

**PRACTICES, PERCEPTIONS AND PERFORMANCE: A TEXAS
COOPERATIVE STUDY**

A Thesis

by

AMY D. HAGERMAN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 2005

Major Subject: Agricultural Economics

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Approved by:

Chair of Committee,	John L. Park
Committee Members,	David J. Leatham
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ABSTRACT

Practices, Perceptions and Performance: A Texas

Cooperative Study. (December 2005)

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Chair of Advisory Committee: Dr. John L. Park

Agricultural cooperatives are a unique form of business whose performance is tied closely to the financial health of their farmer members. The changing business environment in Texas and other parts of the Midwest has put strain on farm and ranch owners as well as the cooperatives that serve them. As margins diminish and customer base grows smaller, cooperatives must become more financially efficient to remain economically viable.

This study was aimed at identifying those operational decisions and company characteristics that separate successful, growing cooperative agribusinesses from stagnant ones through empirical analysis. In addition, through the use of directed acyclic graphs and econometric techniques, the study sought to explain the connection of manager practices and perceptions to organizational performance. The analysis was based on a survey of managers in the state of Texas operating a diverse group of agricultural cooperatives. It did not include financial or utilities cooperatives.

The results indicated that successful cooperatives were larger in size, had a smaller number of close competitors, and perceived loyalty to be a large issue for the

cooperative. Strategic planning was utilized equally by successful and stagnant cooperatives. Successful cooperatives were more apt to have a formal equity redemption plan, but this did not appear to have a significant impact on financial performance.

The directed graphs showed a strong impact of manager perceptions in the area of member loyalty and performance. Further econometric analysis brought us to the conclusion that performance group and perceptions have some measurable impact in the areas of competition and loyalty. This is evidenced by the coefficients of the slope and intercept shifters for performance group being different from zero. An understanding of the factors that have the greatest impact on performance, such as competition and loyalty, can assist cooperative management teams in making operational decisions to mitigate their greatest risks and weaknesses, leading to a stronger financial position.

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CHAPTER I

INTRODUCTION

Change is a natural part of life, and for the food and fiber system change is both exciting and fearful. The agricultural cooperative industry has been in a trend of consolidation since the mid-1980s (Zuelli 2003). For some, the changes in the current business environment has led to expansion, growth and well deserved financial success; however, not all cooperatives have shared this experience. Some struggle to adjust in this business environment and eventually sink into a state of financial stagnation, just trying to make it through one more year. The question remains, what makes some rise to the top while others barely stay afloat?

The objective of this study is to identify those perceptions and practices that separate successful, growing cooperative agribusinesses from stagnant ones. Identification of best practices will serve two purposes. First, it will provide a better understanding of the cooperative's organizational structure. Second, this information can then be utilized by cooperatives to improve their chances of success. In order to achieve these objectives, there must first be an understanding of what cooperatives "look like" today. Then, it must be recognized that both financial and non-financial factors impact performance. This recognition allows for an extension of the traditional performance analysis. Finally, a conclusion as to how cooperatives can achieve greater success should

This thesis follows after the style of the *American Journal of Agricultural Economics*.

be sought.

The most logical place to begin this discussion is with a brief overview of the cooperative model. This overview is important from the viewpoint that cooperatives are unique in many ways and these characteristics define how they operate. The ownership structure of a cooperative is such that company culture and non-financial factors become very important. The customers are the owners of the business; therefore, issues like community involvement, loyalty, and board competency are potentially of greater consequence than in an investor oriented firm (IOF). Furthermore, non-financial factors that are important for any business, like competition, membership structure, and management remain important.

Empirical studies that combine financial and non-financial factors in such a way are limited. During these two decades, changes have occurred in the cooperative culture (the collective attitudes, actions, values and goals of the company) and business environment that warrant fresh study. As you will see, today's cooperative business culture is more reflective of IOFs than of their traditional cooperative predecessors (Hogeland 2004).

The culture of a company has a direct link to the owners and customers, which in the case of cooperatives are the same people. In general, cooperative membership was once homogenous made up primarily of medium sized farmers. However, modern trends have led to a bipolarization of cooperative membership where a small minority of large farmers provides the majority of sales volume. In 2002, 8% of farms generated 68% of

all farm production (Dunn et al. 2003). This new diverse membership is creating challenges and conflicts to cooperative aims.

This study will build on past theoretical, empirical and strategic business literature in order to discover a set of factors that drive cooperative performance. These factors may include financial factors such as sales volume and liabilities; it will also include operational variables like company size, number of business activities, board size, and membership size. In addition it will include non-financial and non-operational information on the perceptions of management on government policies, competition, member loyalty, technology adoption, pricing policies, and trends in agriculture. Studying the perceptions and practices of both successful and stagnant firms can shed new light on these factors of success.

This paper is divided into seven chapters. The second chapter deals with the literature supporting this study and is used extensively in performing the analysis. The third chapter will present a description of our procedures, and then set forth the hypotheses of this study. The fourth, fifth, and sixth chapters will present the results and discussions of the statistical summary, directed graph analysis and regression analysis respectively. Finally, the seventh chapter will integrate these three pieces of the study into a summary and conclusions.

CHAPTER II

REVIEW OF LITERATURE

In order to understand the drivers behind cooperative performance, it is important to understand what cooperatives are, how they have behaved in the past and how they behave today. The United States Department of Agriculture (USDA) describes a cooperative as “an organization characterized by member ownership, member control, and member benefits.” Clearly, members are the true core of the business and provide the base on which cooperatives build their culture, principles and practices.

The remainder of this section is split into four areas. A review of the history of cooperation in the U.S. provides background on the environment cooperatives thrive in and their foundation of member orientation. This will be followed by an address to the evolution of cooperative culture and its impact on performance. Next, the challenges to cooperators given their current business environment will be discussed. The final section will provide a review of select empirical studies that this study will build upon.

2.1 History of Cooperation in the U.S.

Since its introduction in the U.S., the cooperative form of business has continued to evolve. The first cooperative associations in the U.S. were modeled after the early successful cooperatives of Europe. In particular, many looked to the success of the Rochdale Society of Equitable Pioneers as a model for viable cooperative operations.

The Rochdale Society, formed in 1844, was an organization made up of 28 craftsmen who worked together to sell food and clothing. The founders, who are often referred to as the Rochdale Pioneers, were realists who chose to form because of dissatisfaction with the retail shopkeepers of the area that sold the goods the Pioneers made (Barton 1989). Similarly, early U.S. cooperatives were designed to compete against monopoly power and to provide services that were as yet unavailable to their members. The agricultural cooperative movement gained strength with the formation of The Grange in 1869. Local Grange chapters set up supply stores, grain elevators and other services for farmers (Fairbairn 2003). These chapters were the predecessors of the cooperative associations that incorporated largely between 1920 and 1950.

During this time, the cooperative movement gained political favor as well. The federal government passed legislation that enabled legal cooperative formation, and even took an active role in establishing cooperative credit associations. The Great Depression 1933 forced the nation into a severe economic crisis that, coupled with widespread drought and farmer migration, led to the desolation of agricultural businesses in the Midwest. In response, President Franklin D. Roosevelt offered a “New Deal” that took drastic measures to draw the nation together with a common national goal. The cooperative business form, which is based on ideals of individuals banding together for a common cause, was a natural business structure choice as the agricultural sector resurrected itself. The Federal Government’s support of the cooperative business form gave legitimacy to these new companies and created another barrier to monopoly power (Ingalsbe and Groves 1981).

Rural residents took advantage of these opportunities and became the founders of what we describe here as “traditional” cooperatives. These organizations are characterized by democratic control, limited return on equity capital, service at cost and open membership. These cooperatives have roots in fierce loyalty, a family like service culture, and a spirit of looking out for your neighbor. The cooperative was there for some farmers when no other business could meet their needs. Understandably, social influences were an important part of the culture surrounding these original cooperatives.

In addition to the social and political influences on cooperative formation, competition had a significant role. Cooperatives have historically formed in industries during times when competition is weak and have declined when competition is robust (Cross and Buccola 2004). In the late 1800s and early 1900s farmers faced adverse competitive environments. Some were limited to a few companies that held market power, while others lacked needed services or market access. Cooperatives acted as a competitive yardstick in that they priced their goods with the member’s interests in mind, forcing the competition to either lower their prices or move out of the area. The collective influence of members created bargaining power in their market. In areas where competition was non-existent the cooperative provided the goods and services they needed to operate.

Cooperatives thrived during the mid 1900s. They provided supplies and marketed commodities for medium size farms in rural areas. In return for their loyalty, farmers were serviced at a low cost and received a dividend when the cooperative had a profitable year. Non-cooperative competition was almost non-existent in most areas, and

cooperatives were geographically spread so that competition among cooperatives was mild.

However, farm demographics and the competitive environment have changed. Today, the greatest amount of commodities is produced by relatively few, albeit very large farmers. Technological advancement has brought the world, almost literally, to the farmers' finger tips. Margins have declined to the point that loyalty is based on the best price. Today, cooperatives compete with cooperative and non-cooperative firms, wholesalers, direct retailers, and Internet suppliers. Some are struggling to adjust.

2.2 A Changing Cooperative Culture

One must first understand the ownership structure of the cooperative to truly appreciate the potential impact of their culture on their performance. Business ownership and control can be defined by the concept of property rights. Tietenberg defines property rights as a bundle of entitlements defining the owner's rights, privileges and limitations for use of a resource (2003). However, it is only when property rights are well defined that the organization is considered to be efficient. More specifically well defined property rights must exhibit four traits:

1. Universality: resources are privately owned and entitlements are specified.
2. Exclusivity: all benefits and costs accrued from owning and using the business accrue to the owner and only the owner.
3. Transferability: all rights can be transferred in voluntary exchange.
4. Enforceability: rights are secure from involuntary seizure.

The cooperative model lives up to two of these four traits. Property rights of a cooperative should accrue to the user / owners of the business. In addition, the users are the only owners of the business, meeting the characteristic of universality. Enforceability is ensured by the purchase of common stock, which creates a legally binding ownership right to the business.

However, since cooperatives are common property resources, exclusivity is not well defined. There are many stakeholders in a cooperative that have different levels of investment in the business. This leads to free-rider problems, which are common in traditional cooperatives, creating the potential for organizational failure. The traditional cooperative also violates the characteristic of transferability as members are not permitted to transfer their ownership rights directly to another member. In the mid 1900s the lack of transferability and poor definition of exclusivity were not a problem. Memberships were homogenous and their interests were common; therefore, they collectively minimized free rider problems. Furthermore, membership in traditional cooperatives is open; meaning anyone who meets membership criteria can join with no cap on the number of members. Open membership is a problem because there is no incentive to use the cooperative for all of a member's needs (Zuelli 2004).

In an attempt to better define member property rights, a new type of cooperative has gained in popularity since the 1990s. This "new generation" cooperative has a closed membership and allows delivery rights to be transferred. It still maintains universality and enforceability. These cooperative businesses have adjusted to correct the property rights failures that plague the traditional form.

This understanding of user / members ownership rights leads us to a discussion of cooperative culture. As discussed earlier, the cooperative was formed by and formed for the rural resident. These early cooperators created a culture centered on the user whose vested interest in the business gave them incentive to patronize that business. Since that time, changes in membership composition and within the business environment have caused a continued evolution of the cooperative business model. Particularly, the changes in membership composition have caused the traditional cooperative to experience organizational failure from poorly defined property rights. As memberships have changed and cooperative management teams have tried to adjust and survive, cooperative culture has moved away from its social roots to a more competitive, aggressive set of goals and ideals (Hogeland 2004, Hind 1997).

Business culture is a driving force behind the performance of any company—cooperative or otherwise (Deshpande, Farley and Webster 1993, Kyriakopoulos, Meulenber and Nilsson 2004, Hind 1997, Hogeland 2004). Authors like Hogeland and Hind recognize a general shift in cooperative culture; however it is unlikely that all cooperatives are making this transition smoothly. Management and boards of directors are still trying to satisfy the entire membership. Today, that may mean satisfying the needs of membership segments with opposing goals. Cooperatives that incorrectly treat their membership as homogenous face a more difficult transition from their old culture to a new culture.

Deshpande, Farley and Webster address the issue of transitioning from one type of culture to another. Their paper studied Japanese (non-cooperative) firms and the impact their firm culture had on performance. Organizational culture was modeled as one of four types (adapted from Cameron and Freeman 1991 and Quinn 1988): clan (which can be related to a traditional cooperative culture), adhocracy, hierarchy, and market (1993). The study's results indicated that companies tend to transition from a clan culture to a market culture or from an adhocracy culture to a hierarchy culture. Rarely will a firm transition from a clan to an adhocracy or from a hierarchy to a market, and so on.

A company may show characteristics of all four culture types, but most will exhibit a dominant culture. A closer look at the clan and market types shows a similarity to the culture transition taking place in cooperatives in the U.S. The clan culture is defined by cohesiveness, teamwork, sense of family, loyalty and tradition (Deshpande, Farley and Webster 1993). Interestingly, in a separate article released by the USDA, the traditional cooperative culture is described in much the same way. It was a socially based culture that relied on loyalty of user / owners and placed the needs of those user / owners above the well being of the cooperative (Hogeland 2004).

In contrast, Deshpande, Farley and Webster's market culture is defined by competitiveness, achievement orientation and strategic emphasis on competitive advantage and market superiority. Those firms that exhibited market culture outperformed clan culture firms and were the highest performing of any of the four culture types. This can, again, be related to Hogeland's work, which recommends that

cooperatives move away from their traditional “service” culture to a more competitive model in order to prosper in the new business environment. Although this transition sounds uncomplicated, individual cooperatives struggle with the turmoil caused by cultural transformation. In conclusion, effects of business environment and culture are easily seen on the surface of the industry. The goal of this work is to find the deeper undercurrent of cooperative change through empirical study in Texas. To do this, we must look to the challenges faced by cooperatives in today’s business environment.

2.3 Challenges to Cooperatives

The cooperative is a form of business that faces unique challenges in the business environment and creates unique challenges for the researcher. In a summary of a Rural Cooperative Business Service (RCBS) report (Grey and Kraenzle 2002), Dunn et al. reported what cooperative managers, directors and advisors feel are the issues that have the greatest impact on their business (2003). External to the cooperative, there were five issues of greatest concern: changing farm demographics, technological innovation, consolidation and industrialization, globalization, and consumerism.

The trend of changing farm demographics has been thoroughly covered in other literature sources. For the purposes of Dunn’s study, the primary concern was the impact it has on cooperatives. Today’s membership is made up of very large, very small and medium sized farmers that each requires specific services, products and structures. Cooperatives must adapt to these special needs. This may mean diversification or it may mean specialization, depending on the situation of the specific cooperative.

Technological innovation is another area that has received much attention in the popular press. The agricultural sector has experienced many technology developments in transportation, information, and biotechnology since traditional cooperatives first formed in the U.S. For example, improvements in transportation efficiency have impacted the geographical spread of cooperatives. There is not the need for the amount of long term commodity storage in some areas, and members are able to harvest and haul longer distances. In addition, cooperatives and members are able to access information more quickly and directly than ever before. The third area, biotechnology, has been much debated, but appears to be here to stay. This wide variety of change has some cooperatives struggling to adjust in this growth area.

Consolidation and industrialization is a fact. Cooperatives have entered stage four of their industry life cycle, and in all levels of the food and fiber system consolidation is the trend. Even the largest cooperatives are finding it difficult to exert market influence and bargaining power like they once did. Furthermore, small and medium sized cooperatives are either finding a niche market beyond their “traditional” membership or they are forced to join larger associations before going bankrupt.

The market place that cooperatives compete in has expanded beyond the state, nation or continent to include the entire world. Management in particular must be aware of the opportunities that exist from this global market; however, there are also risks. How a management team deals with this new, expanded market place can determine their level of success. Cooperatives must learn to do business in this environment.

Perhaps the most complex issue in this list of five external challenges is consumerism. The loyalty borne during the Depression has dissipated and the new generation of user / owner is willing to shop for the best price. Some cooperatives are facing the decision of either catering to one type of member group or being forced to diversify to meet the needs of many member groups.

In addition to external challenges, cooperatives also face significant challenges within their own organizations. Four internal challenges were identified by Dunn et al. These challenges are acquiring equity, diverging memberships, board effectiveness, and the federated model.

Equity is a delicate issue in cooperatives, because of the close personal link between equity and the member / owners of the business. Acquiring equity was not difficult when many cooperatives formed in the early to mid twentieth century. According to Dunn et al., member / owners do not have the proper incentive to invest equity in the cooperative because the opportunity cost has become too great. This weakens the balance sheet and limits the company's ability to adapt in the market. Furthermore, many cooperatives are not willing or able to properly utilize commercial debt as a part of the capitalization plan.

The issue of diverging memberships has already been discussed in other parts of this paper. Memberships are becoming more heterogeneous. Cooperatives must create new business strategies to satisfy these diverging interests or begin targeting specific types of members.

Board effectiveness has held a place in the challenges of agribusiness cooperatives for decades. Boards of directors must invest the time and effort into having the knowledge and experience necessary to run a business that is dealing with all of the challenges listed here. In addition, most cooperatives are restricted to only having board members that are also users of the business. For agribusiness cooperatives whose memberships are made up solely of farmers, this can pose a knowledge problem. Board members do not have the knowledge for specific business ventures and sometimes hesitate to use outside consultants and advisors.

The federated model is loosely defined as a cooperative that is owned by other cooperatives rather than by farmers at the base level. Often these are large companies that local cooperatives buy supplies from, and in return the federated cooperative gives the local cooperative dividends, which are passed on to farmer / members of the local cooperative. The federated model has recently come under fire due to some high profile business failures such as Agway and Farmland Industries. The main argument is that this model places power too far out of the hands of producers and that they are too diverse, making them unable to move with the nimbleness and swiftness needed in today's marketplace (Dunn et al. 2003).

Similar external and internal challenges have been discussed in the investor oriented firm (IOF) literature. Studies for both cooperatives and IOFs that look at these issues rarely consider them as a whole and more importantly, they fail to investigate how the cooperative's perceptions of them impact performance.

2.4 Past Performance Studies

Although several empirical studies are available on performance factors, two warrant further discussion for our purposes. The first is an empirical analysis of grain elevators and farm supply businesses across the Midwest (Harling and Funk 1987). This study applies Porter's generic strategies to both cooperative and non-cooperative businesses in Indiana, Illinois, Iowa and Kansas. Porter says that there are three strategies that every company uses either singly or in some combination: overall cost leadership, differentiation and focus. They work most effectively when used in some combination (Porter 1980). Harling and Funk applied Porter's work and measured the impact each generic strategy had on performance.

Return on assets (ROA) was chosen as a measure of performance for two reasons: 1) it measures how companies used their funds irrespective of how they were provided and 2) it is less biased than return on equity, return on investment and return on sales. When cooperatives were compared to non-cooperatives in the same industry, the results showed that being structured as a cooperative actually depresses performance as measured by ROA.

The second study investigates Dutch cooperative enterprises, but follows an approach that can be applied to U.S. cooperatives as well. A unique characteristic of this study is that it looks to the causal relationships that exist within a cooperative. Moreover, it looks to the non-financial characteristics that have causal relationships in cooperatives. The authors include such variables as type of cooperative, type of customer base, competitive intensity, cost/pricing policies, control and ownership, as

well as a measure of market orientation and entrepreneurial firm culture (Kyriakopoulos, Meulenber, and Nilsson 2004).

The authors' objective was to make general conclusions as to how cooperatives can better compete with IOFs. They concluded that cooperatives should create an entrepreneurial firm culture, which exhibits "growth oriented professional management, non-hierarchical structure, and innovative strategy and risk preference" (pp 391). The authors base this on past cooperative research and posit that having an entrepreneurial culture will greatly impact performance. For cooperatives, this means aggressively recruiting the best managers and employees, not depending on income from federated cooperatives, and placing themselves in the market to aggressively compete rather than just exist.

In their discussion of the impact of pricing policies in the cooperative, the authors concluded that if membership is homogenous, pricing policy has very little impact on performance. However, Dunn et al and Hogeland specifically state that cooperative membership cannot generally be considered homogenous today. Some cooperatives are challenged greatly by diverging membership interests due to size of farms, age of members, and background of members. Kyriakopoulos, Meulenber and Nilsson state that a cooperative with a membership that is heterogeneous will be significantly impacted by pricing policy. Specifically these companies should consider differential cost / pricing strategies to enhance their market orientation, which impacts their ability to compete, attract customers, and create value (2004).

