. However, while specialization is somewhat necessary, the performance of these activities does not rely heavily on the professional knowledge of the veterinarian. There are also opportunities for leveraging capabilities in the veterinary practice to the ancillary activities, such as boarding, by requiring routine vaccinations for all boarded animals, and thereby guaranteeing a safer boarding experience. This is effectively what Nayyar (1990, 1992) called client-based diversification. The practice can generate additional revenues per transaction from providing this additional service to its clients and it may also have lower costs per transaction to provide this service than other stand alone providers.

In Hypothesis 5a.i we hypothesize that the practices with the scale and staff resources to offer this service with search qualities will have a higher level of performance.

> *Hypothesis 5a.i: Practices which offer* Boarding Services *will have a higher* Revenue/Expense *ratio.*

Likewise, a well-run boarding facility can also provide a powerful signal of the quality of services in the veterinary practice in general. While the intangible nature of some of these services makes it more difficult to assess the quality of the these activities, they still are more tangible than many other veterinary services. For example, the effectiveness of behavior training is readily apparent to the customer, as is the appearance of the animal after grooming. The experience qualities that a buyer uses to evaluate the service include the satisfaction with the service, level of comfort with the service provider, attitude toward the animal, and attention to its needs. These are many of the same experience qualities that the client might look for in other veterinary services.

Just as in Hypothesis 4a.ii we hypothesize that the presence in the practice of services with complex search qualities, such as *Boarding Services*, may interact with the proportion of *Repeat Clients* to jointly increase the *Revenue/Expense* ratio of practices.

> *Hypothesis 5a.ii: An increase in* Boarding

Services *will positively moderate the relationship between the proportion of* Repeat Clients *and the* Revenue/Expense *ratio.*

Search activities: Routine care, retailing

Veterinary care activities also include common services such as new pet vaccinations, and spays and neuters. Due to the fairly routine nature of these activities, they are rapidly becoming more of a commodity in the eyes of consumers. Similarly, veterinary practices have routinely offered an assortment of items such as supplies and premium pet foods. While a veterinarian's recommendation can influence buyers, these are tangible goods whose attributes are readily determined prior to purchase. For these shopping goods, search qualities dominate the purchase experience. For these activities the service is evaluated in terms of easily obtained information on service cost, speed, and convenience (Darby and Karni, 1973). Search qualities are the predominant activity used to evaluate service quality. Therefore we do not expect advantages for practices oriented to repeat clients with this type of service.

For both routine care and retailing, competitive advantage is primarily achieved through a competitive service cost. Thus, market scale becomes the dominant source of competitive advantage for delivering these services. We do not have independent measures of the presence of retailing and routine medical care but instead assume that all practices engage in these activities to some degree. We would also assume that larger practices would have competitive advantages in providing these services with search qualities. If these services are an important source of competitive advantage for independent veterinary practices we would expect a direct effect of total transactions, or scale, on the *Revenue/Expense* ratio.

Hypothesis 6: An increase in scale, or total transactions, will increase the Revenue/Expense *ratio.*

COMPETITIVE DYNAMICS

The resources to deliver services with credence quality in independent veterinary practices are difficult to distinguish by clients (and researchers). One way to identify their effect is through an experiment in which competition includes competitors whose levels of these resources are questionable. If activities linked to credence qualities are especially important in such a highly competitive context, we would infer that they are important because the value of these resources has increased due to their scarcity relative to competitors. The process of entry and consolidation in a previously fragmented industry structure may reveal the sources of competitive advantage and underlying resources among successful independent practices (Lewis and Thomas, 1990). The returns based on these resources among independent veterinary practices is therefore associated with either scare resources of difficult-to-imitate characteristics that could be thought of as capabilities (Henderson and Cockburn, 1994).

The CAVM industry represents a good context to examine this issue. Specifically, CAVM is currently undergoing dramatic changes from the entry of new practices that are parts of large, multiple-practice chains. Some chains such as Veterinary Centers of America (VCA) are consolidating existing practices and attempting to standardize some parts of service delivery to gain economies of purchasing and marketing. Others, such as VetSmart, are also linking the delivery of veterinary medicine to pet supply superstore chains such as PETsMART to provide one-stop veterinary services and pet supply shopping for pet owners. Because of their markets scale advantages, the chains have been particularly successful in providing activities where search qualities dominate and the competitive advantage stems from volume—that is, retailing and routine veterinary care (Balter et al., 1994; Lofflin, 1994a, 1994b).

While the large chains are clearly a significant threat to independent veterinarians, additional evidence from other medical service industries suggests that the independents are not without options in formulating a competitive response (Klooz, 1993). Specifically, both the optometry and dentistry industries have experienced industry consolidation by large chains long before CAVM. However, recognizing that the large chains possessed sizeable scale advantages, the independent optometrists and dentists fought back by emphasizing the development of capabilities in areas

where they possessed a competitive advantage (Sabol, 1984; Schwartz, 1985; Sposato and Bennett 1985; Bennett, 1987, 1992; Herrin, 1993a, 1993b, 1993c, 1993d; Hubsch, 1992). They concentrated on core medical activities, personalizing service delivery and creating a strong doctor/patient bond. Thus, in both optometry and dentistry the independents have been able to successfully compete by developing capabilities in activities in which experience and credence qualities are important (Gerber, 1983; Wood, 1995).

We therefore seek to determine whether activities involving credence qualities, or interactions of credence and experience qualities, are more important for the performance of practices that are facing immediate and intense competitive challenges from entrants who might lack resources needed to deliver these services. While the new entrants clearly have scale advantages, evidence from the American Animal Hospital Association reveals that less than 10 percent of pet owners view price as an important factor in choosing veterinary services. Further, 70 percent of pet owners stated that they are much less likely to use veterinary services at pet superstores than at their independent veterinarians (American Animal Hospital Association, 1995). Thus, the credence qualities of the service provided by the new entrants is most suspect, in part due to the large-scale format. Clients might ask themselves, 'Are DVMs that work for these new delivery formats really as qualified as independent veterinarians?' In addition, the capability to deliver services with both experience and credence qualities may have yet to be developed by the large chains. It is precisely these services for which independent veterinarians may have latent or developed capabilities for delivering. We test whether these services associated with experience qualities become more important for veterinarians when faced with this new type of competition. In other words, is client retention, and the capabilities which support it, even more important in this context (Becker, 1993; Dooley, 1994)?

In Hypotheses 1a through 5a, we argue that benefits accrue to all independent veterinarians who develop the capabilities necessary to provide service expertise in areas where experience and credence qualities dominate. These activities can increase customer retention and improve performance. However, we also believe that the urgency of the development of these capabilities is more

critical, and their impact more pronounced, for those independent veterinarian practices facing an immediate competitive threat from the large pet franchisers.

For this experiment, we contrast the Far West region with the other regions, because the PETs-MART chains have become established in that region before other regions (PETsMART Inc., 1993a, 1993b). By fiscal year end PETsMART had installed 37 out of 106 superstores, or 35 percent in the three state regions comprising the Far West: California, Nevada, and Arizona (PETsMART Inc., 1993a: 22). In addition, VCA had 17 out of 27 franchised animal hospitals in these three states (Veterinary Centers of America, 1993).

A preliminary look at the descriptive statistics for this region suggests that both *Expense/Transaction* and *Revenue/Transaction* are higher in the Far West region than in all regions (see Table 2). *Revenue/Expense* is also higher than the average for all regions. The effect of competition from franchisers may not necessarily reduce performance of these practices but may be pushing them to compete in different ways nonetheless. For example, the *Lab Services/ Transaction* in the Far West region is quite a bit higher in this region, which may mean that practices are competing more through offering preventive medicine approaches. Indeed, in the Far West region the correlation between *Revenue/Expense* and *Lab Services/Transactions* is almost double that for all regions (Table 3). A greater urban population in the Far West region may cause some of the expenses and prices to be higher in this region, and may also cause a demand for additional services. On the other hand, these differences in demographics may also be causing the franchisers to start in this area which focuses competition on delivering the services demanded by these demographics. In either case, if the competitive strategies are different for these practices, it may be possible that practice capabilities are an important component in delivering the services required for these competitive strategies.

Since the large franchisers have established a competitive presence most in the Far West, we compare the Far West region to other regions for each of the Hypotheses 1 through 5.