Other studies have concentrated on the impact of technology adoption (see King and Shuker 1987), management (see Noe and Rebello 1996), and board effectiveness (see Fama and Jensen 1983), in addition to the issues addressed by Dunn et al. In reviewing the literature it becomes clear that empirical study of Texas cooperative performance has not been greatly pursued since the 1980s. Today, Texas is the number one producer of beef and cotton; it has the third largest number of cooperatives and is home to a diverse range of agricultural producers (RBS 2003). Conducting such a study is a logical next step based on the theoretical and methodological work that has already been done elsewhere.

CHAPTER III

PROCEDURES AND METHODOLOGY

The literature review provides a sound base on which to build a methodology for this study. First, the challenges to cooperatives are diverse, therefore many variables must be considered. Second, there is no current data set available for Texas cooperatives that contain such information; therefore, primary data collection is necessary. Third, the non financial factors that have a pivotal role in the history of cooperation in the U.S. should be included somehow, and a balance must be struck between those non financial factors and the financial analysis. A financial and operational analysis of the business is necessary to offset any bias that may exist in using the perceptions of management. Essentially, the financial and operational information should corroborate the story that management tells. Finally, a way must be found to objectively separate the successful from stagnant agribusiness cooperatives.

The procedures begin by with the primary data collection from cooperative managers. The variables that are collected through this are related to management perceptions of the various challenges cooperatives face in addition to financial and operation information. This information is used to do a financial and operational analysis, separate the successful from stagnant cooperatives and identify causes of financial performance in cooperatives. By understanding the financial and non financial drivers of performance, we obtain a “map” of the Texas cooperative industry. Finally,

regression analysis was used to identify any differences in the factors identified in the causal analysis between the successful and stagnant groups.

3.1 Primary Data Collection

The primary data collection consisted of Texas agribusinesses that are cooperative in form. Electrical, telephone, and financial cooperatives are significantly different than agricultural cooperatives, and warrant a separate study. However, all types of agribusiness cooperatives were included in the survey population; this should provide the most diverse sample available and allow for the analysis of subgroups within the industry.

The survey of Texas cooperative management, including both quantitative data and qualitative data collection, was distributed for the fiscal year 2004. This survey was pre-tested on a small group of cooperative managers, professors in the management and finance fields, as well as a cooperative industry professional at the Texas Cooperative Council. The information requested was both self reported and accounting based in nature; this provides a robust picture of performance (Kyriakopoulos, Meulenber and Nilsson 2004). The accounting information was based on the year ending in 2004. Due to accounting differences, the month of year end is variable across cooperatives.

The selection of variables was based on past studies, the objectives of this study, and feedback from the pre-test. Self reported information was largely related to both the external and internal challenges cooperative face, and how the cooperative was strategically placing itself to meet those challenges. The survey questioned managers on their perceptions of issues relating to strategic management, financial performance,

pricing policies, technology adoption, board effectiveness, competition, equity, membership, the global market and cooperative mergers. The goal was to obtain a picture of how the cooperative was reacting to the challenges discussed in the literature section and the differences in perceptions between market segments.

The survey was mailed to a population of 230 cooperative managers based on a mailing list provided by the Texas Cooperative Council. The list consisted of all cooperatives the TACC had knowledge of, both members of TACC and non-members; however, the TACC was unsure as to how many of the non-member cooperatives were actively operating. After removing financial and utilities cooperatives as well as those that did not have addresses, the list totaled 231 cooperatives. Because two cooperatives were managed by the same person, only one survey was sent to that person, giving a total mailing of 230 survey packets. Each packet contained two copies of the survey, one for the manager of the cooperative, and one for the chairperson of the board of directors. It also contained a letter outlining the purpose of the survey and a statement of confidentiality of responses. The surveys were numbered to provide anonymity and encourage them to be as open and honest in their answers as possible.

Following the mailing, those cooperatives for which a phone number was available were called to remind them of the importance of the survey and to make sure that the packet had arrived in the mail. For those who did not receive it, a request to allow the packet to be re-mailed was made and also the option of filling the survey out online was offered.

These efforts lead to a 20% response rate among managers, making the sample population on managers 46 cooperatives. However, only a 6% response rate was obtained among directors. The director response rate was deemed too small to make any generalizations on the perceptions of directors and it was discovered in conversations with managers that the manager and board chairman were filling the questionnaire out together. Therefore, the director surveys were thrown out of the study due to small sample size and bias.

The manager response rate was large enough to proceed with the study, but with caution due to the dangers of bias presented by a small survey sample. Not all of the respondents had complete financial information. The 37 cooperatives that had complete surveys represented 16% of the total population. Additionally, this sample represents approximately 9.46% of the \$4,524 million in gross business volume (RBS 2003) that Texas cooperatives did in 2002. It is necessary to use 2002, because it is the most up to date information available on Texas cooperatives in aggregate. In addition this sample represents and serves 32.52% of the total cooperative members in Texas (RBS 2003) in 2002. In the statistical analysis, each question is first analyzed independently, the sample for each variable consists of all complete surveys; therefore, the number of observations for each variable is reported in the statistical summary results chapter. The remainder of the analysis necessarily only includes the 37 complete surveys since the interaction among variables is considered.

3.2 Statistical Summary

The procedures for the statistical summary were straight forward and simple. The first step was to look at the sample as a whole and identify any trends or apparently significant questions. The second step was to identify a way to separate the successful cooperatives from the stagnant ones and to then sort them into groups. The third step was to compare the statistics and ratios for the whole sample to the successful and stagnant subgroups. Finally, the two subgroups can be compared to each other to identify differences. The following section will provide the procedures used for each of these steps.

In the first step of the statistical summary, all of the sample observations were used to develop summary statistics. These statistics were calculated in Microsoft Excel using the modeling tool Simetar. The purpose for running these statistics is to create a prior knowledge of the information and to develop a general idea of how the successful and stagnant groups compare. This becomes important as the analysis moves forward into the causal graphing phase.

The second step is to separate the successful from the stagnant through financial performance. The literature suggests different procedures for measuring financial performance. The most obvious way is through the use of some financial measure. Options that have been previously utilized are return on assets, return on equity, market share, profit margin, growth relative to competition, customer orientation, liquidity, leverage, and asset turnover (See Harling and Funk 1987, Nerver and Slater 1990, Kyriakopoulos, Meulenberg and Nilsson 2004, and Rotan 2004).

For this study, a combination of two historical performance measures was used. The first measure is return on assets (ROA). This measure was chosen based on its use as an unbiased measurement of short term financial health and performance. Furthermore, ROA is a good measure of how efficiently the cooperative is using its funds (Harling and Funk 1987). However, because this study has only one year of information available, it is not possible to track ROA over time to obtain a picture of long term performance, so a measure of long term viability was chosen. The equity to assets (E/A) ratio was chosen over other, more mainstream, long term ratios because of the importance equity plays in the cooperative form of business.

After calculating the two ratios based on the financial information, the next step was to determine where to draw the line between what was deemed successful and what was deemed stagnant. CoBank, the primary financial lender to cooperative agribusinesses in Texas, provided the benchmark numbers for these two performance measures and it was decided to divide the data into four groups. The benchmark for ROA is 8% (or 5% in drought years) and for E/A the benchmark is 50%. It was determined that Texas did not experience a significant drought in 2004, so the 8% ROA benchmark was used. Figure 1 shows the division in the respondents along these benchmarks.

The first group was those cooperatives deemed successful because they exceeded benchmark standards in both performance measures. These cooperatives lie in the upper right hand quadrant of this graph and are labeled “top performers”. The second group was those cooperatives that were short term performers, in other words they had

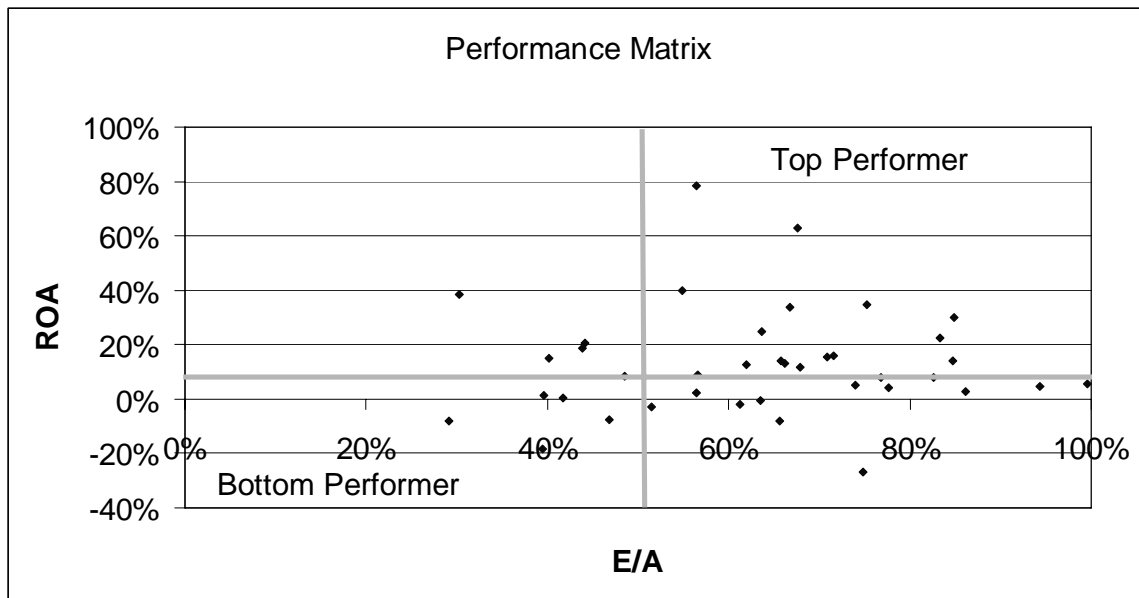


Figure 1: Performance Matrix for Respondents

ROA: Return on Assets

E/A: Equity to Assets Ratio

exceeded the benchmark for ROA but fell short of the benchmark for E/A. These cooperatives are located in the upper left hand quadrant of Figure 1. The third group was those cooperatives that were considered long term performers, exceeding the E/A benchmark but falling short of the ROA benchmark. These cooperatives are located in the lower right hand quadrant of Figure 1. The fourth and final group was those cooperatives that were considered stagnant; having fallen short of the benchmarks for both ROA and E/A. These cooperatives, labeled bottom performers, are located in the lower left hand quadrant.

It was decided that, while the short and long term performer groups were interesting and could be further analyzed in the future, the analysis of these two groups does not bring us closer to the objective of this study. Therefore, they were set aside for

this study, but could be considered for further analysis at a later date. Simetar was again used to run separate sets of summary statistics for the two subgroups of interest. These statistics can then be compared from subgroup to the entire sample and between subgroups. This comparison first identifies whether or not the measures chosen are adequate to sort the two groups, and whether these groups, when separated, are significantly different from the sample as a whole. This allows us to consider whether or not the characteristics and financial measures we have chosen are sufficient for comparing the two groups.

The statistical summary performed in Simetar included analysis of sample mean, standard deviation, min, max, median, 95% upper confidence interval, and 95% lower confidence interval. This same analysis was performed on the two subgroups identified through benchmark analysis as discussed earlier. Each variable was analyzed independently of the other variables for this portion of the analysis. Their correlation to each other and their causal interrelationships were analyzed through the use of causal diagrams and regression analysis.

3.3 Causal Diagrams

The idea of cause and effect is an old and well known one. We learn from a young age that there is a unidirectional movement from cause to effect. If I touch something hot, I burn my hand. Historically, the use of causation in economics has been limited primarily to structural equations modeling. Causal modeling has been used even less in those applications requiring the use of statistical theory; primarily because only recently has a harmonious relationship been established between statistical theory and

causation theory. The cause and effect relationship is often presented as being one in which there are “true” causes and “true” effects. It leaves no room for the uncertainties that exist in the real world. Statistics on the other hand accounts for uncertainties by working with probabilities rather than concrete events. This difference caused a great deal of disharmony between causal and statistics camps; however, steps have been taken to integrate these two areas into one. Dr. Judea Pearl has been at the forefront of this and presents such a marriage of probability theory and causation in his 2000 book *Causality*.

The uncertainty or paradox occurs, rarely in the individual event, such as the hot pan / burnt hand example above, but when it is extended to chains of cause and effect relationships, or causal chains. Continuing with our previous example, if I apply heat to a pan, the effect is a hot pan. If I touch a hot pan, the effect is a burnt hand. However, heating a pan is not a cause of burning my hand unless the intermediate event of touching the pan occurs. For this reason causality is written in the language of probability theory. By using probabilities, there can be room for uncertainty.

There are certain conditions that must be met though, to be sure that our model is robust. When building a causal model, there must first be a minimal model which we can intervene in to observe new effects. This model is the simplest model that is still consistent with the data. This model would necessarily be stable and robust. As a visual test of robustness, the skeletal minimal model would still be present after intervention (Pearl 2000).

The selection of variables for this model is extremely important. It is impossible to know if every possible variable that could have a causal relationship on the

performance of these cooperatives has been accounted for. If one could identify and possess infinite observations on every variable in the model, then there would be no doubt that the model is robust. Unfortunately such knowledge is improbable if not impossible to obtain. A benefit of the use of directed acyclic graphs, which will be explained below, is that they are by their very nature a stable model (See Pearl 2000 for further details).

In addition, the absence of certain latent variables can have a profound impact on the model and result in spurious causal relationships. Therefore, some causal assumptions must be made as to the variables that are collected and utilized in this causal study. Glymour, Scheines and Spirtes identified three primary ways in which a case could be made for the causal assumptions in a model. The first is a prior knowledge or well justified theory that would imply a unique set of causal assumptions or reduce the number of alternative assumptions to a small number. This however, must be based on sound, severely tested theory. The second model is the use of experimental controls to isolate causal effects. As the authors point out, this is rarely feasible, particularly in areas such as economics. The final option is to use prior knowledge to conduct a systematic search for alternative models that is likely to provide the best available explanation of the data. To this effect these three professionals developed an algorithm that works in a mathematical program to do just this.

The probability of getting the “true” causal chain is very low due to the uncertainty involved in working with empirical data. However, by using a PC Algorithm, their program (TETRAD IV) can build from raw data a model that is the

most robust out of the different possibilities. This model is not meant to estimate parameters but instead to discover models with mathematical properties that explain the interrelationships among the variables collected in the simplest terms, without sacrificing the robustness of the model (Glymour, Sheines and Spirtes 1988).

The remainder of this section will work to develop the methodology of developing casual graphs and explain the mental procedure used for developing them. Specifically, this study seeks to identify directed acyclic graphs (DAGs), a type of causal graph that has certain properties that make interpretation and analysis less complex. These graphs are also known as Bayesian Networks.

The word “directed” implies that there is a direction of causation between two or more variables. In the case of cooperatives there is a strong argument for the validity of unidirectional movement between variables. This argument is based on the fact that cooperative variables can change gradually overtime in response to a dynamic market (Kyriakopoulos, Meulenberg and Nilsson 2004).

This study does not include any temporal analysis because it is only a snapshot of one year’s performance; however, because this relationship between the external market and the cooperative exists, the argument for unidirectional movement still holds. Future analysis could include multiple years of data, creating a temporal dimension to the data. An argument could be made for a temporal dimension based on the operational variables of the business changing very slowly compared to the year by year volatility of the financial information; however, for the purposes of this study no temporal dimension will be considered.

The term “acyclic” implies that no path leading away from a variable will later return to that same variable. In other words there is no path in which a variable causes itself (Pearl 1995). The special quality of these graphs is that they provide a more robust model with fewer opportunities for spurious results than graphs that are undirected or cyclic. Furthermore the probability theory that is used in developing the mathematical models behind the DAGs is less complex than when models are undirected, bidirected or cyclic.

The steps to developing these graphs are to first identify all of the variables that, given previous knowledge of the industry and market, will be applicable to the model. Then all of the possible correlations that might exist are identified and skeletal models are built. A skeletal model is one in which relationships among variables have been identified, but in which no directionality has been established. Variables are connected by edges, but no markers are added until one can identify the direction of causality. The markers are placed on one (or both) ends of the edge to indicate the direction of causality.

When done by hand, this process can be extremely long and tedious. Furthermore, as discussed earlier, it is extremely difficult to find the most robust model. Therefore, algorithms such as the PC Algorithm used in TETRAD IV are programmed to follow these steps and utilize mathematical knowledge to help find the most robust model. TETRAD IV begins by building a basic undirected model based on covariance and a correlation matrix. It then removes edges between variables in a stepwise fashion based on zero correlation or partial correlation until a stable model is reached. While the

use of PC Algorithm facilitates the building of the model, the first step is still finding the right variables before the mathematics are valid.

The mathematical framework that follows is specific to DAGs. A DAG represents conditional independent relationships by using a basic decomposition scheme that utilizes probability theory. First, it is important to understand the concept of “Markovian Parents”. Formally defined, Markovian Parents (pa_j) of a particular variable x_j are “the minimal set of predecessors of x_j that renders x_j independent of all its other predecessors” (Pearl 2000 pg. 14). In other words, only the parent variables of x_j are needed to determine its probability. Therefore, we can express the probability for any variable x_j as

$$P(x_j | x_1, \dots, x_{j-1}) = P(x_j | pa_j)$$

Pearl proves that the conditional independence shown by this equation can be expressed exactly by the graphical representations of DAGs. This relationship is known as the DAG and probability function being Markov Compatible (Pearl 2000). There are three assumptions of DAGs. The first, Markovian Condition (or Parents), has already been discussed. The second is the assumption of causal sufficiency. This means that there are no omitted variables that cause two or more of the included variables, but as discussed earlier there is no way of knowing for certain if this condition has been met. The third assumption is the faithfulness condition. This condition simply means that if an edge exists between two variables in the final model, then those models do not have zero correlation, and in contrast if we do not see an edge between two models it is

because they have zero correlation. If these assumptions hold, then the resulting model is stable and robust.

The variables chosen in this study are based on a review of past literature and those key characteristics that have been identified as important in the past. The background research performed should ensure that the majority of variables have been identified; however, there is no way of knowing this for sure. Model specification tests will be used in the regression analysis chapter to test for data problems due to the small sample and latent variables. There may be other variables that are important in such a study, but we feel that the most important ones have been included here. Upon the identification of the minimal model, we can then “intervene” in the graph with other variables of interest. The most basic model will include financial information and the operational information of the firm, such as membership size, average capital expenditures, the number of business activities the firm is involved in, and the age of the oldest common stock outstanding. This will provide the foundation of the minimal model that describes the firms in the sample.

Then intervening variables are added. Due to the small sample size the interventions had to be broken into categories. The categories were based on the major themes of the survey, which was based on the past literature review already discussed. These themes are competition, strategic planning, equity and equity management, and member loyalty. Ideally, all of these factors would be intervening variables in one large model, and should this study be repeated in the future and a larger sample size available, it would be the logical next step in the process. However, due to the limitations of the

data, the best alternative is to make educated deductions as to how they would operate when placed together.

One potential drawback of these graphs is that they do not indicate whether a particular variable has a positive or negative impact on another variable, only that it has a causal impact on that variable. Given knowledge of the industry and deductive reasoning, and educated guess as to whether a variable has a positive or negative impact may be made. However, in this case it was felt that there is a need for further expansion than human deduction. Furthermore, the number of responses limits the degrees of freedom and prevents separate graphs for being run for the successful versus stagnant groups. Therefore, regressions were run using the directed graphs as guides.

3.4 Econometric Analysis

The regression analysis will be built upon the causal graphs. Due to the Markovian Parents Theorem the root causes on the graph can be used as the independent variables in the regression, with the sink variables serving as the dependent variables. Regressions will be run to determine, first, whether the root positively or negatively impacts the sink. Then a second set of regressions will be run to determine the impact of performance group on the models.

Multiple regressions will need to be run for each category due to the graphs containing multiple paths. In addition, the graph narrows the variables included in the regression because the Markovian Parents theorem tells us that only the parent variables are needed to explain a sink variable. For example, the middle link of a causal chain

could not be included, because to include such a variable would in essence “block” the information flow from the first variable to the third variable. The middle variable of the path of interest is a spurious cause if it is included. In addition, multiple roots may be present for a single sink. In these cases, those roots would be included as independent variables with the sink being the dependent variable, again using Markovian Parents.