Hypothesis 1b: An increase in the proportion of Repeat Clients *will increase* Revenue per

Table 2.   Descriptive statistics

Variable	N	Mean	S.D.	Minimum	Maximum
All regions					
Revenue/Transaction	717	49.328	20.917	11.471	250.944
Expense/Transaction	717	44.536	18.930	12.024	252.630
Revenue/Expense	717	1.130	0.241	0.512	2.268
Repeat Client/Transaction	717	0.933	0.047	0.500	0.986
Transactions	717	3739.510	2081.590	653.000	16003.000
Boarding Services	717	0.635	0.482	0	1.000
Lab Services/Transaction	717	1.475	1.035	0	8.083
Repeat Client Proportion Boarding Services	717	0.593	0.452	0	0.983
Repeat Client Proportion Lab Services/Transaction	717	1.357	0.892	0	6.293
Far West	717	0.110	0.313	0	1.000
Far West region					
Revenue/Transaction	79	59.25	25.357	20.022	162.918
Expense/Transaction	79	51.58	23.322	22.470	162.469
Revenue/Expense	79	1.20	0.315	0.512	2.268
Repeat Client/Transaction	79	0.927	0.029	0.833	0.983
Transactions	79	3473.82	1796.78	807	7199
Boarding Services	79	0.544	0.501	0	1
Lab Services/Transaction	79	1.661	1.080	0.126	5.807
Repeat Client Proportion Boarding Services	79	0.502	0.463	0	0.983
Repeat Client Proportion Lab Services/Transaction	79	1.533	0.984	0.114	5.351

transaction *more for veterinary practices in the Far West than in other regions.*

Hypothesis 2b: An increase in the proportion of Repeat Clients *will decrease* Expense per transaction *more for veterinary practices in the Far West than in other regions.*

Hypothesis 3b: An increase in the proportion of Repeat Clients *will increase the* Revenue/Expense *ratio more for veterinary practices in the Far West than in other regions.*

Hypothesis 4b.i: An increase in Lab Services/Transaction *will increase the* Revenue/Expense *ratio more for veterinary practices in the Far West than in other regions.*

Hypothesis 4b.ii: An increase in Lab Services/Transaction *will positively moderate the relationship between the proportion of* Repeat Clients *and the* Revenue/Expense *ratio*

more for veterinary practices in the Far West than in other regions.

Hypothesis 5b.i: An increase in Boarding Services *will increase the* Revenue/Expense *ratio more for veterinary practices in the Far West than in other regions.*

Hypothesis 5b.ii: An increase in Boarding Services *will positively moderate the relationship between the proportion of* Repeat Clients *and the* Revenue/Expense *ratio more for veterinary practices in the Far West than in other regions.*

METHOD

First we derive the total revenue and total cost function. Both costs and revenues are primarily a function of total transactions to an elasticity which allows scale benefits from these transactions. We also have terms which allow this elasticity to be a variable. In other words, the

Table 3.   Pearson correlation coefficients (probabilities in parentheses)

Variable	Revenue/ Transaction	Expense/ Transaction	Revenue/ Expense	Repeat Client/ Transactions	Transactions	Boarding Services	Lab Services/ Transaction	Repeat Client · Boarding Services	Repeat Client · Lab Services/ Transaction	Far West
All regions (n = 717)										
Revenue/ Transaction	1.00 (0.0)									
Expense/ Transaction	0.87 (0.00)	1.00 (0.0)								
Revenue/ Expense	0.25 (0.00)	−0.22 (0.00)	1.00 (0.0)							
Repeat Client/ Transaction	−0.62 (0.00)	−0.65 (0.00)	0.05 (0.21)	1.00 (0.0)						
Transactions	−0.18 (0.00)	−0.13 (0.00)	−0.11 (0.00)	0.06 (0.14)	1.00 (0.0)					
Boarding Services	−0.28 (0.00)	−0.14 (0.00)	−0.27 (0.00)	0.08 (0.04)	0.06 (0.12)	1.00 (0.0)				
Lab Services/ Transaction	0.58 (0.00)	0.54 (0.00)	0.05 (0.16)	−0.38 (0.00)	−0.10 (0.01)	−0.20 (0.00)	1.00 (0.0)			
Repeat Client Proportion · Boarding Services	−0.29 (0.00)	−0.15 (0.00)	−0.27 (0.00)	0.11 (0.00)	0.05 (0.14)	0.99 (0.00)	−0.21 (0.00)	1.00 (0.00)		
Repeat Client Proportion · Lab Services/ Transaction	0.468 (0.00)	0.428 (0.00)	0.064 (0.09)	−0.20 (0.00)	−0.10 (0.01)	−0.20 (0.00)	0.97 (0.00)	−0.20 (0.00)	1.00 (0.00)	
Far West	0.17 (0.00)	0.13 (0.00)	0.10 (0.01)	−0.04 (0.26)	−0.04 (0.23)	−0.07 (0.08)	0.06 (0.09)	−0.07 (0.06)	0.07 (0.06)	1.00 (0.0)
Far West (*n* = 79)										
Revenue/ Transaction	1.0 (0.0)									
Expense/ Transaction	0.82 (0.00)	1.0 (0.0)								
Revenue/ Expense	0.16 (0.16)	−0.38 (0.00)	1.0 (0.0)							
Repeat Client/ Transaction	−0.38 (0.00)	−0.54 (0.00)	0.23 (0.04)	1.0 (0.0)						
Transactions	−0.31 (0.01)	−0.33 (0.00)	0.01 (0.92)	0.03 (0.76)	1.0 (0.0)					
Boarding Services	−0.18 (0.12)	0.05 (0.67)	−0.36 (0.00)	−0.17 (0.13)	0.06 (0.62)	1.0 (0.0)				
Lab Services/ Transaction	0.38 (0.00)	0.29 (0.01)	0.09 (0.43)	−0.21 (0.06)	0.13 (0.24)	0.02 (0.84)	1.0 (0.0)			
Repeat Client · Boarding Services	−0.18 (0.11)	0.04 (0.75)	−0.35 (0.00)	−0.13 (0.24)	0.06 (0.59)	0.99 (0.00)	0.02 (0.87)	1.0 (0.00)		
Repeat Client Proportion · Lab Services	0.36 (0.00)	0.26 (0.02)	0.11 (0.35)	−0.17 (0.14)	0.14 (0.22)	0.02 (0.87)	0.99 (0.00)	0.02 (0.88)	1.0 (0.0)	

benefits of scale in transaction are a function of the type of transaction. For example, in Models 1′, 2′, and 3′ this is a function of a constant term and the *Repeat Client Proportion*. The term based on the proportion of repeat clients in the practice is used to allow for a different revenue and cost elasticity for firms as the proportion of repeat clients changes. This functional form allows us to interpret coefficients as elasticities and to estimate a linear model after taking logs later. Key variables are defined below and Models 1 and 2 are derived from them.

Revenue = Total Fees for Services per quarter
Expense = Total Expense for Professional Services per quarter
Transactions = Transactions per quarter, or client visits

New Clients = Number of new clients per quarter

Repeat Clients = Transactions – New Clients

Repeat Client Proportion = Repeat Client/Transactions

Model 1′) *Revenue* = $\alpha_0 \cdot$ *Transactions* $^{\alpha} \cdot \epsilon$ where $\alpha = \alpha_1 + \alpha_2$ *Repeat Client Proportion*

Model 2′) *Expense* = $\beta_0 \cdot$ *Transactions* $^{\beta} \cdot \epsilon$, where $\beta = \beta_1 + \beta_2$ *Repeat Client Proportion*

By dividing both sides by *Transactions* we are able to estimate the relationship as an average cost and average revenue curve. We are primarily interested in the change in average cost and average revenue with changes in the repeat client proportion.

Model 1″: *Revenue/Transactions* = $\alpha_0 \cdot$ *Transactions* $^{\alpha-1} \cdot \epsilon$

Model 2″: *Expense/Transactions* = $\beta_0 \cdot$ *Transactions* $^{\beta-1} \cdot \epsilon$

This functional form allows us to estimate a linear model after transformation. To derive the estimated equations, Models 1 and 2, we take the natural log of both sides and estimate α_0, β_0, α_1, β_1, α_2, and β_2 using OLS regression (see Table 4 for explanations of variables associated with estimated coefficients). For example, Models 1″, 2″ can be rewritten as Model 1, and Model 2, which will be the form in which the equations are estimated.

Model 1: ln (*Revenue/Transactions*) = ln $\alpha_0 + (\alpha - 1)$ ln (*Transactions*) + ln ϵ, where $\alpha = a_1 + \alpha_2$ *Repeat Client Proportion*
=ln $\alpha_0 + (\alpha_1 + \alpha_2$ *Repeat Client Proportion* $-1) \cdot$ ln (*Transactions*) + ln ϵ
=ln $\alpha_0 + (\alpha_1 - 1)$ ln (*Transactions*) + α_2 (*Repeat Client Proportion*)· ln (*Transactions*) + ln ϵ

Model 2: ln (*Expense/Transactions*) = ln $\beta_0 + (\beta_1 - 1)$ ln (*Transactions*) + β_2 (*Repeat Client Proportion*) $\cdot$ ln (*Transactions*) + ln ϵ

From Model 1, the elasticity of *Revenue/ Transaction* with respect to *Transactions* is the derivative d ln (*Revenue/ Transactions*)/d ln *Transactions*. It can be shown that this is equal to $(\alpha_1 - 1) + \alpha_2$ (*Repeat Client Proportion*) $(1 - \alpha_2$ ln (*Transactions*)).[3] Evaluated at the average value

of *Repeat Client Proportion* which is 0.93 and the average value of *Transactions* which is 3739, therefore, the total effect of a 1 percent increase in *Transactions* will be a $((\alpha_1 - 1) + (\alpha_2 \cdot 0.93)(1 - \alpha_2 \cdot 8.23)$ percent change in *Revenue/Transaction*. Similarly, the elasticity with respect to *Repeat Client Proportion* will be α_2 ln (*Transactions*). Evaluated at the mean of *Transactions*, a 1 percent increase in *Repeat Client Proportion* will increase *Revenue/Transactions* by $(\alpha_2 \cdot 8.23)$ percent. A similar elasticity with respect to *Transactions* and with respect to *Repeat Client Proportion* can be calculated for the *Expense/Transaction* equation to determine the percent change in *Expense/Transaction* with a 1 percent change in *Transactions* or a 1 percent change in *Repeat Client Proportion*.