Another consideration in building the regression models is that they must meet the back door criterion to assure that the root cause is being used as the independent variable rather than a spurious cause. The back door criterion states that a root variable can explain a sink variable only when there are no paths through other variables that could be taken to get to the sink variable. If there are any such paths, then they must be blocked. To accomplish this, a variable on the back door path’s causal chain is included in the regression. Just as the middle variable of the path of interest could not be included, so the back door variable must be included in order to create an information block. This seems counter to logic; however, by blocking the flow of information by that other path, the best estimate of the impact of the root variable on the sink variable can be identified.

Once these regressions have been built, there should be no evidence of autocorrelation or heteroskedasticity due to the procedures followed in building them. If such evidence does exist it would signify that there is a problem in either the regression model, the directed acyclic graph it was derived from, or in the data itself depending on the problem. It would be possible to draw the conclusions gained from regression analysis from the graphs alone with sufficient knowledge of all of the factors included; however, the regression models reduce the likelihood of human error.

In the chapters to follow a presentation of the results and a brief discussion will be presented for the statistical analysis of the raw data, the causal graphs, and the regression models respectively. The summary and conclusions will follow. The final section included in the procedures and methodology chapter will be a presentation of the hypotheses to be tested by the analysis.

3.5 Hypotheses

The hypotheses to be evaluated here are only a few of the possibilities that the data would allow. A hypothesis was made for each of the major categories and the impact the variables in that category would have on performance and the basic model. As noted earlier the categories chosen are based on past works and are believed to be representative of the issues facing Texas cooperative managers in this new business environment.

It was decided that, since culture was a culmination of all other practices and perceptions in a businesses, it did not need to be specifically addressed in the analysis. Instead the analyses of the categories can be viewed as a whole to obtain a picture of what Texas cooperative culture looks like. Based on these statements, the following hypotheses will be evaluated:

H₁: Cooperatives that actively participate in strategic planning will experience greater financial performance.

H₂: Cooperatives with a greater understanding of their equity position will experience greater financial performance.

H₃: Cooperative performance will be negatively impacted by competition.

H₄: Cooperatives that value member loyalty will experience greater financial performance.

These hypotheses will be re-visited specifically in Chapter VII, the Summary and Conclusions. However, they are addressed indirectly throughout the analysis of this study. It is important to understand that these hypotheses come from the past literature, and the results of the hypotheses should be in agreement with the literature presented in Chapter II. The categories analyzed from this point forward—competition, equity, strategic planning, and loyalty—are a direct result of these hypotheses.

CHAPTER IV

STATISTICAL SUMMARY DISCUSSION AND RESULTS

This section presents the basic statistical analysis of the raw primary data. An understanding of the nature of Texas cooperatives and their general operational structure develops the framework needed to design the directed graph models and regressions. Section 4.1 deals with the sample as a whole and creates a picture of the average cooperative in Texas. Each section is further divided into five sub-sections.

The first sub-section is a general picture of the financial status and operational design of the average cooperative in the sample. The remaining results presentation is divided into four sub-section categories that overlap slightly: competition, equity, strategic planning and loyalty. Section 4.2 of this discussion presents the group of cooperatives deemed successful, or the top performers, and provides a discussion of their results in the same format as section 4.1. In addition this section provides some comparison to the results of the sample as a whole. The third section, 4.3, follows the same procedures as 4.2 for the group of cooperatives deemed stagnant, or the bottom performers. The final section, 4.4, is a comparison of the two groups in terms of the financial and operational, competition, equity, strategic planning and loyalty framework.

4.1 Statistical Summary for the Sample as a Whole

The purpose of analyzing the sample as a whole is to understand what the Texas cooperative industry looks like in its entirety. The responding cooperatives represent a diverse group. This section is looking at each question individually; therefore, there will be more responses used here than in other sections where only 100% complete surveys were used.

4.1.1 Cooperative Operational and Financial Overview

Responding cooperatives reported an average net savings of \$1.2 million, but this number was highly variable. Profit margin for the average cooperative is 11.2%. Average membership size was 883 members and a board made up of 9 members. The average cooperative is of a medium size, with an average 3 locations of operation including the primary location. Of the total responding group, 54% reported operating in just one primary location with no satellite locations. Table 1 provides a breakdown of the financial profile of the average cooperative.

The current assets item includes \$796,991 in accounts receivables. Current ratio is 2.11, compared to the benchmark values of 1.5 for supply cooperatives and 2.0 for grain cooperatives. Average capital expenditures over two historical years, the current year (2004), and one estimated year is \$327,084. Working capital of the average cooperative is \$1,797,125 and it has a net working capital ratio of 28.74%. The average equity to assets ratio is 61%, a healthy margin above the benchmark of 50%, and the return on assets ratio is 12%, which is again well exceeding the 8% benchmark.

Table 1: Financial Profile of the Average Cooperative

	Number Observations	Average	Standard Deviation
Current Assets	40	\$ 3,421,408	4,181,922
Fixed Assets	40	\$2,419,508	3,181,840
Current Liabilities	41	\$1,624,283	1,758,736
Long Term Liabilities	41	\$596,279	1,228,135
Retained Earnings	39	\$952,156	1,991,888
Stockholder and Patron Equity	41	\$4,004,097	5,236,434
Sales	39	\$10,979,364	14,223,400
COGS*	38	\$7,585,841	11,155,958
Gross Margin	40	\$2,763,717	4,003,110
Total Expenses	39	\$2,855,921	4,168,369
Net Savings	40	\$1,229,746	2,642,248
Active Membership	41	883	2,047
Board Size	42	9	8
Average Number of Branches **	19	2	2
% Retained	32	24%	.29
Capital Expenditures 2002	32	\$219,466	442,893
2003	35	\$252,708	450,559
2004	34	\$245,484	298,934
2005 (estimate)	31	\$590,677	2,315,200

* Cost of Goods Sold

** The question asks for the number of branches outside of the primary location of the company

The debt to equity ratio is 62.32%, which is fairly high for a cooperative but still below the benchmark of less than 70%. Cash dividend payout ratio is 67.45%, which is higher than the peer average of 20%. (All benchmarks are courtesy of Jason Lawrence, CoBank). The average cooperative is a financially healthy company that should thrive well into the future.

Table 2 provides a breakdown of the type of business activities that these companies are involved in. Although the “other” category represents a significant

portion of the answers, no detail can be provided on the type of cooperative that is in this category due to the sensitivity of the information. Some cooperatives are involved in more than one activity. Of the population sample, the average cooperative is involved in two of these business activities.

The remainder of the analysis on the cooperative as a whole will be divided into the four categories of competition, equity, strategic planning, and loyalty.

Table 2: Business Activity Participation

	Number of Observation	Average % of Businesses Involved	Standard Deviation
Grain Handling and Storage	46	30%	.47
Fertilizer and Chemical Sales	46	46%	.50
Fuel or Tires	46	30%	.47
Rice Handling and Storage	46	2%	.15
Cotton Ginning	46	50%	.51
Application Services	46	13%	.34
Feed and Livestock Supplies	46	30%	.47
Commodity Marketing	46	7%	.25
Other	46	24%	.43

4.1.2 Competition

As previously noted, competition has been proven as a key factor in the performance of cooperatives. The role of cooperatives in the competitive environment has varied historically, the two most prominent theories being written by Edwin Nourse and Aaron Sapiro. Nourse provided the competitive yardstick theory, in which cooperatives existed only when competition was weak and, by their nature as a not for

profit organization, they forced an oligopoly or monopoly to be more competitive. Nourse felt that cooperatives had no place in a competitive market; therefore, once competition had been established they should either dissolve or transform into an IOF.

By contrast, Sapiro theorized that cooperatives play a vital role in a competitive environment and are created to give power to small producers. He felt this was a valid purpose, no matter what the competitive situation of the firm. The only reason a cooperative should dissolve or transform into an IOF is if it is the best possible decision for the benefit of their small producer members (Barton 1989). There is no doubt that both of these cooperative researchers could find application for their theory today. Nourse's competitive yardstick was created for the Midwestern supply and elevator cooperatives, while Sapiro had the California produce cooperatives in mind. It is probable that given any individual situation, a particular theory is more applicable than the other. Through the analysis of the competitive situation, it is hoped that some generalization may be made on Texas cooperatives.

The questions dealing with competition in the survey deal with both direct, tangible issues such as the number of competitors as well as intangible perceptions of management as to their place in the competitive environment. The first query concerned the competitive situation the firm was involved in. This was accomplished through a series of four questions in which the manager was asked to list the total number of business rivals, the number of cooperative business rivals, the number of national chain business rivals, and the number of internet rivals that they compete closely with. This leaves the remainder of the total rivals as anything not falling into those other categories.

The average cooperative competes with five total rivals, who are broken down into two cooperative rivals, one national chain rival and one internet rival, so one rival does not lie in these categories.

The second query involved perceptions by managers about what factors had the greatest impact on the company's ability to compete with their closest rival. They were asked to choose the three most influential factors since it possible that many factors can impact the competitiveness of any one firm. The data was entered as dummy variables with one denoting that the factor in question has a great impact on the company's ability to compete and zero denoting that it does not. Managers overwhelmingly (69%) felt that member loyalty was one of the most important factors. This was followed by pricing policies (49%) and the number of competitors (40%). The remaining answers were distributed as listed in Table 3.

Through the use of the likert scale, the final two questions involving competition ask the manager whether he/she agrees or not to a set of statements, with an answer of "5" signifying that the manager strongly agrees with the statement, a "3" signifying indecision, and a "1" signifying that the manager strongly disagrees with the statement. The first statement was, "My company is a leading competitor among its rivals." On average, the respondents "agreed" with this statement by answering with a 4 on the scale. This question had a standard deviation of .86.

Table 3: Factors Impacting the Cooperative’s Ability to Compete with Their Closest Rivals

	Number of Observation	Average % of Businesses Involved	Standard Deviation
Cost Structure	45	24%	.43
Employee Expertise	45	27%	.45
Government Policies	44	7%	.25
Internet and Technology Utilization	45	2%	.15
Laws Unique to Cooperative Businesses	45	0%	.00
Leadership Experience	45	13%	.34
Location of the Company	45	24%	.43
Member Loyalty	45	69%	.47
Number of Competitors	45	40%	.50
Pricing Policies	45	49%	.51
Strategic Planning	45	11%	.32
Technological Advances	45	4%	.21
Unique Service/ Product Offering	45	9%	.29
Other	45	7%	.25

The second such likert scale question is an overlapping question with the loyalty category. It asks managers, on the same scale as above, to answer to the statement, “Identifying the top 25 current and potential customers is key.” Managers generally “agreed” with this statement as well; in addition, when asked (by dummy variable) whether or not they actually identify their top 25 customers 28% of respondents identify only and 33% identify them as well as taking specific steps to retain them as future customers.

4.1.3 Equity

The equity account is important in any business, but it is particularly important in cooperatives. Cooperative equity is what gives the investor ownership rights in the

business, which for cooperatives means voting rights and a say in company policy, in addition to the usual dividend claims on the business. There is no law defining how much equity a cooperative must pay back in each year, if any at all. Therefore, cooperatives often do not redeem equity, even in a profitable year. Even those cooperatives that have a specific section in their bylaws defining their equity redemption policy are not obligated to redeem unless the cooperative can financially support it. Some cooperatives will chose to retain earnings or give a larger dividend rather than redeem equity in a profitable year. It is hoped that this study will discover the redemption habits of cooperatives in Texas and whether they differ between successful and stagnant cooperatives.

Survey respondents reported the type of redemption policy used by their company, or that they had no redemption policy. There was also an “other” option to report a different type of policy than those listed. In the literature these are called special situation redemption plans (Cobia, Royer, and Ingalsbe 1989). The most predominant policy type in Texas is a revolving fund equity redemption policy, which is a “first in, first out” policy. Under this plan, the oldest stock gets redeemed first. What this means for members, is that those who have been members of the cooperative for a longer period of time will get their equity back before those who have been there a shorter period of time. This plan is utilized by 41% of respondents.

The least used plan was the percentage of all equities policy, which involves the cooperative retiring a defined percentage of total equity in each year, regardless of the age of equity. The benefit of this policy is that it gives almost instant reward to new

members; however, the downfall is that over-invested members will probably remain over-invested because the cooperative cannot pay their equity down in large amounts under this plan. Percentage of all equities accounts for only 5% of respondents.

The final policy option was for the base capital equity redemption plan, in which the company has a base number of years after which they either redeem equity or ask for additional equity depending on the individual. When a farmer is over-invested, the company would redeem the amount of equity above his/her fair portion of investment during the base period. If the farmer is under-invested, the company will require an investment of equity to bring him/her up to the fair portion of investment during the base period. Although this policy is the most equitable because it links investment with redemption, it accounted for only 7% of respondents. In addition, 2% of respondents reported some other form of “special situation” policy. Of particular interest is that 48% of respondents reported having no formal equity redemption policy. The company was asked to share the age of the oldest outstanding stock that the cooperative had on the books. On average the oldest stock was 18 years old, with a standard deviation of 20.

There were other questions relating to equity as well. When questioned on topics that will help the cooperative prepare for future challenges, 52% of respondents chose “balancing dividend payments and equity redemption” as one of their top five topics. The same question also included the topic, “understanding and analyzing financial information”, which was chosen by only 17% of the survey respondents. The equity management and perceptions of equity by managers in this category appear to as one would expect from a review of the literature on the subject.

4.1.4 Strategic Planning

Strategic planning has been touted as a way for cooperatives to identify their company's strengths and weaknesses, as well as future opportunities and outside threats to the company. Cooperatives are encouraged to seek alternative avenues and structure short and long term plans for the future of the company. In a strategic planning retreat companies will review their mission and vision, as well as consider any changes that need to be made to policies and bylaws in order to achieve the company objectives. It is hoped that through the strategic planning process cooperatives can become stronger and more efficient, as well as identify growth and expansion activities. Or they might discover that they need to "tighten their belts" and downsize the company. In any case, the goal of strategic planning is clear, if only cooperatives utilize it to the fullest potential. The survey asked specifically for practices and perceptions in strategic planning. In addition it questions managers on what literature suggests as the "results" of strategic planning—efficiency, diversity and growth.

The first question in this section dealt with the initiatives the company had toward future growth. The question had five possible options plus the "other" option, where they could enter their own personal response. The five possibilities were to raise margin levels, expand volume in current lines of business, cut costs, and sell assets. The most responses (61%) were in favor of expanding current lines of business followed by a much closer decision to raise margin levels (28%), cut costs (22%), and develop new lines of business (20%). The final option, selling assets had a zero response rate. The other category accounted for 7% of respondents.

When questioned as to the greatest contributor to operational efficiency in the company, managers were offered four choices as well as the option to write in an “other” contributor. The four options available were centralization of services, reduction of redundant labor, utilization of advanced technology, and training of personnel. The greatest contributor was the training of personnel at 36% of respondents, followed by centralized services at 29%, reduction of redundant labor at 22% and utilization of advanced technology at 16%. The option of some other contributor was chosen by 4% of respondents.

When questioned as to what diversification method would be most likely to succeed, four options were available plus the option to include an “other” answer. The four options were: to introduce new departments within the company, to participate in joint ventures with other cooperatives, to participate in joint ventures with other non-cooperatives, and to provide expanded services within the existing departments. The greatest response was to provide expanded services within the existing departments, which made up 47% of responses. This was followed by participation in joint ventures with other cooperatives, with 33% of responses, and introduction of new departments within the company with 16% of responses. The “other” category made up 11% of the total responses. The “other” answers seem to convey a sense that many cooperatives feel there is no need to diversify and that they plan to instead concentrate on efficiency. The lowest response group at 9% was for participation in joint ventures with non-cooperatives.

The final question related to topics that cooperatives feel will help them prepare for future challenges, 67% chose strategic planning as one of their top five choices. When questioned (on the likert scale of 5 being “strongly agree” and 1 being “strongly disagree”) managers “agree” to the statement, “it is important to the success of my company to have a long run strategic plan” with an average ranking of 4. However, managers are not as positive about the statement “our company’s strategic plan is reviewed and potentially revised at least annually.” Managers were “undecided” about this statement.

On the more operational side, cooperative managers “agree” with the statements “my current financial position will allow for future growth and expansion” and “my company is operationally efficient enough to sustain growth and expansion.” The average on both questions was 4, but the standard deviations vary with a 1.05 std. dev. on the former and .82 std. dev. on the latter.

4.1.5 Loyalty

Member loyalty is a complex issue, particularly for cooperatives. Some measure member loyalty through dollar sales done with the business, some through their involvement in the business, but none agree as to an efficient way to measure something so variable and individual to the person. In this case, rather than trying to measure loyalty directly, the survey asked for a report of the change in membership size and the manager’s perceptions on of the loyalty of their own members. It is probable that this perception is not entirely accurate; however, the goal of this sub-section is not to

ascertain the true state of members' loyalty but to ascertain the impact that the manager's perception of loyalty has on the performance of the business.

The active membership trend is reported in Table 4. The majority of cooperative managers felt that their memberships have stayed the same, with a somewhat normal distribution on each side.

Table 4: Active Membership Trend in the Last Five Years

Membership Size Trend ...	Number of Observation	Average % of Businesses Involved	Standard Deviation
Increased 25% or More	45	4%	.21
Increased 11-15%	45	7%	.25
Increased 10% or Less	45	20%	.40
Stayed the Same	45	38%	.49
Decreased 10% or Less	45	20%	.40
Decreased 11-15%	45	9%	.29
Decreased 25% or More	45	2%	.15

The remainder of the questions in this category deal with the manager's perceptions of loyalty in his/her own cooperative. The first questions relating to this topic deal with how critical the financial condition of members and improving member services are to the cooperative. This was a likert scale question with 5 signifying "very critical", 3 signifying "neutrality", and 1 signifying "not critical". Managers felt that the financial condition of members is a "critical" issue for the cooperatives; similarly, they felt that improving member services is "critical" as well. In an overlapping question with the competition category, 69% of managers (the largest percentage of the options) felt that member loyalty was critical to the cooperative's ability to compete.

The final group of questions was aimed at ascertaining the manager's perceptions of the impact of various factors on member loyalty through the use of a likert scale where five equals "strongly agree", three signifies "uncertain" and one signifies "strongly disagree". The questionnaire asked for perceptions on five factors, which were: professional expertise of staff, confidence in the general manager, confidence in the board of directors, the level of community involvement, and customer service. Managers "agreed" that all of these factors greatly impact member loyalty by ranking all of them at an average 4. When questioned whether cooperatives are losing large farmers as customers and members, managers "disagree" (2). Finally, when questioned whether it is essential to educate members of the operational decisions of the company, managers "agree" with an average of 4.

4.2 Statistical Summary for the Sample Group: Top Performers

The successful group, or top performers, is made up of the cooperatives which exceeded acceptable levels of both ROA and E/A. There are 18 cooperatives that sorted into this group. The purpose of analyzing the statistics of this group separately is to have a basis of comparison against the bottom performers so that further analysis can be done to ascertain the differences between the two groups and to provide a comparison against the average.

4.2.1 Cooperative Operational and Financial Overview

Cooperatives in this group had an average net income of \$2.4 million, as well as an average ROA of 25% and an E/A of 70%. These strong numbers signify that these cooperatives are viable financially currently and into the future. The current ratio is 2.33,

which is well above the benchmark. Profit margin is 14.03% for the cooperatives in this category. The average operational structure in this group is a cooperative averaging \$17 million in sales, with one main location and one branch office. Active membership is 1443 members with an average board size of 12 members. This is considerably larger than the average of the sample as a whole. Working capital for these cooperatives is \$2,864,335 and the net working capital is 32.84%. Debt to Equity is 41.13%, which is more acceptable than the sample as a whole. Dividend payout is 64%, which is lower than the average, but still considerable when the comparative increase in net income is taken into account. Overall, the top performer cooperative is larger in size and slightly higher performing than the average of the sample as a whole. Table 5 outlines the basic profile of the average top performer.

The largest numbers of cooperatives in this group were cotton gins or some specialization (respondent marked “other” as their primary business activity). Cotton gins accounted for 50% of responses and “others” accounted for 39%. The average cooperative in this group was involved in two business activities. Table 6 below lists the remaining cooperatives business participation and the standard deviation of the variable.