Model 3 allows us to test for the difference between α_1 and β_1 and between α_2 and β_2 as can be seen by dividing Model 1″ by Model 2″ to get Model 3″.

Model 3″: *Revenue/Expense* = $\alpha_0 \cdot$ *Transactions* $^{(\alpha - \beta)} \cdot \epsilon$, where
$\alpha = \alpha_1 + \alpha_2$ *Repeat Client Proportion*
$\beta = \beta_1 + \beta_2$ *Repeat Client Proportion*

---

[3] Elasticity of *Revenue/Transactions* with respect to *Transactions* is d ln (*Revenue/Transactions*)/d ln *Transactions*. Since equation 1 is ln *Revenue/Transactions*

= ln $\alpha_0 + (\alpha_1 - 1)$ ln (*Transactions*) + α_2 (*Repeat Client Proportion*) $\cdot$ ln (*Transactions*) + ln ϵ

Therefore d ln (*Revenue/Transactions*)/d ln *Transactions*

= $(\alpha_1 - 1) + \alpha_2$ (*Repeat Client Proportion*) + ln *Transaction* $\cdot \alpha_2 \cdot$ d *Repeat Client Proportion*/d *Transactions* $\cdot$ d *Transactions*/d ln (*Transactions*)   (a)

Since *Repeat Client Proportion* = *Repeat Client/Transactions* and d *Repeat Client Proportion*/d *Transactions* = d (*Repeat Client/Transactions*)/d *Transactions*

= -1/*Transactions*$^2 \cdot$ *Repeat Client*   (b)

and since d *Transactions*/d ln (*Transactions*)

= 1/*Transactions* therefore d ln *Transactions*/d *Transactions*)
= *Transactions*   (c)

Then by substituting equation (b) and (c) into (a), d ln (*Revenue/Transactions*)/d ln *Transactions*

= $(\alpha_1 - 1) + \alpha_2$ (*Repeat Client Proportion*) + α_2 ln (*Transactions*) $\cdot (-$ *Repeat Client/Transactions*$^2) \cdot$ *Transactions*
= $(\alpha_1 - 1) + \alpha_2$ (*Repeat Client Proportion*) + α_2 ln (*Transactions*) $\cdot (-$ *Repeat Client Proportion*)
= $(\alpha_1 - 1) + \alpha_2$ (*Repeat Client Proportion*) $(1 - \alpha_2$ ln (*Transactions*)).

Table 4. Estimates of Revenue/Transaction, Expense/Transaction, and Revenue/Expense for veterinary practices as a function of proportion of repeat customers and interactions with on-premises boarding services and preventive medicine practices (interactions of the above variables with the Far West region dummy are also included)

Variables:	Coefficients (models with Revenue/ Transaction)	Model 10 Revenue/ Transaction	Coefficients (models with Expense/ Transaction)	Model 11 Expense/ Transaction	Coefficients (models with Revenue/ Expense)	Model 12 Revenue/ Expense
All regions						
Constant	α_0	4.576** (0.000)	β_0	3.960** (0.000)	$\alpha_0 - \beta_0$	0.616** (0.000)
Transactions	$\alpha_1 - 1$	0.387** (0.000)	$\beta_1 - 1$	0.600** (0.001)	$\alpha_1 - \beta_1$	−0.213** (0.001)
Repeat Client Proportion	α_2	−0.530** (0.000)	β_2	−0.700** (0.000)	$\alpha_2 - \beta_2$	0.170** (0.009)
Repeat Client Proportion · Lab Services	α_3	0.055** (0.000)	β_3	0.077** (0.000)	$\alpha_3 - \beta_3$	−0.022~ (0.068)
Lab Services	α_4	−0.034* (0.021)	β_4	−0.054** (0.000)	$\alpha_4 - \beta_4$	0.020~ (0.070)
Repeat Client Proportion · Boarding Services	α_5	0.161* (0.034)	β_5	0.315** (0.000)	$\alpha_5 - \beta_5$	−0.154** (0.007)
Boarding Services	α_6	0.168* (0.018)	β_6	0.298** (0.000)	$\alpha_6 - \beta_6$	0.130** (0.014)
Far West region						
Far West	α_7	0.734* (0.02)	β_7	0.074 (0.814)	$\alpha_7 - \beta_7$	0.660** (0.005)
Far West · Repeat Client Proportion	α_8	−0.772* (0.022)	β_8	−0.058 (0.864)	$\alpha_8 - \beta_8$	−0.713** (0.005)
Far West · Repeat Client Proportion · Lab Services	α_9	−0.019 (0.900)	β_9	−0.448** (0.004)	$\alpha_9 - \beta_9$	0.428** (0.000)
Far West · Lab Services	α_{10}	0.015 (0.916)	β_{10}	−0.403** (0.005)	$\alpha_{10} - \beta_{10}$	−0.388* (0.000)
Far West · Repeat Client Proportion · Boarding Services	α_{11}	1.010** (0.000)	α_{11}	0.529~ (0.066)	$\alpha_{11} - \beta_{11}$	0.481* (0.025)
Far West · Boarding Services	α_{12}	−0.929** (0.001)	α_{12}	−0.474~ (0.076)	$\alpha_{12} - \beta_{12}$	−0.455* (0.023)
Seasonal dummies						
DumSprg	α_{02}	0.072** (0.008)	β_{02}	0.013 (0.636)	$\alpha_{02} - \beta_{02}$	0.059** (0.003)
DumSum	α_{03}	−0.006 (0.831)	β_{03}	−0.033** (0.226)	$\alpha_{03} - \beta_{03}$	0.026 (0.191)
DumFall	α_{04}	−0.037 (0.162)	β_{04}	0.081** (0.003)	$\alpha_{04} - \beta_{04}$	−0.118** (0.000)
R^2		0.485		0.452		0.226
R^2-adj.		0.474		0.440		0.210

Probabilities in parentheses for two-tailed tests.
**Significant at 99% confidence level; *significant at 95% confidence level; ~significant at 90% confidence level.

Model 3′ would also be transformed by taking the natural logarithm of both sides, and it would then take the form of Model 3—which allows us to test for whether the difference in the coefficients of $\alpha_1 - \beta_1$ and $\alpha_2 - \beta_2$ is significant. Similar derivatives can be determined for *Revenue/Expense* as for *Revenue/Transaction* and *Expense/Transaction*. A 1 percent change in *Transactions* would result in a $(\alpha_1 - \beta_1) + (\alpha_2 - \beta_2)$ (*Repeat Client Proportion*) $(1 - \alpha_2 - \beta_2)$ ln (*Transactions*)) percentage change in the *Revenue/Expense* ratio. Similarly, a 1 percent change in the *Repeat Client Proportion* would result in a $(\alpha_2 - \beta_2)$ ln (*Transactions*) percentage change in the *Revenue/Expense* ratio.

Model 3: ln (*Revenue/Expense*) = ln ($\alpha_0 - \beta_0$) + ($\alpha_1 - \beta_1$) ln (*Transections*) + ($\alpha_2 - \beta_2$) (*Repeat Client Proportion*) · ln (*Transactions*)

Models 1′–3′ (and estimated Models 1–3) represent the range of models with different dependent variables. They also test the basic model necessary to test Hypotheses 1–3. These hypotheses are concerned only with the relative effects of repeat clients. To test Hypotheses 4 and 5, additional models need to be specified which include interaction terms. For these interaction term models, we will only specify how the model which is equivalent to Model 3 would change with these interactions. Therefore we don't write out Models 4–5 and 7–8. In addition, Models 10, 11, and 12 are not written out, because they are simple combinations of earlier models.

In Hypothesis 4 we are interested to know whether the effect of the *Repeat Client Proportion* on practice profitability is different for practices using a preventive medicine approach. In Models 4–6, a variable is interacted with *Repeat Client Proportion* from Models 1–3 (Pindyck and Rubinfeld, 1981: 120). The variable reflects the expenses from outside lab fees and in-house lab supplies; this is called *Lab Services/Transaction*. This allows us to test whether the effects of *Repeat Client Proportion* differ in practices with varying use of lab services, and therefore their emphasis on preventive medicine. In addition, the *Lab Services/Transaction* is added to the equation to control for the effect of *Lab Services/Transaction* on profitability of practices that is independent of their effect through *Repeat Client Proportion*.

Lab Services/Transactions = (Expenses from outside lab fees and in-house lab supplies)/Transactions

Model 6, which has *Revenue/Expense* as the dependent variable, tests for the differences in $\alpha_3 - \beta_3$ for the effect of *Repeat Client Proportion* interacted with *Lab Services/Transactions* and $\alpha_4 - \beta_4$ for the effect of *Lab Services/Transaction* directly. In other words, for ($\alpha_3 - \beta_3$), is there a difference in the effects of *Repeat Client Proportion* on the *Revenue/Expense* ratio for practices that have high levels of *Lab Services/Transactions*? If ($\alpha_3 - \beta_3$) is significant (and positive), then it indicates that *Repeat Client Proportion* increases the *Revenue/Expense* ratio more for practices with high values of *Lab Services/Transaction*. If ($\alpha_4 - \beta_4$) is significant (and positive) then it indicates that there is a direct effect of *Lab Services/Transaction* on the *Revenue/Expense* ratio.