Table 5: Financial Profile of the Average Top Performer Cooperative

	Number Observations	Average	Standard Deviation
Current Assets	18	\$5,018,787	5,416,192
Fixed Assets	18	\$2,901,568	3,359,196
Current Liabilities	18	\$2,154,452	2,070,530
Long Term Liabilities	18	\$306,539	695,702
Retained Earnings	18	\$1,509,612	2,792,441
Stockholder and Patron Equity	18	\$6,260,467	6,831,347
Sales	17	\$17,270,320	19,128,765
COGS*	16	\$11,425,704	15,805,750
Gross Margin	17	\$4,528,725	5,428,725
Total Expenses	17	\$4,726,904	5,753,385
Net Savings	18	\$2,423,674	3,440,018
Active Membership	18	1443	2,939
Board Size	18	12	11
Average Number of Branches **	8	1	1
% Retained	15	28%	.28
Capital Expenditures 2002	12	\$685,309	685,309
2003	14	\$687,771	687,770
2004	15	\$377,493	377,492
2005 (estimate)	13	\$327,805	327,805

*Cost of Goods Sold

** The question asks for the number of branches outside of the primary location of the company

Table 6: Business Activity Participation: Top Performer

	Number of Observation	Average % of Businesses Involved	Standard Deviation
Grain Handling and Storage	18	11%	.32
Fertilizer and Chemical Sales	18	28%	.46
Fuel or Tires	18	6%	.24
Rice Handling and Storage	18	0%	0
Cotton Ginning	18	50%	.51
Application Services	18	17%	.38
Feed and Livestock Supplies	18	22%	.43
Commodity Marketing	18	6%	.24
Other	18	39%	.50

4.2.2 Competition

The competitive situation of the top performers appears to run closely to the sample averages reported earlier. The cooperatives face an average 5 closest competitors, with 2 competitors being cooperatives, 2 being national chains, and one being internet based. Particularly because of the size of these companies, it seems reasonable that there would be more national chain competitors than the average. The number only increases by one; however, depending on the size of the company and/or the size of the national chain store, the impact could range in intensity.

When looking at the responses of this group in particular for the question related to the factors that impact the cooperative's ability to compete, one sees that the results are similar to the sample as a whole. The only real difference is the jump in "employee expertise" as one of the most important factors. The other variable that increased significantly is the importance of a unique product or service. The answers for the sample as a whole and for the top performer subgroup are similar in that member loyalty, number of competitors and pricing policies remain top factors. Table 7 provides an overview of these answers and others in the top performer subgroup.

When analyzing the two likert scale questions regarding competition, the first question, "My company is a leading competitor among its rivals" is met more confidently than the sample as a whole. Top performer cooperatives "strongly agreed" (5) to this statement compared to the sample as a whole who "agreed". The second question on likert scale did not change from the sample as a whole. When asked "Identifying my top 25 current and potential customers is key" cooperatives "agreed"

with the statement,. Overall, successful cooperatives appear to be in a slightly more competitive situation, but are confident in their role in that environment, leaning more toward the Sapiro school of competitive thought.

Table 7: Factors Impacting the Top Performer Cooperative’s Ability to Compete with Their Closest Rivals

	Number of Observation	Average % of Businesses Involved	Standard Deviation
Cost Structure	17	18%	.39
Employee Expertise	17	41%	.51
Government Policies	17	6%	.24
Internet and Technology Utilization	17	0%	.00
Laws Unique to Cooperative Businesses	17	0%	.00
Leadership Experience	17	18%	.39
Location of the Company	17	18%	.39
Member Loyalty	17	71%	.47
Number of Competitors	17	41%	.51
Pricing Policies	17	47%	.51
Strategic Planning	17	12%	.33
Technological Advances	17	6%	.24
Unique Service/ Product Offering	17	18%	.39
Other	17	0%	.00

4.2.3 Equity

The equity situation of the successful group follows a similar pattern as the sample as a whole. The revolving fund equity redemption policy is utilized by 61% of respondents. This is similar to the sample as a whole, but it is used by 20% more respondents in the top performer group. The base capital equity redemption policy is still the second most used at 6%, only one percent less than the sample as a whole. The

percentage of all equities policy is not used by this group. In addition, no cooperatives in this group need the use of a special situations equity redemption policy. The respondents who have no equity redemption policy dropped from 48% in the sample as a whole to only 33% in the top performer subgroup.

Of the managers who are seeking additional help to prepare for future challenges, 44% of respondents chose “balancing dividend payments and equity redemption” as one of their top five topics. This is an 8% reduction from the sample as a whole. The same question also included the topic, “understanding and analyzing financial information”, which was chosen by only 17% of the survey respondents. This is the exact percentage of respondents to this question in the sample as a whole.

4.2.4 Strategic Planning

Since these cooperatives are deemed to be successful and viable on the long term (as signified by their E/A ratio exceeding 50%) it is logical that, if strategic planning has a significant impact on success, efficiency and long term viability these cooperatives should be participating in strategic planning or at least recognize it as valuable. The first question in this section dealt with the initiatives the company had toward future growth. Over the five possibilities, this group followed closely with the sample as a whole. In response to the option of raising margin levels, 22% felt that this was the best initiative to take. This is a 6% reduction from the sample as a whole. The same percentage of respondents chose the option of developing new lines of business (22%), this was a 2% increase from the sample as a whole. The most popular response was still to expand volume in current lines of business, to which 67% of those surveyed responded. This is a

6% increase from the sample as a whole. Cutting costs accounted for 11% of responses, dropping a spot in the ranked order and declining 11% from the sample as a whole. The final option of selling assets of course had a zero response rate. The other category accounted for 6% of respondents.

When questioned as to the greatest contributor to operational efficiency in the company, top performer cooperative managers felt that the greatest contributor was a tie between the training of personnel and centralized services at 33% each. The reduction of redundant labor and the utilization of advanced technology also accounted for the same number of responses at 17% each. The option of some other contributor was chosen by 6% of respondents, which is up from 4% in the sample as a whole.

When questioned as to what diversification method would be most likely to succeed, the greatest response was still to provide expanded services within the existing departments, which made up 44% of responses. This is down by 5% from the sample as a whole. The second most popular diversification method among the top performers was participation in joint ventures with other cooperatives, with 28% of responses (down from 33%). This is followed by a tie between the introduction of new departments within the company and “other” answers at 22% of responses. Written answers to the “other” option seem to convey a sense that many cooperatives feel there is no need to diversify and that they plan to instead concentrate on efficiency. The lowest response group at 6% was for participation in joint ventures with non-cooperatives.

The final questions relating to strategic planning were on the topics that cooperatives feel will help them prepare for future challenges. In this subgroup 83%

chose strategic planning as one of their top five choices. This is up 16% from the sample as a whole. When questioned (on the likert scale of 5 being “strongly agree” and 1 being “strongly disagree”) managers again “agree” to the statement, “it is important to the success of my company to have a long run strategic plan” with an average ranking of 4. This is the same as in the sample as a whole. The similarity to the sample as a whole continues as top performer managers are “undecided” (3) about the statement “our company’s strategic plan is reviewed and potentially revised at least annually.”

On the more operational side, cooperative managers “agree” with the statements “my current financial position will allow for future growth and expansion” and “my company is operationally efficient enough to sustain growth and expansion.” The average on both questions was 4, which is the same as the sample as a whole. However, the standard deviations go down somewhat for the former to .96 from 1.05 and go up slightly for the latter question from .82 to .84 respectively.

4.2.5 Loyalty

The top performer group has more members than the sample as a whole. The members of this group have an average 1883 members, and the range is from a minimum of one to a maximum of 10,000 members. Both of these outliers are regional cooperatives. It is unknown if this larger average member size impacts the number of loyalty related issues the cooperative faces. The active membership trend is reported in Table 8. One of the responding cooperatives that sorted into this group did not complete this question. The majority of cooperative managers felt that their memberships have

stayed the same, with a somewhat normal distribution on each side, similar to the sample as a whole.

Table 8: Active Membership Trend for the Top Performers in the Last Five Years

Membership Size Trend	Number of Observation	Number of Reponses	Average % of Businesses Involved	Standard Deviation
Increased 25% or More	17	1	6%	.24
Increased 11-15%	17	1	6%	.24
Increased 10% or Less	17	3	18%	.39
Stayed the Same	17	6	35%	.49
Decreased 10% or Less	17	3	18%	.39
Decreased 11-15%	17	2	12%	.33
Decreased 25% or More	17	1	6%	.24

The remainder of the questions in this category deal with the manager's perceptions of loyalty in his/her own cooperative. The first questions deal with how critical the financial condition of members and improving member services are to the cooperative. This is based on a likert scale with 5 signifying "very critical", 3 signifying "neutral", and 1 signifying "not critical". Managers felt that the financial condition of members is a "critical" issue for the cooperative; similarly, they felt that improving member services is "critical". This is the same as the sample as a whole. In an overlapping question with the competition category, 71% of managers (the largest percentage of the options) felt that member loyalty was critical to the cooperative's ability to compete. This is up slightly (2%) from the sample as a whole.

The final group of questions was aimed at ascertaining the manager's perceptions of the impact of various factors on member loyalty through the use of a likert scale

where five equals “strongly agree”, three signifies “uncertain” and one signifies “strongly disagree”. The five factors, of professional expertise of staff, confidence in the general manager, confidence in the board of directors, the level of community involvement, and customer service were rated the same as the sample as a whole with one exception, customer service. Managers “agreed” with the first four by ranking them at an average 4. However, managers “strongly agreed” that customer service greatly impacts member loyalty (5).

When questioned whether cooperatives are losing large farmers as customers and members, managers disagree (2) just as in the analysis of the sample as a whole. Similarly, when questioned whether it is essential to educate members on the operational decisions of the company, top performer managers agree with an average of 4. Overall, the top performer group is very similar to the sample as a whole, with only slightly more positive responses in most cases. The following section will perform a similar analysis with the bottom performing group.

4.3 Statistical Summary for the Sample Group: Bottom Performers

The bottom performers, or the stagnant group, are those cooperatives that failed to meet the benchmark standards in both ROA and E/A. Only six cooperatives sorted into this category making it difficult to make any sound conclusions from this group; however, this information will still be presented for the sake of comparison.

4.3.1 Cooperative Operational and Financial Overview

Cooperatives in this group had an average net income of negative \$170,391 as well as an average ROA of negative 6% and an E/A of 33%. Profit margin was negative

3.57%. Just as troubling, the debt to equity ratio is 143.79%. As these numbers signify, the cooperatives in this group, however few, are in a serious situation. The average operational structure in this group is a cooperative averaging \$4.8 million in sales, with one main location and four branch offices. However, since only two cooperatives responded as having branch offices at all, it is unlikely that this average is representative of the population.

The current ratio is 1.77, barely making the benchmark for a supply cooperative and under the mark for a grain supply company. Active membership is 840 members with an average board size of 8 members. This is closer to the numbers obtained from the sample as a whole than the top performers. The average working capital is \$711,737 with a net working capital of 26.58%. An interesting note is on the amount of earnings retained from net savings every year. These cooperatives are retaining an average 65% of their net earnings every year, which appears to signify a dedication to building up the business. Their small net earnings amounts (if they are even positive) appear to be preventing this. The retained earnings account is about one third the size of the retained earnings account for the sample as a whole. The average company paid out no dividends in 2004. Table 9 outlines the average bottom performer in this sample.

The largest numbers of cooperatives in this group were involved in farm supply and services including fertilizer and chemical sales, fuel or tires, grain handling and storage, and feed and livestock supplies. The average cooperative in this group was involved in three business activities. The percentage of cotton gins was reduced to 17%

as compared to the top performers which had 50% cotton gins. Table 10 below lists the remaining cooperatives business participation and the standard deviation of the variable.

Table 9: Financial Profile of the Average Bottom Performing Cooperative

	Number Observations	Average	Standard Deviation
Current Assets	6	\$1,637,761	1,579,270
Fixed Assets	6	\$742,949	567,037
Current Liabilities	6	\$926,024	950,724
Long Term Liabilities	6	\$573,862	369,997
Retained Earnings	6	\$326,361	397,211
Stockholder and Patron Equity	6	\$1,050,281	853,176
Sales	6	\$4,775,268	3,665,931
COGS*	6	\$4,283,704	3,292,816
Gross Margin	6	\$712,903	811,449
Total Expenses	6	\$1,121,233	648,227
Net Savings	6	\$-170,391	204,714
Active Membership	6	840	1320
Board Size	6	8	2
Average Number of Branches **	2	4	3
% Retained	4	65%	47%
Capital Expenditures 2002	6	\$71,266	94,743
2003	6	\$177,381	190,515
2004	6	\$67,500	59,644
2005 (estimate)	6	\$97,667	70,941

* Cost of Goods Sold

** The question asks for the number of branches outside of the primary location of the company

Table 10: Business Activity Participation: Bottom Performers

	Number of Observation	Average % of Businesses Involved	Standard Deviation
Grain Handling and Storage	6	33%	.52
Fertilizer and Chemical Sales	6	83%	.41
Fuel or Tires	6	50%	.55
Rice Handling and Storage	6	17%	.41
Cotton Ginning	6	17%	.41
Application Services	6	0%	0
Feed and Livestock Supplies	6	33%	.52
Commodity Marketing	6	0%	0
Other	6	17%	.41

4.3.2 Competition

The competitive environment in which these cooperative operate is likely more difficult than the average cooperative in the sample, and most likely more difficult than in the top performer group. This is illustrated both in the number of competitors as well as the manager's perception of the number of competitors on the cooperative. The total rivals of the cooperative goes up in comparison to the sample as a whole. The average bottom performer has a total nine close rivals, of which two are cooperative rivals, three are national chain rivals and two are internet rivals. The only number which stayed the same from the sample in its entirety is the number of cooperative competitors. It is possible that the managers of these smaller cooperatives that are in more difficult financial situations feel that more competitors are "close rivals" than those cooperatives in other groups.

Another way in which the more difficult competitive situation is illustrated would be in the responses concerning the factors that have the greatest impact on the cooperative's ability to compete with their closest rivals. The most frequently chosen factor at 67% of responses is the number of competitors being one of the top three factors. Rounding out the top three are pricing policies and the location of the company. An overview of the ranking of these factors and the other possibilities are shown in Table 11.

Table 11: Factors Impacting the Bottom Performer Cooperative’s Ability to Compete with Their Closest Rivals

	Number of Observation	Number of Businesses Involved	Average % of Businesses Involved	Standard Deviation
Cost Structure	6	1	17%	.41
Employee Expertise	6	1	17%	.41
Government Policies	6	2	33%	.52
Internet and Technology Utilization	6	1	17%	.41
Laws Unique to Cooperative Businesses	6	0	0%	0
Leadership Experience	6	0	0%	0
Location of the Company	6	3	50%	.55
Member Loyalty	6	2	33%	.52
Number of Competitors	6	4	67%	.52
Pricing Policies	6	3	50%	.55
Strategic Planning	6	1	17%	.41
Technological Advances	6	0	0%	0
Unique Service/ Product Offering	6	0	0%	0
Other	6	0	0%	0

In contrast to their seemingly weaker competitive situation, managers still maintained a positive outlook on their role in the market area. When analyzing the two likert scale questions regarding competition, the first question, “My company is a leading competitor among its rivals”, managers agree to this statement by answering an average of 4. This is the same as the sample as a whole. The second question on likert scale did not change from the sample as a whole either. When asked whether “Identifying my top 25 current and potential customers is key” cooperatives “agreed” with the statement. Overall, stagnant cooperatives appear to be in a more difficult competitive situation, but they are maintaining a positive outlook on the situation.

4.3.3 Equity

Equity was expected to be a difficult issue for these cooperatives because it is unlikely that they would be able to redeem equity in many years given that they are following the pattern seen in the sample year and making little money if any at all. Therefore, we would expect that these cooperatives will not be as active in their equity redemption policies and attitudes as the sample as a whole or their top performer counterparts.

This is illustrated by the response to the question asking managers to identify their formal equity redemption policy, which has the options of revolving fund equity policy, base capital equity policy, percentage of all equities policy or a special situations equity policy. None of the cooperatives in this group utilized any of these formal equity redemption policies. The respondents unanimously chose the option of having “no formal equity redemption plan”.

The equity situation as noted in section 4.3.1 is that the average amount of stockholder and patron equity held by the cooperative is just over \$1 million and the age of the oldest stock is 28 years. Of the managers who are seeking additional help to prepare for future challenges, 50% of respondents chose “balancing dividend payments and equity redemption” as one of their top five topics. This is a 2% reduction from the sample as a whole. The same question also included the topic, “understanding and analyzing financial information”, which was chosen by 17% of the survey respondents. This is the exact percentage of respondents to this question in the sample as a whole.

4.3.4 Strategic Planning

It is hoped that these cooperatives are at least interested in learning more about strategic planning if they are not already participating in it. The first question in this section dealt with the initiatives the company had toward future growth. Over the five possibilities this group was more interested in expansionary initiatives rather than cutting costs or selling assets. In response to the option of raising margin levels, 17% felt that this was the best initiative to take. This is an 11% reduction from the sample as a whole. The same percentage of respondents chose the option of developing new lines of business (17%). The most popular response was still to expand volume in current lines of business, which accounted for 67% of those surveyed. Cutting costs accounted for 17% of responses. The final option of selling assets of course had a zero response rate and the “other” option had a zero percent response as well.

When questioned as to the greatest contributor to operational efficiency in the company, bottom performer cooperative managers felt that the greatest contributor was reduction of redundant personnel, which accounted for 67% of total responses. Centralization of services was the second most popular answer with 33% of responses followed by the training of personnel at 17% and “other” answers, also at 17%. The option of utilizing advanced technology was chosen by none of the cooperatives in this sample subgroup.

When questioned as to what diversification method would be most likely to succeed, the greatest response was still to provide expanded services within the existing departments, which made up 50% of responses. This is up 3% from the sample as a

whole. The second most popular diversification method among the bottom performers was participation in joint ventures with other cooperatives, with 33% of responses. This was followed by 17% of managers choosing to participate in joint ventures with non-cooperatives. None of the managers in this category chose the option of introducing new departments within the company; however, this is not a surprising result considering that these companies averaged 3 primary business departments already established in their business. Neither did any of these managers choose to fill in an “other” response.

When questioned on the topics that cooperatives feel will help them prepare for future challenges, 67% chose strategic planning as one of their top five choices. This is the same as the sample as a whole. When questioned (on the likert scale of 5 being “strongly agree” and 1 being “strongly disagree”) managers again “agree” to the statement, “it is important to the success of my company to have a long run strategic plan” with an average ranking of 4. Bottom performer managers are “undecided” (3) about the statement “our company’s strategic plan is reviewed and potentially revised at least annually.” Both of these rankings are the same as the sample as a whole.

On the more operational side, cooperative managers are “undecided” with the statements “my current financial position will allow for future growth and expansion” but “agree” with the statement “my company is operationally efficient enough to sustain growth and expansion.” The sample as a whole had an average response of “agree” on both of these statements. The standard deviation goes up for the former to 1.37 from 1.05 and goes up for the latter question from .82 to .89. It is not unexpected that

managers would be undecided on whether their current position would allow for future growth and expansion considering the financial position discussed in section 4.3.1.

4.3.5 Loyalty

The bottom performers do not have as large an average membership as the top performers, and therefore it is possible that member loyalty is either a much larger issue or a much smaller issue for them. The membership trend of the bottom performers is much more stagnant than the sample as a whole, with very little movement. What movement was seen tended to be more in the “decreasing” trend than in the “increasing” trend. Table 12 provides a breakdown of the active membership trend of the bottom performers in the last five years.