Similarly, in Model 6 a variable is interacted with *Repeat Client Proportion* which represents the presence of boarding at the practice, *Boarding Services*. This allows us to test Hypothesis 5, that the opportunities for cross-selling a search good with experience qualities such as *Boarding Services* to repeat clients will add to the effect of *Repeat Client Proportion* on the *Revenue/Expense* ratio.

Boarding Services = 1 if the practice includes a facility for boarding animals, 0 otherwise

Thus Model 6 estimates the difference in $\alpha_5 - \beta_5$ for *Repeat Client Proportion* interacted with *Boarding Services*. In other words, is there a difference in the effects of *Repeat Client Proportion* on the *Revenue/Expense* ratio for practices that have high levels of *Boarding Services*? If ($\alpha_5 - \beta_5$) is significant (and positive), then it indicates that an increase in the *Repeat Client Proportion* increases the *Revenue/Expense* ratio more for practices with *Boarding Services*. The difference in $\alpha_6 - \beta_6$ simply controls for a direct effect of *Boarding Services* on *Revenue/Expense*.

Model 6″: *Revenue/Expense* = α_0 *Transactions* $^{(\alpha - \beta)}$ · ϵ where
$\alpha = \alpha_1 + \alpha_2$ *Repeat Client Proportion* + α_3 *Lab Services/Transactions* + α_4 *Lab Services/Transactions* + α_5 *Repeat Client Pro-*

portion · Boarding Services + α_6 *Boarding Services*

β = β_1 + β_2 *Repeat Client Proportion* + β_3 *Lab Services/Transactions* + β_4 *Lab Services/Transactions* + β_5 *Repeat Client Proportion · Boarding Services* + β_6 *Boarding Services*

Therefore Model 6 would be written as follows:

Model 6: ln (*Revenue/Expense*) = ln (α_0 − β_0) + (α_1 − β_1) ln (*Transactions*) + (α_2 − β_2) ln (*Repeat Client Proportion*) · ln (*Transactions*) + (α_3 − β_3) *Lab Services/Transactions · Repeat Client Proportion* · ln (*Transactions*) + (α_4 − β_4) *Lab Services/Transactions* · ln (*Transactions*) + (α_5 − β_5) *Repeat Client Proportion · Boarding Services* · ln (*Transactions*) + (α_6 − β_6) *Boarding Services* · ln (*Transactions*)

Next we want to answer the question of whether the estimated effects in Models 1–6 differ in the Far West region, which is facing new forms of competition.

Far West = a dummy variable which is 1 if the practice is in the Far West region, and 0 if it is in any other region which includes Northwest, Western, Middle West, Northeast, or Southeast.

Model 9 tests for variables that cause differences in the *Revenue/Expense* ratio for practices in the Far West region. The form of Model 9 is equivalent to Model 3 with the exception that *Far West* is included as interactive variables with *Repeat Client Proportion* as well as by itself. Model 9, which has *Revenue/Expense* as the dependent variable, tests for the respective differences in α_7 − β_7 and α_8 − β_8. In other words, is there a difference in the effects of *Repeat Client Proportion* on the *Revenue/Expense* ratio for practices that are in the Far West region? If (α_7 − β_7) is significant (and positive), then it indicates that an increase in the *Repeat Client Proportion* increases the *Revenue/Expense* ratio more in the Far West region than in other regions. This change of (α_7 − β_7) in the *Far West* region will be in addition to whatever the change would be in other regions. The difference in α_8 − β_8 simply controls for whether the Far West region has a direct effect on the *Revenue/Expense* ratio. If the

mean level of *Revenue/Expense* is higher for practices in the Far West region then this difference will be positive.

Model 9″: *Revenue/Expense* = α_0 *Transactions* $^{(\alpha - \beta)}$ · ϵ, where

α = α_1 + α_2 *Repeat Client Proportion* + α_7 *Far West · Repeat Client Proportion* + α_8 *Far West*

β = β_1 + β_2 *Repeat Client Proportion* + β_7 *Far West · Repeat Client Proportion* + β_8 *Far West*

Therefore Model 9 would be written as follows:

Model 9: ln (*Revenue/Expense*) = ln (α_0 − β_0) + (α_1 − β_1) ln (*Transactions*) + (α_2 − β_2) ln (*Repeat Client Proportion*) · ln (*Transactions*) + (α_7 − β_7) *Far West · Repeat Client Proportion* · ln (*Transactions*) + (α_8 − β_8) *Far West* · ln (*Transactions*)

In Model 12″ we add interaction variables such as *Lab Services/Transaction* and *Boarding Services* to estimate whether the underlying benefits for developing practice capabilities are even greater in the Far West region. For example, in this model, α equals the following:

α = α_1 + α_2 *Repeat Client Proportion* + α_3 *Lab Services/Transactions · Repeat Client Proportion* + α_4 *Lab Services/Transactions* + α_5 *Boarding Services · Repeat Client Proportion* + α_6 *Boarding Services* + α_7 *Far West · Repeat Client Proportion* + α_8 *Far West* + α_9 *Far West · Lab Services/Transactions · Repeat Client Proportion* + α_{10} *Far West · Lab Services/Transactions* + α_{11} *Far West · Boarding Services · Repeat Client Proportion* + α_{12} *Far West · Boarding Services*

The coefficient difference α_9 − β_9 tests for the interaction of *Lab Services/Transactions* with *Repeat Client Proportion* after controlling for the difference in α_{10} − β_{10} which is the direct effect of *Lab Services/Transactions* in the Far West. The coefficient difference α_{11} − β_{11} tests for the interaction of *Boarding Services* with *Repeat Client Proportions* after controlling for α_{12} − β_{12} which is the direct effect of Boarding Services in the *Far West*. Thus we investigate Hypotheses 1–5 in the context of the Far West region to

see whether they are more strongly supported in this region.

Finally, for all models, we modify the constant term to include a dummy variable for seasonal dummies. In addition to α_0, we also estimate α_{02}, α_{03}, and α_{04} which are dummy variables with a value of 1 for spring, summer, and fall respectively and are 0 in other seasons. The excluded category is thus the first category, or winter, and all seasonal dummies estimate whether their season has a different effect than the winter quarter. It is also possible that all parameters would vary for the four seasons. We also estimate a model equivalent to Models 4–6 with dummy variables on all variables and calculate an *F*-test to determine if the quarterly data can be pooled.

DATA

To investigate these hypotheses, we use a data base collected by Practice Edge Management Report which was made available to us by the American Animal Hospital Association (AAHA). AAHA is an international association of over 12,000 veterinarians that is responsible for setting veterinary hospital standards for quality pet care and ensuring compliance with those standards. The practices that are members of AAHA tend to be well-established practices that are willing to accept minimum requirements for facilities and inspection for the AAHA certification. We received quarterly data from 1993 on 193 independent veterinary practices that are members of AAHA. None of these 193 practices are affiliated with the pet superstores. These practices reported income statements as well as information about the number of total transactions or visits and the number of new clients. We have calculated *Repeat Client Proportion* from these data in the manner explained. In addition, we used Total Fees for Services per quarter and Total Expense for Professional Services per quarter. The income statements also included information about revenues and expenses associated with *Lab Services/Transaction* such as outside lab fees paid and expenses from in-house lab supplies. Whether the practice had a facility for boarding animals was noted. Finally, the location of the practice was identified as either Far West, Northwest, Western, Middle West, Southeast or Northeast within the United States.

EMPIRICAL FINDINGS

Empirical findings for all regions

When we look at the effect of *Repeat Client Proportion* we find similar effects with respect to *Revenue/Transaction* and *Expense/Transaction*. In other words, as the *Repeat Client Proportion* increases, the *Revenue/Transaction* and *Expense/Transaction* decrease. However, the *Expense/Transaction* decreases more rapidly than the *Revenue/Transaction*, which results in a positive change in *Revenue/Expense*. Since an increase in the *Repeat Client Proportion* does not increase *Revenue/Transaction*, there is no support for Hypothesis 1a (Table 4, Model 10). This is probably because initial visits by people with puppies or kittens require a broad range of veterinary services. Unlike most consumer services, in veterinary medical services, new patients generally use a lot of services initially with a young animal. But the decrease in *Expense/Transaction* does support Hypothesis 2a (Table 4, Model 11). Here, as *the Repeat Client Proportion* increases, the *Expense/Transaction* does decrease as hypothesized. This also counters the possibility that repeat clients demand more customized, and therefore more difficult-to-deliver services, as a result of their experience with the service. Finally, there is a positive and significant increase in *Revenue/Expense* from an increase in the *Repeat Client Proportion* which is support for Hypothesis 3a ($\alpha_2 - \beta_2$, Table 4, Model 12). The estimated coefficient suggests that a 1 percent increase in *Repeat Client Proportion* increases the *Revenue/Expense* ratio by $0.17 \cdot \ln (Transactions)$ percent. This is the direct effect of an increase in *Repeat Client Proportion* and does not include its effect through other interactions. The total effect of a 1 percent change in *Repeat Client Proportion* would also include $(\alpha_3 - \beta_3) \cdot Lab\ Services/Transaction \cdot \ln (Transactions)$ as well as $(\alpha_5 - \beta_5) \cdot Boarding\ Services \cdot \ln (Transaction)$.

The magnitude of this direct and total effect can be examined further. For the average practice with *Revenue/Expense* = 1.130203 (Table 2) and transactions per quarter = 3739 (and *Repeat Client Proportion* = 0.93), the impact of the direct effect is approximately that an increase of 1 percent will increase the *Revenue/Expense* ratio by $0.17 \cdot \ln (Transactions)$ percent or $0.17 \cdot 8.2 = 1.39$ percent. This would shift the ratio from

1.1302 to 1.1459. With average costs per practice of \$161,391 per quarter, this is an increase in the revenues minus expenses of approximately \$2533 per quarter, or a profit of \$23,546 compared to \$21,013 per quarter. The interaction *with Lab Services/Transaction* would add $-0.02 \cdot Lab\ Services/Transaction \cdot \ln(Transaction) = -0.02 \cdot 1.47 \cdot 8.2 = -0.24$ percent. The interaction with *Boarding Services* would add $-0.15 \cdot 0.63 \cdot 0.82 = -0.78$ percent. Thus the total effect of a 1 percent change in *Repeat Client Proportion* would be 0.37 percent—still support for Hypotheis 3a. The total effect would shift the ratio from 1.1302 to 1.1344. This would increase revenues minus expenses by \$674 per quarter, or would result in a profit of \$21,687 compared to \$21,013 per quarter.

Hypothesis 4a.i is that there is an improvement in performance for practices offering preventive medicine. This hypothesis is weakly supported (0.07% confidence level). There is a positive effect on performance for solely offering these credence quality services ($\alpha_4 - \beta_4$, Table 4, Model 12). We also developed a Hypothesis 4a.ii that an interaction between *Lab Services/ Transaction* and the *Repeat Client Proportion* would increase the *Revenues/Expense* ratio due to preventive practices having some experience qualities. This effect of preventive practices on revenues and expenses shows a negative but only weakly significant coefficient which is counter to Hypothesis 4a.ii ($\alpha_3 - \beta_3$, Table 4, Model 12). Since the direct effect of *Lab Services/ Transaction* is of opposite sign and roughly the same magnitude as the effect for the same variable interacted with *Repeat Client Proportion* the importance of the net effect of preventive medicine does not appear to be dramatic for these practices.

Interestingly, an increase in the interaction of *Repeat Client Proportion · Lab Services/ Transaction* increases both the *Revenues/ Transaction* and *Expense/Transaction* and these effects are statistically significant (α_5, β_5, Table 4, Models 10 and 11). The combination of higher *Revenues/Transaction* and *Expense/Transaction* with an increase in the *Repeat Client Proportion* is consistent with what one would expect from a veterinary practice pursuing a preventive medicine approach. However, we hypothesized that these practices would be able to capture some of this increased value received by their repeat clients.

While practices do benefit from offering these preventive medicine approaches we do not find evidence that they captured this primarily through repeat clients.

The direct effect of practices which offer Boarding Services is to raise the *Revenue/Expense* ratio which is significant and consistent with Hypothesis 5a.i ($\alpha_6 - \beta_6$, Model 12, Table 4). We find no support for Hypothesis 5a.ii that veterinary practices with *Boarding Services* will have a higher *Revenue/Expense* ratio from an increase in the number of *Repeat Clients*. In fact, just the opposite effect seems to be the case ($\alpha_5 - \beta_5$, Model 12, Table 4). The *Revenue/Expense* ratio is lower for the interaction between *Repeat Client Proportion · Boarding Services* and the effect is significant. It appears that *Boarding Services* do not interact with the experience good aspects of practice capabilities to reinforce these capabilities.

From examination of Table 4, we can see that the average revenue and average cost curves are both increasing with respect to *Transactions*. In other words, the coefficient on *Transactions* in the *Revenue/Transaction* and *Expense/ Transaction*, $\alpha_1 - 1$ and $\beta_1 - 1$ respectively, are both positive in Model 10 and Model 11. Compared directly, in the *Revenue/Expense* equation in Model 12, for transactions in general, there is a decline in *Revenue/Expense* as transactions increase, i.e., $\alpha_1 - \beta_1$ is negative and significant with a value of -0.21 (Table 4). Thus the ratio of *Revenue/Expense* actually converges for practices as transactions increase. In other words, the direct effect of a 1 percent increase in transactions reduces *Revenue/Expense* by -0.21 percent. There are additional negative effects of transactions, and scale, which act through the other variables that complement this. In particular, the indirect effect of the next term in the elasticity of *Revenue/Expense* with respect to *Transactions* is $\alpha_2 - \beta_2$ *Repeat Client Proportion* $\cdot (1 - (\alpha_2 - \beta_2)(\ln(Transactions)))$ is such that a 1 percent change in *Transactions* has a small but negative effect of $0.17 \cdot 0.93 \cdot (1 - 0.17 (8.23)) = -0.06$ percent at the average level of 0.93 for *Repeat Client Proportion* and 8.23 for $\ln(Transactions)$ (Model 12, Table 4). The combined effect of scale for these first two parameters would thus be only -0.27 percent. Since the remaining All Region terms (all of which include $\ln(Transactions)$) have negative effects when inter-

acted with *Repeat Client Proportion* ($\alpha_3 - \beta_3$, and $\alpha_5 - \beta_5$), and small additional negative effects which don't include *Repeat Client Proportion* ($\alpha_4 - \beta_4$, $\alpha_6 - \beta_6$) there do not appear to be major benefits of scale for the primary service activities of veterinary medicine. This is counter to Hypothesis 6, which proposed that if services with search qualities were important for competitive advantage in veterinary medicine, and since scale is a driver of competitive advantage for services with search qualities, then increases in scale should increase performance. This result could be because in practices the scarce resource for scale is the DVM's time. Practices which stretch this resource too thinly might exhaust the economies of scale in the relevant range at which most practices are operating.

There is some evidence that independent veterinarians do benefit from developing practice capabilities which increase customer retention. However, the additional services that might reinforce those capabilities, such as the practice of preventive medicine and the offering of boarding services, are not empirically related to increases in the *Revenue/Expense* ratio of these practices in the direction expected. However, acting independently of the presence of repeat clients, these additional services do directly increase the *Revenue/Expense* ratio. We now empirically examine what effect these same capabilities and additional services might have for independent veterinarians who are competing in a market that is facing a threat from the large franchisers. If practice capabilities are important in general, we would especially expect them to be important in this context.

Empirical findings of differences in the Far West region

In the Far West region, *Repeat Client Proportion* is associated with a reduction of *Revenue/ Transaction*, α_1 is -0.77 (significant and rejects Hypothesis 1b). In the *Expense/Transaction* the *Repeat Client Proportion* is also associated with a reduction but to a much smaller degree, β_1 is also negative but is only -0.06 percent (significant and supports Hypothesis 2b)(see Table 4, Models 10 and 11). The net coefficient on the *Revenue/Expense* ratio, $\alpha_1 - \beta_1$, is a decline of -0.71, which is significant and does not support Hypothesis 3b (Table 4, Model 12).

Thus the size of this direct effect indicates that a 1 percent increase in *Repeat Client Proportion* will reduce the *Revenue/ Expense* ratio by (-0.71 · ln (*Transactions*)) percent = (-0.71 · 8.2) percent = 5.82 percent.

What is quite interesting is that this large negative direct effect of *Repeat Client Proportion* is substantially offset by the large positive indirect effects of *Repeat Client Proportion* interacted with *Lab Services/Transaction* and *Boarding Services*. The indirect effect for a 1 percent change in *Repeat Client Proportion* for *Lab Services/Transaction* is 0.428 · *Lab Services/ Transaction* · ln (*Transactions*) = 0.428 · 1.47 · 8.22 = 5.17 percent when evaluated at the mean value of variables. For Boarding Services the indirect effect is 0.481 · *Boarding Services* · ln (*Transactions*) = 0.428 · 0.63 · 8.22 = 2.49 percent. Clearly, the total effect for *Repeat Client Proportion* offsets the negative direct effect. All these effects are net of controls for a substantial coefficient on the Far West region in the *Revenue/Expense* equation ($\alpha_7 - \beta_7$ of 0.66 (significant) and the positive coefficient 0.17 ($\alpha_2 - \beta_2$) for Repeat Client Proportion for practices in all regions. Differences in the profitability of practices in the Far West region may be due to other factors and the Far West region dummy variable controls for a different mean of the *Revenue/Expense* ratio in this region.