Table 12: Active Membership Trend for the Bottom Performers in the Last Five Years

Membership Size Trend	Number of Observation	Average % of Businesses Involved	Standard Deviation
Increased 25% or More	6	0%	.00
Increased 11-15%	6	0%	.00
Increased 10% or Less	6	17%	.41
Stayed the Same	6	50%	.55
Decreased 10% or Less	6	17%	.41
Decreased 11-15%	6	17%	.41
Decreased 25% or More	6	0%	.00

The remainder of the questions in this category deal with the managers’ perceptions of loyalty in his/her own cooperative. The first questions deal with how critical the financial condition of members and improving member services are to the cooperative base on a likert scale with 5 signifying “very critical”, 3 signifying “neutral”

and 1 signifying “not critical”. In the question relating to the financial condition of members, managers in this group felt that this was a “critical” issue; however, managers in the bottom performer group were “neutral” about improving member services. The sample as a whole felt that both categories are “critical”. In an overlapping question with the competition category, only 33% of managers felt that member loyalty was critical to the cooperative’s ability to compete. This is down by 36% from the sample as a whole, which had listed member loyalty as the most critical factor affecting the cooperatives ability to compete with their closest rivals.

The final group of questions was aimed at ascertaining the manager’s perceptions on the impact of various factors on member loyalty in their own cooperative. This was accomplished through the use of a likert scale where five equals “strongly agree”, three signifies “uncertain” and one signifies “strongly disagree”. The five factors, of professional expertise of staff, confidence in the general manager, confidence in the board of directors, the level of community involvement, and customer service were split between managers “agreeing” with the statement or “strongly agreeing” with the statement. The respondents “agreed” that professional expertise of staff, community involvement, and confidence in the board of directors greatly impacts member loyalty. However, they “strongly agree” that customer service and confidence in the general manager impacts member loyalty.

When questioned whether cooperatives are losing large farmers as customers and members, managers are “undecided” as compared to the sample as a whole which “disagreed” with this statement. Finally, when questioned whether it is essential to

educate members of the operational decisions of the company, bottom performer managers “agree” with an average of 4. Generally, the bottom performer group does not appear to “agree” with the literature as well as the sample as a whole or the top performer group, which could be a result of bias from the small sample size.

4.4 Comparison of Top Performers and Bottom Performers

In comparing the top and bottom performers there is an obvious difference in size as well as in sales volume, indicating that some significant differences are occurring. The top performers appear to be making a better use of debt capital. Current liabilities in top performers were approximately \$2.1 million compared to only \$926,024 for the bottom performers, which is not surprising considering the size difference. However, the long term liabilities of top performers are \$306,539 compared to the bottom performers’ average \$573,862. In comparing the debt to equity ratio of these two firms, the top performers have only 41.13% versus 143.79% for the bottom performers. This limits the options for diversification or expansion for bottom performers, because their ability to obtain further debt capital is likely limited.

Working capital for the top performers is \$2.8 million compared to only \$711,000 for bottom performers. When looked at working capital as a ratio with sales, working capital to sales for top performers is 16% compared to the bottom performers 14%. The typical benchmarks for this area are 10-15% for small cooperatives, and greater than 5% for large cooperatives. It is encouraging to note, that both groups fall into the acceptable range meaning that neither of the groups are likely out of long term debt covenant requirements with their financial lender. The net working capital for the

bottom performers is 26.58% compared to 32.84%. In accounts receivable turnover, the top group had an average turnover of 14 days, compared to the bottom performers who had an average turnover of 12 days.

In comparing the operational aspects of the business, the size difference between the two groups of companies is obvious. Therefore, the logical place to delve further is into the operational and management philosophies of the two subgroups. In relation to competition, the bottom performers obviously face a larger number of competitors, but this does not stop their managers from believing they are a leading competitor in their market. In looking at the differences between the two subgroups in relation to the factors impacting the cooperative's ability to compete, top performers are more likely to look internally toward member loyalty, pricing policies, leadership experience and employee expertise as well as externally toward the number of competitors. The bottom performers appear to dwell more on factors that cannot be readily changed such as the number of competitors, government policies, and location of the company. Figure 2 provides a complete listing of the critical factors to these two groups and the difference between the two.

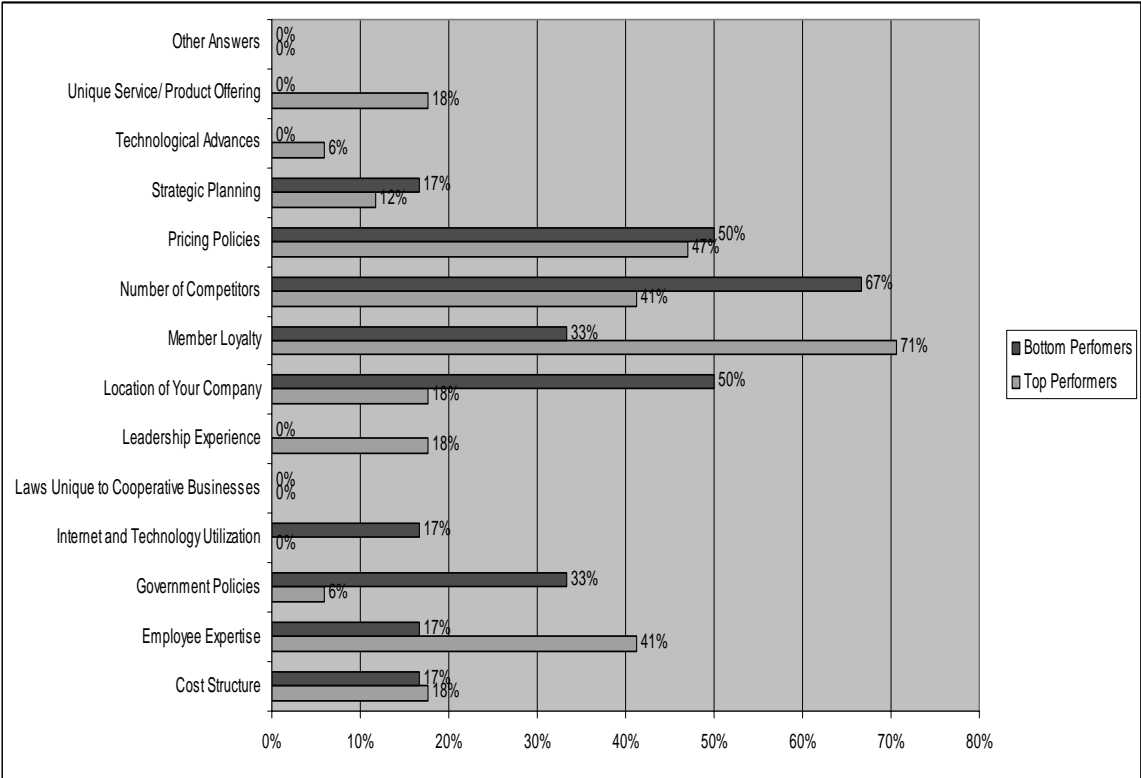


Figure 2: Factors Critical to the Success of the Cooperative

In considering the active membership trend of these two companies the top performer cooperatives have had some movement in their membership, whereas the bottom performer group has had a stagnant membership with the majority of cooperatives not having any movement in any direction. Figure 3 provides a comparison of the membership trends between these two cooperative groups.

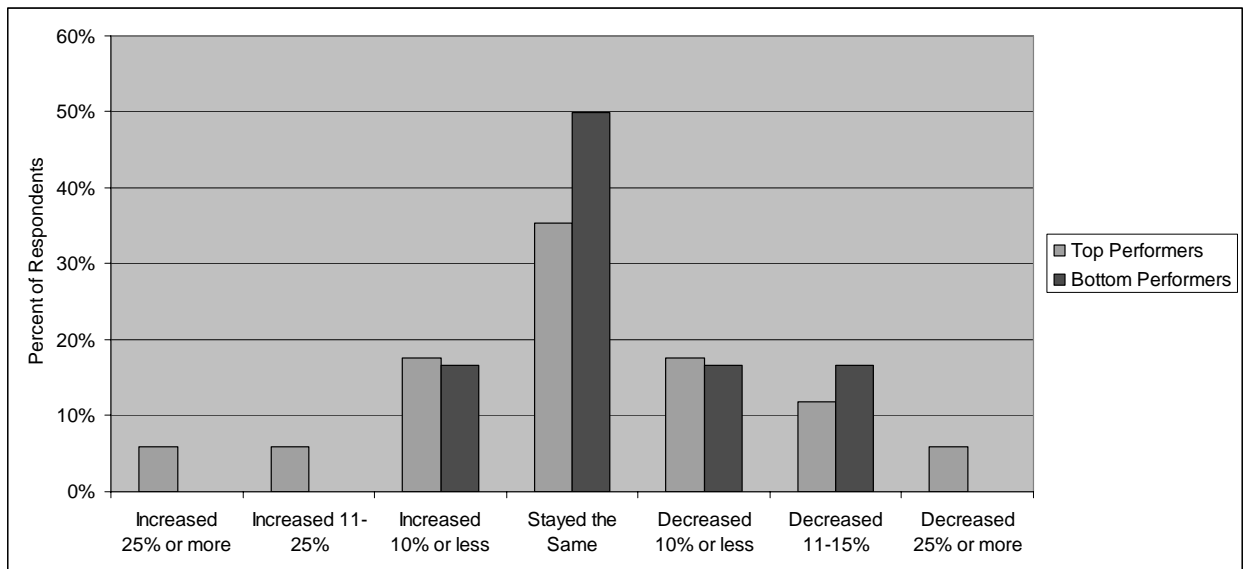


Figure 3: Membership Trend Comparison

To become more competitive, many companies (often in strategic planning retreats) will perform an analysis of their membership in order to identify who their top customers are and to consider policies that might provide some incentive to remain a member of the cooperative (or to become a member). Both sets of managers agree that it is important to identify the top 25 customers of their cooperative, so to see any difference in these two groups another question which takes the issue a little deeper is analyzed.

The question gives the manager a choice of saying they have not identified who the top 25 customers are, they have a general idea of who their top 25 customers are, they have specifically identified their top 25 members, or they have specifically identified their top 25 members and taken steps to retain them. It also provides the standard option of writing in an “other” answer. Top performers were scattered among

the options with the largest percentage (44%) having specifically identified the top 25 and taken steps to retain them. The bottom performers had specifically identified the top 25 (67%) but not many had gone to the next level and taken steps to retain them (44%). Table 13 provides a breakdown of this question.

Table13: Top 25 Customer Identification between the Two Groups

Cooperative Has	Sample as a Whole	Top Performers	Bottom Performers
Not identified who the top 25 customers are	9%	11%	0%
A general idea of who the top 25 customers are	30%	17%	17%
Specifically identified the top 25 customers	28%	33%	67%
Specifically identified the top 25 and taken steps to retain/ recruit them	33%	44%	17%
Other	4%	6%	0%

In reference to the equity position of the two cooperatives, the starkest difference is that the top performers have the expected distribution among various equity redemption policies with a few cooperatives that do not have an equity redemption policy. However, the bottom performers do not have any formal equity redemption policy at all. There could be many reasons for this, but it still casts a shadow on any opinions they might have on the positive aspects of equity redemption.

The top performer group appears to be taking the benefits of strategic planning seriously, as do the bottom performers. However, when considering the “results” of strategic planning, namely efficiency, growth and long run economic viability the bottom performers do not appear to be gaining the same benefits from strategic planning. Perhaps this is because bottom performers are not willing to implement the change required from an effective strategic plan or perhaps their situation does not allow them to implement any kind of drastic change.

In reference to loyalty, these two groups are very different. The top performers have more members to be concerned about; therefore, member loyalty may be a bigger issue with them. However, the fact that bottom performers are uncertain whether they are losing large farmers as members should be a key indicator to them that they need to begin considering policies that could draw these members back in. This is assuming that they did not lose these large members due to retirement, death, or the loss of their farm land to urban sprawl.

The bottom performers were also uncertain when asked about policies that would treat large farmers differently and how their other members would support those policies. The top performers disagreed that they were losing large members, and felt that their current members would not support differential pricing policies; however, they were uncertain whether they would need to treat large members differently in the future. As a summary, Table 14 is an overview of those issues that are most critical to the cooperative. Both of these groups appear to be concerned about the same issues, but the top performer group is certainly better equipped to handle these situations.

Table 14: Critical Issues to Cooperatives in the Top and Bottom Performer Groups

	Sample as a Whole	Top Performers	Bottom Performers
Availability and Skill of Labor	4	5	4
Business Volume	5	5	5
Cost and Availability of Insurance	4	4	4
Differential Pricing Strategies	3	2	3
Environmental Regulations and Legal Liabilities	4	4	4
Farm Programs	4	4	4
Financial Conditions of Members	4	4	4
Financial Management	4	4	4
Improving Member Services	4	4	3
Inadequate re-investment in cooperative Infrastructure	3	3	3
Innovation/Technology in Cooperative Operations	3	4	3
Labor Regulations	3	3	3
National and World Economies	4	4	4
Other	5	0	1

CHAPTER V

CAUSAL DIAGRAMS DISCUSSION AND RESULTS

The statistical summary is very informative of how cooperatives appear to behave “on average” but it does not answer the question this study seeks. Knowing that a difference exists in particular categories cannot explain why some companies exhibit certain characteristics and others do not. In order to answer that question, knowledge of the causal flows in the business is important. The benefits of using causal graphs is outlined in the procedures section. This section presents the directed acyclic graphs associated with the categories of questions presented in the statistical summary section. The graphs could not be run for each subgroup because of an issue with degrees of freedom. So these issues are addressed in the regressions presented in the following section.

5.1 Basic Model

The first step in the Bayesian Network analysis is to establish a minimal model that is useful in portraying the average Texas cooperative. Once this basic model is established the network can then be interfered in with outside variables to see how they interact with the minimal model and whether the minimal model relationships shift with the introduction of this new information. The first section, 5.1.1 is an explanation of the variables and the correlation among variables. Section 5.1.2 is a presentation of the

graphical model and an explanation of the relationships seen in the model. Finally section 5.1.3 is a short discussion of the implications of the model.

5.1.1 Variables

The basic model is made up of financial and operational information about the business. The statistical information and the literature were used to establish a pool of questions that would identify a minimal model. These numbers were then used to develop a correlation matrix and each value in the matrix was tested for significance using a t-test at the 5% significance level. Those variables that were significantly correlated to at least one other variable were included in the final correlation matrix that was used to develop the causal diagrams. These variables are as follows:

- Q1: Regional Cooperative: whether or not the cooperative is of a centralized or federated structure, whether or not a cooperative is regional creates new challenges for management.
- Q2: Accounts Receivable: AR management can be a challenge, and although it is a part of current assets, it was felt that this variable could have a great impact on overall performance.
- Q3: Current Assets: A key balance sheet account
- Q4: Fixed Assets: the fixed assets of the company are a measure of size and are a key account in ratio analysis.
- Q5: Current Liabilities: often in the form of a revolving seasonal debt account
- Q6: Long Term Liabilities: the long term debt of the company give the researcher an idea of the future cash needs of the company

- Q7: Retained Earnings: an important account that many cooperatives do not build to a level approaching IOF levels
- Q8: Stockholder and Patron Equity: the ownership account of the cooperative
- Q9: Sales: a measure of the business of the cooperative
- Q10: Cost of Goods Sold (COGS): a key factor in determining the price of goods offered by the cooperative
- Q11: Total Expenses: can be a measure of how efficiently a cooperative uses its resources
- Q12: Cash Patronage Distribution: one of the incentives members have to maintain their membership and continue their patronage in the cooperative.
- Q13: Active Membership: the size of the active membership of the cooperative
- Q14: Age of the Oldest Stock Outstanding: a measure of the frequency of equity redemption
- Q15: Board Size: a measure of the size of the company and possibly a determinant of the level of control in the company
- Q16: Number of Locations (including the primary location): seeks to identify the positive effects of economies of scale or the negative effects of being too large to be efficient.
- Q17: Average Annual Capital Expenditures: a measure of the growth potential of the cooperative
- Q18_b: Number of Business Activities the Cooperative Is Involved In: measures the impact of having too many activities or not enough.

- Q19_b: Total Number of Business Rivals: measures the impact of competition on the company's performance
- Q20_b: Percent of Time Spent by the Manager on Their Greatest Challenge: measures for the 80/20 rule.

These variables were chosen for either their direct relation to performance or the probability of a direct relation to performance. No totals were used because the most basic building blocks of the finances were included in the minimal model. Additionally, when totals of these basic elements are included a bias is created because of the prior correlation of the variables. Accounts receivables is included because it is only one element in current assets, therefore, will not create a bias.

5.1.2 The Basic Graphical Model

The basic (minimal) model was run through the PC Algorithm and yielded the model shown in Figure 4. This model is a directed acyclic graph as shown by the absence of paths leading away from a variable only to return to the same variable. In addition only unidirectional marks were discovered. The roots of the graph are the cash patronage distribution, the cost of goods sold and total rivals of the cooperative. The sinks of the model are the number of locations, average annual capital expenditures, active membership, sales and the number of business activities the cooperative is involved in. The line of directed edges leading from each root to each sink is called the "path" between the two vertices. Each path will be discussed in more detail in the discussion and implications section.

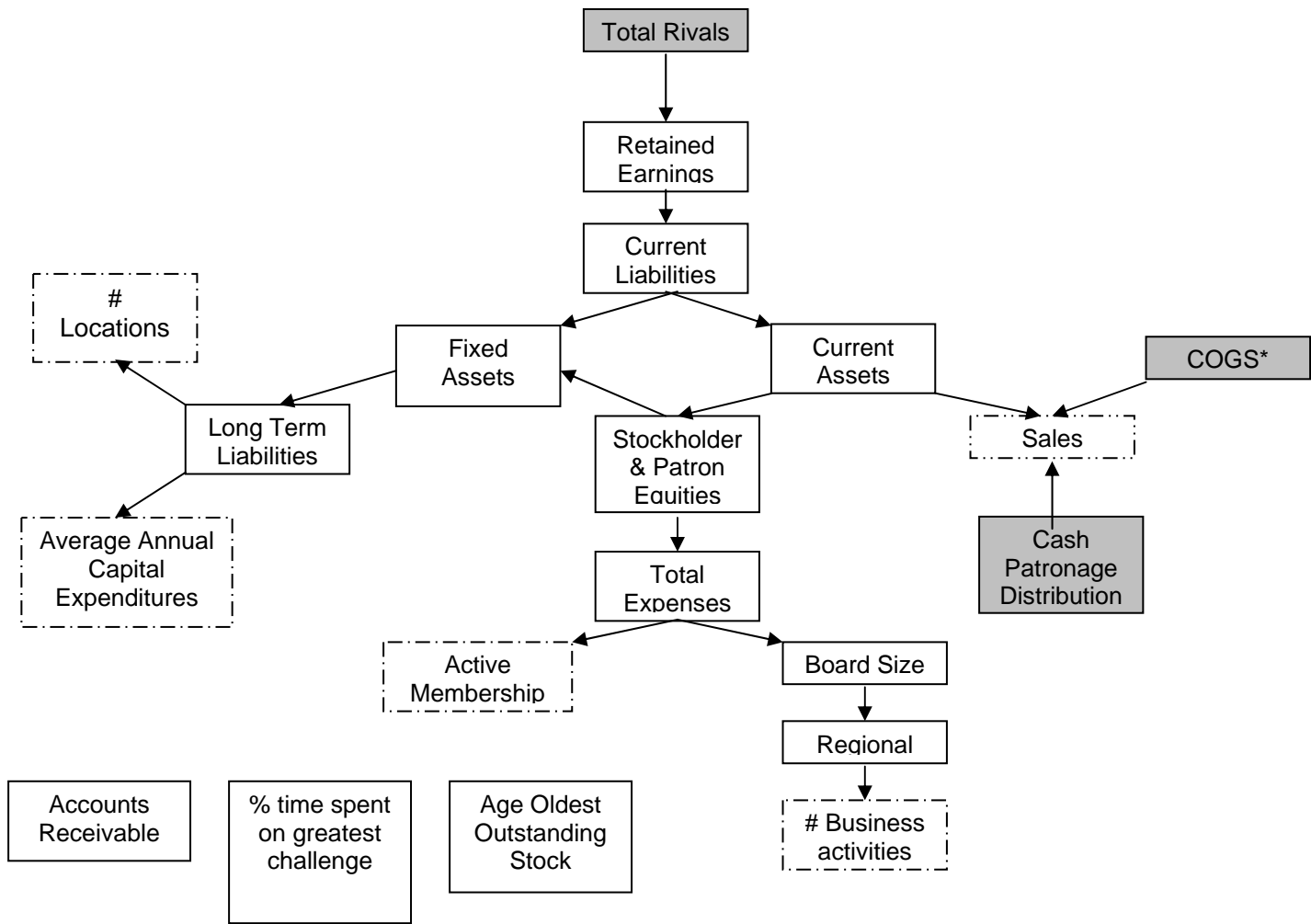


Figure 4: Basic Directed Acyclic Graph of Texas Cooperatives
 *COGS: Cost of Goods Sold

In this graph the algorithm produced unidirectional causal relationships in the variables with the exception of accounts receivable, percent of time the manager spends a day on his greatest challenge, and the age of the oldest outstanding stock. Although these three variables were correlated to other variables in the model, there was not sufficient evidence to suggest a causal relationship.

These relationships form the backbone of the interventions relating to competition, equity, strategic planning and loyalty later on. Therefore, the first step is to understand this structure. It is important to again note that the skeletal structure should remain constant in a robust model; therefore, the direction of causation may change as we intervene in the model as long as the basic interrelationships remain the same.

The first relationship in these graphs is the total number of rivals of the firm having a causal relationship to the retained earnings of the firm. This relationship is likely due to the competitive pressures of a larger number of rivals on the cooperative's bottom line, therefore making it more difficult to retain great amounts of earnings in any given year. The second relationship is the retained earnings' causal influence on the current liabilities account. Because retained earnings represent assets at the company's disposal for use in building the business, the current liabilities of the company do not have to be used as much. Often the largest portion of current liabilities in cooperatives is the revolving seasonal line of credit used to cover payables or hedge commodities.

The current liabilities and current assets are used to determine working capital and therefore should be linked in some manner. Part of current liabilities may be used to capitalize fixed assets, particularly in the case of machinery and other fixed assets with

short term lending requirements. Fixed assets are a causal influence on long term liabilities because what is not capitalized through current liabilities or retained earnings would be capitalized through term debt. This relationship can then be followed through to the number of locations and the average annual capital expenditures, both of which use long term liabilities, current liabilities and retained earnings in their financing.

Notice that pathway flows along all of these things before ending at these two sinks. The parent of both of these sinks in this graph is the total number of rivals for the cooperative.

In moving down another line, the current assets have a causal influence on the stockholder and patron equity which is probably a reflection of the association between equity, and assets and liabilities. Equity then has a causal influence over total expenses of the company which has causal influence over the number of active members in the cooperatives. Therefore, the variable “total rivals” is the parent of the number of active members as well. Total expense also opens up the flow of information to the board size and whether the cooperative is regional in form. This in turn has a causal influence on the number of business activities of the firm. Regionals tend to be more specialized than local, centralized cooperatives therefore this direction of causation is logical. Again the parent of the sink variable “number of business activities” is the total rivals of the cooperative.

The final path we can take is through current assets, toward sales. This path is logical based on the fact that current assets hold the inventories and accounts receivables of the firm. Other roots that feed into this variable are the cost of goods sold and the cash

patronage distribution of the firm. Therefore the sink variable “sales” has three parent variables. The mathematical implications of these relationships are discussed in the following section.

5.1.3 Discussion and Implications

Using the probability calculus presented in the procedures section and the Markov Parent Theorem, the following functions are defined for the paths of the basic graph. The first four of the five functions are similar in that their Markovian Parent is the total number of rivals the cooperative faces. The only exception is the function for sales, which also includes the cost of goods sold and the cash patronage dividend.

$$\Pr (Q16 | pa_{Q16}) = \Pr (Q16 | Q19_b)$$

$$\Pr (Q17 | pa_{Q17}) = \Pr (Q17 | Q19_b)$$

$$\Pr (Q13 | pa_{Q13}) = \Pr (Q13 | Q19_b)$$

$$\Pr (Q18_b | pa_{Q18_b}) = \Pr (Q18_b | Q19_b)$$

$$\Pr (Q9 | pa_{Q9}) = \Pr (Q9 | Q10, Q12, Q19_b)$$

These probability functions provide the basis on which the regression models will be built in chapter six.

5.2 Competition

The cooperatives in this sample present clear evidence for the importance of competition to cooperative performance, as presented in the statistical summary section.

The questions whose answers were presented in chapter four will now be used to ascertain their causal relationship to the basic model.

5.2.1 Variables

The first eighteen variables are the same as in the minimal model. Variable Q19_b has been split into two variables Q19_c and Q20_c, which is the number of cooperative competitors and the number of national chain competitors respectively. The number of internet competitors was not significantly correlated to any other variable in the model and was thrown out. Variable Q21_c is now the percentage of time spent by the manager on his greatest challenge.

- Q22_c: No Formal Equity Redemption Policy
- Q23_c: Employee Expertise Ability to Impact Competitiveness
- Q24_c: Government Policies Ability to Impact Competitiveness
- Q25_c: The Utilization of Technology and the Internet's Ability to Impact Competitiveness
- Q26_c: Leadership's Ability to Impact Competitiveness
- Q27_c: Location's Ability to Impact Competitiveness
- Q28_c: Member Loyalty's Ability to Impact Competitiveness
- Q29_c: Number of Competitor's Ability to Impact Competitiveness
- Q30_c: Technological Advancement's Ability to Impact Competitiveness
- Q31_c: Unique Product Offering's Ability to Impact Competitiveness
- Q32_c: Membership Size Stayed the Same
- Q33_c: Manager's Agreement/Disagreement that the Company is a Leading Competitor

5.2.2 The Competition Graphical Model

The graphical model presented in Figure 5 is a representation of the basic model when the above competitive variables are intervened in the basic model. Two variables were found to have no correlation to anything else, these were accounts receivable and membership size remaining the same. The percent of time spent by management on his/her greatest challenge was found to be correlated to cooperative location's impact on competitiveness and the age of oldest stock was found to be correlated to technological advancement's impact on competitiveness; however, none of these variables were correlated to the primary graph.

The model is an acyclic graph but some of its edges are undirected. Visually, those edges that have no marker on them are undirected. The undirected edges that join them signify that although the two variables are correlated and some relationship exists between them, the algorithm could not determine the direction of causal flow. Because these are Bayesian networks it is possible to estimate the direction of causation based on prior knowledge of the industry and, in this case, of basic accounting principles.

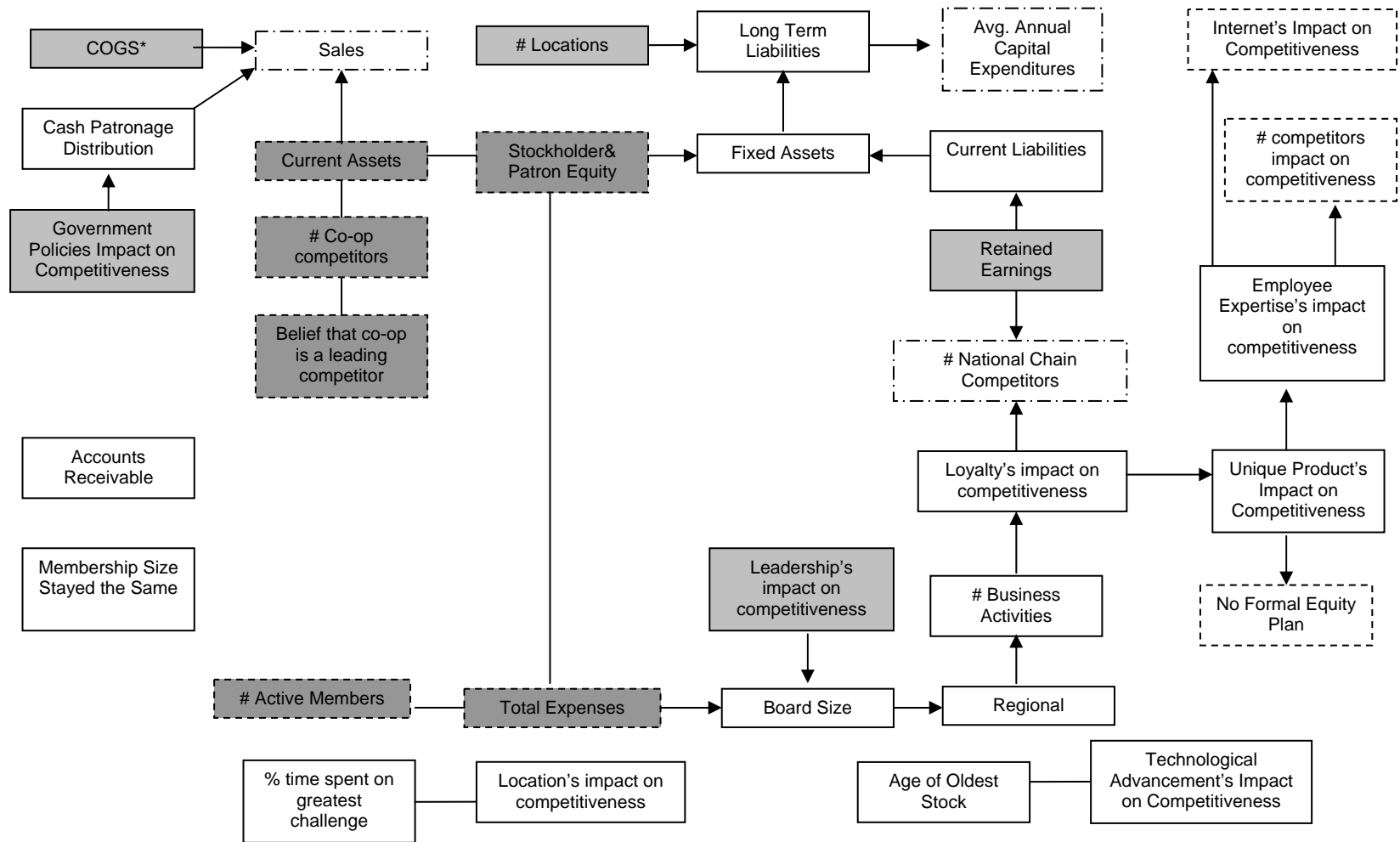


Figure 5: Directed Acyclic Graph of Texas Cooperatives with Competitive Variables

* COGS: Cost of Goods Sold

The first undirected edge is the edge lying between the belief that the cooperative is a leading competitor among its rivals, (which is a likert scale question in which managers strongly agree, agree, remain undecided, disagree or strongly disagree) and the number of cooperative competitors the firm faces in their market. It is possible that the number of cooperative competitors is a cause of the belief that the cooperative is a leading competitor since a larger number of competitors would make it harder to be a leading competitor in the market.

$$Q19_c \rightarrow Q33_c$$

The second undefined relationship is between the number of cooperative competitors and the current assets account of the company. Given the relationship of total rivals and current assets in the basic model and other models, it is probable that the number of cooperative competitors has a causal influence on the current assets of the company.

$$Q19_c \rightarrow Q3$$

The third undefined relationship can be estimated by looking at the other graphs. The causal flow between current assets and stockholder/ patron equity is a flow away from current assets toward stockholder/ patron equity. This relationship is evident in the other graphs developed off of the basic graph; therefore, it is highly possible that this relationship will hold true in this case as well.

$$Q3 \rightarrow Q8$$

The relationship between stockholder and patron equity and the variable total expenses is less constant across the various graphs developed here. Therefore, it is

unknown what this causal direction is in the case of this graph. Finally, the relationship between the number of active members in the cooperative and total expenses is a movement away from total expenses toward the number of active members. Like the relationship between current assets and stockholder / patron equity, this relationship has the same direction of causation throughout the graphical analysis, so it is likely present here. There is no way of knowing if the above estimates are robust given a larger sample size; therefore, they must be considered cautiously.

Q11 → Q13

The other relationships among the basic variables are in agreement with the skeletal basic graph, and the undirected edge is making a connection between variables that are connected in the basic model. This makes the model a robust picture of the market when competitive variables are used to intervene in the model. Specifically the manager's perceptions of whether the nine variables of government policies, leadership, loyalty, unique product, employee expertise, number of competitors, internet usage, technological advancement and location impact competitiveness impacted strategic points on the graph.

Government policies have a causal influence on the cash patronage distribution of the company. This makes sense on the merits of the farm program and taxation alone. Leadership's impact on competitiveness is a causal factor in board size. This may be related to the fact that the more successful cooperatives tend to have larger boards. As we move along that same path, the relationship between the number of business activities and its causal influence on loyalty's impact on competitiveness could be

related to managers' feelings that by meeting the needs of the customer, they are impacting loyalty.

Loyalty's impact on competitiveness and the retained earnings of the company both have a causal relationship on the number of national chain competitors. It is possible that loyalty is related to how managers feel they are meeting the needs of the customers and whether those customers will seek other sources and that the retained earnings has some relation to the size of the company. These two factors combined will determine how much of the customer base will turn to national chain stores to meet their needs. Loyalty's impact on competitiveness also has a causal influence on the unique product offering's impact on competitiveness. Again, this is likely due to the manager's perception of his/her own competitive environment. A unique product requires specialized employee expertise. Employees are often overlooked in their importance in the business, but as this graph shows the employee expertise can have an impact on how much the number of close competitors impacts the business's competitive situation and it also impacts how the use of the internet impacts the company's competitive situation.

The final two variables intervened in this model are the number of cooperative competitors and the manager's belief that the cooperative is a leading competitor among its closest rivals. These were discussed earlier.

Variables that were correlated but did not have a causal relationship in the model are accounts receivable, percent of time spent by the manager on his greatest challenge, age of oldest stock, and technological advancement's impact on competitiveness. There is some sort of relationship between location and time spent on the manager's greatest

challenge and age of stock and technological advancement; however, these variables are not intervening on the basic model and are therefore will not be analyzed further at this time.

5.2.3 Discussion and Implications

Unlike in the basic probability functions, these functions have unique parent sets. The first function for the number of competitors' ability to impact competitiveness is impacted by only one variable, which is leadership's ability to impact competitiveness. It is likely that at least one other variable should be included here. According to the logic presented earlier this could be variable Q19c, the number of cooperative competitors; however, because these relationships are undefined it is unknown what exactly the other variable would be in this case. The same holds true for the variable for technology and the internet's impact on competitiveness.

$$\Pr (Q29_c | pa_{Q29_c}) = \Pr (Q29_c | Q26_c)$$

$$\Pr (Q25_c | pa_{Q25_c}) = \Pr (Q25_c | Q26_c)$$

The average annual capital expenditures probability function only contains parents from the basic variable set.

$$\Pr (Q17 | pa_{Q17}) = \Pr (Q17 | Q16, Q7)$$

The probability function for the cooperative having no formal equity redemption policy depends solely on the leadership's ability to impact competitiveness. Like in the first function, this likely has another factor, but due to the undirected relationships it is not possible to be able to tell what that variable is.

The function for the number of national chain competitors is very similar.

$$\Pr (Q22_c | pa_{Q22_c}) = \Pr (Q22_c | Q26_c)$$

$$\Pr (Q20_c | pa_{Q20_c}) = \Pr (Q20_c | Q7, Q26_c)$$

The sales function could also have another variable from that set in its Markovian Parent set; however, we know that the cost of goods sold and government polices' impact on competitiveness are Markovian Parents.

$$\Pr (Q9 | pa_{Q9}) = \Pr (Q9 | Q10, Q24_c)$$

5.3 Equity

The equity model of the cooperative firm is important because by understanding the relationship of equity and equity management to the rest of the cooperative, we can make general conclusions as to how equity impacts performance. Equity management should provide a positive impact on performance because it provides incentive to members to continue their patronization of the business.

5.3.1 Variables

The first 20 variables of the equity model are the variables of the base model.

The remaining four variables are those variables that

- Q21_e: Revolving Fund Equity Redemption Plan
- Q22_e: Percentage of All Equities Redemption Plan
- Q23_e: No Formal Equity Redemption Policy
- Q24_e: Manager Seeks Further Education on Balancing Dividend Payments and Equity Redemption
- Q25_e: Manager Agrees that Members Understand the Equity Redemption Policy

In the case of the equity model, there were very few variables considered that were correlated at the 5% significance level. The graphical model of this portion of the study is included in the following section.

5.3.2 Equity Graphical Model

The graphical model presented in Figure 6 is a representation of the basic model when equity variables are used to intervene in the basic relationships. Only two new relationships are apparent in the basic model when equity variables are used to intervene in it. The first is the undirected edge between the number of locations and the cooperative utilizing a percentage of all equities redemption policy. It is unlikely that this variable is more than a pass through on the path from the number of locations to the long term liabilities of the company because so few cooperatives selected this variable. Therefore the direction of causation is thought to be from the number of locations through the percentage of all equities plan and to the long term liabilities.

$$Q16 \rightarrow Q22_e$$

The other new relationship is not through a new variable. This is the only permeation of the graph in which a causal relationship is found between whether or not the cooperative is a regional cooperative and the cash patronage distribution. Because regionals are usually such large companies that return large cash dividends to their customers, this relationship is logical; however, it is unknown why this is the only graph in which this relationship exists.

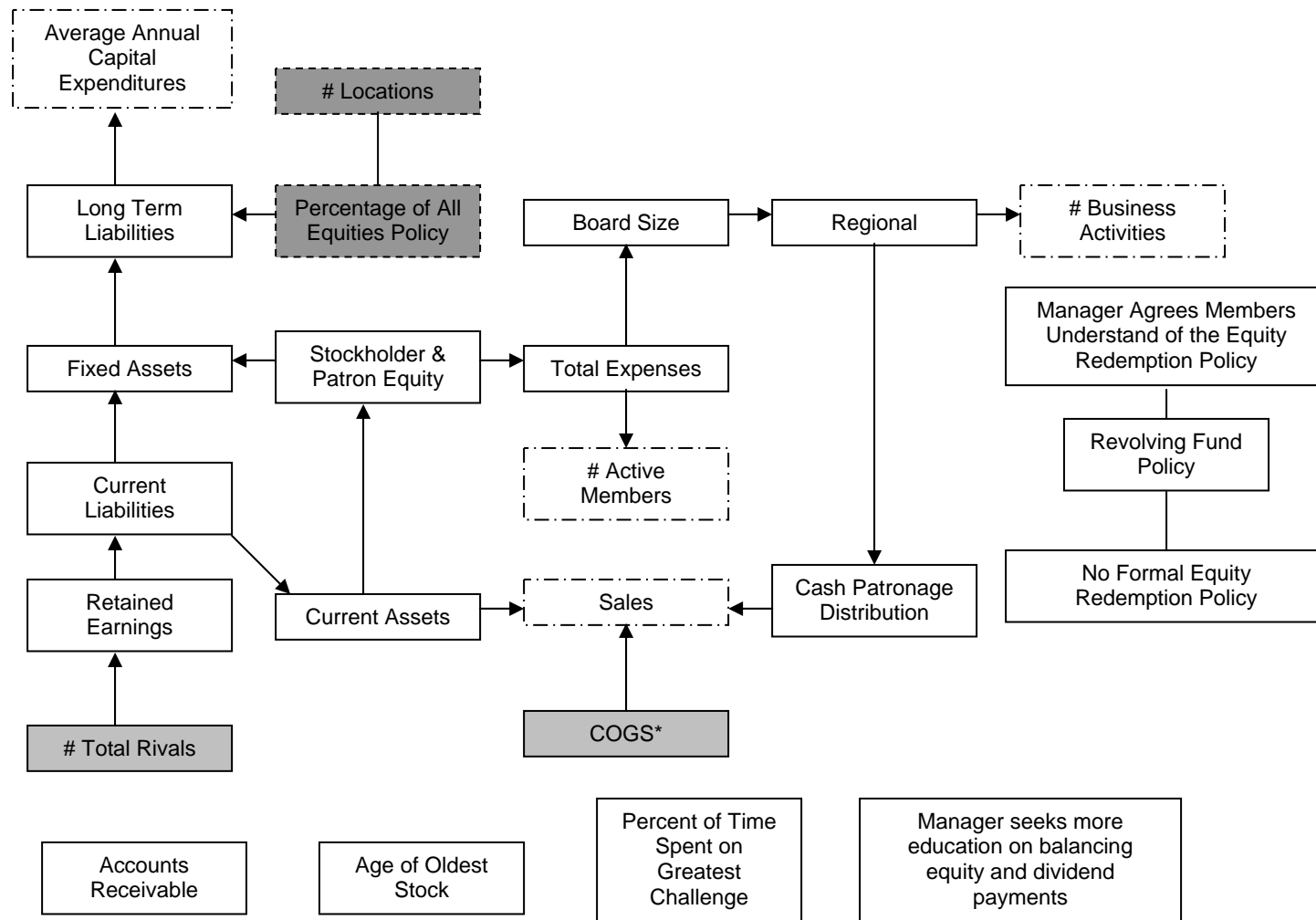


Figure 6: Directed Acyclic Graph of Texas Cooperatives with Equity Variables

* COGS: Cost of Goods Sold

The other variables are found outside of the basic diagram. There is an undefined relationship between three of the variables added relating to equity, but the other four variables are unrelated to each other or the basic model. Therefore, they will not be analyzed any further in this study.