The coefficient $\alpha_{10} - \beta_{10}$ is negative and significant (-0.388) and thus there is no support for a positive direct effect of *Lab Services/ Transaction* on the *Revenue/Expense* ratio (rejects Hypothesis 4b.i) (Model 12, Table 4). A 1 percent increase in *Lab Services/Transaction* decreases the *Revenue/Expense* ratio by -0.388 · ln (*Transactions*) or -3.18 percent in the Far West region. However, there is a statistically significant positive coefficient of 0.428 for the interaction of *Lab Services/Transaction* with *Repeat Client Proportion* (supports Hypothesis 4b.ii, $\alpha_9 - \beta_9$ in Model 12, Table 4). The coefficient means that a 1 percent increase in the *Lab Services/Transaction* is equivalent to an increase in the *Revenue/Expense* ratio of 0.428 · *Repeat Client Proportion* · ln (*Transaction*) percent or 0.428 · 0.93 · 8.2 = 3.26 percent due to the interaction with *Repeat Client Proportion*. This offsets the negative direct effect of a change in *Lab Services/Transaction*. The net effect of a 1 percent change in *Lab Services/Transaction* is

0.08 percent increase in the *Revenue/Expense* ratio. As noted above, the effect of a 1 percent increase in *Repeat Client Proportion* which acts through the effect on *Lab Services/Transaction* is considerably higher—a 5.17 percent effect. Thus there is considerable evidence that there is a positive effect on the interaction between practices which have a preventive medicine approach and those with higher proportions of repeat customers, which increases the *Revenue/Expense* ratio in the Far West region. This indicates that where competition from franchisers is intense the emphasis on practice capabilities that involve both experience and credence qualities becomes more important for the *Revenue/Expense* ratio than in other markets.

Practices that offer this preventive medicine approach with its credence qualities have a higher performance in the Far West and the effect is critically dependent on the presence of higher values of the *Repeat Client Proportion*. This may be interpreted as an important competitive response by practices in these regions and suggests that the franchisers may have less credibility in providing services involving credence and experience qualities. As a result, these become even more important for success among the independent practices. Even though the benefits of preventive medicine as a service with credence qualities alone is not helpful, the interaction with services that have experience qualities does improve performance.

There is no support for Hypothesis 5b.i that the presence of *Boarding Services* in the Far West will increase the *Revenue/Expense* ratio since the coefficient is actually negative (-0.46) and significant. There is support, however, for Hypothesis 5b.ii that the addition of *Boarding Services* in the Far West region improves the *Revenue/Expense* ratio from an interaction with *Repeat Client Proportion* (Table 4, Model 12). The coefficient on the interaction with *Repeat Client Proportion* ($\alpha_{11} - \beta_{11}$) is a significant and positive 0.48. Thus, while boarding does not help provide the expected link to experience goods in all regions, there is evidence that it has positive effects for the *Revenue/Expense* ratio in the Far West region. The presence of Boarding Services, as a service with search qualities, is actually negatively related to the *Revenue/Expense* ratio in the Far West, but controlling for this, boarding services still complement experience effects which are present in the Far West region.

We also tested whether it was appropriate to pool quarterly data for firms. A nested *F*-test compares Models 10–12 with models that allowed parameters to be different for the spring, summer, and fall seasons (in addition to the seasonal interactions in Models 10–12). The models with seasonal dummy variables interacted with all variables result in insignificant nested *F*-tests when compared to Models 10–12. This suggests that it is appropriate to pool the quarterly data. Table 5 presents the results for Model 12 with these interactions which we call Model 12a. One can also see from the results of Model 12a that the interpretation of coefficients for particular variables in spring, summer, and fall is not significant from the base coefficient. Thus there do not appear to be different interpretations of individual coefficients for different seasons. The coefficients on the base variables in Model 12a have the same interpretation as those for the results that are pooled across quarters. The coefficients are in some cases significant at lower confidence levels, but in every case results that were significant continue to be significant at least at the 90 percent confidence level.

DISCUSSION

Starting in the middle of the continuum between Perfectly Symmetric Information and Perfectly Asymmetric Information between Client and Provider in Figure 1, we find support that an increase in the proportion of repeat clients in all veterinary practices will improve practice performance. This means that there are differences between practices in terms of their abilities to retain clients and that this difference has strong performance implications. We interpret the source of these differences to be capabilities in that they involve complex combinations of resources in terms of client/doctor, staff/patient interactions for providing services with experience qualities (Teece *et al.*, 1997). While revenues per transaction did decline with an increase in the proportion of repeat customers, expense per transaction declined even more, which resulted in a net increase in the ratio of revenue to expense. While the finding that revenues per transaction would fall with increases in repeat customers is somewhat counterintuitive, we attribute it to the fact that for veterinary services first-time customers often purchase a broader range of services than in most

Table 5. Estimates of Revenue/Expense for veterinary practices (Model 12 in Table 4) compared to the same model with seasonal dummy variables interacted with all variables (Model 12a)

Variables:	Coefficients (models with Revenue/ Expense)	Model 12 Revenue/ Expense	Base Model 12a Revenue/ Expense	Spring Model 12a Revenue/ Expense	Summer Model 12a Revenue/ Expense	Fall Model 12a Revenue/ Expense
All regions						
Constant	$\alpha_0 - \beta_0$	0.616**	0.792**	−0.113	−0.002	−0.616~
		(0.000)	(0.001)	(0.736)	(0.994)	(0.070)
Transactions	$\alpha_1 - \beta_1$	−0.213**	−0.292*	0.028	0.090	0.196
		(0.001)	(0.033)	(0.876)	(0.656)	(0.325)
Repeat Client Proportion	$\alpha_2 - \beta_2$	0.170**	0.235~	−0.010	−0.096	−0.151
		(0.009)	(0.091)	(0.958)	(0.638)	(0.455)
Repeat Client Proportion · Lab Services	$\alpha_3 - \beta_3$	−0.022~	−0.043	0.009	0.031	0.039
		(0.068)	(0.105)	(0.795)	(0.462)	(0.266)
Lab Services	$\alpha_4 - \beta_4$	0.020~	0.037	−0.007	−0.026	−0.031
		(0.070)	(0.125)	(0.815)	(0.494)	(0.335)
Repeat Client Proportion · Boarding Services	$\alpha_5 - \beta_5$	−0.154**	−0.302*	0.082	0.172	0.255
		(0.007)	(0.024)	(0.653)	(0.330)	(0.153)
Boarding Services	$\alpha_6 - \beta_6$	0.130**	0.268*	−0.075	−0.158	−0.238
		(0.014)	(0.033)	(0.661)	(0.337)	(0.154)
Far West region						
Far West	$\alpha_7 - \beta_7$	0.660**	0.885~	0.117	−0.614	−0.500
		(0.005)	(0.067)	(0.859)	(0.452)	(0.523)
Far West · Repeat Client Proportion	$\alpha_8 - \beta_8$	−0.713**	−0.951~	−0.128	0.643	0.542
		(0.005)	(0.066)	(0.856)	(0.463)	(0.519)
Far West · Repeat Client Proportion · Lab Services	$\alpha_9 - \beta_9$	0.428**	0.394~	0.178	−0.173	0.124
		(0.000)	(0.057)	(0.534)	(0.727)	(0.758)
Far West · Lab Services	$\alpha_{10} - \beta_{10}$	−0.388*	−0.359~	−0.161	0.166	−0.118
		(0.000)	(0.059)	(0.541)	(0.715)	(0.751)
Far West · Repeat Client Proportion · Boarding Services	$\alpha_{11} - \beta_{11}$	0.481*	0.980*	−0.438	−0.749	−0.905
		(0.025)	(0.034)	(0.489)	(0.303)	(0.169)
Far West · Boarding Services	$\alpha_{12} - \beta_{12}$	−0.455*	−0.912*	0.392	0.693	0.829
		(0.023)	(0.034)	(0.505)	(0.305)	(0.176)
Seasonal dummies						
DumSprg	$\alpha_{02} - \beta_{02}$	0.059**				
		(0.003)				
DumSum	$\alpha_{03} - \beta_{03}$	0.026				
		(0.191)				
DumFall	$\alpha_{04} - \beta_{04}$	−0.118**				
		(0.000)				
R^2		0.226				
R^2-adj.		0.210				

Probabilities in parentheses for two-tailed tests.
**Significant at 99% confidence level; *Significant at 95% confidence level; ~significant at 90% confidence level.

consumer services. Initial expenses stemming from the first physical examinations, immunizations, and the like cause the revenue generated by the first-time customer to be relatively high. Unless a major problem arises, subsequent visits by the customer are for relatively minor services such as preventive medicine check-ups, and tend to generate less revenue.

For the Far West region, we find that an increase in the proportion of repeat clients has a net effect on the revenue to expense ratio which is positive but only because interactions with other variables offset the negative direct effect. The positive effect of a change in the *proportion of repeat clients* for practices in the Far West region provides indirect support that practice capabilities which retain clients are even more important as isolating mechanisms there. Independent practices are rewarded for putting greater emphasis on services with *experience qualities* when facing competition which has inherent competitive advantage in the delivery of services with *search qualities* (Reed and DeFillippi, 1990; Rumelt, 1984).

Moving along the continuum in Figure 1 to the right toward services which involve more asymmetric information between client and provider, we also test whether the *preventive medicine approach* taken by practices increases their profitability through effects on repeat clients. This is a test of whether there is an interaction between activities with *credence and experience qualities* that can be identified through the differential profitability of repeat clients. We find that while this does not differentiate the performance of practices when all regions are pooled, it is important in markets facing new competition. The preventive medicine approach increases profitability indirectly through an effect on repeat customers. This can be interpreted as an effect of a service with credence qualities which may be driven by the existing credentials and resources of the veterinarian, but a necessary link for improved performance is that these services with credence qualities act through repeat customers. This further suggests that a preventive medicine approach in the practice is also a form of *practice capability*. These capabilities appear to be an important isolating mechanism separating traditional providers when these practices face competitive entry by firms whose ability to deliver services with credence quality is particularly sus-

pect. In other words, when clients question the credence qualities of the franchise entrants, it makes even more sense for the independent practitioners to specialize in the capabilities needed to deliver services requiring credence and experience qualities. When independent veterinarians face competition by entrants who are less capable of specializing in the delivery of services with *experience and credence qualities* it makes more sense for independent veterinarians to do so.

The absence of significant effects in markets without new entrants could be because some practices serve low-cost niches for which preventive approaches are not valued and/or because competition is not intense enough to require these capabilities as a necessary condition for moderately successful performance. In these practices, the medical service may have more *search qualities* than *experience qualities*.

Moving to the left of center in Figure 1 toward services which involve more symmetric information between client and provider, we also expected the provision of services with *complex search qualities* such as boarding services to have some *experience qualities*. When all regions are pooled, we did not find evidence to support this argument that boarding services could leverage the reputation of the practice. Nor did we find evidence that the practice could provide a broader range of high-quality services that would also help to retain clients and increase profitability through this mechanism. However, when markets facing new forms of competition are considered, boarding services have a significant interaction with the proportion of repeat clients to increase the profitability of practices. In markets facing new competition, boarding services have *experience good qualities*. In theory it may be possible that the franchisers could provide these services if they are primarily services with search qualities. However, the significant effect of these services through an interaction with repeat clients suggests that they are services with *complex search qualities*. They appear to have some experience qualities associated with them. If the franchisers are unable to provide these components of the service as well as the independent veterinarians these services then become more important to the independent veterinary practices.

Taken as a whole, these findings caution against broad-based prescriptions concerning the contingencies of resources for delivering services

with different types of credence, experience, and search qualities. Research has shown that in some contexts increasing customer retention clearly improves performance (Reichheld and Sasser, 1990). We also find that this is the case in a service industry which is selected to have important credence qualities. We extended the current literature on information asymmetry to investigate complex services which may contain interactions among credence and experience qualities or experience and search qualities. However, for veterinary practices in general, the driver of competitive advantage for services with experience qualities, i.e. customer retention, does not interact with activities that have clearly defined credence qualities (preventive medicine), nor does it combine with activities that have clearly defined search qualities (boarding) to increase performance. However, these activities do act on their own to increase performance.

Only in the more contestable markets of the Far West are these interactions effects important for increasing performance. Researchers must closely examine the characteristics of the service, and the competitive environment to accurately assess the importance of experience qualities in the service and the value of investing in capabilities that are needed to retain customers. The contingency of the complex credence and search activities investigated here is also dependent on the competitive environment. These capabilities are resources which are 'valuable' only for the delivery of some services and in some competitive contexts (Barney, 1991).

CONCLUSION

The paper makes three primary contributions: (1) it formally analyzes the effect of repeat clients and shows their benefits in a medical service industry where *credence qualities* may have limited their applicability; (2) it shows that in some contexts, benefits from repeat clients positively interact with *credence activities*, such as preventive medicine, and with a *complex search activity* such as boarding services; and (3) it shows that, in markets facing new entry which may have lower levels of some resources necessary for offering services with credence qualities, the benefits of repeat clients can have interaction effects with other services to increase the prof-

itability of practices. These effects occur through an interaction with services with credence qualities such as preventive medicine and services with search qualities such as boarding services. The ability to distinguish among practices facing new competitors suggests that they can be considered as a type of isolating mechanism (Rumelt, 1984).

The study points out that the value of resources and capabilities depends upon the information asymmetry characteristics of the product market. As such, this study could be a first step toward making RBV into a full-fledged contingency theory for strategy, in the same sense that Thompson (1967) or Lawrence and Lorsch (1967) provided a contingency theory for organizational structure. The value of resources is contingent on the context in which it is used; more specifically in this case, the importance of practice capabilities was found to be dependent on the type of service being offered and the implicit information asymmetry in the client–provider relationship. One can think of other contingency factors (besides information asymmetry) which might affect the value, rarity, imitability, or substitutability of resources and capabilities. For example, the value and imitability of employee knowledge depend on the mental models used in the firm to utilize that knowledge (Senge, 1990), the organization and formal reporting structure can complement the utilization of resources (Amit and Schoemaker, 1993; Barney, 1997), or the industry context could be an important determinant of imitability and substitutability (Williams, 1992). Further development toward a contingent-oriented RBV theory could go a long way to make the theory more applicable and useful.

An important limitation of this research is that practice capabilities which cause repeat clients are to a large extent unobserved. Like its predecessors (Reichheld and Sasser, 1990), this research shows that there can be benefits from repeat customers for profitability and *infers* that practices with repeat customers have taken actions to develop and cultivate customer loyalty. We go beyond previous research to show that in some contexts there are differences in profitability due to the presence of repeat clients between firms operating in the same market. We conclude that these differences arise from firm-specific differences or capabilities because they are conceptually and empirically useful in explaining firm differences

in profitability. However, there may be other conditions of submarkets or types of practices which might also cause a link between repeat clients and profitability that is not caused by practice capabilities in developing customer loyalty. For example, there may be rural markets with little competition in which the proportion of repeat clients is high simply because there are no alternative choices—in this case, the high proportion does not indicate the presence of underlying capabilities. There are a number of ways in which underlying conditions of markets, such as demographic factors, might be associated with a high repeat client proportion but a high level of capabilities is not in fact present.

We could also be wrong about this assumed relationship between client retention and practice capabilities in a number of other ways. (1) It is possible (although highly unlikely) that capabilities are just plain ineffective at boosting the client-retention ratio. (2) Even if capabilities do boost the client-retention ratio, it is possible that this particular sample of clinics has little or no variation in their client-retaining capabilities (i.e., they all have roughly the same client-retaining capabilities). In that case, virtually all of the variance in the client-retention ratio would be due to other extraneous factors—despite the efficacy of capabilities. (3) Even if capabilities are effective at boosting client retention, and even if the clinics in the sample vary in their client-retaining capabilities, there might be a strong negative correlation between those capabilities and the other extraneous factors affecting client retention. In that case, the impact of capabilities on client retention might be undetectable in the sample because it would be largely cancelled out by the opposing effect of the extraneous factors on client retention.

If our inference is correct that practice capabilities are important for developing customer loyalty, then our findings imply that veterinarians may need to develop practice capabilities in those activities where experience qualities are important (Darby and Karni, 1973; Heskett *et al.*, 1990). These capabilities are imbedded in the processes and routines within the practice and therefore are difficult to develop (Dierickx and Cool, 1989; Nelson and Winter, 1982; Teece *et al.*, 1997). This implies that not all independent practices will be able to do so, but the evidence is that those that do may improve their ability to com-

pete against other independent practices. Further, these capabilities appear to be particularly important as a type of isolating mechanism among independent veterinarians in markets facing competition from veterinary chains (Reed and DeFillippi, 1990; Rumelt, 1984). We think that this is particularly true for services involving *credence and experience* qualities because the credence resources in the franchise firms are not well established in the potential client's mind. They may well be suspicious about the 'credentials' of the type of DVM that is willing to work in these franchises. In addition, staff may not have the same personal involvement with clients in a delivery format that is inherently large scale.

Whether independent practitioners without these capabilities can successfully upgrade their practices and offset the advantages of the chain veterinary firms is still an open question. We have only shown evidence that these capabilities can be used to distinguish the profitability of independent veterinarians in contested markets. The evidence that independent optometrists could develop these capabilities and use them to regain market share from chain and franchised competitors in optometry is an important precedent. It suggests that independent veterinarians without these capabilities can develop them to compete against new entrants as well.

As noted earlier, an additional limitation of the contingency model used here is that it investigates how matches between activities and firm capabilities result in firm performance rather than investigating the performance of individual activities. It would be a closer test of the idea of contingency to limit the performance effects to the focal activity. However, there are both measurement and conceptual reasons that make this difficult to do. An important argument in the paper is that there are firm capabilities that moderate the delivery of a range of services that have either credence and experience qualities, experience qualities only, or experience and search qualities. The cost of developing and maintaining these capabilities is thus shared across these services. To meaningfully identify the profitability of each activity would thus be very hard to do. In addition, there are resources such as the veterinarian's time, staff time, receptionist time etc. that would have to be allocated to each of a number of activities which may in fact be delivered sequentially, if not contemporaneously,

for clients. In other words, routine vaccines (a service with search characteristics) may be administered jointly with preventive medicine suggestions (a service with credence and experience qualities) that would have to be allocated to different activities. By analyzing the effect on firm performance of interactions between activities and capabilities we are taking an approach somewhat similar to an approach used by Davis and Thomas (1993) and Nayyar (1992). Davis and Thomas (1993) directly estimate synergy by examining firm performance as a function of the presence of pharmaceutical firms in additional businesses such as chemicals, health care products or agricultural products. Each drug and related business combination implies a particular capability or expertise for the firm such as production, marketing, or R&D. Nayyar (1992) identified the effects of focus among business units of the firm on common customers, service capabilities, or common geographic markets as indicators of firm performance. Further research might try to tie the contingencies identified here to the profitability of individual activities (if it is possible to allocate them) rather than looking at the interactions and how they explain firm profitability.