5.3.3 Discussions and Implications

The equity probability function is very similar to the basic probability functions. In fact the functions for average annual capital expenditures, active membership, and number of business activities are exactly like the basic model.

$$\Pr (Q17 | pa_{Q17}) = \Pr (Q17 | Q19_b)$$

$$\Pr (Q13 | pa_{Q13}) = \Pr (Q13 | Q19_b)$$

$$\Pr (Q18_b | pa_{Q18_b}) = \Pr (Q18_b | Q19_b)$$

The only function that is different is the function representing the sales of the firm. In this case the Markovian Parents are the same; however, one more variable that is not a parent must be included in the analysis because the function does not meet the back door criterion without it. One of the variables along the back door path to sales must be included, in this case the variable for whether or not the cooperative is regional was chosen.

$$\Pr (Q9 | pa_{Q9}) = \Pr (Q9 | Q19_b, Q10, Q1)$$

5.4 Strategic Planning

The Strategic Planning model had the greatest number of possible variables because of the consideration of those variables dealing with efficiency, growth and diversification. However, few of these variables were found to be correlated to other

variables in this permeation of the model. Therefore, only 26 total variables were used, the first 20 of which are the variables of the basic model. The other six variables are as follows:

5.4.1 Variables

- Q21_{sp}: No Formal Equity Redemption Plan
- Q22_{sp}: Manager Seeks Further Education on Strategic Planning
- Q23_{sp}: Manager's Level of Belief that the Cooperative's Current Position Allows for Future Growth
- Q24_{sp}: Manager's Level of Belief that the Cooperative is Efficient Enough for Future Growth
- Q25_{sp}: Manager's Level of Belief that it is Important to Have a Strategic Plan
- Q26_{sp}: Manager's Level of Belief that it is Important to Review and Potentially Revise the Strategic Plan at Least Annually

These variables were then run through the PC Algorithm to produce the graphical representation presented in the next section. Of these six variables, five of them make it into the model. The exception is variable Q21_{sp}, no formal equity redemption policy.

5.4.2 The Strategic Planning Graphical Model

The basic model skeleton still remains in this model; however, instead of the number of locations being a sink, the new variables all branch off of that one variable, Q16. The graph is show in Figure 7 below. The new sink in this case is management's level of belief that the cooperative is efficient enough for future economic growth. Perhaps, when the cooperative is at its optimal size, partially given by the number of

locations, it influences the manager's opinion in this relation. On the other side of this sink variable is the management's level of belief that the cooperative's current position allows for future economic growth. Because of the closeness of these two questions, it is logical that they should be related.

The other variables attached to this model do not have a direction of causation. We only know that a relationship of some kind exists. These variables are the age of the oldest stock outstanding, the manager's level of belief that it is important to have a strategic plan and his/her level of belief that it is important to review that strategic plan at least annually. The age of the oldest stock outstanding is a measure of how up to date the cooperative is in their equity redemption. Since equity redemption is related to the cooperative's current financial position, this relationship makes sense and there could be a causal flow from the age of oldest stock to the manager's belief in his current position. However, it is unknown how the other two variables related to each other or the age of oldest stock.

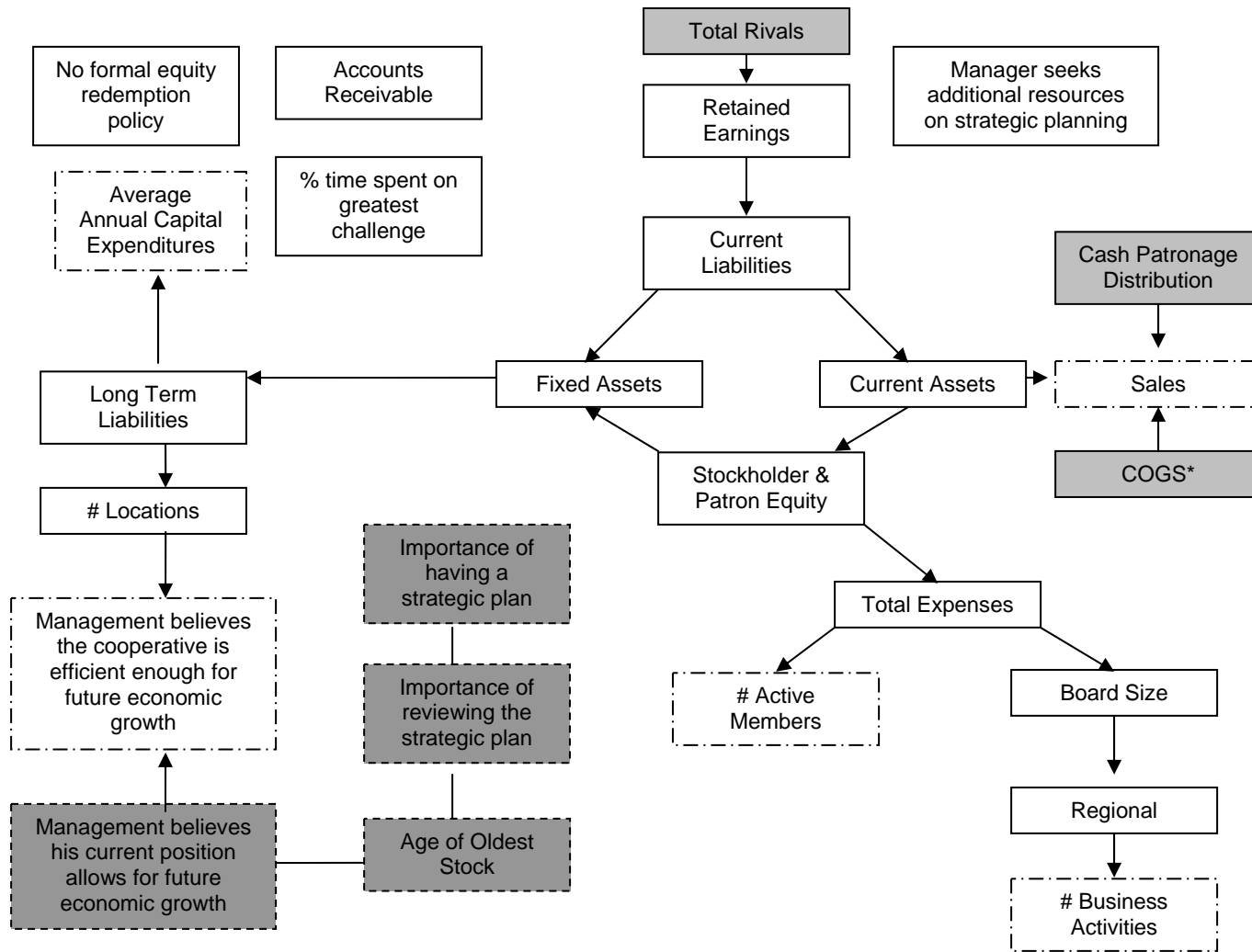


Figure 7: Directed Acyclic Graph of Texas Cooperatives with Strategic Planning Variables

*COGS: Cost of Goods Sold

5.4.3 Discussions and Implications

The strategic planning functions again fall into similar form as the basic model probability functions. Again every function depends on the total rivals of the firm, only instead of the number of locations being a sink, the management's belief that the cooperative is efficient enough for future economic growth is a sink. This new sink variable again depends on total rivals and also on the manager's belief that the cooperative's current financial position will allow for future economic growth.

$$\Pr (Q17 | pa_{Q17}) = \Pr (Q17 | Q19_b)$$

$$\Pr (Q24_{sp} | pa_{Q24sp}) = \Pr (Q24_{sp} | Q19_b, Q23_{sp})$$

$$\Pr (Q18_b | pa_{Q18b}) = \Pr (Q18_b | Q19_b)$$

$$\Pr (Q9 | pa_{Q9}) = \Pr (Q9 | Q19_b, Q10, Q12)$$

5.5 Loyalty

The final category for which a causal diagram was created is in relation to member loyalty. As discussed earlier, member loyalty can be extremely important to the company. In addition, where we have seen member loyalty in these graphs thus far has show that it is a factor worth mentioning and one that needs to be delved into further.

5.5.1 Variables

The variables of this category were put through the same methodology as in previous categories to obtain the variables that would be intervened into the basic model. A larger number of variables were correlated in this category than in some of the others. The first 20 variables are the variables of the basic model.

- Q21: No Formal Equity Plan
- Q22: Financial Condition of Members as a Critical Factor to the Success of the Business
- Q23: Improving Member Services as a Critical Factor to the Success of the Business
- Q24: Member Loyalty's Impact on the Competitiveness of the Cooperative
- Q25: Membership Size Increase
- Q26: Membership Size Decrease
- Q27: Manager's level of belief that it is Important to Educate Members on the Operational Issues of the Cooperative.
- Q28: Manager's level of belief that customer service greatly impacts loyalty
- Q29: Manager's level of belief that employee expertise greatly impacts loyalty
- Q30: Manager's level of belief that community involvement greatly impacts loyalty
- Q31: Manager's level of belief that confidence in the general manager greatly impacts loyalty
- Q32: Manager's level of belief that confidence in the board of directors greatly impacts loyalty.

When these variables are used to intervene in the basic model the following graphical model is discovered.

5.5.2 *The Loyalty Graphical Model*

The graphical model for the loyalty category is a directed acyclic graph that shares the same skeleton as the basic model. The graph is shown in Figure 8 below. The variables added to the basic model attach themselves through the outside of the graph rather than intervening between two variables from the basic relationship. To begin at the left hand side of the model, in this permeation the percent of time spent by management on his/her greatest challenge is a cause of the manager's level of belief that confidence in the board has a great impact on member loyalty. This in turn has a causal influence on the manager's level of belief that confidence in the general manager greatly impacts member loyalty. These relationships are directly related to the manager, who filled the original survey out, and are logically connected in such a way.

Furthermore, the general manager's impact on loyalty has a causal influence on the impact of employee expertise and the impact of customer service. Since both of these factors are under the direct influence of the general manager, this causal flow is logical. The connection between the employee expertise's impact on loyalty and the age of oldest stock is not easily explained in the context of this study. Employee expertise also influences the impact member loyalty has on competitiveness. Employees, being those who customers are serviced by, could reasonably have a direct influence on the loyalty of that customer, and such a relationship has been exhibited in the DAG of Texas Cooperatives with Competitive Variables as well.

Loyalty is also impacted by the number of business activities the cooperative is involved in. Loyalty's impact on competitiveness then has a causal influence on the number of rivals managers consider to be close rivals. This is logical since the number of customers loyal to the company determines the competitive advantage of the cooperative.

The financial condition of members has a causal influence on how critical the manager feels it is to improve member services. This variable is also caused by the variable membership size decrease. Often in struggling cooperatives, such as those observed in the bottom performer group, improving member services through the cooperative is one way to help customers remain members and farmers. This sink variable is impacted by one more thing, the number of locations of the company. It is possible that the number of locations is one way of providing a member service, by providing the customer with a geographically convenient place to take their crops or purchase their inputs.

The membership size decrease is shown to cause customer service's impact on loyalty as well. Again, one way to create value with the cooperative's members is to provide them with better service. This does not necessarily mean expanded service, only a higher quality of the services already being provided. The final link from membership size decrease is toward membership size increase. It is likely that these are correlated simply by their closeness to each other. In order to not risk biasing the data, the variable "membership size stayed the same" was omitted.

The impact of customer service on loyalty also has a causal influence on the manager's level of belief that community service greatly impacts loyalty. This particular idea has come under some scrutiny lately as more cooperatives are moving toward a more entrepreneurial culture. However, it still appears to have some influence on loyalty in the eyes of managers in Texas, and it probably does in small towns where the cooperative is the hub of local activity. This variable in turn has a causal influence on the variable "regional". A regional cooperative does not usually have members in the community they operate out of, therefore, it is likely that if a cooperative is regional in structure, community involvement will not be as important as compared to a small centralized cooperative.

Two variables did not make it into this final model, accounts receivable and the manager's level of belief that it is critical to educate members on operational decisions. This model still maintains the basic model skeleton, making it a robust and stable model.

5.5.3 Discussion and Implications

The loyalty model creates the most complex probability functions of the various categories because so many new variables are included in the roots and sinks of the model. Average annual capital expenditures relies on variables introduced to the basic model as well as drawing in the percent of time the manager spends on his greatest challenge, which had no causal relationship with the other parts of the model before, and the number of business activities of the cooperative.

$$\Pr(Q17 | pa_{Q17}) = \Pr(Q17 | Q20_b, Q21_1, Q26_i, Q18_b, Q24_i)$$

The age of the oldest stock outstanding is another variable that had no causal relationships with other variables in the model before. In addition to $Q20_b$, it also draws in the influence of a cooperative having no formal equity redemption policy.

$$\Pr(Q14 | pa_{Q14}) = \Pr (Q14 | Q20_b, Q21_1)$$

The probability functions for improving member services' criticalness to the success of the business and the membership size increase function are similar, except that $Q23_1$ also has the variable for member loyalty's criticalness to the success of the business included to block a back door path.

$$\Pr (Q23_1 | pa_{Q23_1}) = \Pr (Q23_1 | Q20_b, Q21_1, Q26_l, Q18_b, Q24_l)$$

$$\Pr (Q25_1 | pa_{Q25_1}) = \Pr (Q25_1 | Q20_b, Q21_1, Q26_l, Q18_b)$$

The functions for active membership and sales are similar except that the sales function also has two additional Markovian Parents, and includes an additional variable for member loyalty's criticalness to the success of the business in order to block a back door path.

$$\Pr (Q13 | pa_{Q13}) = \Pr (Q13 | Q20_b, Q21_1, Q26_l, Q18_b)$$

$$\Pr (Q9 | pa_{Q9}) = \Pr (Q9 | Q20_b, Q21_1, Q26_l, Q18_b, Q10, Q12, Q24_l)$$

5.6 Summary of Causal Diagrams

It is clear from the probability functions obtained from the causal graphs that certain factors have a great impact on the performance of the business. The first and foremost of these is the number of rivals the cooperative faces in their market area. Kyriakopolous, Meulenberg and Nilsson noted the importance of competition as did Harling and Funk. Another factor that appears to have a great impact is member loyalty.

The member loyalty DAG showed that the various factors that could impact member loyalty have a causal impact on many different parts of the business. Equity redemption appears to play a minor role to the overall performance of the cooperative and the act of strategic planning will not assist the cooperative unless they act on that strategic plan.

5.7 Limitations of Causal Diagrams

These causal diagrams appear to be limited in how much they can tell us about the interaction of these various factors. In addition TETRAD is susceptible to Type I or Type II errors (Akowkuse and Bessler 2002). In particular, we are interested in the magnitude of influence the variables have on the dependent variables and whether the independent variables have a positive or negative influence on the dependent variables. Such questions can be addressed through the use to regression models. Another benefit of taking this analysis one step further is that these diagrams do not provide measures by which we can test for bias.

CHAPTER VI

ECONOMETRIC DISCUSSION AND RESULTS

6.1 Overview of Regression Analysis

The regression analysis presented in this chapter is the result of the casual chains presented in the previous chapter. Each function represents a path where the sink variable is the dependent variable and the Markovian Parent root variables are independent variables. In addition, certain independent variables must be added to meet the back door criterion. These variables block back paths so that only one path exists between a root and a sink.

As a discussion of the use of directed graphs in building regression models, one must first revisit the idea of d-separation in directed graphs. D-separation exists when two variables, say X and Y , are connected by a path in which there is no other path Z that connects the two. In other words, the back door criterion is met. If such a back door path exists in Z , that path must be blocked by conditioning on either a middle node of the causal chain (such is the case if $l \rightarrow m \rightarrow n$, and we condition on m) or a fork (such is the case if $l \leftarrow m \rightarrow n$, and we condition on m). If the chain contains an inverted fork then we do not condition on the middle node, because to do such would un-block the path (such is the case if $l \rightarrow m \leftarrow n$). In order to use directed graphs to build regression models, one must be able to identify and block back door paths, achieving d-separation. Just as in any other method of choosing regression variables, using directed graphs

requires one to carefully analyze the paths in the graph and choose appropriate variables that will “explain” those paths.

By blocking back door paths, the modeler is preventing correlation between the error term and the root variable in the model. Essentially, when a back door path is left open, it is in the error term and therefore, the error term is correlated to the X variables because that back door path variable also causes X. So when some variable Z is the back door path our regression should resemble the formula below.

$$Y = a + B_1X + B_2Z + e$$

Upon identifying the models that met the back door criterion, they were analyzed using an ordinary least squares regression. Models were run for each path in the five graphs presented in chapter 5.

6.2 Regression Analysis for the Sample as a Whole

In answering the final portion of our objective question we must be able to compare the top and bottom groups; however, the first step in doing this is to identify those DAG paths that are the most robust. For each path listed in the chapter V an ordinary least squares regression was performed. The appropriate Probit regression was performed on those dependent variables that were dummy variables.

Not all of the paths significantly explained the data. However, in every category, the path leading to the dependent variable “sales” results in beta coefficients that significantly explained the data as exhibited by the R^2 of the model and the p-value and t-test of each coefficients. Therefore, these models will be used in the further regression analysis of the performance subgroups on the paths established by the directed graphs.

Due to our small sample size, the R^2 , Durbin-Watson Statistic, Wald Chi-Squared Statistic, Akaike Information Criterion and the Schwarz Criterion were run to test for model fit, autocorrelation and heteroskedasticity.

The “sales” model coefficients sufficiently explain the data and are presented in Table 15 below. Statistical test values were obtained from Kmenta 1971. The model for “sales” in the strategic planning category is identical to the “sales” model obtained from the basic DAG; therefore, it is only necessary to present one. In this case the basic model is presented. This is due to the fact that no strategic planning intervention variables were found to impact sales. As noted in chapter 5, only one path included new variables and the regression showed that the model did not sufficiently explain the data.

Table 15: The Regression Models for Sales in the DAG Categories

Variable	Beta Coefficient	Standard Error	T-Test	P-Value	
Model: Basic					
<i>Dependent Variable</i> <i>Q9: Sales</i>					R^2 : .9768
Q10: COGS	1.0674	.04378	24.38***	.000	DF: 28
Q12: Cash Patronage Dist.	1.6187	.2581	6.271***	.000	
Q19b: Total Rivals	13369	112100	.11193	.906	
Intercept	1044800	839200	1.245	.223	

Table 15 Continued

Variable	Beta Coefficient	Standard Error	T-Test	P-Value	
Model: Competition					
<i>Dependent Variable:</i> <i>Q9: Sales</i>					R ² : .9523
Q10: COGS	1.1954	.05240	22.82***		DF: 29
Q24c: Government Policies' Impact on Competitiveness	5656000	2521000	2.244**		
Intercept	989320	742200	1.333*		
Model: Equity					
<i>Dependent Variable</i> <i>Q9: Sales</i>					R ² : .9554
Q10 COGS	1.1611	.05514	21.06***	.000	DF: 28
Q1: Regional (Block)	4125300	1556000	2.652***	.013	
Q19b: Total Rivals	30294	155400	.1950	.847	
Intercept	555620	1165000	.4768	.637	
Model: Loyalty					
<i>Dependent Variable</i> <i>Q9: Sales</i>					R ² : .9823
Q10: COGS	1.0269	.04930	20.83***	.000	DF: 24
Q12: Cash Patronage Distribution	1.6208	.2765	5.861***	.000	
Q18b: Number of Business Activities	-47261	294500	-.1605	.874	
Q20b: Percent of Time Spent on Greatest Challenge	-1194800	1184000	-1.009	.323	
Q21l: No Formal Equity Redemption Policy	-1495200	901700	-1.658*	.110	
Q24l: Loyalty's Impact on Competitiveness (Block)	-1557300	907200	-1.717**	.099	
Q28l: Customer Service's Impact on Loyalty (Block)	-231300	562400	-.4113	.684	
Intercept	4449300	2488000	1.789**	.086	
t-test: * 10% significance ** 5% significance ***1% significance DF: Dickey Fuller Statistic COGS: Cost of Goods Sold					

6.3 Expansion of Regression Models to Account for Performance Group

Even with these first regression models, we still are not answering the question regarding whether or not the performance group the cooperative falls into has a significant impact in the data. There were two options for implementing this performance group dimension. The first is simply to run the regressions limiting the sample to those cooperatives that are top performers and again limiting to those cooperatives that are bottom performers. The benefit of this method is a clear distinction between the two groups; however, this method does not account for the interaction between the two variables in the model and the small sample size in the bottom performers could lead to problems. A second method is to create a new variable for performance group (P1) and use it as a slope and intercept shifter in the model. Variable P1 is a dummy variable in which “1” signifies the observation is a top performer and “0” signifies the observation is not a top performer. The reason we chose to define the results as either top performer or not top performer is due to the small number of bottom performer variables.