We hope that the form of analysis used here will be useful for setting up further analysis of the changes in this industry, as well as for studies of entry and industry restructuring in general for professional medical services. More work could be done to explore the characteristics of other medical services to determine which activities have *experience qualities*, in addition to the activities which are readily considered to have *credence qualities* and the drivers of competitive advantage associated with each. By showing that the services improve performance in only certain competitive environments, we showed the importance of not only distinguishing between these activities for the presence of *credence, experience*, and *search qualities* but also distinguishing the competitive context. Medical service firms which mistakenly believe that all activities have *credence qualities* may be misunderstanding the nature of their service and its drivers of competitive advantage. On the other hand, medical service firms which draw on existing literature on services may overestimate the importance of experience activities for their service in all contexts (Reichheld and Sasser, 1990). Perhaps more importantly, medical service firms need to con-

sider the competitive context for understanding the importance of these different types of services and the capabilities that are the drivers of competitive advantage of these services.

ACKNOWLEDGEMENTS

REFERENCES

American Animal Hospital Association (1995). *The 1995 AAHA Report: A Study of the Companion Animal Veterinary Services Market*. American Animal Hospital Association, Lakewood, CO.

Amit, R. and P. Schoemaker (1993). 'Strategic assets and organizational rent', *Strategic Management Journal*, **14**(1), pp. 33–45.

Balter, G. et al. (29 November 1994). PETsMART Inc., Company Report, Donaldson Lufkin and Jenrette Securities.

Barney, J. B. (1991). 'Firm resources and sustained competitive advantage', *Journal of Management*, **17**, pp. 99–120.

Barney, J. B. (1997). *Gaining and Sustaining Competitive Advantage*. Addison-Wesley, Reading, MA.

Becker, M. (February 1993). 'The marketplace is changing: Are you?', *Veterinary Economics*, pp. 58–68.

Bennett, I. (April 1987). 'State of the ophthalmic industry 1987', *Optometric Management*, pp. 35–46.

Bennett, I. (October 1992). 'State of the profession—1992', *Optometric Economics*, pp. 10–16.

Bowen, D. E. and G. R. Jones (1986). 'Transaction cost analysis of service organization–customer exchange', *Academy of Management Review*, **11**, pp. 428–441.

Cohen, W. and D. Levinthal (1990). 'Absorptive capacity: A new perspective on learning and innovation', *Administrative Science Quarterly*, **35**, pp. 128–152.

Darby, M. R. and E. Karni (April 1973). 'Free competition and the optimal amount of fraud', *Journal of Law and Economics*, pp. 67–88.

Davis, R. and L. G. Thomas (1993). 'Direct estimation of synergy: A new approach to the diversity performance debate', *Management Science*, **39**, pp. 1334–1346.

Dierickx, I. and K. Cool (1989). 'Asset stock accumulation and sustainability of competitive advantage', *Management Science*, **35**, pp. 1504–1511.

Dooley, D. R. (January 1994). 'Sizing up the competition', *Veterinary Economics*, pp. 19–23.

Gerber, P. C. (August 1983). 'O.D./D.D.S.: Parallels between professions', *Optometric Management*, pp. 19–27.

Grant, R. M. (1991). *Contemporary Strategy Analysis*. Blackwell Business, Cambridge, U.K.

Henderson, R. and K. Clark (1990). 'Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms', *Administrative Science Quarterly*, **35**, pp. 9–30.

Henderson, R. and I. Cockburn (1994). 'Measuring competence: Exploring firm effects in pharmaceutical research', *Strategic Management Journal*, Winter Special Issue, **15**, pp. 63–84.

Herrin, S. (July 1993a). 'Don't play the commodities market', *Optometric Management*, p. 9.

Herrin, S. (August 1993b). 'How to beat Goliath', *Optometric Management*, p. 9.

Herrin, S. (November 1993c). 'Who's afraid of Wal-Mart?', *Optometric Management*, p. 9.

Herrin, S. (November 1993d). 'Wal-Mart loss probably not optometry's gain', *Optometric Management*, p. 3.

Heskett, J. L., W. E. Sasser and C. W. L. Hart (1990). *Service Breakthroughs*. Free Press, New York.

Hubsch, A. (November 1992). 'How to outshine Wal-Mart', *Optometric Management*, pp. 29–30.

Klooz, S. (August 1993). 'Signs of the times: Lessons from other industries', *Veterinary Economics*, pp. 65–68.

Lawrence, P. and J. Lorsch (1967). *Organization and Environment*, Harvard Business School Press, Boston, MA.

Lewis, P. and H. Thomas (1990). 'The linkage between strategy, strategic groups, and performance in the U.K. retail grocery industry', *Strategic Management Journal*, **11**(5), pp. 385–397.

Lofflin, J. (December 1992). 'Challenge '93: Competing with the superstores', *Veterinary Economics*, pp. 28–35.

Lofflin J. (June 1994a). 'Who is Dr. Scott Campbell and why is he bringing full-service veterinary care to PETsMART?', *Veterinary Economics*, pp. 27–43.

Lofflin J. (November 1994b). 'The follow-up interview with Scott Campbell', *Veterinary Economics*, pp. 44–54.

Metzger, F. (November 1996). '10 compelling reasons to offer in-house testing', *Veterinary Economics*, pp. 70–72.

Metzger, F. (June 1997). 'Help clients see geriatrics', *Veterinary Economics*, pp. 58–75.

Meyers, W. (June 1997). 'What do clients want?', *Veterinary Economics*, pp. 40–45.

Nayyar, P. (1990). 'Information asymmetries: A source of competitive advantage for diversified service firms', *Strategic Management Journal*, **11**(7), pp. 513–519.

Nayyar, P. (1992). 'Performance effects of three foci in service firms', *Academy of Management Journal*, **35**(5), pp. 985–1009.

Nelson, P. (1970). 'Information and consumer behavior', *Journal of Political Economy*, **78**(2), pp. 311–329.

Nelson R. R. and S. G. Winter (1982). *An Evolutionary Theory of Economic Change*. Belknap Press of Harvard University Press, Cambridge, MA.

Peteraf, M. A. (1993). 'The cornerstones of competitive advantage: A resource based view', *Strategic Management Journal*, **14**(3), pp. 179–191.

PETsMART Inc. (1993a). Prospectus for Common Stock Offering, 7,200,000 shares, Subject to Competition, June 4, 1994, pp. 1–44.

PETsMART Inc. (1993b). Form 10K, Fiscal Year ending January 31, 1993.

Pindyck, R. S. and D. L. Rubinfeld (1981). *Econometric Models and Economic Forecasts* (2nd ed.). McGraw-Hill, New York.

Porter, M. (1985). *Competitive Advantage*, Free Press, Macmillan, New York.

Prahalad C. K. and G. Hamel (1990). 'The core competence of the corporation', *Harvard Business Review*, **68**(3), pp. 79–91.

Reed, R. and R. J. DeFillippi (1990). 'Causal ambiguity, barriers to imitation, and sustainable competitive advantage', *Academy of Management Review*, **15**(1), pp. 88–102.

Reichheld, F. F. (1993). 'Loyalty-based management', *Harvard Business Review*, **71**(2), pp. 64–73.

Reichheld, F. F. and W. E. Sasser Jr. (1990). 'Zero defections: Quality comes to services', *Harvard Business Review*, **68**(5), pp. 105–111.

Rumelt, R. P. (1984). 'Toward a strategic theory of the firm'. In R. Lamb (ed.), *Competitive Strategic Management*, Prentice-Hall, Englewood Cliffs, NJ, pp. 556–570.

Sabol, J. T. (January 1984). 'How dental franchises impact the future for private practice', *Dental Management*, pp. 19–27.

Schwartz, C. A. (February 1985). 'O.D.'s vs. chains: The "yes, but" dilemma', *Optometric Management*, pp. 63–89.

Senge, P. (1990). *The Fifth Discipline*. Doubleday, New York.

Sposato P. and I. Bennett (June 1985). 'Franchise

optometry: Still flying high?', *Optometric Management*, pp. 35–43.

Stigler, G. J. (1961). 'The economics of information', *Journal of Political Economy*, **69**, pp. 213–225.

Teece, D. J., G. Pisano and A. Shuen (1997). 'Dynamic capabilities and strategic management', *Strategic Management Journal*, **18**(7), pp. 509–533.

Thompson, J. (1967). *Organizations in Action*, McGraw-Hill, New York.

Tumblin, D. and C. Wutchiett (September 1996). 'Uncovering the secret to higher revenue', *Veterinary Economics*, pp. 56–61.

Veterinary Centers of America (1993). U.S. Securities and Exchange Commission, Form 10-KSB (Annual Report and Form 10K combined), Item 3, Description of Properties, Fiscal Year Ending Dec. 31, 1993, *SEC File*. Q-Data Corporation, St. Petersburg, FL.

Wernerfelt, B. (1984). 'The resource-based view of the firm', *Strategic Management Journal*, **5**(2), pp. 171–180.

Williams, J. (1992). 'How sustainable is your competitive advantage?', *California Management Review*, **34**(3), pp. 29–51.

Wood, F. (February 1995). 'Corporate competition: What you can learn from the optometrists' success', *Veterinary Management*, pp. 44–51.

Zeithaml, V., A. Parasuraman and L. Berry (1990). *Delivering Quality Service*. Free Press, New York.

Zeithaml, V. and A. Parasuraman (1985). 'Problems and strategies in services marketing', *Journal of Marketing*, Spring, pp. 33–46.