In order to measure the effect of the performance group, the performance variable P1 will be added in two ways. The first, as an intercept shifter, will ascertain the effect of P1 on the intercept of the function. In order to find the effect of the performance group variable on the intercept of the function, the dummy variable was added as an independent variable to each “sales” model. Any change in the intercept beta coefficient of the function given this new variable is an indicator of the impact of performance group on the intercept.

As a slope shifter, P1 was used to determine the impact of performance group on the slope of the model. This was accomplished by adding a new variable to the model that measures the impact of the performance group in each independent variable. In this instance the dummy variable is multiplied by the independent variable in question, and this new variable is added to the model. By having the independent variable for the sample as a whole and the independent variable for the top performer sample, we can ascertain the impact of the performance group on the slope of the model by looking at changes in the beta coefficient related to the variable. The new variable pgQn is simply $Q_n * P1$, where n is the variable number.

6.3.1 The Basic Model

In the basic model three independent variables could be compared to the top performer subgroups of those variables. The three variables are cost of goods sold, cash patronage distribution and the number of total rivals the cooperative competes with closely. Table 16 contains the results of the regression run on this model with the performance group taken into account.

Table 16: Basic Model Regression of Sales Given Performance Group Variables

Variable	Beta Coefficient	Standard Error	T-ratio	P-value	
<i>Dependent Variable:</i> <i>Q9: Sales</i>					R ² : .9802
Q10: COGS	1.1508	.1194	9.636***	.000	DF: 24
Q12: Cash Patronage Distribution	2.1075	.9706	2.171***	.040	DW: 1.8718
Q19b: Total Rivals	52101	170100	.3063	.762	AIC: 29.576
pgQ10: COGS Top Performers	-.11041	.1289	-.8564	.400	SC: 29.942
pgQ12: Cash Patronage Distribution Top Performers	-.58736	1.011	-.5807	.567	
pgQ19b: Total Rivals Top Performers	-16110	230400	-.06992	.945	
P1: Top Performer Dummy	2541000	1745000	1.457*	.158	
Intercept	295070	1311000	-.2251	.824	
t-test: * 10% significance **5% significance ***1% significance COGS: Cost of Goods Sold DF: Dickey Fuller Statistic DW: Durbin Watson Statistic AIC: Akaike Information Criterion SC: Schwarz Criterion					

In this model the variables for cost of goods sold, cash patronage distribution and the performance group dummy variable significantly explain the data at least at the 10% significance level. The model as a whole has a high R², and moderately low AIC and SC signifying a good fit to the data. The Durbin Watson Statistic is close to two; therefore, it is not likely that the data exhibits autocorrelation. The dummy variable for performance group has a significant t value, so being a top performing cooperative appears to have some impact on sales. However, the independent variables for COGS and cash patronage

distribution that include performance group did not appear to significantly explain the data. Therefore, joint hypothesis tests were run to determine whether the collective impact of the performance group could make a difference on the final result. The collective hypotheses were:

$$H_0: pg10 = pg12 = pg19b = p1 = 0$$

$$H_1: pg10 \neq pg12 \neq pg19b \neq p1 \neq 0$$

The f statistic calculated was 1.0411, which is less than the critical value of 4.22 at the 1% significance level. Therefore we fail to reject the null hypothesis that the variables that include performance group dummy variable are equal to zero. In addition the Wald Chi-Squared Statistic of 4.1647 is less than the critical value of 13.28 at 4 degrees of freedom and 1% significance level. Therefore we again fail to reject the null. In the basic model, performance group does not have a significant impact on sales.

6.3.2 The Competition Model

In the competition model the first path regression that significantly explains the data is the “sales” pathway, just as in the basic model. The additional variables of $pg10=p1*q10$ and $pg24c=p1*q24c$ as well as the dummy variable $p1$ are added to the regression. The results are reported in Table17 below.

The addition of variables accounting for the performance dummy variable results in the government policies’ impact on competitiveness among top performers being able to explain the data with 99% confidence. This is in addition to the cost of goods sold and top performer dummy variables, which are also significant. The R^2 is high and the AIC

and SC are sufficiently low, so the model as a whole has a good fit. Durbin Watson is close to two, so there is no indication of autocorrelation.

Table 17: The Competition Model Regression Results with Top Performer Variable Considered

Variable	Beta Coefficient	Standard Error	T-ratio	P-value	
<i>Dependent Variable:</i> <i>Q9: Sales</i>					R ² : .9757
Q10: COGS	1.1698	.1271	9.205***	.000	DF: 26
Q24c: Government Policies' Impact on Competitiveness	1518600	2642000	-.5749	.570	DW: 1.8071
pgQ10: COGS Top Performers	-.049005	.1349	-.3633	.719	AIC: 29.658
pgQ24c: Government Policies' Impact on Competitiveness Top Performers	15388000	3811000	4.038***	.000	SC: 29.933
P1: Top Performer Dummy	2369300	1273000	1.861**	.074	
Intercept	485990	882300	.5508	.586	
t-test: * 10% significance **5% significance ***1% significance COGS: Cost of Goods Sold DF: Dickey Fuller Statistic DW: Durbin Watson Statistic AIC: Akaike Information Criterion SC: Schwarz Criterion					

Although there appears to be evidence that performance group has a significant impact on the model, a joint hypothesis test was run to discover whether the collective impact of the performance group on all of the independent variables of the model is significant. The null and alternative hypotheses are:

$$H_0: pg10 = pg24c = p1 = 0$$

$$H_1: pg10 \neq pg24c \neq p1 \neq 0$$

In analyzing the results of the joint hypothesis test, the f statistic of 8.338535 is greater than the critical value of 4.64 at the 1% significance level. Therefore, the null hypothesis is rejected. Furthermore, the Wald Chi-Squared Statistic is 25.0156, which is greater than the critical value of 11.345 at 3 degrees of freedom and 1% significance. Therefore, we reject the null hypothesis. Therefore we can conclude that performance group has a significant impact in this model including competition variables.

6.3.3 The Equity Model

The equity model is a further analysis of the sales pathway, with variables for cost of goods sold, total rivals and whether or not the cooperative is a regional. The final variable for regional is a block variable to block a back door path into the dependent variable “sales”. The results for this analysis are presented in Table 18 below.

Table 18: The Equity Model Regression Results with Top Performer Variable Considered

Variable	Beta Coefficient	Standard Error	T-ratio	P-value	
<i>Dependent Variable:</i> <i>Q9: Sales</i>					R ² : .9678
Q10: COGS	1.1514	.1524	7.556***	.000	DF: 24
Q1: Regional Cooperative	1685500	1944000	.8670	.395	DW: 2.4294
Q19b: Total Rivals	64599	220500	.2929	.772	AIC: 30.063
pgQ10: COGS Top Performers	-.088024	.1651	-.5333	.599	SC: 30.430
pgQ1: Regional Top Performers	5976800	3068000	1.948**	.063	
pgQ19b: Total Rivals Top Performers	-124860	304300	-.4103	.685	
P1: Top Performer Dummy	2845300	2274000	1.251	.223	
Intercept	-177400	1728000	-.1027	.919	
t-test: * 10% significance **5% significance ***1% significance COGS: Cost of Goods Sold DF: Dickey Fuller Statistic DW: Durbin Watson Statistic AIC: Akaike Information Criterion SC: Schwarz Criterion					

Other than the cost of goods sold base variable, only the regional cooperatives in the top performing group had a significant individual impact at the 5% level for the new variables. The model has a good fit as shown by the high R² and reasonably low AIC and SC. The Durbin Watson statistic is close to two, so the data does not appear to exhibit autocorrelation. However, no decided proof is provided for the argument that performance group significantly impacts this model. Therefore, a joint hypothesis test

was run for the performance group variables of the model. The null and alternative hypotheses are as follows:

$$H_0: pg10 = pg1 = pg19b = p1 = 0$$

$$H_1: pg10 \neq pg1 \neq pg19b \neq p1 \neq 0$$

Given these hypotheses, the f statistic for the joint test is 2.313 which is less than the critical value of 4.22 at the 1% significance level. The Wald Chi-Squared Statistic is 9.252, which is less than the critical value of 13.227 at 4 degrees of freedom and 1% significance. Based on these two statistics, we fail to reject the null hypothesis as stated above and there is no significant difference obtained by the addition of the performance group to the analysis.

6.3.4 The Loyalty Model

The loyalty model is the most complex model of this group. The variables added to the regression include the performance group variables for the cost of goods sold, cash patronage distribution, number of business activities, the percent of time the manager spends on his greatest challenge, and whether or not the cooperative has no formal equity redemption policy. In addition two block variables were added for the top performance group, the top performers' belief of the impact of loyalty on competitiveness and the top performer's belief of the impact of customer service on loyalty. The results of this analysis are reported in Table 19 below.

Table 19: The Loyalty Model Regression Results with Top Performer Variable Considered

Variable	Beta Coefficient	Standard Error	T-ratio	P-value	
<i>Dependent Variable:</i> <i>Q9: Sales</i>					R ² : .9952
Q10: COGS	1.146	.1182	9.710***	.000	DF: 16
Q12: Cash Patronage Distribution	2.2016	.8703	2.530**	.022	DW: 2.5693
Q18b: Number of Business Activities	96693	331900	.2913	.775	AIC: 28.664
Q20b: Percent of Time Manager Spends on Greatest Challenge	-29512	1188000	-.02484	.980	SC: 29.397
Q21l: No Formal Equity Redemption Plan	228170	991300	.2302	.821	
Q24l: Loyalty's Impact on Competitiveness	129540	993800	.1304	.898	
Q28l: Customer Service's Impact on Loyalty	-78620	547700	-.1435	.888	
pgQ10: COGS Top Performers	-.17030	.1242	-1.372*	.189	
pgQ12: Cash Patronage Distribution Top Performers	-.76596	.8932	-.8575	.404	
pgQ18b: Number of Business Activities Top Performers	-393260	599800	-.6557	.521	
pgQ20b: Percent of Time Top Performer Manager Spends on Greatest Challenge	-2156700	1736000	-1.242	.232	
pgQ21l: No Formal Equity Plan Top Performers	-5434000	1520000	-3.576***	.003	
pgQ24l: Loyalty's Impact on Competitiveness for Top Performers	-4237100	1342000	-3.158***	.006	
pgQ28l: Customer Service's Impact on Loyalty for Top Performers	-1492200	825100	-1.808**	.089	
P1: Top Performer Dummy	15408000	3657000	4.213***	.001	
Intercept	-114440	2203000	-.05194	.959	
t-test: * 10% significance **5% significance ***1% significance COGS: Cost of Goods Sold DF: Dickey Fuller Statistic DW: Durbin Watson Statistic AIC: Akaike Information Criterion SC: Schwarz Criterion					

The variables for the top performer dummy, the two block variables, the cost of goods sold for top performers and the impact of top performers having no formal equity plan are all significant in this model. The R^2 is high and the AIC and SC are sufficiently low to signify that this model fits the data well. Durbin Watson is close to two; therefore, the model does not appear to exhibit autocorrelation. We can conclude that individually the top performer variables explain the data reasonably well. What we don't know is whether the total effect of these variables is significant. To this end a joint hypothesis test on the data will be performed with null and alternative hypotheses as follows:

$$H_0: pg10 = pg12 = pg18b = pg20b = pg21l = pg24l = pg28l = p1 = 0$$

$$H_1: pg10 \neq pg12 \neq pg18b \neq pg20b \neq pg21l \neq pg24l \neq pg28l \neq p1 \neq 0$$

The result of the joint hypothesis test is an f value of 5.32789 which is greater than the critical f value of 3.89 at the 1% significance level. The Wald Chi-Squared Statistic is 42.623, which is greater than the critical value of 20.090 with 8 degrees of freedom and 1% significance. Therefore we reject the null hypothesis and in the loyalty model the addition of performance group variables will have a significant impact.

6.4 Summary

In summary, the performance group shifts the intercept significantly in the sales models that contain intervention variables for loyalty and competition, as well as in the basic model. The performance group is a slope shifter on one or more variables in loyalty, equity and competition models. No proof was exhibited that the collected impact of performance group is significant in the equity model. However, in the loyalty and competition models there is proof that P1 has a significant impact on the model.

CHAPTER VII

SUMMARY AND CONCLUSIONS

In summarizing this study, one must first begin with the current business environment. Cooperatives are in a very different world than could have been imagined as they were forming in the mid-1900s. Other studies have pointed to challenges cooperatives face including changing member demographics, competition, obtaining and managing equity, global marketing and others. Although these studies isolated and analyzed particular categories of these problems, few analyzed the problem with non-financial factors taken into account. To summarize the results of this study we will first revisit the objectives of the study, followed by a discussion of the hypotheses presented in the procedures section.

7.1 Summary of Objectives

The objective of this study is to identify those perceptions and practices that separate successful, growing cooperative agribusinesses from stagnant ones. In beginning with the statistical summary we have shown that a difference does exist between the two groups. Generally, successful cooperatives are larger and more specialized. They are in a strong financial position that opens many possibilities for future expansion should they choose to pursue it. The perceptions of the managers of these cooperatives appear to exhibit confidence in the abilities of the cooperative employees, leadership and in the members themselves.

In contrast, bottom performers are not in a strong financial position and they appear to be unable to move forward due to financial and other limitations of the business. The perceptions of cooperative managers appear to place more emphasis on external factors such as government policies and number of competitors.

When compared, there are three areas in which these two performance groups appear to differ. The first is the financial and operational form of the business, in which there is a stark difference between the top and bottom groups. This difference is expected due to the fact that they were separated based on financial ratios. The second is competition. The bottom performers appear face a more competitive situation than the top performers. The third is about the loyalty of the members. Top performers appear to be more concerned about loyalty than the bottom performers. In fact, one might even say that top performing firms place a strategic focus on internal issues while bottom performers concentrate on issues outside of the firm's control. However, the reasons behind these observations require further analysis.

The directed graphs provide useful information about causal relationships of performance factors and how management perceptions impact the business. The basic DAG provides a foundation for the remainder of the analysis. It was shown to be robust as evidenced by a common skeletal structure present in each model. The competition acyclic graph has some incongruities when the new variables are added; however, we know that they do have a causal influence on the basic DAG. It appears that government policies and cooperative leadership has the greatest impact on the competitive situation of the firm.

The equity DAG does not exhibit a great change from the basic DAG, except that being a regional cooperative appears to create a new connection and changes the paths of the model. The federated cooperative's members are businesses rather than individuals, which may be causing equity to have a stronger causal influence in the DAG. Similarly, the strategic planning DAG does not appear to change greatly from the basic DAG. The strategic planning variables intervene at the number of locations, causing a new sink. This new sink is caused by other strategic planning variables as well, which leads to a consideration of whether the physical size of a cooperative makes strategic planning more necessary.

The final DAG is related to loyalty in the cooperative. This presents the most complex set of relationships in the study. Loyalty variables only results in five sinks: age of oldest stock, how critical it is to improve member service, the number of active members, sales and membership size increase. The number of business activities, which was previously a sink variable, becomes a root cause in the context of loyalty. It is interesting that this variable is a Markovian parent of all sink variables except the age of the oldest stock. Other authors have shown that memberships are becoming heterogeneous and this is resulting in cooperatives being asked to meet a diverse number of needs. The number of business activities the cooperative is involved in becoming a root cause in the context of loyalty could be reflective of this relationship.

Another interesting change from the other DAGs is that the percent of time the manager spends on his/her greatest challenge is a root cause of every sink in the diagram. Time management has been presented at numerous board and manager training

seminars. This diagram shows a direct causal relationship between the management's ability to effectively allocate time and the other loyalty variables of the business.

Another variable that previously had no connection to the graph is whether or not the cooperative has a formal equity redemption policy. Although equity redemption was not shown to be significant on its own, when connected through the loyalty variables it becomes a root cause.

The final and perhaps most powerful conclusion is that the human factors (board expertise, community involvement, general manager expertise, employee expertise) are at the beginning of the causal chain for every sink variable. This leads to the conclusion that the manager's perception is that loyalty begins with the people in cooperatives rather than with the price. Whether or not this is an accurate representation of membership's perceptions is still unknown.

Directed graphs provided a basis for further econometric analysis. DAG roots and sinks provided structural equations for simple regressions. The only models that yielded some interesting results were those models in which the dependent (sink) variable was sales. In addition, slope and intercept shifters were added to evaluate the statistical difference of performance groups. Intercept and slope shifters were jointly significant for each of the loyalty and competition models. This result is in agreement with what had suggested by the statistical summary and the DAGs.

7.2 Hypotheses Revisited

At this point, the hypotheses made in Chapter III can be discussed and some conclusions made as to whether or not they should be rejected. The first hypothesis is:
H₁: Cooperatives that actively participate in strategic planning will experience greater financial performance.

Although strategic planning appears to have some impact on the business, there is no evidence that strategic planning will cause the cooperative to be in the top performance group. Both the top and bottom cooperatives participate in strategic planning, and there appears to be no measurable difference in the perceptions of top performer management and bottom performer management relating to strategic performance. For the purposes of this study we reject this hypothesis; however, we recognize that cooperatives that have recently begun participating in strategic planning may not see the fruits of their work until years into the future. Therefore, this hypothesis is outside of the scope of this study in the short term.

H₂: Cooperatives with a greater understanding of their equity position will experience greater financial performance.

There is a significant difference in the number of companies that have formal equity redemption policies between the top and bottom performers, but there is little difference in the perceptions of management relating to their equity redemption policy. In this sample, the directed graph for equity redemption changes very little. In the regression analysis, the intercept and slope shifters were not significantly different from

zero. Therefore, understanding of the equity position is rejected as a driver of greater financial performance.

H₃: Cooperative performance will be negatively impacted by competition.

There is a definite difference in the competitive situation of the top performers and the bottom performers. Furthermore the basic firm model is significantly impacted by competitive variables. In the regression analysis, the slope and intercept shifters are able to significantly explain the data. Therefore, we fail to reject this hypothesis. This conclusion agrees with the literature as well.

H₄: Cooperatives that value member loyalty will experience greater financial performance.

Member loyalty and the perceptions of management relating to member loyalty appear to be of slightly more concern to top performers. However, in the DAG and regression analysis it is not the perceptions of management as much as the membership structure and operational structure of the firm that form significant impacts on the basic model. Furthermore, the top performer intercept and slope shifters significantly explain the loyalty regression, which causes an interesting conclusion. As stated in H₄, we reject the hypothesis. However, this study suggests that the causal relationship we hypothesized might be reversed. We could create a new hypothesis positing that greater financial performance significantly impacts member loyalty and its importance in the business.

7.3 Limitations of the Study and Future Research

This study is justified in that it provides the first step in what could be a series of studies relating to loyalty, competition, equity, strategic planning and others. However, the sample size obtained for this study limits what can be done with the data due to degrees of freedom restrictions. A more complete picture of performance could be obtained by repeating the survey for multiple years to get not only a range of financial information but also to track how perceptions change over time and its correlation to financial data.

Although effort was made to include all relevant variables it is possible that other variables exist that could impact the performance of these cooperatives; therefore, future studies should always be open to the inclusion of other potential variables. Furthermore, the number of bottom performers makes the comparison between successful and stagnant cooperative more difficult. If there were some way to encourage small, struggling cooperatives to include their responses in such a study it could be more precise in its analysis than what was presented here.

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